ISSN 2521-3113 (Online)
ISSN 1024-8714 (Print)

BMDC RECOGNIZED

BANGLADESH HEART JOURNAL

VOL. 37 NO. 1 JANUARY 2022

CONTENTS

Official Journal of
Bangladesh Cardiac Society

BANGLADESH HEART JOURNAL

VOL. 37, NO. 1, JANUARY 2022

Published by :
Prof. M.G. Azam
Publicity Secretary
Bangladesh Cardiac Society
Karukaj Hashim Heritage (1st Floor)
21/8, Khiljee Road, Block-B, Mohammadpur
Dhaka-1207, Bangladesh
Tel: 01799925522 (Office)
E-mail: bcs@bol-online.com
Website: www.banglacardio.org

Printed by :
Asian Colour Printing
130, DIT Extension Road
Fakirerpool, Dhaka-1000
Phone : 49357726, 58313186
E-mail: asianclr@gmail.com

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21/8, Khiljee Road, Block-B, Mohammadpur, Dhaka-1207, Bangladesh
Tel: 01799925522 (Office), E-mail: bcs@bol-online.com, Website: www.banglacardio.org

INSTRUCTION TO AUTHORS

A. Introduction

Bangladesh Heart Journal is the official journal of Bangladesh Cardiac Society, and accepts articles for publication from home and abroad. This is a biannual, peer-reviewed journal and aims to publish work of the highest quality from all sub-specialties of cardiology and cardiovascular surgery. The aim of the publication is to promote research in Bangladesh and serve as platform for dissemination of scientific information in cardiology.

B. Categories of Articles

The journal accepts original research, review articles, case reports, cardiovascular images and letters to the editor, for publication.

Original Research:

Original, in-depth research article that represents new and significant contributions to medical science. Each manuscript should be accompanied by a structured abstract of up to 250 words using the following headings: Objective, Methods, Results, and Conclusions. Three to 5 keywords to facilitate indexing should be provided in alphabetical order below the abstract. The text should be arranged in sections on INTRODUCTION, METHODS, RESULTS and DISCUSSION. The typical text length for such contributions is up to 3000 words (including title page, abstract, tables, figures, acknowledgments and key messages). Numberof references should be limited to 50.

Review Articles:

Generally review articles are by invitation only. But unsolicited reviews will be considered for publication on merit basis. Following types of articles can be submitted under this category: Newer drugs, new technologies and review of a current concept.The manuscript should not exceed 5000 words (including tables and figures). A review article should include an abstract of up to 250 words describing the need and purpose of review,methods used for locating, selecting, extracting and synthesizing data, and main conclusions. The number of references should be limited to 50.

Case Reports:

Only case reports of exceptional quality will be published in the case report format. The text should not exceed 1500 words and is arranged as introduction, case report and discussion. Include a brief abstract of about 150 words. Number of tables/figures should be limited to 3. Include up to 10 most recent references. The patient's written consent, or that of the legal guardian, to publication must be obtained.

Cardiovascular Images:

Only clinical photographs with or without accompanying skiagrams, pathological images, echocardiographic images, angiographic images etc. are considered for publication. Image should clearly identify the condition and have the classical characteristics of the clinical condition. Clinical photographs of condition which are very common, where diagnosis is obvious, or where diagnosis is not at all possible on images alone would not be considered. Photographs should be of high quality, usually 127 × 173 mm (5 × 7 in) but no larger than 203 × 254 mm (8 × 10 in). A short text of up to 250 words depicting the condition is needed. Figures should be placed exactly at a logical place in the manuscript. The submitted images should be of high resolution (>300 dpi). The following file types are acceptable: JEPG and TIFF. The number of authors should not exceed 3. The authors should ensure that images of similar nature have not been published earlier. Authors must obtain signed informed consent from the patient, or the legal guardian.

Letter to the Editor:

Letters commenting upon recent articles in Bangladesh Heart Journal are welcome.Such letters should be received within 16 weeks of the article's publication. Letters should be up to 250 words; should contain no more than 1 figure/table and upto 5 most recent references. The text need not be divided into sections. The number of authors should not exceed 3.

C. Criteria for Acceptance

All manuscripts should meet the following criteria: the material is original, study methods areappropriate, data are sound, conclusions are reasonable and supported by the data, and the information is important; the topic has general cardiology interest; and that the article is written in reasonably good English. Manuscripts which do not follow the guidelines of Bangladesh Heart Journal are likely to be sent back to authors without initiating the peer-review process. All accepted manuscripts are subject to editorial modifications to suit the language and style of Bangladesh Heart Journal and suggestions may be made to the authors by the Editorial Board to improve the scientific value of the journal.

D. Editorial Process

The Bangladesh Heart Journal commits to high ethical and scientific standards. Submitted manuscripts are considered with the understanding that they have not been published previously in print or electronic format (except

in abstract or poster form) and are not under consideration by another publication or electronic medium. Statements and opinions expressed in the articles published in the Journal are those of the authors and not necessarily of the Editor. Neither the Editor nor the Publisher guarantees, warrants, or endorses any product or service advertised in the Journal. Bangladesh Heart Journal follows the guidelines on editorial independence produced by the International Committee of Medical Journal Editors (ICMJE). All manuscripts correctly submitted to the Bangladesh Heart Journal are first reviewed by the Editors. Manuscripts are evaluated according to their scientific merit, originality, validity of the material presented and readability. Some manuscripts are returned back to the authors at this stage if the paper is deemed inappropriate for publication in the Bangladesh Heart Journal, if the paper does not meet the submission requirements, or if the paper is not deemed to have a sufficiently high priority. All papers considered suitable by the Editors for progress further in the review process, undergo peer review by at least two reviewers. If there is any gross discrepancy between the comments of two reviewers, it is sent to a third reviewer. Peer reviewers' identities are kept confidential; authors' identities are also not disclosed to the reviewers. Accepted articles are edited, without altering the meaning, to improve clarity and understanding. Decision about provisional or final acceptance is communicated within 8 weeks.

E. Cover Letter

The cover letter should outline the importance and uniqueness of the work. It should include the signed declaration from all authors on:

1. Category of manuscript (original research, review article, case report, cardiovascular image, letter to the Editor)
2. Statement that the material has not been previously published or submitted elsewhere for publication (this restriction does not apply to abstracts published in connection with scientific meetings.)
3. Transfer of copyright to the Bangladesh Heart Journal upon the acceptance of the manuscript for publication
4. All authors have reviewed the article and agree with its contents
5. Information of any conflicts of interest (of any) of the authors.
6. Sources of research support, if any, including funding, equipment, and drugs.

The cover letter should also include the mailing address, telephone and fax numbers, and e-mail address of the corresponding author.

F. Manuscript Preparation

The manuscripts should comply with the prescribed guidelines. It should be well organized and written in simple and correct English under appropriate headings. The abbreviations and acronyms should be spelled out when they occur first time.

The Introduction should address the subject of the paper. The Methods section should describe in adequate detail the laboratory or study methods followed and state the statistical procedures employed in the research. This section should also identify the ethical guidelines followed by the investigators with regard to the population, patient samples or animal specimens used. A statement should be made, where applicable, that their study conforms to widely accepted ethical principles guiding human research (such as the Declaration of Helsinki) AND also that their study has been approved by a local ethics committee.The Results section should be concise and include pertinent findings and necessary tables and figures.The Discussion should contain conclusions based on the major findings of the study, a review of the relevant literature, clinical application of the conclusions and future research implications. Following the Discussion, Acknowledgements of important contributors and funding agencies may be given.

a. Title page information

- Title. Concise and informative. Titles are often used in information-retrieval systems. Avoid abbreviations where possible.
- Author names and affiliations. Please clearly indicate the given name(s) and family name(s) of each author and check that all names are accurately spelled. Present the authors' affiliation addresses (where the actual work was done) below the names. Indicate all affiliations with a lower case superscript letter immediately after the author's name and in front of the appropriate address. Provide the e-mail address of each author.
- Corresponding author. Clearly indicate who will handle correspondence at all stages of refereeing and publication, also post-publication. Ensure that the e-mail address is given and that contact details are kept up to date by the corresponding author.

b. Abstract

A concise and factual abstract is required. The abstract should state briefly the purpose of the research, the principal results and major conclusions. An abstract is often presented separately from the article, so it must be able to stand alone. References should be avoided. Also, non-standard or uncommon abbreviations should be

avoided, but if essential they must be defined at their first mention in the abstract itself.

c. Keywords

Immediately after the abstract, provide a maximum of 5 keywords. Keywords should be the listed terms in the Medical Subject's Headings (MeSH) of the National Library of Medicine (NLM), available at https://www.nlm.nih.gov/mesh.

d. Abbreviations

Define abbreviations that are not standard in this field in a footnote to be placed on the first page of the article. Such abbreviations that are unavoidable in the abstract must be defined at their first mention there, as well as in the footnote. Ensure consistency of abbreviations throughout the article.

e. Acknowledgements

Collate acknowledgements in a separate section at the end of the article before the references. List here those individuals who provided help during the research (e.g., providing language help, writing assistance or proof reading the article, etc.).

f. Units

Follow internationally accepted rules and conventions: use the international system of units (SI). If other units are mentioned, please give their equivalent in SI. Generic rather than trade names of drugs should be used.

g. Figures and graphics

- For graphics, a digital picture of 300 dpi or higher resolution in JPEG or TIFF format should be submitted.
- Figures should be numbered consecutively according to the order in which they have been first cited in the text, if there is more than 1 figure. Each figure should be cited in the text.
- Each figure/illustration should be provided with a suitable legend that includes enough information to permit its interpretation without reference to the text.
- All photomicrographs should indicate the magnification of the prints.
- When symbols, arrows, numbers or letters are used to identify parts of the illustrations, each one should be explained clearly in the legend.

h. Tables

Tables should be placed next to the relevant text in the article.

- Number tables consecutively in accordance with their appearance in the text. Each table should be cited in the text in Arabic numerals.
- Titles should be brief and a short or abbreviated heading for each column should be given.
- Explanatory matter should be placed in footnotes and not in the heading.
- Abbreviations in each table should be explained in footnotes.
- The data presented in a table should not be repeated in the text or figure.

i. References

References should follow the standards summarized in the NLM's International Committee of Medical Journal Editors (ICMJE) Recommendations for the Conduct, Reporting, Editing and Publication of Scholarly Work in Medical Journals (ICMJE recommendations), available at: http://www.icmje.org/recommendations/. The titles of journals should be abbreviated according to the style used for MEDLINE (www.ncbi.nlm.nih.gov/nlmcatalog/journals). Journals that are not indexed should be written in full.

- References should be numbered consecutively in the order in which they are first mentioned in the text.
- References in text, tables and legends should be identified by superscript Arabic numerals at the end of the sentence outside any punctuation. If several different studies or papers are cited within one sentence, the number should be placed where it will accurately identify the correct study.
- The names of authors in the text should concur with the reference list.
- References cited only in tables or in legends to figures should be numbered in accordance with a sequence established by the first identification in the text of the particular table or illustration.
- Abstracts as references may be used; "unpublished observations" and "personal communications" may not be used as references, although references to written, not oral, communications may be inserted (in parentheses) in the text.
- Papers accepted but not yet published may be included as references by adding "In press" after the journal name. Information from manuscripts submitted but not yet accepted should be cited in the text as "unpublished observations" (in parentheses).
- In general: All authors/editors should be listed unless the number exceeds six, when you should give six followed by "et al."

Examples of correct forms of references are given below:

Articles in Journals (see also *Journal article on the Internet*)

1. *Standard journal article*

List the first six authors followed by et al.

Halpern SD, Ubel PA, Caplan AL. Solid-organ transplantation in HIV-infected patients. N Engl J Med. 2002 Jul 25;347(4):284-7.

More than six authors:

Rose ME, Huerbin MB, Melick J, Marion DW, Palmer AM, Schiding JK, et al. Regulation of interstitial excitatory amino acid concentrations after cortical contusion injury. Brain Res. 2002;935(1-2):40-6.

2. *Organization as author*

Diabetes Prevention Program Research Group. Hypertension, insulin, and proinsulin in participants with impaired glucose tolerance.Hypertension. 2002;40(5): 679-86.

3. *Both personal authors and organization as author* (List all as they appear in the byline.)

Vallancien G, Emberton M, Harving N, van Moorselaar RJ; Alf-One Study Group. Sexual dysfunction in 1,274 European men suffering from lower urinary tract symptoms. J Urol. 2003;169(6):2257-61.

4. *Volume with supplement*

Geraud G, Spierings EL, Keywood C. Tolerability and safety of frovatriptan with short- and long-term use for treatment of migraine and in comparison with sumatriptan. Headache. 2002;42Suppl 2:S93-9.

5. *Issue with supplement*

Glauser TA. Integrating clinical trial data into clinical practice.Neurology. 2002;58(12 Suppl 7):S6-12.

6. *Type of article indicated as needed*

Tor M, Turker H. International approaches to the prescription of long-term oxygen therapy [letter]. Eur Respir J. 2002;20(1):242.

Lofwall MR, Strain EC, Brooner RK, Kindbom KA, Bigelow GE. Characteristics of older methadone maintenance (MM) patients [abstract]. Drug Alcohol Depend. 2002;66Suppl 1:S105.

7. *Article published electronically ahead of the print version*

Yu WM, Hawley TS, Hawley RG, Qu CK. Immortalization of yolk sac-derived precursor cells. Blood. 2002 Nov 15;100(10):3828-31. Epub 2002 Jul 5.

Books and Other Monographs

1. *Personal author(s)*

Murray PR, Rosenthal KS, Kobayashi GS, Pfaller MA. Medical microbiology. 4th ed. St. Louis: Mosby; 2002.

2. *Editor(s), compiler(s) as author*

Gilstrap LC 3rd, Cunningham FG, VanDorsten JP, editors.Operative obstetrics. 2nd ed. New York: McGraw-Hill; 2002.

3. *Organization(s) as author*

Advanced Life Support Group. Acute medical emergencies: the practical approach. London: BMJ Books; 2001. 454 p.

4. *Chapter in a book*

Meltzer PS, Kallioniemi A, Trent JM. Chromosome alterations in human solid tumors. In: Vogelstein B, Kinzler KW, editors. The genetic basis of human cancer. New York: McGraw-Hill; 2002. p. 93-113.

5. *Conference proceedings*

Harnden P, Joffe JK, Jones WG, editors.Germ cell tumours V. Proceedings of the 5th Germ Cell Tumour Conference; 2001 Sep 13-15; Leeds, UK. New York: Springer; 2002.

6. *Dissertation or thesis*

Borkowski MM. Infant sleep and feeding: a telephone survey of Hispanic Americans [dissertation]. Mount Pleasant (MI): Central Michigan University; 2002.

Other Published Material

Newspaper article

Tynan T. Medical improvements lower homicide rate: study sees drop in assault rate. The Washington Post. 2002 Aug 12;Sect. A:2 (col. 4).

Unpublished Material

In press or Forthcoming

Tian D, Araki H, Stahl E, Bergelson J, Kreitman M. Signature of balancing selection in Arabidopsis. ProcNatlAcadSci U S A. Forthcoming 2002.

Electronic Material

1. *Journal article on the Internet*

Abood S. Quality improvement initiative in nursing homes: the ANA acts in an advisory role. Am J Nurs. 2002 Jun [cited 2002 Aug 12];102(6):[about 1 p.]. Available from: http://www.nursingworld.org/AJN/2002/june/Wawatch.htmArticle

Article published electronically ahead of the print version:

Yu WM, Hawley TS, Hawley RG, Qu CK. Immortalization of yolk sac-derived precursor cells.Blood. 2002 Nov 15;100(10):3828-31. Epub 2002 Jul 5.

Article with document number in place of traditional pagination:

Williams JS, Brown SM, Conlin PR. Videos in clinical medicine.Blood-pressure measurement. N Engl J Med. 2009 Jan 29;360(5):e6. PubMed PMID: 19179309.

Article with a Digital Object Identifier (DOI):

Zhang M, Holman CD, Price SD, Sanfilippo FM, Preen DB, Bulsara MK. Comorbidity and repeat admission to hospital for adverse drug reactions in older adults: retrospective cohort study. BMJ. 2009 Jan 7;338:a2752. doi: 10.1136/bmj.a2752. PubMed PMID: 19129307; PubMed Central PMCID: PMC2615549.

2. *Monograph on the Internet*

Foley KM, Gelband H, editors. Improving palliative care for cancer [Internet]. Washington: National Academy Press; 2001 [cited 2002 Jul 9]. Available from: http://www.nap.edu/books/0309074029/html/.

3. *Homepage/Web site*

Cancer-Pain.org [Internet]. New York: Association of Cancer Online Resources, Inc.; c2000-01 [updated 2002 May 16; cited 2002 Jul 9]. Available from: http://www.cancer-pain.org/.

G. Submission Preparation Checklist

As part of the submission process, authors are required to check off their submission's compliance with all of the following items, and submissions may be returned to authors that do not adhere to these guidelines.

1. The submission has not been previously published elsewhere, is original and has been written by the stated authors.
2. The article is not currently being considered for publication by any other journal and will not be submitted for such review while under review by the Bangladesh Heart Journal.
3. The submission file is in Microsoft Word file format, and the figures are in JEPG or TIFF format.
4. The text is single-spaced; uses a 12-point font; employs italics, rather than underlining (except with URL addresses); and all illustrations, figures, and tables are placed within the text at the appropriate points, rather than at the end.
5. The text adheres to the stylistic and bibliographic requirements outlined in the Instruction to Authors. Make sure that the references have been written according to the ICMJE Recommendations Style.
6. Spell and grammar checks have been performed.
7. All authors have read the manuscript and agree to publish it.

H. Submission

Papers should be submitted to the Editor. Three copies of manuscript should be submitted duly signed by all authors with a copy of CD, to:

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Bangladesh.

Papers can also be submitted via the email using the following address:

Email: bangladeshheartj@yahoo.com

Original Article

The Outcome of LM PCI: A Single Center Experience of First 50 Cases without In-site IVUS Facility

MG Azam[1], Md. Shafiqul Islam[1], Shekhar Kumar Mondal[1], Nobiul Islam[1], Mizanur Rahman[1], Abdullah Al Matin[1], Dr Nishat Ahmed[1], Md. Minhaj Arefin[1]

Abstract:

Introduction: Left main disease (LMD) is related to significant morbidity and mortality. This study was done to evaluate the clinical major adverse cardiovascular event (MACE), including unstable angina, myocardial infarction, heart failure, target vessel revascularization, stroke and death in patients undergoing left main stem stenting without availability of in-site intravascular imaging (IVUS).

Methods & Materials: It was a prospective observational study done in National Institute of Cardiovascular Diseases & Hospital (NICVD) from March 2014 to June 2019. Our study included 50 patients who underwent Percutaneous Coronary Intervention for left main disease without use of IVUS. All the patients were followed up for 1 year & 2 years, one patient was lost to follow-up. Outcomes included in MACE were death, myocardial infarction, unstable angina, heart failure, stroke and target vessel revascularization (TVR).

Results: Fifty patients (mean age 58.4 ± 4.1 years, 44 male, 06 female) were treated with a mean SYNTAX score of 24.8 ± 2.6. Thirty two (64%) patients had stable angina, 17 (34%) had unstable angina/non ST-elevation myocardial infarction, and 1 (02%) had ST-elevation Myocardial infarction. Among the risk factors, 21(42%) had DM, 33 (66%) were hypertensive, 22 (44%) were smoker, 19 (38%) had dyslipidemia, 09 (18%) had previous h/o MI, 11 (22%) had family h/o CAD & 01 (02%) had previous h/o CVD. Pre-procedural LVEF was 49.92± 6.60 % and post procedural 54.84 ± 4.55% which showed significant improvement of LVEF after PCI (p=0.003). Most of the patients presented with LM with SVD (82%). Among all patients, 39 (78%) underwent complete revascularization in compare to 11 (22%) had incomplete revascularization. Thirty eight (76%) patients received a single-stent DES and 12 (24%) received two-stents DES. Among double stent strategy, majority underwent TAP (50%). All access was femoral & No reflow phenomena were found in any of the patients during the procedure. No perioperative mortalities were noted and no urgent coronary bypass graft surgery was required. One patient was lost to follow-up. After 1-year follow-up period, 1 (02%) patients had non-fatal myocardial infarction, 7 (14%) had episodes of unstable angina (UA) and 3 (06%) had heart failure (HF). After 2-years there was no new MI but 09 (18%) had UA & 4 (08%) patients had HF episode in total. TLR was 2 (04%) in first year and 3 (06%) in 2nd year. Total mortality was 1(02%) in first year & 3(06%) in 2nd year. The multivariable analysis showed a good prognosis in patients receiving LM PCI with a total event rate of 28% & mortality 6%. A multivariate regression analysis with risk factors for coronary artery disease as predictive variables showed that high SYNTAX score (p = 0.013), incomplete revascularization (p=0.002) & low post procedural LVEF (p= 0.001) was an independent predictor of MACE.

Conclusion: Percutaneous coronary intervention of left main coronary disease without use of IVUS showed good prognosis after 1-year & 2-years follow-up. It would not only save a procedure time for physicians but also prevent a financial burden on patients if they cannot afford intravascular imaging.

Key Words: *Left Main (LM), Percutaneous Coronary Intervention (PCI), Single vessel disease (SVD), Intravascular Ultrasound (IVUS), Major Adverse Cardiac Events (MACE)*

(Bangladesh Heart Journal 2022; 37(1): 1-9)

1-Department of Cardiology, National institute of Cardiovascular Diseases & Hospital (NICVD), Dhaka, Bangladesh

Address of Correspondence: M G Azam, Professor of Cardiology, NICVD, Dhaka, Bangladesh. Phone: +8801711238696, Email: mgazam71@yahoo.com

DOI: https://doi.org/10.3329/bhj.v37i1.60098

Introduction:

The fundamental revascularization strategy (coronary artery bypass surgery [CABG] or percutaneous coronary intervention [PCI]) for patients with complex coronary artery disease is a continuing topic of debate. Patients undergoing revascularization of unprotected LMCA diseases are considered at high risk for adverse cardiovascular events. There are many large studies and meta-analyses that have compared outcomes between CABG & PCI; most have found similar intermediate and long term safety outcomes and low rate of strokes but an increased requirement for repeat revascularization with PCI in compare to CABG; a few studies have also suggested a long-term survival with CABG. This analysis describe the 5-year outcomes of the LMCA disease patients who were receive PCI or CABG randomly in the Synergy between PCI with Taxus and Cardiac Surgery (SYNTAX) trial.[1-3]

LMCAD, defined as >50% lumen narrowing, found in about 5-7% of all patients after coronary angiography.[4] CABG always confer a survival benefit and is the gold standard for patients with LM stenosis in compare to medical therapy. The first balloon angioplasty case for the Left Main disease was reported in 1979 by Gruntzig, the series of 129 patients were reported by Hartzler and O'Keefe in 1989, who received bare metal stents (BMS) for LMD that showed a 10% index hospitalization mortality and 64% after 3 years mortality.[5,6] The ULTIMA experience reported that PCI was associated with improved outcomes for the patients with acute ST-elevation myocardial infarction (STEMI) associated with LMCAD.[7]

The evolution of drug-eluting stent (DES) showed a new hope for PCI in LMCAD. DES were reported to have good durability, efficiency and significant reduction in restenosis and need for revascularization in several observational, single- and multicenter registries.[8] In the ACC/ AHA/SCAI 2004 Guideline describes PCI for LMD was put in class IIa for unstable angina Canadian Cardiovascular Society (CCS) class III/non-STEMI and class IIb indication for asymptomatic ischemia, CCS class I or II angina.

Isolated LMCA disease involving the ostium or shaft only, can be treated well with either PCI or CABG. However, distal LM bifurcation lesions or complex multivessel disease may give better outcome with CABG.[9]

Currently, in the US & ESC guidelines, PCI has a class IIa recommendation ("is reasonable") for isolated LMCAD involving the ostium or shaft and without coexisting multivessel disease and those have risk for surgical correction. PCI has a class IIb recommendation ("may be reasonable") for LMCAD involving the distal bifurcation or with less complex multivessel disease with low or intermediate SYNTAX score (d"33) and also those have an increased surgical risk. The current US & ESC guidelines recommend against PCI in patients who are good candidates for CABG including complex type multivessel disease with high SYNTAX score (≥33). [3,4]

Regardless of method of revascularization, current guidelines highlights the "heart team" approach for managing complex coronary artery disease including LMCAD. The heart team discuss the risks, benefits & outcome among medical treatment alone, PCI or CABG, considering patient's informed preference. MACE are higher in patients with incomplete revascularization in compare to complete revascularization regardless of the revascularization strategy.[10]

Intravenous ultrasound (IVUS) is an important tool for deciding the approach of revascularization as well as post procedural prognosis. According to ESC guideline[4] use of IVUS is placed under Class IIb indication in all LM PCI but its availability is not possible in every PCI center because of its cost effectiveness. Our center had no IVUS facility during study period so our study focused the outcome of LM PCI by experience operator without IVUS facility.

Methods & Materials:

This prospective observational study was performed in National Institute of Cardiovascular Diseases & Hospital (NICVD), Dhaka, Bangladesh and first 50 cases were enrolled in the study. Patients diagnosed as LMCAD at NICVD between March 2014 and June 2019 whose coronary angiography showed a greater than 50% lumen narrowing, and/or who refused for CABG, were enrolled into this study. Patients those had previous history of PCI or CABG, valvular heart disease and other significant co-morbidities, were excluded from the study.

Clinical outcomes were followed-up at 1st year and 2nd year. Outcome variables were Unstable angina, Myocardial infarction, Target lesion revascularization (TLR), Heart failure, Stroke and Death.

The angiographic data were analyzed with SYNTAX (Synergy between PCI with TAXUS™ and Cardiac Surgery) score and classified as low (0-22), intermediate (23-32), and high (≥33).[11,12] Procedural-related mortality was defined as any cases of mortality during the procedure of index LM PCI in the catheterization laboratory.

All patients were followed-up clinically. If the patients had no clinical presentation of further myocardial ischemia or staged PCI for non-LM lesions, coronary angiography was not performed. LM target vessel revascularization was defined as any revascularization procedure that is done for restenosis at the region of the previously treated lesion along with clinical evidence of myocardial ischaemia whether it involved the LM alone or the LM crossing to LAD or to LCX.

Data collection and statistical analyses:

The numerical data obtained from the study was analyzed and significance of differences were estimated by using statistical methods. The Statistical Package for Social Sciences version 20 software (SPSS Inc., Chicago, Illinois, USA) was used for data analysis. Categorical variables were expressed as percentage and frequency and continuous variables as mean and standard deviation. Continuous variables were compared through the Student's t-test and for the categorical variables the chi-square test and Fisher's Exact test were done as appropriate. Multivariate logistic regression analysis was done to identify independent effect on in hospital outcome after LM PCI. A p-value of <0.05 was considered statistically significant.

Results:

In total, 50 patients (mean age 58.4 ± 4.1 years, 44 male, 06 female) were enrolled, of whom 32 (64%) had stable angina, 17 (34%) had unstable angina/NSTEMI, and 1 (02%) had STEMI. The demographic data of all patients with risk factors and the angiographic and procedural characteristics are listed in Table I & Table II. Among the risk factors, hypertension (66%) is more prevalent followed by dyslipidemia (52%), smoking (44%), diabetes (42%), previous h/o MI (34%), family h/o coronary artery disease (11%) and h/o stroke (02%).

Table-I

Demographic data & risk factors of study patients

Variables	Total Patients N=50 (%)
Age (years) Mean ± SD	58.4±4.1
Sex	
Male	44 (88%)
Female	06 (12%)
Risk Factors	
Hypertension	33 (66%)
Diabetes	21 (42%)
Dyslipidemia	26 (52%)
Previous H/O MI	17 (34%)
Smoking	22 (44%)
H/O CVD	01 (02%)
Family H/O CAD	11 (22%)

Upon coronary angiogram of selected patients, 01 (02%) had LM ostial disease only with no LM distal involvement, 39 (78%) had LM disease with single vessel disease, 09 (18%) had LM with double vessel disease, and 01 (02%) had LM with triple vessel disease (TVD). Among them only 12% involved LM ostium or mid zone, majority (88%) lesion involved in LM distal region. After proper assessment of all patients, 39 (78%) patients underwent complete revascularization and 11 (22%) incomplete revascularization with planned stage PCI in later date. After 1 year of index LM PCI, 94% patients underwent complete revascularization and 3 (06%) patients had residual CTO (2 in RCA and 1 in LCX) which could not negotiated due to lack of rotational atherectomy in our center.(Table II)

Among the study patients pre procedural mean left ventricular EF (LVEF) was 49.92±6.60 % and post procedural LVEF 54.84±4.55% which was statistically significant (p value 0.003) [Table III].

Table-II

Clinical & angiographic characteristics of study patients

Variables	Total Patients N=50 (%)
Diagnosis on Admission	
SCAD	32 (64%)
UA/ NSTEMI	17 (34%)
STEMI	01 (02%)
LM disease subtypes	
LM only	01 (02%)
LM plus SVD	39 (78%)
LM plus DVD	09 (18%)
LM plus TVD	01 (02%)
Location of LM disease	
Ostium & Mid Zone	06 (12%)
Distal LM	44 (88%)
Pattern of Revascularization	
Incomplete Revascularization	11 (22%)
Complete Revascularization	39 (78%)

Table-III

Echocardiographic variable of study patients

Variables	LVEF Mean, SD	P Value
LVEF		
Pre procedural	49.92 ± 6.60%	0.003 [s]
Post Procedural	54.84 ± 4.55%	

The mean SYNTAX score was 24.8 ± 2.6, including 25 (50%) patients with low, 18 (36%) with intermediate, and 07 (14%) with high scores (Fig 1).

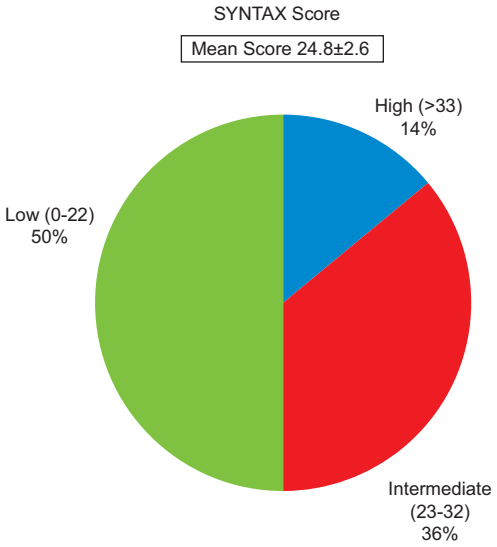

Fig.-1: *SYNTAX Score of study populations*

Thirty eight (76%) patients received a single stent strategy, including 01 (02%) cases of LM only, 34 (68%) of LM crossing over LAD, and 03 (06%) of LM crossing over LCX. Twelve (24%) patients received two-stents, including 06 (50%) with TAP, 03 (25%) with culotte stenting, and 03 (25%) with a DK Crush (Fig 2 a & b)

All patients were treated with drug eluting stent (DES). There were no cases of procedure related mortality, and no emergency CABG were required. Default route was femoral for every patient. The mean diameter of the stent from LM crossing over LAD was 3.29 ± 0.39 mm and mean length 26.1 ± 5.7 mm, for LM crossing over LCX mean stent diameter was 2.96± 0.38 mm and mean length 22.3 ± 5.8 mm (Table IV).

Table-IV
Mean Diameter & Length of Stents among study patients

Variables	Diameter Mean, SD mm	Length Mean, SD mm
Stent Characteristics		
LM crossing over LAD	3.29 ± 0.39	26.1± 5.7
LM crossing over LCX	2.96± 0.38	22.3 ± 5.8

During index hospitalization after LM PCI, four (08%) patients underwent cardiogenic shock which required continuous ionotropic support in coronary care unit. Among these 04 patients, three (06%) developed Killip class III acute heart failure which improved with diuretics. The average admission duration after index LM PCI was 3.7 ± 1.2 days. No death was recorded on index hospitalization.

Within 1 year of follow-up, one patient (02%) was lost to follow-up. 11 (22%) patients were hospitalized due to repeated cardiovascular events, including 01 (02%) case of recurrent myocardial infarction (MI), 07 (14%) of unstable angina, 03 (06%) of congestive heart failure (Table V).

Six patients underwent repeat angiogram at one year. The LM TLR rate was 04% (02 patients) at 1 year of

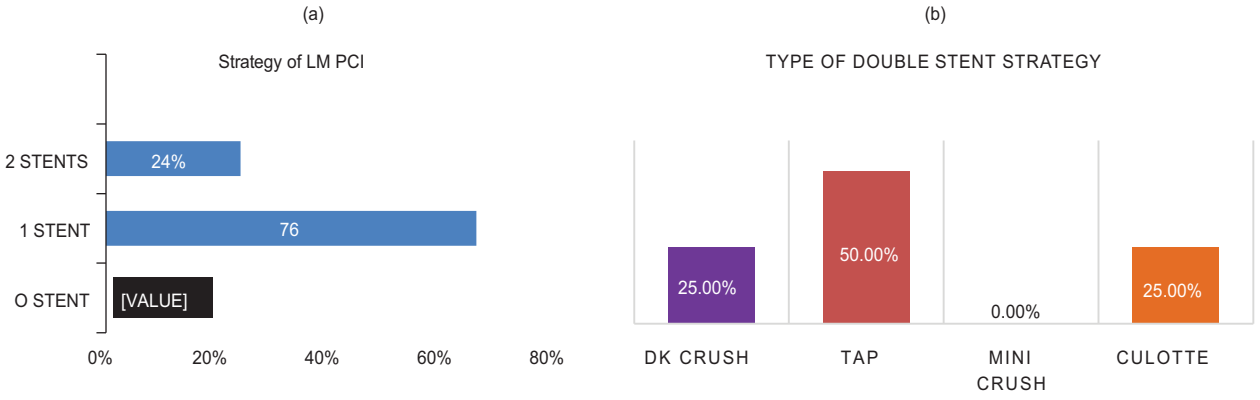

Fig.-2: *PCI variable of study population*
(a) Number of stent used during index LM PCI, (b) Strategy of double stent technique

which one patient treated with single DES and another by balloon angioplasty alone. One (02%) patient was found large LM aneurysm on repeat angiogram who died after sending for emergency surgical repair.

Within 2 years of follow-up, total 15 (30%) patients were hospitalized for cardiovascular events, amongst them 03 new cases detected on 2nd year, 02 (04%) patients with unstable angina and one (02%) with heart failure. Another 02 (04%) new death was recorded on 2nd year both due to congestive heart failure with incomplete revascularization. Total TLR rate was 06% with another one patient was treated with single DES on 2nd year. MACE were defined as cardiac mortality, acute MI, heart failure, unstable angina, stroke, and any revascularization, were 22% at 1 year and 28% at 2 years. Total death was 2% at 1 year and 6% at 2 year (Table 5).

Table-V
Outcome of study patients after One year and Two year

Variables	After 1 Year (Total)	After 2 Year (Total)
Lost To Follow up	1 (02%)	1 (02%)
Re-hospitalization (MACE)	11 (22%)	14 (28%)
MI	01 (02%)	01 (02%)
Unstable Angina	07 (14%)	09 (20%)
Heart Failure	03 (06%)	04 (08%)
LM TLR	02 (04%)	03 (06%)
Death	01 (02%)	03 (06%)

In multivariate analysis, high SYNTAX Score [odds ratio (OR) 1.654, 95% confidence interval (CI) 1.112~13.604, p < 0.05], low post procedural LVEF [odds ratio (OR) 6.553, 95% confidence interval (CI) 1.984~21.643, p < 0.05] & incomplete re-vascularized [odds ratio (OR) 3.854, 95% confidence interval (CI) 1.321~11.193, p < 0.05] patients have a relatively higher mortality rate after LM PCI along with increase re-hospitalization due to MI, Unstable Angina, Heart failure or TLR (Table VI).

Table-VI
Multivariate regression analysis among the study patients

Variables of interest	Multivariate analysis		
	OR	95% CI of OR	*p* value
Age (>50 year)	0.684	0.246-2.856	0.778 ns
Male Sex	0.378	0.286-3.775	0.478ns
Smoking	1.470	0.151-2.118	0.998ns
Diabetes mellitus	1.690	0.546-3.876	0.473ns
Hypertension	0.900	0.267-3.035	0.866 ns
Dyslipidemia	0.670	0.259-3.017	0.805ns
Family history of CAD	0.993	0.980-1.006	0.295 ns
Low post procedural EF	6.553	1.984-21.643	0.002 s
High SYNTAX score	1.654	1.122-13.604	0.013s
Incomplete Revascularization	3.854	1.321-11.193	0.002s

Table-VII
Comparison with Other studies

Study name	Year	MACE (%)	TLR (%)	Mortality (%)
Lee et al[22]	2007	32%	24.8%	9.1%
Cheng et al[23]	2007	25.6%	10.3%	11.8%
Wang et al[24]	2010	28.4%		8.1%
Pedrazzini et al[25]	2011	17.9%		7.2%
EXCEL Trial[20]	2016	23.1	12.9%	8.2%
NOBEL Trial[21]	2016	28.9	16.2%	11.6%
Stone et al[15]	2019	22%	16.9%	5.0%
This Study	2019	28%	6.0%	6.0%

Discussion:

The LM coronary artery differs from the other coronary arteries by its relatively greater elastic tissue content which can explain high restenosis rate & elastic recoil tendencies following balloon angioplasty. Ostial and mid vessel lesions (~30%) can essentially be treated like other vessels and can follow single-stent strategy. Distal left main lesions (~70%) are our main concern & can be treated as true bifurcation lesions. Restenosis rate are approximately 5% for LMCAD but higher in patient with distal LMCAD (~10%). TLR rate < 10%. Distal LMCAD shows lower success rate but higher rate of restenosis[13]. In our study majority patients also found LM distal disease (88%) followed by LM ostial or mid segment disease (12%).

To determine the strategy of revascularization (single vs double stent), IVUS shows most reliable information for both main vessel and side branch disease· IVUS is also useful for PCI optimization for distal LMCA bifurcation lesion. After stent implantation, IVUS secures proper expansion & apposition at the level of the polygon of confluence, ostial LAD & LCX and the distal LMCA.[14] But IVUS facility required some instrumental & technical support which lacks in many PCI center. In this study we demonstrate the outcome of LM PCI without availability of IVUS facility.

In total, 50 patients were enrolled, of whom 88% were male & 12% female with mean age 58.4 ± 4.1 years. Among the risk factors, hypertension (66%) is more prevalent followed by dyslipidemia (52%), smoking (44%), diabetes (42%), previous h/o MI (34%), family h/o coronary artery disease (11%) and h/o stroke (02%). Stone GW et al[15], showed the mean (±SD) age of the patients with LM disease was 66.0±9.6 years, 76.9% of were male, and predominant 29.1% had diabetes. Hussain C et al[16], reported mean age of LM patients were 54.98 years with male (70.63%) predominance. Hypertension was present in 50.8% and diabetes in 26.9% patients.

The mean SYNTAX score was 24.8 ± 2.6, including 50% patients with low, 36% with intermediate, and 14% with high scores. Cheng et al[17] showed the mean SYNTAX score of LM intervention was 34.8 ± 12.6, including 17.1% patients with low, 27.1% with intermediate, and 55.7% with high scores. Stone GW et al[15], the mean SYNTAX score was 20.3±3.4 assess in local sites and 26.6±7.5 analyzed in angiographic core laboratory and nearly 80.5% patients has distal Left main bifurcation disease.

After proper assessment of all patients, 78% patients underwent complete revascularization and 22% incomplete revascularization with planned stage PCI in later date. After 1 year of index LM PCI, 94% patients underwent complete revascularization and 06% patients had residual CTO (2 in RCA and 1 in LCX) which could not negotiated due to lack of rotational atherectomy in our center.

Among the study patients pre procedural mean left ventricular EF (LVEF) was 49.9±6.6 % and post procedural LVEF 54.8±4.5% which was statistically significant (p value <0.005). The multi-centre Left Main Coronary Artery Stenting (LE MANS) trial[18] showed at 10 years, there was a higher ejection fraction with PCI compared with CABG (54.9% ± 7.3 versus 49.8% ± 9.3; p=0.07).

Thirty eight (76%) patients received a single stent strategy, including 01 (02%) cases of LM only, 34 (68%) of LM crossing over LAD, and 03 (06%) of LM crossing over LCX. Twelve (24%) patients received two-stents, including 06 (50%) with TAP, 03 (06%) with culotte stenting and 3 (06%) with a DK Crush (Fig 2 a & b).

All patients were treated with drug eluting stent (DES). There were no cases of procedure related mortality, and no emergency CABG were required. Default route was femoral for every patient. The mean diameter of the stent from LM crossing over LAD was 3.29 ± 0.39 mm and mean length 26.1 ± 5.7 mm, for LM crossing over LCX mean stent diameter was 2.96± 0.38 mm and mean length 22.3 ± 5.8 mm (Table 4).

During index hospitalization after LM PCI, 8% patients underwent cardiogenic shock which required continuous ionotropic support in coronary care unit. Among these, 6% developed Killip class III acute heart failure which improved with diuretics. The average admission duration after index LM PCI was 3.7 ± 1.2 days. No death was recorded on index hospitalization.

Within 1 year of follow-up, 2% was lost to follow-up. 22% patients were hospitalized due to repeated cardiovascular events, including 2% case of recurrent myocardial infarction (MI), 14% of unstable angina, 6% of congestive heart failure.

12% patients underwent repeat angiogram at one year. The LM TLR rate was 4% at 1 year of which one patient treated with single DES and another by balloon angioplasty alone. 2% patient was found large LM aneurysm on repeat angiogram who died after sending for emergency surgical repair.

Within 2 years of follow-up, total 28% patients were hospitalized for cardiovascular events, amongst them 6% new cases detected on 2nd year, 4% patients with

unstable angina and 2% with heart failure. Another 4% new death was recorded on 2nd year both due to congestive heart failure with incomplete revascularization. Total TLR rate was 6% with another one patient was treated with single DES on 2nd year. The major adverse cardiac events (MACE) rate, which were defined as cardiac mortality, acute MI, heart failure, unstable angina, stroke, and any revascularization, were 22% at 1 year and 28% at 2 years. Total death was 2% at 1 year and 6% at 2 year.

Stone GW et al[15], The secondary composite outcome of death, stroke, myocardial infarction, or ischemia-driven revascularization at 5 years occurred in 31.3% of the patients in the PCI group

10-year follow-up data of the SYNTAX trial[19] showed 10-year mortality in LM PCI 29.4% in the overall cohort.

The multi-center Left Main Coronary Artery Stenting (LE MANS) trial[18] showed at 10 years, there was lower mortality (21.6%) and lower MACCE (51.1%) in LM PCI group in compare to CABG group. Re-occurrence of MI (8.7%) stroke (4.3%) and repeat revascularization rates (26.1%) are lower in LM PCI group.

In the EXCEL trial[20], the primary endpoint (all cause death, MI & stroke) occurred in 15.4% of the patients in the PCI group. The secondary endpoint (all-cause death, MI, ischemia-driver revascularization or stroke) at 30 days occurred in 4.9% patients in the PCI group & at 3 years in 23.1% patients in the PCI group. In summary, 30-day MACE was lower in PCI group, but 3-year follow-up shows similar result between PCI & CABG.

In the NOBLE trial[21], the 30-day outcomes were similar to those of the EXCEL trial, but at 5 years, estimates of MACCE were 29% for PCI among them 12% for all-cause mortality, 7% for non-procedural MI, 16% for any revascularization, and 5% for stroke.

In multivariate analysis, high SYNTAX Score [odds ratio (OR) 1.654, 95% confidence interval (CI) 1.112~13.604, $p < 0.05$], low post procedural LVEF [odds ratio (OR) 6.553, 95% confidence interval (CI) 1.984~21.643, $p < 0.05$] & incomplete re-vascularized [odds ratio (OR) 3.854, 95% confidence interval (CI) 1.321~11.193, $p < 0.05$] patients have a relatively higher mortality rate after LM PCI along with increase re-hospitalization due to MI, Unstable Angina, Heart Failure or TLR .

Conclusion:

This study demonstrated that high SYNTAX Score, low post procedural LVEF & incomplete re-vascularized patients have a relatively higher mortality rate during LM PCI along with increase re-hospitalization due to MI, UA, HF or TLR. Our clinical outcomes demonstrate that PCI for patients with LM coronary artery disease is also an effective strategy in a high-volume hospital with experienced operator even without IVUS facility. Careful attention should be given to case selection, comprehensive clinical judgment and excellent PCI technique. It prevents a financial burden on patients if they cannot afford intravascular imaging & refuse CABG, also reduce procedure time & radiation exposure.

Limitation

- Small sample size
- Prolonged follow-up may require (5 years)
- Multi center data may require

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Original Article

Study of Disease Profile of Patients Admitted in Cardiac Unit in a District Hospital of Bangladesh

Md. Abdul Mannan[1], Solaiman Hossain[2], Md. Zahidul Islam[1], Sahidul Islam Talukdar[1], Mohammadullah Feroz[3], AAS Majumder[3]

Abstract:

Objectives: Aim of our study was to predict the pattern of disease of patients admitted in cardiac unit in a district hospital of Bangladesh.

Material and Methods: This observational study was conducted in the department of cardiology, General hospital, Sirajgonj, Bangladesh during the period of 02 months from June to July, 2019. Total of 504 patients were enrolled who were admitted in cardiac unit in Sirajgonj 250 bed General Hospital during two months' period from 1st June to 31st July, 2019. Every admitted patient was included in the study and history, clinical examination and investigation was done. Risk factors and complications ware noted. After diagnosis, treatment was given and outcome was recorded.

Result: Age ranges was 23 to 74 year mean age was 55.9±13.6, 322 were male and 182 were female. According to risk factors, 211 were smoker, 206 were hypertensive, 166 have dyslipidemia, 110 have diabetes mellitus, 146 were prediabetic, 70 have family history of IHD and 20 were obese. The patients were diagnosed as AMI (ST elevation)-115, NSTEMI-45, UA-40, CSA-100, CCF-20, HTN-50, MS-7, MR-5, AS-5, RMI-15, OMI-20, ICM-13, ASD-3, VSD-5, TOF-2, PPCI-2. Admitted patients have following complications- LVF-50, PE-2, PVC-55, AF-30, Cardiogenic shock-20, SVT-15, VT-10, CHB-10, VF-5 and atrial flutter-5. Comorbidity profile were COPD-36, Bronchial Asthma-40, CKD-30, Musculoskeletal pain-20, AN-15, PUD-10, RTI-10, CVD-76, Tubercular pleural effusion-10, Anaemia-15, Cervical spndylosis-5, UTI-5, RA-5, Sacroilitis-5. Following were the treatment outcome cured-40, improved-414, referred-35 and death-15.

Conclusion: Most of the patients were male and smoking was the predominant risk factor. Acute ST-elevation MI was the predominant primary disease. PVC was the most common complication and CVD was the highest comorbidity. Death was 2.9% and it was most commonly due to Acute ST elevation MI with development of LVF with cardiogenic shock.

Key Word: *Acute ST Elevation Myocardial Infarction, Congestive Cardiac Failure, Primary Percutaneous Coronary Intervention*.

(Bangladesh Heart Journal 2022; 37(1): 10-15)

Introduction:

In Bangladesh, districts hospitals are secondary level hospitals. Some district hospitals have CCU and department of cardiology like Sirajgonj 250 bed district hospital. In this hospital in the cardiology ward in addition to cardiovascular diseases, patients are admitted with comorbid conditions and diseases that simulate to cardiovascular diseases.

Cardiovascular disease is a group of diseases that include both the heart and blood vessels [1], thereby

1. Department of Cardiology, Shaheed M. Monsur Ali Medical College, Sirajgonj.
2. Department of Cardiology, Enam Medical College and Hospital, Savar, Dhaka
3. Department of Cardiology, National Institute of Cardiovascular Disease and Hospital.

Address of Correspondence: Dr. Md. Abdul Mannan1, Assitt. Professor, Department of Cardiology, Shaheed M. Monsur Ali Medical College, Sirajgonj. E-mail: drmannan80@gmail.com

DOI: https://doi.org/10.3329/bhj.v37i1.60099

including coronary heart disease and acute coronary syndrome among several other conditions. Coronary heart disease is one of the leading causes of death in the developed world as well as in developing countries like Bangladesh[2]. Coronary heart disease is a major cause of death and disability in developed countries [3]. Although the mortality for this condition has gradually declined over the last decades in western countries, it still causes about one-third of all death in people older than 35 years [4-6]. The Framingham Heart Study perfectly summarizes the risk factors that contribute to the development of CHD, providing critical information regarding objectives for the primary and secondary prevention of CHD. Rapid globalization, urbanization, aging of society and an increase in chronic disease pose new challenge to modern health care system [7, 8]. CVD is preventable, but physical inactivity, nicotine abuse and bad nutrition practices [9] are leading to an increase of prevalence in most countries[10]. Further, social inequalities increase CVD mortality [10-12] and negative life style influences such as increased physical inactivity in more obesogenic environment are reverting the improvement in CVD data that were obtained in some countries[13].

The 2016 Heart Disease and Stroke Statistics update of the American Heart Association (AHA) has recently reported that 15.5 million persons more than 20 years of age in the USA have CHD [14], whilst the reported prevalence increases with age for both women and men and it has been estimated that approximately every 42 second an American will suffer for a MI [15].

Among the risk factors genetics linked to about half of cases, smoking and obesity are associated with about 36% and 20% of cases respectively. Hypertension is one of the major risk factor of CVD and preventable causes of CVD and all-cause death globally.

Although the trend has tended to reach a plateau since 1990, the overall mortality rates for CVD and CHD have fallen in most developed countries by 24-50% since the 1975. Approximately one half of this effect was accounted for factors like improvement in therapy, including secondary preventive measure after MI or revascularization, initial treatment of ACS, therapy for heart failure and revascularization for chronic angina accounted for one –half of the decline in CHD mortality[16].

In addition, valvular heart disease, cardiomyopathy, congenital heart disease and associated comorbid conditions also cause morbidity and mortality in district hospital.

So, this study is undertaken to evaluate the pattern of diseases among the admitted patients in the department of cardiology in Sirajgonj district hospital.

Material and Methods:

This observational study was conducted in the department of cardiology, General hospital, Sirajgonj, Bangladesh during the period of 02 months from June to July, 2019. Total of 504 patients were enrolled who were admitted in cardiac unit in Sirajgonj 250 bedded General Hospital during two months' period from 1st June to 31st July, 2019. Every admitted patient was included in the study and history, clinical examination and investigation was done. ECG, cardiac biomarker, Echocardiography, blood sugar, lipid profile and serum creatinine was done. Risk factors and complications ware noted. After diagnosis, treatment was given and outcome was recorded. Appropriate statistical techniques were applied for data analysis. Results were presented with tables and graphs where required.

Result:

Table-I

The socio demographic characteristics of the study patients participated in the study (n=504)

Variables	Sociodemographic characteristics	Frequency	Per(%)
Sex	Male	322	63.9
	Female	182	36.1
Age (years)	≤30	11	2.2
	30-60	327	64.9
	≥60	166	32.9
	Mean ± SD	55.9±13.6	

The above table shows the demographic characteristics of the study subjects. Qualitative and quantitative variables were presented as percentage and mean ± SD respectively.

Out 504 patients, 322 (63.9%) were male and 182 (36.1%) were female. The study patients were in the age ranged 23-74 years. The mean age of the subjects noticed was 55.9±13.6. It was observed that most of the cardiac patients were in the age group 30-60 followed by >60 and the lowest <30 years. All types of patients irrespective of age and sex were included randomly.

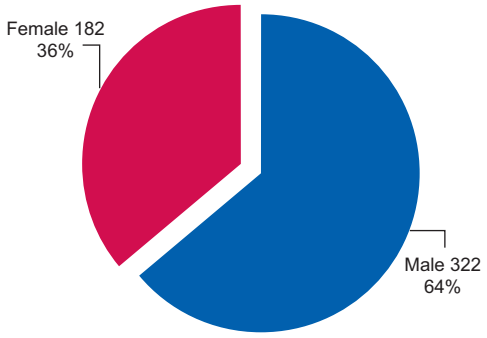

Fig.-1: *Pie diagram showing sex distribution of the studied patients (n=504).*

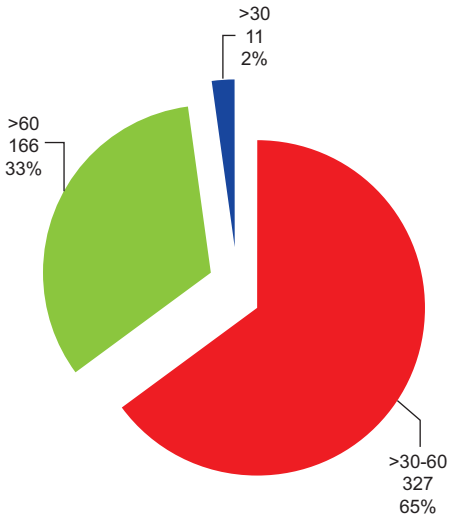

Fig.-2: *Pie diagram showing age (yrs) distribution of the studied patients (n=504).*

Table-II

Distribution of the study patients according to risk factors (n=504).

Risk factors	Number	Percent (%)
Smoking	211	42.0
Hypertension	206	41.0
Diabetes mellitus	110	22.0
Dyslipidemia	166	33.0
Family H/O CAD	70	14.0
Obesity	20	4.0
Pre-diabetic	146	29.0

Table II shows the risk factors of CAD among the population under study. Smoking habit was found in 42%. Hypertension was found in 41%. Diabetes mellitus was found in 22%. Dyslipidemia was found in 33%. Family history of CAD was found 14%. Obesity was found 4% and finally pre-diabetic was found 29%. Among the risk factors smoking is on the top of the list.

Table-III

Distribution of the study patients according to dyslipidemia (n=504).

Lipid type	Number	Percent (%)
TC↑	171	34.0
LDL↑	100	20.0
TG↑	65	13.0
HDL↓	25	5.0

The above table describes that dyslipidaemia status among the study patients. Abnormal fasting total cholesterol, LDL cholesterol, TG cholesterol and HDL cholesterol were found in 34%, 20%, 13% and 5% patients respectively. It is true that dyslipidemia is important modifiable risk factors of CVDs.

Table-IV

Distribution of patients according to diagnosis (n=504).

Diagnosis	Frequency	Percent (%)
AMI (ST elevation)	115	22.8
NSTEMI	45	8.9
UA	40	7.9
CSA	100	19.8
CCF	20	3.9
HTN	50	9.9
MS	7	1.4
MR	5	1.0
AS	5	1.0
RMI	15	3.0
OMI	20	4.0
ICM	13	2.6
PPCI	2	0.4
ASD	3	0.6
VSD	5	1.0
TOF	2	0.4

The above table depicts that Acute Myocardial Infarction (AMI) and Chronic Stable Angina were most common diagnosis among the study patients. Hypertension, NSTEMI and UA were also remarkable diagnosis among the study patients. The study reveals that the prevalence of AMI, CSA, HTN, NSTEMI and UA were higher in the

study. The remaining diagnosis and their percentage were shown in the above table. It can be concluded that early detection of disease can largely reduce morbidity and mortality and alternative undue burden on our limited budget.

Table-V

Distribution of patients according to complications (n=504).

Complaints	Frequency	%
PVC	55	11.0
LVF	50	9.9
AF	30	5.9
A.Flutter	5	1.0
SVT	15	3.0
VT	10	2.0
CHB	10	2.0
VF	5	1.0
Cardiogenic Shock	20	4.0
PE	2	2.6

The above table expresses that PVC, LVF, AF and Cardiogenic Shock were most frequent complications among the study patients.

Table-VI

Distribution of patients according to co-morbidity (n=504).

Co-morbidities	Frequency	%
COPD	35	7.0
Bronchial Asthma	40	8.0
CKD	30	6.0
MSK pain	20	4.0
AN	15	3.0
PUD	10	2.0
RTI	10	2.0
CVD	76	14.9
Cervical Spondylosis	5	1.0
UTI	5	1.0
TB-PI effusion	10	2.0
RA	5	1.0
Anaemia	15	3.0
Sacroilitis	5	1.0

The above table shows that CVD, COPD and bronchial asthma were most frequent co-morbidities among the study patients.

Table-VII

Investigation status of the study patients (n=504).

Investigations	Abnormal		Normal	
	Frequency	%	Frequency	%
ECG	378	75.0	126	25.0
Troponin I	125	24.8	362	71.8
RBS	258	51.2	246	48.8
Lipid Profile	247	49.0	257	51.0
S. Creatinine	31	6.1	473	93.8
Echocardiogram	100	19.8	404	80.2

The above table describes the investigation status among the study patients.

Table-VIII

Distribution of patients according to treatment outcome (n=504).

Outcome	Frequency	%
Cured	40	7.9
Improved	414	82.1
Referred	35	6.9
Death	15	2.9

The above table revealed the outcome status of the study patients. Among the study patients, cured 7.9%, improved 82.1%, referred 6.9% and death rate 2.9%.

Discussion:

In Bangladesh district hospital is a secondary level hospital. In district hospital in the department of cardiology in addition to patients with cardiovascular diseases, patients with other diseases simulate with CVS symptoms are also admitted in cardiology ward. In these study we observed the disease profile among the all the admitted patient in two months' duration. Among 504 patients, male was predominant and most of the cardiac patients were in the age group 30-60 years followed by 60 years and the lowest less than 30 years.

Among the risk factors of ischaemic heart disease smoking and HTN were almost same and it was highest. Study of lipid profile of the patients, total cholesterol was highest then high LDL. Similar results were found in the study of SM Rezaul Irfan et. al[17] and Mohsin Ahmed et al.[18]

Acute ST-elevation myocardial infarction and chronic stable angina were most common diagnosis among the study patients. Ischaemic heart diseases were the

highest number and congenital and valvular heart diseases were lowest number among the admitted patients. Increased number of ischemic heart disease most probably due to less control of risk factors and awareness of chest pain. Most of the complications were due to ischaemic heart disease. PVC was the highest followed by LVF. A large number of patients developed cardiogenic shock. Most cardiogenic shock developed in patients with patients Acute extensive and anterior ST-elevation MI. Less common complication was VF. This results were similar in the study of Mohsin Ahmed et al.[18] . Most of patients with cardiogenic shock were managed in CCU and some were referred to higher center for CVS diseases.

Cerebrovascular (CVD) was the most prevalence comorbid disease followed by Bronchial Asthma and COPD. Because of same risk factors admitted patients with CVD have associated ischaemic heart diseases. Bronchial Asthma and COPD were admitted due to simulating symptom of LVF like dyspnea. A large number of patients with musculoskeletal pain ware also admitted. Patients with anxiety neurosis were admitted due to palpitation. But more than half (51.1%) of the patients visit cardiologist with non-cardiac problems stated by G K Paul et al.[19]

Most of the patients improved and a sufficient number of patients cured. Percentage of death is low due proper management because referral percentage is also low.

Conclusion:

Most of the patients were admitted with ischaemic heart disease, among them Acute ST-elevation was predominant. Lowest numbers of patients were admitted with congenital and valvular diseases. CVD was the highest comorbid condition followed by Bronchial Asthma and COPD. Most of the patients were improved and a sufficient number of patients were cured. Percentage of death ware low due to proper management because referral percentage is also low.

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Original Article

Association between Myocardial Performance Index (Tei-Index) and Severity of Coronary Artery Disease in Patients with Non-ST Segment Elevation Acute Coronary Syndrome

Bivash Kumer Sheel[1], Mohammad Badiuzzaman[2], Tuhin Haque[3], Habibur Rahman[4], Asim Kumar Biswas[5], Sayeedur Rahman Khan[6]

Abstract:

Background and objectives: Evaluation of ventricular systolic and diastolic functions is an essential part of echocardiographic evaluation in a patient of acute coronary syndrome (ACS). Myocardial Performance Index (MPI), also known as the Tei index, reflects both systolic and diastolic function of the left ventricle. The aim of this study was to see the association between myocardial performance index and severity of coronary artery diseases assessed by the gensini score (GS) in patients with non-ST segment elevation acute coronary syndrome. Methods: This cross-sectional study included a total 135 patients with NSTE ACS who underwent coronary angiography. MPI was measured using Pulse-Wave Doppler in all patients before coronary angiography. The patients were divided into three groups according to the Gensini score (GS); low GS < 19 (n=23); mid GS ≥19 and ≤96 (n= 76); high GS > 96 (n=36) on CAG. Baseline characteristics, MPI parameters & GS were then compared between the three groups. Results: MPI was obtained successfully in 135 patients. MPI parameter was significantly increased with increased GS. MPI was positively correlated with the GS (r = 0.40, p < 0.001) Binary logistic regression analysis showed that MPI was strongly associated of severity of coronary artery disease assessed by GS (β = 3.766, p < 0.001). Conclusion: Patients with NSTE-ACS with severe coronary artery disease may be identified by means of MPI measurement. Key words: Tei Index, Gensini Score, Non-ST Segment Elevation Acute Coronary Syndrome, Coronary Angiogram.

Key Words: **Tei-Index, Gensini score, NSTEACS**

(Bangladesh Heart Journal 2022; 37(1): 16-26)

Introduction:

Ischemic heart disease is a major public health problem associated with high morbidity and mortality. Acute coronary syndrome is a common presentation of ischemic heart disease[1]. It is also the single largest cause of death in developed countries as well as developing countries[2]. Cardiovascular diseases (CVD) are a worldwide health epidemic[3] and a major barrier to sustainable human development[4]. Coronary artery disease (CAD) is leading cause of mortality worldwide and by the year 2020, will be first in the leading causes of disability[5].

1. Assistant Registrar, Department of Pediatric Cardiology, NICVD.
2. Professor of Cardiology and Senior Consultant, Department of Cardiology NHFH&RI.
3. Professor of Echocardiography, Department of Cardiology NHFH&RI.
4. Associate Professor & Senior Consultant, Department of Cardiology NHFH&RI.
5. Assistant Professor, Department of Cardiology, SBMCH.
6. Medical Officer, Department of Cardiology, NICVD.

Address of Correspondence: Dr. Bivash Kumer Sheel, Assistant Registrar, NICVD, Dhaka, Bangladesh. E-mail: drbivashsheel84@gmail.com

DOI: https://doi.org/10.3329/bhj.v37i1.60100

ACS remains a leading cause of mortality and morbidity in the Asia Pacific region. While much effort has been made over the last decade to improve disease management, high variability in management practices and outcomes between countries and regions is still prevalent[6].

Bangladeshis are unduly prone to develop CAD, which is often premature in onset, follows a rapidly progressive course and angiographically more severe[7]. The burden of CHD is emerging as a public health concern in developing countries like Bangladesh[8]. Acute Myocardial Infarction (AMI) is the leading cause of death in Bangladesh in the fourth decade of life and even in the younger individuals pointing to the serious health hazard as well as economic burden[9]. The exact prevalence of CAD in Bangladesh is not known. Probably the prevalence of IHD was first reported in 1976, which was 0.33%[9]. The prevalence of IHD was 3.3/1000[9]; 3.38/1000[10]; 13/1000[11]. As a result of socioeconomic transition, lifestyle, as well as, the dietary pattern is changing in Bangladesh. Increasing prevalence of obesity, tobacco use, high intake of processed foods and less physical activity accompany the transition[7].

The acute coronary syndrome (ACS) encompasses three disorders of related etiology. These are ST segment elevation Myocardial Infarction (STEMI), Non-ST segment Elevation Myocardial Infarction (NSTEMI) and Unstable Angina (UA). The pathogenesis of UA/ NSTEMI involves five non-exclusive causative factors of nonocclusive thrombus on pre-existing plaque, dynamic obstruction, progressive mechanical obstruction, inflammation, and secondary unstable angina associated with increased cardiac work load[12].

An invasive strategy in UA/NSTEMI results in a significant 33% relative risk reduction for both the end-points of refractory angina and rehospitalization at 6 to 12 months while a two fold increase in the risk of peri-procedural myocardial infarction. Now the challenge is early and non-invasive prediction of presence or absence of significant CAD to guide for choosing invasive modality so that more cardiac muscle can be salvaged or early discharge to reduce hospital burden[13].

Although conventional echocardiography is considered to be reliable for ventricular wall motion analysis, there is high interobserver and intraobserver variability[14]. In addition, poor temporal resolution of the human eye creates limitations for the accurate visual assessment of the longitudinal myocardial motion in detail[15]. Ventricular function is the best predictor of death after an acute coronary syndrome. It serves as a marker of myocardial damage, provides information on systolic function as well as diagnosis and the prognosis[16, 17].

Myocardial performance index (MPI) is a numeric value, which could be obtained by using cardiac time intervals. This numeric value is defined as the sum of isovolumetric contraction time (ICT) and isovolumetric relaxation time (IRT) divided by ejection time (ET) and could be calculated for each ventricle individually. Myocardial performance index has been described as a Doppler index of combined systolic and diastolic myocardial performance in patients with primary myocardial systolic dysfunction. It is considered as a reliable parameter to assess global left ventricular function[18]. Normal value of MPI is d" 0.4[19]. The Tei index evaluates the LV systolic and diastolic function in combination and correlates well with invasive measures of systolic and diastolic LV function, and has been reported to correlate better with patient outcome than conventional echocardiographic parameters in various myocardial diseases[20]. The Tei index appears to have close correlation with the widely accepted systolic and diastolic hemodynamic parameters[21] as well as potential for clinical application in the assessment of overall cardiac performance[20, 21, 22] .

Echocardiography is a unique and sensitive tool for early detection of myocardial ischemia. Evaluation of ventricular systolic and diastolic functions is an essential part of echocardiographic evaluation in a patient of acute coronary syndrome. It is a reliable index of myocardial performance (The Tei Index/ Myocardial Performance Index) is a reliable index for evaluation of LV systolic and diastolic performance in acute coronary syndrome[23]. Ejection fractions, the most reliable estimator of systolic function, are prone to significant inaccuracies when the elliptical cardiac chamber is transformed to a spherical one. On the other hand, transmitral flow, which is the most frequent method for evaluation of diastolic function, is dependent on age, heart rate, as well as loading conditions[24].

It is more reflective of overall cardiac function than systolic or diastolic function alone, and applied to independently assess the myocardial performance of left and right ventricles[22, 25, 26]. MPI has since been studied in several other cardiac disorders including heart failure, myocardial infarction (MI), systemic hypertension (HT), and diabetes mellitus (DM) and found to predict both worsened morbidity and mortality[24,27] .

Therefore, in this study my aim was to evaluate whether myocardial performance index (MPI) measured by conventional Doppler method is associated with severity

of coronary artery disease in NSTE ACS. This modality of noninvasive imaging has not been evaluated for coronary artery disease (CAD) especially NSTE ACS population of Bangladesh. Hopefully, the findings of myocardial performance index (MPI) will help us to diagnose CAD noninvasively in an appropriately selected patient for planning further management.

Materials and Methods:

This cross sectional study was carried out at the Department of Cardiology of the National Heart Foundation Hospital and Research Institute, Mirpur, Dhaka from August, 2017 to July, 2018. Study Population was patients with NSTE-ACS who were get admitted at National Heart Foundation Hospital and Research Institute. Considering inclusion and exclusion criteria a total of 135 consecutive patients were considered with NSTE-ACS. Patients were divided into three groups on the basis of Gensini score.

In Group I (Low-GS,<19): 23 Patients were enrolled.

In group II (Mid-GS, ≥19 to ≤96): 76 Patients were enrolled.

In Group III (High-GS,>96): 36 Patients were enrolled.

Enrolment of Subjects:

Inclusion Criteria:

1. Clinical diagnosis of NSTE-ACS.
2. Patient who underwent coronary angiography.

Exclusion Criteria:

1. Age< 18 years,
2. Severe valvular heart disease or congenital heart disease,
3. Past History of old myocardial infarction and PTCA or CABG,
4. Atrial fibrillation with heart rate > 100 beats/min or other continuous arrhythmia,
5. NYHA class-III / IV Heart failure or haemodynamically unstable patients,
6. Inadequate echo window for analysis of myocardial Performance Index (Tei-Index),
7. Patient who did not give consent.

Methodology:

135 patients who were admitted at National Heart Foundation Hospital & Research Institute, Dhaka for Non ST Elevation Acute Coronary Syndrome (Unstable angina, NSTEMI) were included in the study after fulfilling the inclusion and exclusion criteria. Informed consent was taken from each subject before enrolment. Meticulous history was taken and detailed clinical examination was performed in each patient. Demographic data such as age, sex, height (cm), weight (Kg) were noted. Risk factors were recorded for all patients. Patients baseline 12 lead ECG was performed. Blood sample was taken for all Haematological and Biochemical parameters. Echocardiographic assessment was done. CAG was performed. After performing CAG according to the Gensini scoring system, the degree of coronary stenosis was classified as follows: mild lesions, one to six points; moderate lesions, seven to 13 points; and severe lesions, >13 points. Patients were divided into tertiles according to the GS: low GS <19; mid GS ≥19 and ≤96; and high GS > 96 points.

Data collection:

Data were collected in a predesigned data collection form.

Statistical analysis:

After processing of all available data, statistical analysis of their significance was done. Obtained data were expressed in frequency, percentage, mean and standard deviation as applicable. Comparison between groups was done by Student's t-test for continuous variables. Categorical data were analyzed by chi-square test. Analysis of variance (ANOVA) was performed to test if the MPI varied with increasing severity of CAD defined by Gensini Score. Logistic regression was performed in order to adjust for baseline characteristics (Age, Family H/O IHD, Diabetes Mellitus, Hypertension, Smoking, Dyslipidaemia, and increased BMI) for the assessment of the independency of MPI parameters associated with CAD. The whole analysis was done with the help of computer based SPSS (Statistical Programme for Social Science) Programme version 16. P-value of <0.05 was considered significant

Observation and Results

The main objective of the study was to assess the association between the MPI severities of CAD patient with NSTE acute coronary syndrome. Considering inclusion and exclusion criteria a total of 135 consecutive patients were considered with NSTE-ACS were studied. Observation and results were presented in different tables and diagrams.

Age Distribution of Patients (n=135).

Table-I
Age Distribution of Study Population (n=135).

Age group (years)	Frequency	Percent%
25 – 40	18	13.3
41 – 50	39	28.9
51– 60	55	40.7
61 – 78	23	17.0
Mean±SD	52.5±.9.9	

Table-I showing, this study population had predominance of age group of 51 to 60 years. Mean age was 52.5 ± 9.9 years.

Sex Distribution of Patients (n=135).

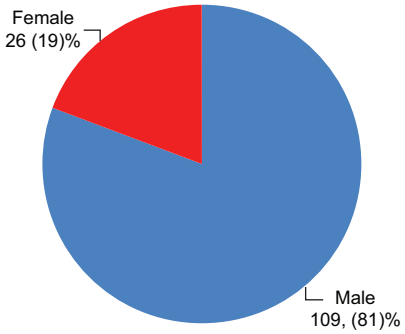

Fig.-1: *Sex Distribution of study population*

This study was male predominant, of all patients, 80.7 % was male and 19.3 % was female.

Pattern of Risk Factor of study population.

Table-II
Pattern of Risk Factor of study population (n=135).

	N	Percent %
Hypertension		
Yes	83	61.5
Diabetes Mellitus		
Yes	68	50.4
Dyslipidaemia		
Yes	46	34.0
Smoking		
Nonsmoker	59	43.7
Smoker	39	28.9
Ex-smoker	31	23.0
Tobacco	6	4.4
Family History of IHD		
Yes	29	21.5
Grouping according to BMI(kg/m2)		
Under weight(≤18.50)	1	0.8
Normal range (18.50 - 24.99)	61	45.2
Overweight (≥25.00 - 29.99)	60	44.4
Obese (≥30.00)	13	9.6

Table-II showing, among risk factors for ischemic heart diseases, this study found diabetes mellitus in 50.4%, dyslipidaemia in 34.0%, and hypertension in 61.5% of study population. 56.3 % had ever history of smoking and 54.0% had BMI more than that of normal range.

Specific diagnosis of NSTE ACS (n=135).

Table-III
Confirmed Diagnosis of study population (n=135).

Diagnosis	Frequency	Percent %
NSTEMI	84	62.2
UA	51	37.8

Table-III showing, of all study patients with clinical diagnosis of NSTE ACS, 62.2% had confirmed NTSEMI and 37.8% had Unstable Angina.

Echocardiographic Findings

Presence of Regional Wall Motion Abnormality (RWMA) (n=135).

Table-IV
Presence of RWMA in study population

RWMA	Frequency	Percent %
Yes	86	63.7

Table-IV showing, among the study population, 63.7% of all study patients had wall motion abnormalities.

Tei-Index according to the age groups (n=135).

Table-V
Tei Index of age groups in study population

Age groups in years	Tei-index		p value
	Mean	SD	
25 – 40 (n=18)	0.59	0.15	
41 – 50 (n=39)	0.62	0.15	
51– 60 (n=55)	0.63	0.20	0.41^{NS}
61 – 78 (n=23)	0.69	0.19	
Mean±SD	0.63±.0.18		

Anova test was done.

S = Significant; NS=Not significant (p>0.05).

Table-V showing, Myocardial Performance Index (Tei-Index) of specific age group of this study population with mean Tei Index was 0.63± 0.18.

Coronary Angiogram

Gensini Score according to the age groups (n=135).

Table-VI

Gensini Score of age groups in study population

Age groups in years	Gensini Score		p value
	Mean	SD	
25 – 40 (n=18)	66.6	63.4	0.24^{NS}
41 – 50 (n=39)	90.7	63.9	
51– 60 (n=55)	69.8	50.0	
71 – 78 (n=23)	88.0	63.9	
Mean±SD	78.54±58.79		

Anova test was done.

S = Significant; NS=Not significant (p>0.05).

Table-VI showing, Gensini Score was divided among the study population with mean value of the Study and mean Gensini score was 78±58.79.

Distribution of the study population by Gensini Score (n=135).

Table-VII

Group distribution according to Gensini Score in study population

Gensini Score	Frequency	Percent%
Low-GS (<19)	23	17.0
Mid-GS (≥19 to ≤96)	76	53.3
High-GS (>96)	36	26.7
Mean±SD	66.4±53.8	

Table-VII showing, The study population was divided in to three groups according to the Gensini Score and found that highest population in Mid-GS (e”19 tod” 96) group with mean GS was 66.4±53.8.

Comparison of baseline parameters within angiographically allocated groups.

Table-VIII

Age distribution of the study population according to Gensini score (n = 135).

Age groups	Gensini Score group			P value
	Low-GS(<19) (n=23) No. (%)	Mid-GS (≥19 to ≤96) (n=76) No. (%)	High-GS(>96) (n=36) No. (%)	
	No. (%)	No. (%)	No. (%)	0.13^{NS}
25 – 40 (n=18)	7 (30.4)	6 (7.9)	5 (13.9)	
41 – 50 (n=39)	6 (26.1)	20 (26.3)	13 (36.1)	
51– 60 (n=55)	7 (30.4)	36 (47.4)	12 (33.3)	
61 – 78 (n=23)	3 (13.0)	14 (18.4)	6 (16.7)	

Anova test was done.

S = Significant; NS=Not significant (p>0.05).

The above table depicts that the patients having high Gensini Score belonged to the higher age range of years but the association did not reach the statistical level of significance (p=0.13).

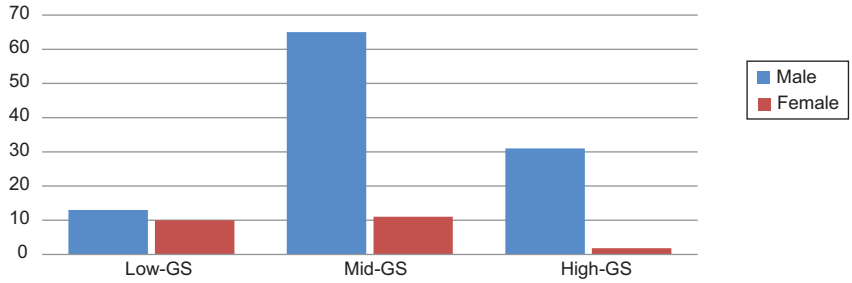

Fig.-2: *Sex distribution of the study population according to Gensini score (n = 135).*

Chi Square test was done.

S= significant (p<0.05); NS=Not significant.

The graph shows that the male patients having high Gensini Score were more than that of female patients and the association reached the statistical level of significance (p=0.005).

Table-IX

Distribution of the study population according to diagnosis (n = 135)

Diagnosis	Gensini Score group			P value
	Low-GS(<19) (n=23) No. (%)	Mid-GS (≥19 to ≤96) (n=76) No. (%)	High-GS(>96) (n=36) No. (%)	
NSTEMI (n=84)	16 (26.1)	53 (69.7)	25 (69.4)	<0.001^{S}
UA (n=51)	17 (73.9)	23 (30.3)	11 (30.6)	

Chi Square test was done.
S= significant (p<0.05); NS=Not significant.

Table-X

Summary of risk factors distribution in between groups (n = 135)

Risk Factors	Gensini Score group			P value
	Low-GS(<19) (n=23) No. (%)	Mid-GS (≥19 to ≤96) (n=76) No. (%)	High-GS(>96) (n=36) No. (%)	
Hypertension (n=83)	12 (52.2)	47 (61.8)	24 (66.7)	0.53^{NS}
Smoking (n=76)	12 (52.2)	38 (50.0)	26 (72.2)	0.07 ^{NS}
Diabetes mellitus (n=68)	10 (43.5)	43 (56.6)	15 (41.7)	0.26 ^{NS}
F/H of IHD (n=29)	4 (17.4)	15 (19.7)	10 (27.8)	0.54 ^{NS}
Dyslipidaemia (n=8)	10 (43.4)	28 (36.8)	8(22.2)	0.54 ^{NS}
BMI (Mean±SD)	26.4±4.2	25.7±3.3	25.4±2.9	0.53 ^{NS}

Chi Square and ANOVA test were done.
S = Significant; NS=Not significant (p>0.05).

Table-XI

Distribution of the study population according to RWMA (n = 135)

RWMA	Gensini Score group			P value
	Low-GS(<19) (n=23) No. (%)	Mid-GS (≥19 to ≤96) (n=76) No. (%)	High-GS(>96) (n=36) No. (%)	
Yes (n=86)	4 (17.4)	52 (68.4)	30 (83.3)	<0.001^{S}
No (n=49)	19 (82.6)	24 (31.6)	6 (16.7)	

Chi Square test was done.
S= Significant (p<0.05); NS=Not significant.

The above table shows that the patients with NSTEMI belonged to more higher Gensini Score than that of patients with UA with statistically significant association (p<0.001).

The above table projects that there were no significant association/difference between risk factors and the severity of CAD in terms of grouping of Gensini Score (p>0.05).

The above table indicates that the patients with RWMA belonged to higher Gensini Score and the association reached the statistical level of significance (p<0.001).

Table-XII

Mean Tei-index of the study population by Gensini Score (n=135).

Parameters	Gensini Score			P value
	Low-GS(<19) (Mean±SD)	Mid-GS (≥19 to ≤96) (Mean±SD)	High-GS(>96) (Mean±SD)	
MPI(Tei Index) Mean±SD	0.58±0.17	0.61±0.16 0.63±0.18	0.71±0.19	0.006 S

ANOVA test was done.
S= Significant (p<0.05); NS=Not significant.

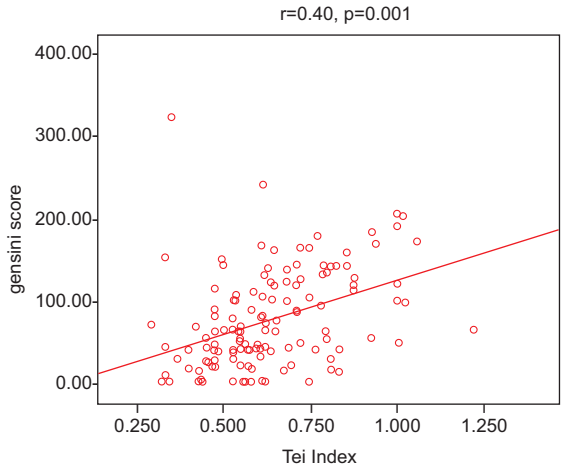

Fig.-3: *Scatter diagram showing correlation between Tei-index and Gensini score (n=135).*

Table-XIII

Binary logistic regression analysis for CAD severity (Gensini Score) with confounding factors (n=135).

Variables of interest	Constant (B)	Standardized coefficient (β)	Odds Ratio (OR)	95% CI of OR	p value
Age (>50 years)	- 4.889	0.124	1.107	0.072 – 1.718	0.17NS
Smoking		0.948	2.58	1.027 – 6.498	0.04S
Hypertension		0.228	1.256	0.504 - 3.130	0.62NS
Diabetes mellitus		-0.813	0.44	0.176 – 1.117	0.08 NS
Family H/O IHD		0.334	1.39	0.488 – 3.990	0.53NS
Dyslipidemia		0.896	2.45	0.429 – 14.057	0.31NS
Increased BMI		0.001	0.99	0.875 – 1.142	0.99 NS
RWMA (Present)		1.345	3.84	1.365 – 10.805	0.01S
Increased MPI		3.766	43.20	3.444 – 542.030	0.004S

S= Significant (p<0.05); NS=Not significant (p>0.05).

The above table displays that Tei-index is increasing as well as Gensini score is also increasing with statistically significant difference (p=0.006).

The figure shows that there is a moderate positive correlation between Myocardial Performance Index (Tei-index) and coronary artery disease severity in terms of Gensini score (r=0.40). It was observed that the Pearson's correlation statistically significant (p=0.001) by correlation t-test.

The above table provides the binary logistic regression analysis of Odds Ratio for characteristics of the subjects

likely to develop Coronary Artery Disease. The above mentioned variables of interest are all entered into the model directly as confounding independent exposures for the developing CAD (dependent variable). The variables smoking, RWMA and increased MPI were found to be significantly associated with CAD severity with the ORs being 2.58, 3.84 and 43.20 respectively.

Discussion:

To our knowledge, this study is the first to evaluate Myocardial Performance Index (Tei Index) as an early method to identify patients with significant coronary artery stenosis in a population with NSTE-ACS in Bangladeshi population.

In present study mean age of patients were 52.5 ± 9.9 years. The commonest age group of study patients was 51 to 60 years in all groups with or without severity of CAD. [30.4%, 47.4% and 33.3% in group I (Low-GS) group II (Mid-GS) and group III (High-GS) respectively]. Mean age difference was not statistically significant (p=0.33). Nearly similar pattern of age distribution was reported by in a study in Bangladesh[28]. But there was difference in mean age with different studies done in home and abroad, 45.5±26.1years[29], 48.96±7.30years[30], 60.1±11years[31], 57.3±6.2years[32]. Most probably this was due to the late onset of atherosclerotic coronary artery disease in developed countries than that of a third world country population.

Most of the patients (80.7 %) were male and (19.3 %) patients were female in this study. Male & female ratio was 4.2:1 in the whole study population, which indicates that male patients were predominant in this study. In Bangladesh & abroad, the various studies showed, the female patients formed a small percentage, 20 percent[32], 30 percent[31], 49 percent[30] female patients in their respective studies. The present study showed that, the male patients having high Gensini Score were more than that of female patients and the association reached the statistical level of significance (p=0.005) [male vs female, 56.5% vs 43.5% in group-I (Low-GS), 85.5% vs 14.5% in group-II (Mid-GS) and 86.1% vs 13.9% in Group III (High-GS)].

There was significant difference in clinical presentation. NSTEMI was the predominant presentation (69.7%) in Group – II (Mid-GS) and (69.4%) in Group III (High-GS), but unstable angina was main presentation (73.9%) in group I (Low-GS) (p<0.001).

There were similar type of risk factors like diabetes, hypertension, smoking, dyslipidaemia, obesity and family history of IHD in all three groups. Overall prevalence of DM was 50.4 % [43.5% in group-I (Low-GS), 56.6% in group-II (Mid-GS) and 41.7% in Group III (High-GS)].

Hypertension, present in 61.5% of total study population [52.2%, 61.8%, 66.7% group-I (Low GS), group-II (Mid-GS), group III (High-GS) respectively]. Dyslipidaemia, present in 34.0% of total study population [43.4%, 36.8%, 22.2% group-I (Low GS), group-II (Mid-GS), group III (High-GS) respectively]. Positive history of smoking, present in 56.3% [52.2% in group-I (Low-GS), 50% in group-II (Mid-GS) and 72.2% in Group III (High-GS)]. Obesity [BMI was 26.4 ± 4.2 kg/m^2 in group-II (Mid-GS), 25.7±3.3 kg/m^2 in group-II (Mid-GS), 25.4±2.9 in group III (High-GS)] and family history of CAD [17.4%in group-II (Mid-GS), 19.7%in group-II (Mid-GS), 27.8% group III (High-GS)]. It was found no statistical significance difference of risk factors among three groups[33].

MPI, also known as the Tei index, reflects both systolic and diastolic function of the left ventricle. MPI is calculated using the formula: (IVCT + IVRT) " ET[23]. During the acute phase of an AMI, IVCT and IVRT increase, and when clinical heart failure becomes apparent, the ET decreases. As a result, MPI increases[34].

Abaci, et al., (2017) denoted that, There are two treatment strategies for patients with NSTEMI: invasive and conservative. Determination of the number of diseased coronary arteries is important in the decision-making process when selecting the course of treatment. The severity of coronary artery disease is associated with mortality in patients with acute coronary syndromes. In the early period of NSTEMI, measurement of MPI may be useful in the decision making process, for selecting the course of treatment and risk stratification[33]. Echocardiographic assessment of LV systolic function plays pivotal role in the diagnosis, risk stratification and therapeutic guidance of proven medical and interventional therapy in patient with suspected or known cardiac disease[35]. EF has been widely used for decades for overall ventricular systolic function and has a central role in many guidelines. EF has a number of important limitations. Some of these such as the calculation of ejection fraction using a variety of geometric assumptions, as well as the error introduced by tangential to mographic planes, generally pose a greater problem to the evaluation of LV volumes than EF[36].

In this study, the mean Tei-Index of study population was 0.63±0.18 [0.58±0.17 in group-I (Low-GS), 0.61±0.16 in group-II (Mid-GS) and 0.71±0.19 in Group III (High-GS)] showing that Tei-index is increasing as well as Gensini score is also increasing with statistically significant

difference (p=0.006). On the other hand in two studies, they found the mean MPI was 0.45 ± 0.106[37] and 0.48 ± 0.09[38] respectively, which is lesser with the current study. This apparent discrepancy may be explained by the homogeneity of the studied population.

In the present study, Correlation analysis was performed to investigate the relationship between the MPI, and GS. MPI was positively correlated with GS(r=0.40. p=0.01). Similarly MPI was positively correlated with GS(r = 0.47, p < 0.001)[33]. Binary logistic regression analysis for CAD severity (Gensini Score) with confounding variables was done in this study. Age, Smoking, Hypertension, Diabetes Mellitus, Family H/O IHD Dyslipidaemia, Increased BMI, RWMA (Present), MPI, variables of interest are all entered into the model directly as confounding independent exposures for the developing CAD (dependent variable). It denotes that the MPI were found to be significantly associated with CAD severity with the ORs was 43.20(ß=3.766. p=0.004).

Conclusion:

The present study showed that MPI (Myocardial Performance Index) was strongly associated with GS (Gensini Score) in patients with NSTE-ACS. MPI is significantly increased with significant CAD in patients presenting with NSTE-ACS patients. MPI measurement can be effective in assessing the severity of CAD patients with NSTE-ACS and planning strategies for their treatment like early revascularization or early hospital discharge as well as risk stratification. Therefore, MPI measured by conventional spectral Doppler method might play a role in the initial triage of patients with NSTE- ACS.

Study Limitations

Although the result of this study supports the hypothesis, there were some limiting factors which might have an effect on the results:

- This study was conducted in only one center (Department of Cardiology of the National Heart Foundation Hospital and Research Institute, Mirpur, Dhaka).
- The majority of study population was male. Thus, these results need to be re-evaluated in other health care center by inclusion of male and female in large numbers.
- The study period was short.

Recommendations

- In our country perspective, Doppler derived Myocardial Performance Index (MPI) is a commonly available tool that helps for evaluation and to see prognosis in acute MI patients. MPI have an impact over left ventricular systolic function as well as in diastolic function in patients with Non-ST elevation myocardial infarction. MPI can give a warning about the outcomes of the patients after NSTEMI. Very few studies were conducted regarding Non-ST elevation myocardial infarction. As, left ventricular systolic and diastolic function was correlated well with MPI level; So, MPI alone can serve dual purpose – for both diagnosis and prognosis of NSTEMI Patients.
- The study also recommends that aggressive treatment strategy including early PCI and closer surveillance should be offered to NSTEMI patients with high MPI levels, as these patients are more prone to develop long term complications like heart failure, arrhythmia and even sudden cardiac death.
- The result of this study needs further confirmation in a randomized large scale, multicenter prospective cohort study.

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Original Article

Anaortic off-pump Complete Arterial Revascularization Using Composite LIMA RIMA Y grafts: 1 Year Outcome

Asraful Hoque[1], Abu Shadat Mohammad Saem Khan[2], Romena Rahman[3], Muhammad Asif Ahsan Chowdhury[4], Imran Ahmed[5], Wahida Salam[6], Md. Monzur Hossain[7], Tanvir Hossain[8], Md. Amirul Islam[9]

Abstract:

Objective: The aim was to evaluate the early outcome of off-pump coronary artery bypass grafting (OPCABG) with a bilateral internal mammary artery (BIMA) Y configuration graft to achieve total arterial myocardial revascularization.

Materials and Methods: From March 2018 to March 2020 total 30 cases of off pump CABG surgery using LIMA RIMA Y sequential grafts to achieve total arterial myocardial revascularization. Comparisons between LIMA + SVG and BIMA Y grafts were not made here.

Result: The average age of the patients was 43.51±2.58 years. Most of them were male (93.34%). A total of 28 (93.34%) cases had triple-vessel disease. Double-vessel disease was found in 2 (6.66%) cases. The skeletonization skill was used to harvest the two IMAs and then the free right internal mammary artery was anastomosed end-to-side to the in situ left internal mammary artery to composite a Y configuration graft. Off-pump and sequential anastomosis methods were used to perform coronary artery bypass surgery for the patients. Graft patency was assessed by doing CT angiogram. All distal and proximal Y anastomoses were patent at 1 year follow up. There were no perioperative deaths.

Conclusion: OPCABG by using LIMA RIMA Y graft is an effective option for total arterial revascularization and avoid surgical complications regarding the ascending aorta manupulation.

Key words: *Bilateral internal mammary arteries, coronary artery bypass grafting, internal mammary artery, LIMA -RIMA Y graft, off-pump*

(Bangladesh Heart Journal 2022; 37(1): 27-33)

Introduction:

Despite of improved long-term survival attained by using bilateral internal mammary arteries (BIMA) over the standard left internal mammary artery (LIMA) with saphenous vein grafts (SVG) supported by recent literatures[1-4], the use of BIMA is very less in reality[5, 6]. Since Barn & Barnett[7], Tector et al[8] and Barr et al[9] proposed Y or T graft procedure done by anastomosing the proximal end of the free RIMA to the side of the in situ LIMA that provides an extra length to facilitate reaching the distal coronary artery branches, issues of complete arterial revascularization using BIMA made a way out. Kamath et al.[10] and Chocron et al.[11] were first to report their experiences usi7ng BIMA grafts in off-pump coronary artery bypass grafting (OPCABG) setting which subsequently become more popular to avoid cardiopulmonary bypass (CPB) related complications. We present here 1 year outcome of consecutive 30 patients on whom anaortic complete arterial OPCABG using composite LIMA RIMA Y sequential grafts were performed.

1. Associate Professor, Cardiac Surgery, NICVD
2. Assistant Registrar, Cardiac Surgery, NICVD
3. Assistant Professor, Cardiac Surgery, NICVD
4. Assistant Registrar, Cardiac Surgery, NICVD,
5. Assistant Registrar, Cardiac Surgery, NICVD
6. Assistant Registrar, Cardiac Surgery, NICVD
7. Assistant Registrar, Cardiac Surgery, NICVD
8. Assistant Registrar, Cardiac Surgery, NICVD
9. Assistant Professor, Cardiac Anaesthesiology, NICVD

Address of Correspondence: Dr. Asraful Hoque Sium, Associate professor, Department of Cardiac Surgery, National Institute of Cardiovascular Diseases(NICVD). E-mail: dr_asraf_sium@ yahoo.com

DOI: https://doi.org/10.3329/bhj.v37i1.60101

Methods:

Clinical Data:

From March 2018 to March 2020 we performed 30 cases of off pump CABG surgery using LIMA RIMA Y sequential grafts to achieve total arterial myocardial revascularization. During these procedures, we considered whether BIMA angiograph data available or not ; whether the patients not suffering from serious peripheral artery disease; and personal willingness of patients. Comparisons between LIMA + SVG and BIMA Y grafts were not made here.

Surgical Technique:

All patients received general anesthesia under a standardized protocol of the median sternotomy. The skeletonization method of the BIMA harvesting technique was employed. The LIMA was harvested first and dissected from the origin to distal bifurcation. The RIMA was then dissected the same way as the LIMA. After heparinization, the RIMA was removed as a free graft. To ensure maximal length, both the internal mammary arteries (IMA) were tried to free much as possible between the subclavian artery proximally and bifurcation of IMA distally. The endotBoth arteries were placed onto a thick pad of gauze. An oblique 1-cm incision was made in the LIMA and the proximal end of the RIMA was anastomosed with a continuous 8-0 polypropylene suture. The anastomosis location was under the level of the pulmonary annulus. The BIMA composed a Y configuration graft, with the LIMA being as the short limb of the Y graft, and the RIMA the long one. The length of the RIMA made it possible to graft as far as the lateral circumflex or posterior descending arteries. LIMA sequential to diagonal (D) D_1 and LAD constructed using 8-0 prolene suture. Then RIMA Y sequential to OM_2, OM_3 and posterior descending artery (PDA) were made using 7-0 prolene suture (figure 1).

Graft patency was assessed by using CT angiogram after 1 year. Cardiac enzyme analyses were performed on all patients peroperatively, immediately postoperatively and at 1, 2, and 6 days. Continueously ECG monitoring was done throughout the perioperative period up to discharge and 12 lead ECG was done in 3rd and 6^{th} postoperativeday routinely. Follow-up echocardiography was done on 1^{st} month ,3^{rd} month and 1 year after surgery.

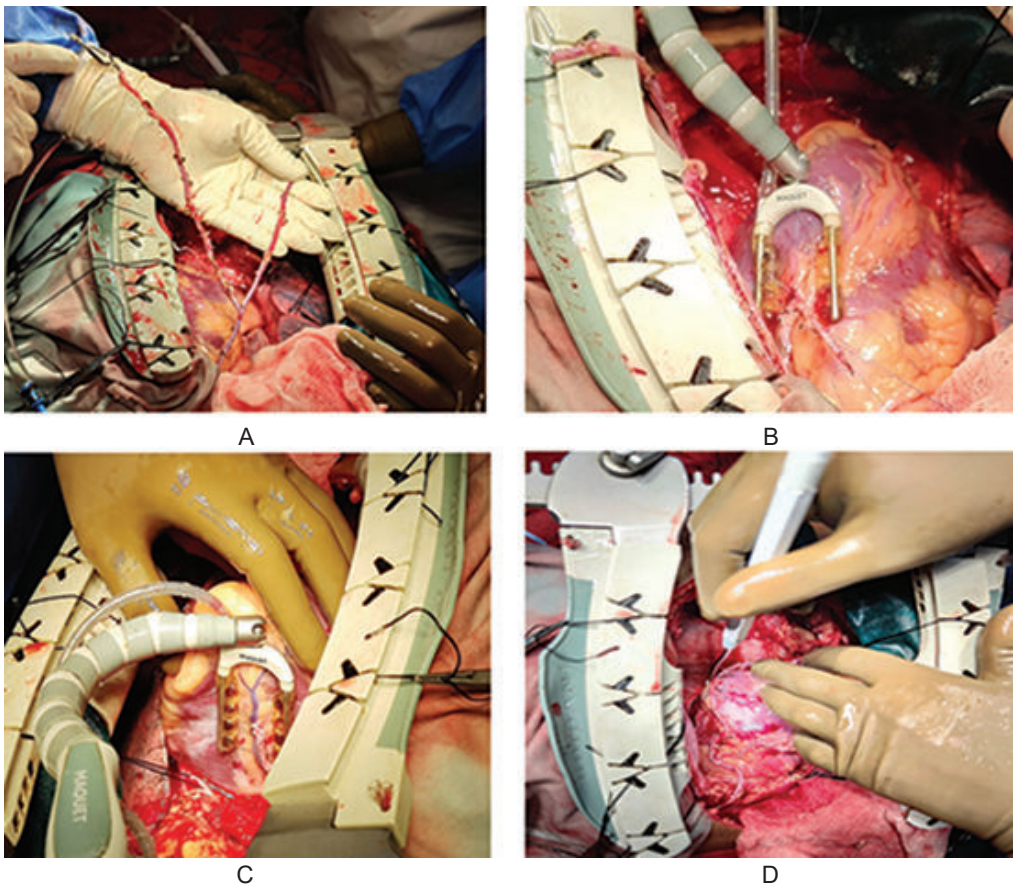
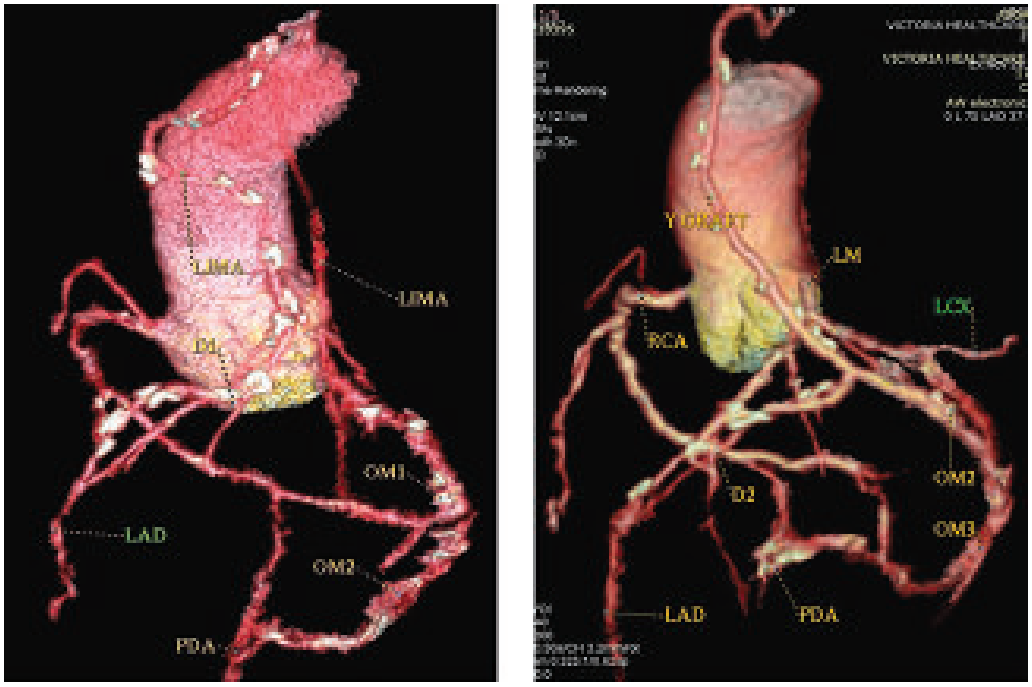


Fig.-1: *A. After construction of Y anastomosis, B. LIMA to D_1 anastomosis is going on, C. Just after construction of RIMA Y to PDA anastomosis, D. after completion of LIMA RIMA Y grafting.*



A B

Fig.-2: *CT angiogram after 1 year of surgery. A. CT angiogram showing patent graft LIMA sequential to D1 & LAD and RIMA Y sequential to OM1, OM2 and PDA.. B. CT angiogram showing patent LIMA sequential to D2 & LAD and RIMA sequential to OM2, OM3 and PDA.*

Statistical analysis:

The variables were expressed as means±standard deviations (SDs). The baseline characteristics and outcomes were compared using χ^2 analysis for categorical data and Student's t-test for continuous variables. Differences were considered significant only when the P-value was < 0.05.

Results:

Table-I

Main Demographic and clinical characteristics

Variables	Distribution
Age in years (Mean± SD)	43.51±2.58
Sex	
Male	93.34%
Female	6.66%
BMI (Mean± SD)	24.2±3.70
History of MI	40%
DM	73%
HTN	70%
Dyslipidemia	76.66%
Preoperative LVEF (Mean± SD)	45.59±2.01
CAG Findings	
TVD	93.34%
DVD	6.66%

Table-II

Distribution of per operative variables

Variables	Distribution
Operative time in hrs (Mean± SD)	4.68±1.21
Conversion to on pump	10%
Peroperative arrhythmia	16.66%
Peroperative MI	0%
Number of grafts	3.96±0.48

We performed 30 cases of off pump CABG surgery using LIMA RIMA Y sequential grafts to achieve total arterial myocardial revascularization. Mean age was 43.51±2.58. Most of them were male (93.34%). A total of 119 distal anastomoses were made in all patients, with an average of 3.96±0.4 bypasses performed for each patient. No one received supplemental vein graft. There were no perioperative deaths.

Two (6.66%) cases needed reoperation for bleeding. Surgical site infection was 10% in early postoperative period. Superficial skin and soft tissue infection was 6.66% in late postoperative period.

All patients were successfully discharged from the hospital.

Table-III

Distribution of post-operative variables:

Variables	Distribution	
Early postoperative outcome		
Ventilation time in hrs (Mean± SD)	4.68±1.02	
Chest drain collection ml in 1st 24 hrs (Mean± SD)	350.53±78.29	
ICU stay in days (Mean± SD)	4.22±1.73	
Postoperative arrhythmia	20%	
Postoperative MI	0%	
Reoperation for bleeding	6.66%	
Surgical site infection	10%	
Late postoperative outcome		
Deep sternal wound infection	0%	
Superficial Skin and soft tissue infection	6.66%	
Postoperative LVEF % (Mean± SD)	53.81±2.79	
Postoperative MI	0%	
Distribution of graft patency		
Name of grafts	Number of grafts	Graft Patency at 1 year
LIMA to LAD	30	100%
RIMA Y to D	26	100%
RIMA Y to OM	33	100%
RIMA Y to PDA	30	100%
Mortality		
Early	0	
Late	0	

Discussion:

Among the various strategies regarding the selection of the ideal arterial graft; the IMA, we used a single Y configuration graft with a free RIMA attached to the side of the LIMA in situ. The RIMA is histologically identical to the LIMA and might show similar long-term patency rates. In most patients, the RIMA could reach the RCA system without difficulty. Composite LIMA RIMA Y first proposed by Sauvage et al.[12] in 1986. Construction of this Y limb using LIMA and free RIMA is technically challenging but that provides an extra length to reach the distal targets including the PDA. The use of this Y conduit in the revascularization of the blocked territory has several advantages[13].

As like all surgical techniques, it has some pitfalls as well. Single source blood supply with steal phenomenon, competitive flow and hypoperfusion syndrome are some of the well recognized drawbacks associated with composite grafting[14,15,16]. Glineur et al[17] conducted a study to determine the capacity of Y graft configuration to provide sufficient blood flow to the whole left coronary system and about possible steal phenomenon occurring during period of maximal myocardial blood flow demand. Sakaguchi G et al.[20] told that total arterial revascularization with two arterial grafts can cause the life-threatening hypoperfusion syndrome. Because reperfusion of the entire myocardium depends on the proximal source of the left IMA. Several reports had concluded that the LIMA RIMA composite graft allowed complete myocardial revascularization with good perioperative results and that the flow reserve of the proximal LIMA was adequate for multiple coronary anastomoses.[20] Clinically, we did not observe any hypoperfusion syndrome in our study, which was consistent with other surgeons who preferred this graft strategy[21]. We performed CABG without CPB to reduce the occurrence of unstable hemodynamics and avoided using the distal IMA for anastomoses. There were evidences that the coronary flow reserve could be improved several months after operation[22,23] and that the IMA could adapt to the myocardial blood demand by compensatory dilatation[24,25].

Increased long time survival has been reported in high risk patients undergone BIMA grafting[18,19,26]. Despite of these good results using BIMA; the use of BIMA grafting

found surprisingly low among the surgeons. LaPar et al.[6] reported that from 2001 to 2013; use of BIMA was only 3% in the overall bypass population and 6% in a subgroup of patients considered "low risk" for BIMA use. An analysis of the Society of Thoracic Surgeons database revealed the use of BIMA was 3.5% in 1999 and 4.1% in 2009[5]. Wound infection can be minimized by harvesting skeletonized IMA[27] and the aggressive control of blood glucose. Di Mauro et al.[28] reported a better 17 years survival in patients with skeletonized BIMA grafts than in patients with pedicled BIMA grafts. We harvested both LIMA and RIMA as skeletonized graft in this study.

IMA hypoperfusion syndrome resulting from vasospasm of the arterial grafts is associated with high mortality[29]. Perioperative hypoperfusion may lead to ischaemia, infarction, low output states, profound hypotension in 1-2% cases undergoing composite grafting[30]. The hypoperfusion syndrome may result from injury to the conduit during harvesting, technical errors in the anastomosis, linear tension on the conduit, angulation at the anastomotic site and unresolved harvest spasm[31]. To reduce the incidence of perioperative hypoperfusion, proper preoperative assessment of the quality of IMA graft and the subclavian artery by angiography, carefulness and adherence of meticulous surgical techniques during conduit harvesting and flow measurement by transit time Doppler flow meter after completion of anastomosis are the key[32].

We performed 30 cases of off pump CABG surgery using LIMA RIMA Y sequential grafts to achieve total arterial myocardial revascularization. In our cases LIMA were grafted sequentially to D_1 and LAD, while RIMA Y were grafted sequentially to OM_2, OM_3 and PDA. Gu et al[33] performed OPCABG using LIMA RIMA Y grafts in 208 patients from October 2002 to December 2008. Their average distal anastomoses was 3.5±1.3 per person. They found OPCABG using the BIMA Y graft was safe and effective to achieve total arterial revascularization. In our cases total 119 distal anastomoses were made in all patients, with an average of 3.96±0.4 bypasses performed for each patient. No one received supplemental vein graft. There were no perioperative deaths. Another study conducted by Glineur et al.[34] from January 2000 to December 2010 among 436 patients at 2 different institutes, using the BIMA Y grafts to assess the utilization of BIMA Y in comparison to BIMA with additional vein grafts revealed improved survival with the use of BIMA Y grafts. Their average number of grafts in BIMA Y group and BIMA with additional vein grafts group was 4.0±0.7 vs 4.0±0.7; p=0.24. Di Mauro et al.[35] in their BIMA in situ vs Y graft 20 year outcome study, reported outcome of BIMA grafting is independent of surgical configuration.

Numerous studies had shown that the use of both internal mammary arteries improved long-term survival relative to the use of the left internal thoracic artery and SVGs. However, the concern that diabetes may lead to an increased risk of deep sternal wound infection had limited the use of both internal mammary arteries in nondiabetic patients [36,37,38]. Although use of BIMA is considered a risk factor for sternal infection[39], this risk appears to be attenuated by skeletonized IMA mobilization[40].Tarrio and colleagues reported the largest group of patients (743 cases) who underwent OPCABG with the BIMA Y or T graft [41]. They used the skeletonization technique to reduce the sternal complication. The rate of mediastinitis was 0.9% (7/743). In our study surgical site infection was 10% in early postoperative period and superficial skin and soft tissue infection was 6.66% in late postoperative period. In our study using skletonization technique for BIMA harvesting causing muscle was left attached to the chest wall. Thus minimizing sternal devascularization and possibly reducing the risk of deep sternal wound infection as well. We did not find any difference with the other CABG patients without the BIMA Y graft in our department. If the blood glucose was controlled ideally before operation and the sternum fracture was avoided; diabetic patients could get same result as non diabetic patients. So in our experience diabetes is not a contraindication to the BIMA Y graft.

OPCABG combined with the aorta no-touch technique has been accepted as an effective procedure to avoid neurologic and aortic complications, and to reduce operative risks [41].In our study, there was no incidence of stroke. In Tarrío's study incidence of stroke was 0.4%, 3 of 743 [41].

In our study, the off-pump coronary artery bypass graft with the BIMA Y graft was safe and feasible for all patients. No one was obliged to change off-pump to on-pump intraoperation, especially including moderate or severe heart function (LVEF<30%). There was no death postoperatively.

Conclusion:

OPCABG by using LIMA RIMA Y .graft is an effective option for total arterial revascularization. Adherence to meticulous surgical techniques can avoid the possible complications as well as to overcome the fear of incomplete revascularization despite the number of target lesions.

For a mature team, this technique could be easily performed in daily practice. It was not a time-consuming procedure and was the same technique as the conventional technique in our department. In fact, a long learning curve is needed for a fresh team.

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Original article

Correlation of hs-CRP with in-hospital Outcome of Patients with Acute Coronary Syndrome (ACS)

Muhammad Khurshed Alam[1], Anisul Awal[1], Salma Nahid[2], Sharif Mohammad Muizzul Akbar Chowdhury, Kazi Shamim Al Mamun[4], AKM Manzur Morshed[5]

Abstract:

Background and Objectives: Coronary artery disease (CAD) is a worldwide health epidemic. Acute coronary syndrome (ACS) is a potentially life-threatening condition of CAD. Serum high-sensitivity C Reactive Protein (hs-CRP) is being increasingly used as a marker for cardiac risk assessment and as a prognostic tool in acute coronary syndrome. The objective of this study was to evaluate the prognostic value of hs-CRP in predicting cardiovascular outcome in patients presenting with acute coronary syndromes.

Methods: This prospective observational study was carried out in the department of cardiology of Chittagong Medical College Hospital (CMCH), Chittagong, from April 2013 to March 2014. Total 100 patients presenting with acute coronary syndromes who fulfilled the selection criteria were included in the study. Serum hs-CRP of all patients was assayed on admission and study population divided into 4 groups according to hs-CRP quartiles. All four groups were followed-up till discharge and occurrence of any cardiovascular events were sought.

Results: Mean hs-CRP was 18±2.9mg/L (mean±SD), ranged from 1.6 mg/L to 71.2 mg/L /L. The mortality was significantly higher in quartile-4 (7%, p-0.001) and quartile-3 (4%, 0.005) as compared to quartile-1 and 2 (0% and 2% respectively). 12% patients developed heart failure in quartile-4 vs 2% in quartile-1 (p-0.045). Similarly other cardiac complications like cardiogenic shock, arrhythmias and heart blocks occurred in increasing frequency among patients of higher quartiles.

Conclusions: Elevated hs-CRP is a predictor of adverse outcome in patients with acute coronary syndromes and helps in identifying patients who may be at risk of cardiovascular complications.

Key words: *Acute coronary syndromes, C-reactive protein, In-hospital outcome*

(Bangladesh Heart Journal 2022; 37(1): 34-39)

Introduction:

Acute coronary syndrome (ACS) is a spectrum of life-threatening disorders that includes Unstable Angina (UA), non-ST-segment elevation Myocardial Infarction (NSTEMI), and ST-segment elevation Myocardial Infarction (STEMI). ACS is a common presentation of coronary artery disease (CAD) and significant cause of mortality and morbidity worldwide. Cardiovascular diseases (CVD) have no geographic, gender, or socio-economic boundaries. The global burden of CVD is increasing, principally because of a sharp increase in low and middle income countries (LMIC). Altered diets, diminished physical activity and tobacco use are critical factors contributing to the acceleration of CVD epidemics.[1] Being a member of LMIC it is assumed that CVD burden is being worse in Bangladesh also. A recent study conducted among rural population of Bangladesh

1. Assistant Professor, Department of Cardiology, Chattogram Medical College
2. Assistant Professor of Cardiology, Cox's Bazar Medical College
3. Assistant Professor of Cardiology, Chattogram Maa-O-Shishu Hospital Medical College, Chattogram
4. Junior Consultant (Cardiology), Chandanaish Upazilla Health Complex, Chattogram
5. Associate Professor of Cardiology (Former), Chattogram Medical College, Chattogram

Address of Correspondence: Dr. Muhammad Khurshed Alam, Assistant Professor, Dept. of Cardiology, Chattogram Medical College.

DOI: https://doi.org/10.3329/bhj.v37i1.60102

showed a dramatic increase in CVD from 1986 to 2006.[2] Presentation of ACS is diverse. Some are haemodynamically stable and can be managed conservatively but some require aggressive management including catheter based interventional procedures. In our settings as not all cardiac centers are equipped with facilities for urgent interventional procedures, the importance of early risk stratification is paramount.

Inflammation is an established cause in pathogenesis of ACS. Of the numerous inûammatory markers investigated over the past decade, C-reactive protein (CRP) measured by high-sensitivity assay (hs-CRP) is the most widely studied and is linked to adverse events. Hs-CRP has prognostic usefulness in cases of acute ischemia, even without troponin level elevation, suggesting that an enhanced inflammatory response at the time of hospital admission can determine subsequent plaque rupture[3]. These findings help explain why individuals with elevated hs-CRP levels are also more likely to be benefitted from early interventions.

The admission CRP value reflects the baseline inflammatory status of the patient; thus, patients with ACS and high CRP levels at admission usually experience more cardiovascular complications during follow-up. Since the maximum CRP level occurs at around 48 hours after the onset of symptoms, there is no need to continue monitoring the CRP levels after this time[4]. Reliable, hs-CRP assay is available at a relatively low cost. By this simple tool we may able to discriminate high risk patient of ACS early after admission and can triage them accordingly. High risk patients can be managed appropriately or be referred to centers' having urgent intervention facilities. Moreover this study will help us in better understanding about in-hospital complications of ACS in our perspective which we can be utilized for proper management of ACS patients.

Methods:

This prospective observational study was conducted at the department of Cardiology, Chittagong Medical College Hospital (CMCH) from April 2013 to March 2014. Patients with acute coronary syndrome (ACS) admitted to the Department of Cardiology, CMCH, within the study period and who met selection criteria were included.

Inclusion Criteria:

Diagnosed cases of ACS admitted to the Department of Cardiology, CMCH.

Exclusion criteria:

ACS patients with concomitant-

1. Malignancies,
2. Rheumatological/ Autoimmune diseases,
3. Chronic inflammatory disorders,
4. Acute infections and with renal/hepatic compromise
5. Patient admitted beyond 48 hours of onset of symptoms.
6. Unwilling to give consent.

Ethical Consideration:

Prior to the commencement of this study, the research protocol was approved by the Research Review Committee of Department of Cardiology and the Ethical Review Committee of CMCH, Chattogram. The aims and objectives of the study along with its procedure, alternative diagnostic methods, risks and benefits was explained to the patients in easily understandable local language and then informed consent was taken from each patient. It was assured that all records were kept confidential and the procedure will be helpful for both the physician and patients in making rational approach regarding management of the case.

Methods of data collection:

Information from the patients and relatives were collected through preformed case record form. Patients were evaluated by history, clinical examination and investigations. Blood samples for estimation of cardiac markers (Troponin-I) were collected after 4 hours of onset of symptoms. In few cases where initial Troponin-I assay was negative repeat assay was done after 6 hours. ACS was diagnosed by history, physical examination, electrocardiographic analysis and cardiac biomarkers (Troponin-I).

Venous blood for estimation of serum hs-CRP was collected within 48 hours of onset of Estimation of hs-CRP was carried out by particle enhanced Immuno-nephelometric method using BN system (BN Pro-spec, DADE-BEHRING). Estimation blood glucose, Lipid profile and renal function tests were also done. Patients were followed-up till their discharge and occurrence of pre-specified outcomes such as heart failure, arrhythmias, conduction block or death were sought.

Statistical analysis:

The statistical analyses were performed with Statistical Package for the Social Sciences (SPSS), version 19.0.

The continuous variables with a normal distribution are described as the mean±standard deviation (SD). The Student's t test (within two groups) and ANOVA (analysis of variance) test (more than two groups) were used for the comparisons between groups. The continuous variables without normal distribution are described as the median. The categorical variables were expressed as absolute values and percentages and comparison with the groups done by using chi square test and fisher-exact test. A multivariable logistic regression model was used to evaluate the independent contribution of hs-CRP levels to in-hospital events. For any analytical test the level of significance was 0.05 and p value<0.05 was considered significant.

Results:

Total 100 patients were selected for the study. The detection limit of hs-CRP was 0.2mg/L and assay was linear from 0.2mg/L to 230mg/L. Hs-CRP level ranged from 1.6 mg/L to 71.2 mg/L. Mean hs-CRP was 18+2.9 (mean+SD). 100 patients under study were arranged in ascending order of admission hs-CRP level and were classified into four groups according to quartiles of hs-CRP level. The 4 groups were Q1 or 1st quartile (hs-CRP<6.8mg/L), Q2 or 2nd quartile (hs- CRP 6.8-14.6mg/L), Q3 or 3rd quartile (hs-CRP 14.6-30.5mg/L) and Q4 or 4th(hs-CRP >30.5mg/L). Appropriate statistical techniques were used for data analysis. Results were presented with tables and graphs where required.

Table-I

Distribution of ACS patients among different quartiles according to age (100).

Age Groups	1st quartile (<6.8mg/L) Q1	2ndQuartile (6.8-14.6mg/L) Q2	3rd Quartile (14.6-30.5mg/L) Q3	4th Quartile (>30.5mg/L) Q4	P Value[a]
35-44 Years	03	03	04	03	0.135NS
45-54 Years	07	07	08	07	0.145NS
55-64 Years	06	06	09	07	0.125NS
65-74 Years	05	05	04	06	0.125NS
≥75 Years	03	02	02	03	0.145NS

Data were presented as frequencies.
[a]P value reached from Analysis of variance (Anova) test, NS- Not significant.

Above table shows the age distribution of study subjects. Almost similar number of subjects of different age groups belongs to all 4 quartiles (24, 23, 27 and 26 in Q1, Q2, Q3 and Q4 respectively) which are not statistically significant.

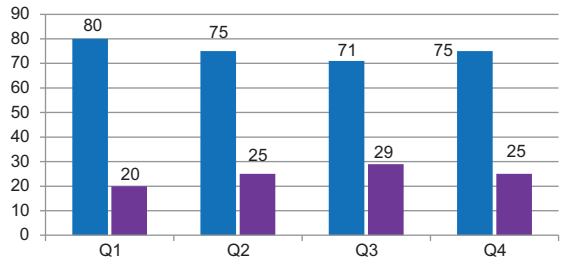

Fig.-1: *Sex distribution (%) among quartiles.*

Table-II

Distribution of presenting symptoms (n=100)

Symptoms	N	%
Chest pain	87	87
Sweating	59	59
Breathlessness	36	36
Vomiting	18	18
Syncope	09	09
Others	07	07

n- Number of patients presented, %- Percentage

Bar diagram showing distribution of the sex between groups. It shows male subjects in all quartiles is ranges from 71-80% and that of females is 20-29%. Distribution of male and female among quartiles are not statistically significant.

Table-II showed the distribution of presenting symptoms. Chest pain was the most common symptom and accounting for 87% of patients, followed by sweating 59%, breathlessness 36%, Vomiting 18%, Syncope 09% and others 07%. Feeling uneasy, Palpitations, vertigo, abdominal discomfort etc. were included in others.

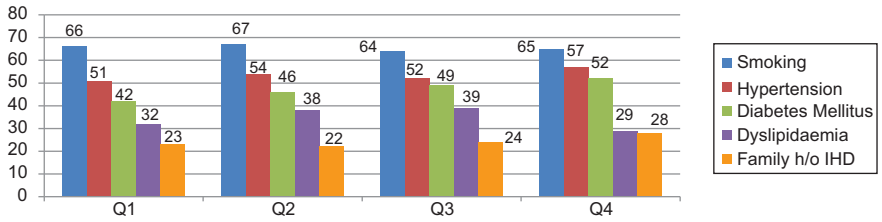

Fig.-2: *Distribution of risk factors (%) among quartiles*

Table-III

Mean hs-CRP of 4 quartiles.

	1st Quartile (<6.8mg/L) Q1	2ndQuartile (6.8-14.6mg/L) Q2	3rd Quartile (14.6-30.5mg/L) Q3	4th Quartile (>30.5mg/L) Q4	P-Value[a]
Mean hs-CRP (mg/L)	4.5±1.3	13.7±1.9	21.6±2.6	42.9±3.2	0.010[S]

Data were presented as mean±SD.
[a]P value reached from Analysis of variance (ANOVA) test, S-Significant

Table-IV

In-hospital complications of study population (n=100)

Complications (%)	1st Quartile Q1 (<6.8mg/L)	2nd Quartile Q2 (6.8-14.6mg/L)	3rd Quartile Q3 (14.6-30.5mg/L)	4th Quartile Q4 (>30.5mg/L)	P-Value[a]
Heart Failure (HF)	2	4	7	12	0.045[S]
Cardiogenic Shock (C.Shock)	0	1	2	4	0.055[NS]
Arrhythmias:					
Supraventricular	0				
Ventricular	0	1	2	3	0.650[NS]
Total	0	0	2	4	0.045[S]
		1	4	7	0.550[NS]
Conduction block:					
AVBlock	0				
BB Block	0	1	2	4	0.075[NS]
Total	0	1	1	2	0.625[NS]
		2	3	6	0.055[NS]

Data were presented as frequencies.
P value reached from Fisher exact test with Bonferroni correction
S-Significant, NS-Not significant,
AV- Atrioventricular block, BB- Bundle branch block

Figure-2 shows that, smoking was the leading risk factor for patients of all quartiles. Hypertension, diabetes mellitus, dyslipidaemia and positive family history for ischaemic heart disease (IHD) were other risk factors in descending order of frequency.

Table-IV shows the In-hospital complications. Heart failure was more frequent (25%) and occurred more in higher quartiles which is statistically significant (pÂ0.050). Other complications were arrhythmias (10%), conduction blocks (10%) and cardiogenic shock (7%). Arrhythmias were both ventricular and supraventricular.

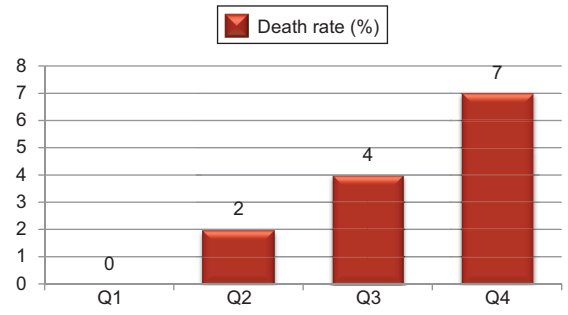

Fig.-3: *Death rate among different quartiles*

Table-V

Multivariate regression analysis for in-hospital mortality of the study population.

Variables	HR	95% CI	P- value
Age (years)	1.07	1.05-1.09	0.001^{S}
Hypertension	1.01	1.00-1.02	0.03^{S}
Diabetes mellitus	1.03	1.02-1.04	0.02^{S}
HF during hospitalization	1.02	1.01-1.03	0.002^{S}
Type of MI	1.06	1.03-1.09	0.055^{NS}
Received thrombolysis	1.05	1.02-1.08	0.001^{S}
Hs-CRP level (mg/L)	1.04	1.03-1.05	0.045^{S}

HR- hazard ratio, CI- confidence intervals, HF- heart failure, MI- myocardial infarction. S- significant, NS- not significant.

Premature ventricular complexes (PVCs) were more frequent ventricular arrhythmias (3% out of total 6%) likewise AF (Atrial fibrillation) in supraventricular. Out of 100, 7 patients of STEMI (7%) presented with cardiogenic shock.

To evaluate the independent predictive power of hs-CRP on in-hospital mortality, the 7clinical and biochemical variables were entered into a multivariable logistic regression model. The multivariable analysis showed hs-CRP as a strong predictor of in-hospital all-cause mortality as shown in table V.

Discussion:

Serum hs-CRP is being increasingly used as a marker for cardiac risk assessment and as a prognostic tool in acute coronary syndrome[5]. In the present study; we examined the prognostic value of admission hs-CRP in a hospitalized population with ACS. For this purpose study population were divided into 4 quartiles according to their hs-CRP levels.

Mean age of patients in the study was 54.6±5.4 (mean ± SD). It is comparable to a study from United Arab Emirates[6] where mean age of ACS patients were 52 ± 11 years (mean ± SD) but lower than the findings of a Spanish study (2012)[7] where mean age of ACS patients were 60.0±13.5 years (mean±SD) and a Thai study (2007)[8] study (65.2±12.3 years). This may be due to larger sample size and geographical variation of the two studies and support an study among Asian Indians in the UK (Enas EA et al 2001)[9] where it was revealed that onset of first myocardial infarction in south Asians is 5 to 10 years earlier than other region.

Our study revealed that most o f the ACS patients are male (75%) which is similar with the findings of in Sergio Raposeiras-Roubý´n[7] et al. study (2012) where 73.5% patients were male. In Paolo Ortolani et al (2007)[10] and AFMS Haque et al (2010)[11] study 64-76% and 82.81 % were male respectively.

In this study, smoking was the most common risk factor among the patients of all 4 hs-CRP quartiles (64-67%). It is in harmony with the study of Shahzada Selim et al (2013)[12] in Dhaka, Bangladesh where around 70% of ACS patients were smoker. According to Non Communicable Disease risk factor survey, Bangladesh 2010[13] prevalence of overall smoking is 26.2% but it is 54.8% among males. As most of our study population are male (75%), it is nearer to our study. In a British study of Kaski et al (2004).[14] 67% of ACS patients were smokers.

Chest pain was the most common symptom (87% of patients) of the study. It is comparable to Suphot Srimahachota et al[8] study, where 96.7% of UA, 86.0% patients of NSTEMI and 91.6% patients of STEMI were presented with chest pain.

Mean hs-CRP of study population is 18±2.9 mg/L (mean±SD). It was comparable to study of Sheikh AS et al (2011)[5] of Quetta, Pakistan where it was 17.6±7.96 mg/L (mean±SE). Mean hs-CRP of 1st to 4th quartiles are 4.5±1.3, 13.7±1.9, 21.6±2.6 and 42.9±3.2. Data from the Women's Angiographic Vitamin and Estrogen (WAVE)[15] study showed the similar result.

Death rate was 13% as a whole. It was comparable with Suphot Srimahachota[8] et al (2007) study where the rate of all cause mortality is 12.6%. The risk of death increased in a stepwise fashion

across increasing quartiles of hs-CRP. Patients in the 4th quartile (Q4) had nearly 4 fold increased risk of death in comparison to 2nd quartile (Q2). It was similar to the study of Paolo Ortolani et al (2007).[10]

Regarding in-hospital complications, rate of development of heart failure was 2%, 4%, 7%, and 12% in 1st, 2nd, 3rd, and 4th quartiles respectively. In Paolo Ortolani et al[10] (2007) study, Killip class e"2 heart failure was 9, 16, 18, and 36 percent in 4 mentioned quartiles (p-0.001). Though frequency of heart failure is more in

comparison to our study, but the study was conducted among STEMI fraction of ACS patients. This difference is likely due to the greater extent of necrosis in STEMI. No cardiogenic shock occurred among study population of 1st quartile, but occurred with increasing frequencies in subsequent quartiles (1, 2 and 4% in 2nd, 3rd and 4th quartile respectively). Paolo Ortolani et al study (2007) showed that cardiogenic shock occurred by 7, 11, 9 and 19% among 1st, 2nd, 3rd and 4th hs-CRP quartile of the study population. Though frequency of cardiogenic shock is more in Q2 than Q3, but in Q4 it is clearly higher than Q1, Q2 and Q3. It reflects that cardiogenic shock occurs more in higher hs-CRP group among population of ACS.

Conclusion:

A higher incidence of in- hospital mortality and morbidity showed in patients with higher hs-CRP level. Raised hs-CRP level revealed as an important marker of adverse outcomes. So, Plasma hs-CRP levels on admission can be utilized to identify high risk patients in the setting of acute coronary syndromes, who may be at high risk of complications. These patients may need aggressive management and close monitoring after discharge.

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Original article

Gender Influence on In-hospital Outcomes of Primary Percutaneous Coronary Intervention

Subas Caandro Datta[1], M G Azam[2], Jafrin Jahan[3], Tariq Ahmed Chowdhury[4], Md. Mamunuzzaman[5], Md. Sazzad Masum [6], S M Nazmul Huda[7], Md. Shamim Aktar [8]

Abstract:

Background: Acute myocardial infarction (AMI) is one of the leading cause death and disability all over the world. But, there is a lack of data about the gender influence on in-hospital outcomes of primary percutaneous coronary intervention (pPCI) among Bangladeshi patients. This study was aimed to evaluate the clinical and angiographic differences and to compare their in hospital outcomes of pPCI between male and female patients.

Objective: To evaluate the gender influence on in-hospital outcome of primary PCI.

***Methods*: This was a prospective observational study of 90 patients with ST elevation myocardial infarction (STEMI) treated with pPCI in the Department of Cardiology, NICVD, Dhaka, Bangladesh from April 2019 to March 2020, followed from admission until hospital discharge or death. The patients were divided equally into two groups, group '! (female) and group a! (male).**

Result : A significant difference was observed for age (61.8±10.9vs.56.5±10.7 years; p=0.02), hypertension (66.7% vs. 42.2%; p=0.02), diabetes (68.9% vs. 44.4%; p=0.01), smoking (0.0% vs. 68.9%; p<0.001), obesity (BMI- 28.3±3.8 vs. 26.5±3.9; p=0.02), troponin I (14.89±20.48 vs. 8.25±7.92; p=0.04) and pain-to-door time (281.90±88.70 vs. 240.33±80.81 minutes; p=0.04). Female had angiographically greater frequency of multivessel disease and similar distribution of infarct related artery in relation to male. The success of the procedure was similar (91.1% vs. 97.8%; p=0.18). Overall, female experienced greater incidence of in-hospital adverse events in comparison to male (28.8% vs. 13.3%; p=0.03) and significantly higher rates of severe bleeding (11.1% vs.2.2%; p=0.03) and vascular access site complications (15.6% vs. 4.4%; p=0.04). Major adverse cardiac events (MACE) were higher among females in comparison to males (11.1% vs. 6.7%; p=0.45). Females experienced significantly higher rates of short-term net adverse clinical events (NACE) than males (20.0% vs. 8.8%; p=0.04). Female sex [odds ratio (OR) 1.94], age e"60 years (OR 1.59) and diabetes (OR 2.75) were identified as independent predictors of adverse in-hospital outcomes among STEMI patients undergoing pPCI.

Conclusion: Female sex presented with significantly more risk factors and experienced more in-hospital adverse outcomes than male in STEMI patients undergoing pPCI. They had significantly higher rates of NACE, largely driven by increased rate of major bleeding. Female sex was an independent predictor for the development of in-hospital adverse outcomes in STEMI patients undergoing pPCI.

Keywords : *Primary percutaneous coronary intervention, Gender influence, In-hospital outcome.*

(Bangladesh Heart Journal 2022; 37(1): 40-51)

1. Resident physician, 250 Bed Bangamata Sheikh Fazilatunnesa Mujib General Hospital, Sirajganj, Bangladesh.
2. Professor of Cardiology, National Institute of Cardiovascular Diseases, Dhaka, Bangladesh.
3. Associate Professor of Cardiology, National Institute of Cardiovascular Diseases, Dhaka, Bangladesh
4. Assistant Professor of Cardiology, National Institute of Cardiovascular Diseases, Dhaka, Bangladesh
5. Assistant professor of cardiology, Shaheed M. Monsur Ali Medical college, Sirajganj, Bangladesh.
6. Junior consultant of cardiology, 250 Bed Bangamata Sheikh Fazilatunnesa Mujib General Hospital, Sirajganj, Bangladesh.
7. Assistant Registrar, Department of Cardiology, National Institute of Cardiovascular Diseases, Dhaka, Bangladesh.
8. Resident Physician, M. Abdur Rahim Medical College Hospital, Dinajpur, Bangladesh.

Address of Correspondence: Dr. Subas Caandro Datta, MD, Resident physician, 250 bed Bangamata Sheikh Fozilatunnesa Mujib General Hospital Sirajganj, Bangladesh, subasdatta40rmc@gmail.com, +8801789494601

DOI: https://doi.org/10.3329/bhj.v37i1.60103

Introduction:

Cardiovascular diseases (CVD) are the leading cause of disease burden and deaths globally with the 2013. Global Burden of Disease (GBD) study estimating that CVD caused 17.3 million deaths globally each year[1].

Coronary artery disease (CAD) is an increasingly important medical and public health problem and is the leading cause of mortality in Bangladesh. Like other South Asians, Bangladeshis are unduly prone to develop CAD which is often premature in onset, follows a rapidly progressive course and angiographically more severe. The exact prevalence of CAD in Bangladesh is not known. Only a limited number of small-scale epidemiological studies are available. One recent review has estimated the prevalence of CAD in Bangladesh to be 4-6%. [2]

Estimates from the global burden of disease study suggests that by the year 2020 the South Asian part of the world (India, Pakistan, Bangladesh, Nepal) will have more individuals with atherosclerotic cardiovascular diseases than any other region[3]. It now accounted for 14.76% of all deaths[4].

IHD may be manifested clinically as either chronic stable angina or an acute coronary syndrome (ACS). ACS can be subdivided into ST-segment elevation myocardial infarction (STEMI), non-ST-segment elevation myocardial infarction (NSTEMI) and unstable angina (UA) [5].

Despite a significant decrease in mortality associated with cardiovascular disease in developed countries over the last decade acute myocardial infarction (AMI) continues to be a major cause of morbidity and mortality[6,7]. It generally occurs due to sudden occlusion of a coronary artery by formation of thrombus at the site of fissured or ruptured atherosclerotic plaque [8]. The major aspect of treatment of ST-elevation Myocardial Infarction (STEMI) is reperfusion of the infarct related artery.

Fibrinolysis and primary PCI are the two options of reperfusion for the patient presenting with STEMI. There is strong evidence from randomized clinical trials that primary percutaneous coronary intervention (pPCI) is associated with lower mortality, as well as lower rates of recurrent AMI and intracranial bleeding, when compared to fibrinolytic therapy[9]. When pPCI is feasible, it is recommended for all patients with acute ST-elevation myocardial infarction (STEMI) who can undergo the procedure within 120 minutes of the first medical contact, performed by qualified professionals, provided that symptoms started within the last 12 hours.

Outcomes after primary PCI are variable and accurate risk stratification is the clinical importance in guiding the management of relatively high risk patient. Prasad et al.[10] found that the older age act as a predictor of major adverse cardiac events (MACE) after primary PCI for myocardial infarction. Patients with diabetes who receive primary PCI for STEMI are also at higher risk of mortality especially during hospitalization and the first year following the procedure[11]. In patients with myocardial infarction, high lipoprotein (a) levels have been found to be associated with adverse long-term result[12]. Shorter interval between the onset of myocardial infarction symptoms and primary PCI will lead to better result. The most favorable interval has been determined as 120 minutes[13].

Several studies have identified different characteristics of STEMI in men and women. Higher mortality is often observed in women, in addition to adverse clinical characteristics at a higher frequency than in men, such as older age, higher prevalence of cardiovascular risk factors, and more severe clinical presentation[14,15]. Moreover, longer delay in the care of women with STEMI has been reported, which could influence results, including patients undergoing pPCI[14] . After pPCI higher in-hospital mortality was observed among the female patients which was 23.5%, where in-hospital mortality among the male patients was 8.9%[16].

This study was aimed to evaluate the clinical and angiographic difference and to compare the in-hospital outcomes of pPCI between male and female patient and to obtain the independent predictors of in-hospital adverse outcomes.

Method:

This Prospective observational study was conducted in the Department of Cardiology, National Institute of Cardiovascular Diseases, Dhaka, April 2019 to March 2020 over a period of one year. Patients with STEMI coming within 12 hours of symptom onset and undergoing primary percutaneous coronary intervention (pPCI) during the time period at NICVD, were selected as study population. Patients with STEMI presenting after 12 hours of symptom onset or received fibrinolytic therapy or with old MI, LBBB, valvular heart disease, cardiomyopathy or having history of prior PCI or CABG or with any severe co-morbidities (eg. Renal disease, previous stroke, COPD, anaemia, malignancy, bleeding disorder) or with a life expectancy of less than one year were excluded from this study. A total of 90 patients with STEMI , based on inclusion and exclusion criteria, who underwent pPCI in NICVD were selected as study population. Study subjects were divided on the basis of

sex difference into two groups(Group I – Female sex and Group II – Male sex).

Informed written consent was taken from each patient before enrolment. ST elevated myocardial infarction was defined according to O'Gara et al[17].

Meticulous history and detailed clinical examination were carried out and recorded in patient's data collection sheet. Demographic data, such as, age, sex, BMI were noted. Troponin I, random blood sugar and serum creatinine were recorded. 12 lead resting ECG was done. Risks factors like, hypertension, diabetes mellitus, smoking status, dyslipidemia, family history of coronary artery disease were recorded. Complications after pPCI, like, bleeding, vascular access site complications, significant arrhythmia, cardiogenic shock, acute heart failure, cardiovascular death, post-procedural angina, length of hospital stay were also recorded.

All the patient underwent primary PCI in transfemoral access were prescribed and provided with guideline directed medication for acute myocardial infarction (e.g-aspirin, P2Y12 inhibitor, statin, opioid analgesic etc). Intervention was performed in infarct related artery and number of vessel involvement were also recorded. After completion of pPCI, post PCI follow up was given and ECG was done immediately after primary PCI. These patients were kept in coronary care unit under close observation with continuous ECG monitoring. Patients were followed up after 2 hours and 24 hours post PCI and every day thereafter until discharge. Any adverse in-hospital outcome was noted in these patients and managed adequately. 12 lead ECG, echocardiography, troponin I, CBC, Duplex study of vessels, CT scan of brain has been done in selected patients. In the event of any arrhythmia the attending nurses were instructed to keep a 12 lead ECG record and inform the attending physician. All the parameters were recorded in data collection sheet. Patients were monitored until discharge from hospital.

The data obtained from the study were analyzed and significance of differences was estimated by using statistical methods. Continuous variables was expressed as mean value ± standard deviation and compared using unpaired student's t-test or chi-squared test. Categorical variables were presented as frequency and percentages and analyzed using Pearson's chi-square test or Fisher's exact test, as appropriate. Logistic regression analysis was performed to adjust for the potential confounders in predicting the relation between gender difference and short-term outcome of primary PCI. Univariate logistic regression analysis was performed to specify the odds ratio (OR) for overall adverse in hospital outcomes. Multivariate logistic regression analysis was performed to determine the independent predictors of adverse in-hospital outcome. Variables yielding p values <0.05 in univariate analysis was selected for multivariable model. Statistical significance has assumed if p 0.<05 throughout the study. Statistical analysis was carried out by using SPSS software version 16.0.

The study protocol was approved by the Ethical Review Committee of NICVD. Informed consent was taken from each patient or near relatives. Confidentiality was maintained strictly and the patient had the right to withdraw himself/herself from the study at any time during the study period. Data was collected in an approved data collection form.

Results And Observations:

In this study, a total of 90 patients of STEMI were selected as study population and 45 patients were considered as group I (female sex) and 45 patients were considered as group II (male sex). The main objective of the study was to evaluate the gender influence on in-hospital outcomes of primary percutaneous coronary intervention.

Table-I

Comparison of the study patients according to age (N=90)

Age in years	Group I (n = 45)		Group II (n = 45)		Total (n=90)		p value
	Number	%	Number	%	Number	%	
≤49	8	17.8	10	22.2	18	20.0	
50 – 59	10	22.2	12	26.7	22	24.4	
60 – 69	19	42.2	13	28.9	32	35.6	
≥70	8	17.8	10	22.2	18	20.0	
Mean ± SD	61.8±10.9		56.5±10.7		59.2±11.1		0.02[s]
Range (min – max)	(40 – 80)		(38 – 73)		(38 – 80)		

Group I = Female patients with acute STEMI, Group II= Male patients with acute STEMI
s = Significant (p<0.05), P value reached from unpaired t-test

Here, the most of the study patients were in 60 - 69 years of age in group I (42.2%) and group II (28.9%) respectively followed by 50-59 years of age in group I (22.2%) and (26.7%) in group II respectively. The mean age was found 61.8±10.9years in Group I and 56.5±10.7years in Group II which was significantly (p=0.02) higher in group I in unpaired t-test. The mean age of the total study patients was 59.2±11.1 years.

Here, hypertension and diabetes mellitus were significantly higher in group I (p = 0.02 and 0.01 respectively) , whereas smoking was significantly higher in group II (p value <0.001). Other variables not reached significant difference between two group.

Here, clinical parameters between two groups of study population shows no significant differences. It indicates two group of study subjects were nearly homogenous.

Table-II

Distribution of patients according to risk factors (N=90)

Risk factors	Group I (n = 45)		Group II (n = 45)		Total (n=90)		p value
	Number	%	Number	%	Number	%	
Smoking	0	0.0	31	68.9	31	34.4	<0.001^{s}
Smokeless tobacco	4	8.9	3	6.7	7	7.8	0.69^{ns}
Hypertension	30	66.7	19	42.2	49	54.4	0.02^{s}
Diabetes mellitus	31	68.9	20	44.4‘	51	56.7	0.01^{s}
Dyslipidaemia	28	62.2	24	53.3	52	57.8	0.39^{ns}
Family history of CAD	17	37.8	18	40.0	35	38.9	0.82^{ns}

Group I= Female patients with acute STEMI, Group II= Male patients with acute STEMI
ns = Not significant (p>0.05), s= Significant (p<0.05)
P value reached from Pearson’s chi square test and Fisher’s exact test (for cell frequency <5).

Table-III

Distribution of study patients by body mass index (BMI) (N=90)

BMI (kg/m^2)	Group I (n = 45)		Group II (n = 45)		Total (n=90)		p value
	Number	%	Number	%	Number	%	
Normal (18.5-24.9)	10	22.2	19	42.2	29	32.2	
Overweight (25-29.9)	21	46.7	17	37.8	38	42.2	
Obese (30-39.9)	14	31.1	9	20.0	23	25.6	
Mean ± SD	28.3±3.8		26.5±3.9		27.4±3.9		0.02^{s}

Group I= Female patients with acute STEMI, Group II= Male patients with acute STEMI
s = Significant (p<0.05)
P value reached from unpaired t-test

The mean BMI of group I and group II were 28.3±3.8 vs. 26.5±3.9 kg/m^2 and the difference of mean BMI between the groups was statistically significant (p=0.02).

Table-IV

Comparison clinical parameters between two groups (N=90)

Clinical statistics	(Group I) n=45 Mean±SD	(Group II) n=45 Mean±SD	(Total) n=90 Mean±SD	p value
Heart Rate /min	79.8±13.9	82.4±15.0	81.1±14.4	0.40^{ns}
Systolic Blood pressure (mmHg)	126.4±18.7	123.3±15.4	122.9±16.5	0.21^{ns}

Group I= Female patients with acute STEMI, Group II= Male patients with acute STEMI
ns = Not significant (p>0.05)
P value reached from unpaired t-test

Table-V

Biochemical status of the study patients (N=90)

Biochemical statistics	(Group I) n=45 Mean±SD	(Group II) n=45 Mean±SD	(Total) n=90 Mean±SD	p value
Plasma glucose mmol/L	10.4±3.1	8.2±2.8	9.3±2.9	0.34^{ns}
Creatinine mg/dl	1.09±0.34	1.13±0.32	1.11±0.33	0.65^{ns}
Troponin I ng/ml	14.89±20.48	8.25±7.92	11.57±15.76	0.04^{s}

Group I= Female patients with acute STEMI, Group II= Male patients with acute STEMI
ns = Not significant (p>0.05), s= Significant (p<0.05)
P value was reached from unpaired t-test

The mean plasma glucose and troponin I level were higher in group I, whereas the mean creatinine level was higher in group II, but only the mean troponin I level reached significantly higher in group I patients compared to group II patients (14.89±20.48 vs. 8.25±7.92) with significant difference (p=0.04).

Among the study patients, 80% patients were found heart failure in the class I, 11.1% patients were in class II and 4.4% patients were in both of class III and IV. In terms of Killip-Kimball classification of heart failure, there was no significant difference between two groups.

The mean duration of chest pain to door time and chest pain to balloon time were observed significantly higher in group I than in group II (281.90±88.70 vs. 246.33±80.81 min, p=0.04 and 359.77±80.83 vs 312.00±76.02 min, p =0.02 ; respectively).

Table VI

Distribution of study patients by Killip-Kimball class of heart failure (N=90)

Killip-Kimball class	Group I (n = 45)		Group II (n = 45)		Total (n=90)		p value
	Number	%	Number	%	Number	%	
I	34	75.6	38	84.4	72	80.0	0.29^{ns}
II	7	15.6	3	6.7	10	11.1	0.18^{ns}
III	2	4.4	2	4.4	4	4.4	1.00 ^{ns}
IV	2	4.4	2	4.4	4	4.4	1.00 ^{ns}

Group I= Female patients with acute STEMI, Group II= Male patients with acute STEMI
ns = Not significant (p>0.05)
P value was reached from chi square and Fisher's exact test.

Table VII

Comparison of the study patients by duration of chest pain (N=90)

Duration of chest pain (min)	(Group I) n=45 Mean±SD	(Group II) n=45 Mean±SD	(Total) n=90 Mean±SD	p value
Pain to door time	281.90±88.70	240.33±80.81	261.1±92.42	0.04^{s}
Pain to balloon time	359.77±80.83	312.00±76.02	335.89±90.73	0.02^{s}
Door to balloon time	77.87±9.12	71.67±8.42	75.81±7.56	0.12^{s}

Group I= Female patients with acute STEMI, Group II= Male patients with acute STEMI
ns = Not significant (p>0.05), s= Significant (p<0.05)
P value reached from unpaired t-test

Table-VIII

Distribution of patients according to the number of diseased vessel by coronary angiography (N=90)

No. of diseased Vessels	Group I (n = 45)		Group II (n = 45)		Total (n=90)		p value
	Number	%	Number	%	Number	%	
Single	9	20.0	15	33.3	24	26.7	0.15^{ns}
Double	18	40.0	14	31.1	32	35.6	0.37^{ns}
Triple	18	40.0	16	35.6	34	37.8	0.66^{ns}

Group I= Female patients with acute STEMI, Group II= Male patients with acute STEMI
p value reached from chi square test
ns= Not significant (p>0.05)

Between two group, the vessel involvement among the study patients were almost similar with statistically insignificant difference (p>0.05).

The study shows that involved vessels among the two group of patients were almost similar with statistically insignificant difference (p>0.05).

Here, it was found that the number of stents were almost identically distributed between the study groups with no significant difference.

The mean diameter and mean stent length were not reaching the significant difference between group II and group I (2.91±0.22 vs. 2.80±0.19 mm, p=0.07 and 26.61±5.11 vs. 25.24±5.07 mm, p=0.09 ; respectively).

Table-IX

Distribution of patients according to infarct related artery (IRA) in coronary angiography(N=90)

Vessels	Group I (n = 45)		Group II (n = 45)		Total (n=90)		p value
	Number	%	Number	%	Number	%	
LAD	21	46.7	22	48.9	43	47.8	0.83^{ns}
LCX	7	15.6	8	17.8	15	16.7	0.77^{ns}
RCA	17	37.8	15	33.3	32	35.6	0.65^{ns}

Group I= Female patients with acute STEMI, Group II= Male patients with acute STEMI
p value was reached from chi square test; ns= Not significant (p>0.05)

Table-X

Distribution of patients according to number of stents(N=90)

No. of stents	Group I (n = 45)		Group II (n = 45)		Total (n=90)		p value
	Number	%	Number	%	Number	%	
1	40	88.9	38	84.4	78	86.7	0.54^{ns}
2	5	11.1	6	13.3	11	12.2	0.74^{ns}
3	0	0.0	1	2.2	1	1.1	0.31^{ns}

Group I= Female patients with acute STEMI, Group II= Male patients with acute STEMI
p value reached from chi square test Fisher's exact test (for cell frequency <5); ns= Not significant (p>0.05)

Table XI

Distribution of patients by characteristics of deployed stents in the target vessels (N=90)

Characteristics	(Group I) n=45	(Group II) n=45	(Total) n=90	p value
	Mean±SD	Mean±SD	Mean±SD	
Stent diameter in mm	2.80±0.19	2.91±0.22	2.88±0.21	0.07^{ns}
Stent length in mm	25.24±5.12	26.61±5.11	25.78±5.44	0.09^{ns}

Group I= Female patients with acute STEMI, Group II= Male patients with acute STEMI
p value reached from unpaired t-test
ns = Not significant (p>0.05)

Table-XII

Procedural outcome of the study patients according to TIMI flow before and after PCI (N=90)

TIMI flow	Group I (n = 45)		Group II (n = 45)		Total (n=90)		p value
	Number	%	Number	%	Number	%	
Before PCI							
0	24	53.3	22	48.9	46	51.1	0.32^{ns}
1	21	46.7	21	46.7	42	46.7	1.00^{ns}
2	0	0.0	2	4.4	2	2.2	0.17^{ns}
3	0	0.0	0	0.0	0	0.0	
After PCI							
0	0	0.0	0	0.0	0	0.0	
1	0	0.0	0	0.0	0	0.0	
2	8	17.8	2	4.4	10	11.1	0.04^{s}
3	37	82.2	43	95.6	80	88.9	0.04^{s}

Group I= Female patients with acute STEMI, Group II= Male patients with acute STEMI
ns= Not significant (p>0.05), s= Significant (p<0.05); p value reached from chi-square test and Fisher's exact test (for cell frequency <5)

The above table shows that before PCI TIMI flow grade 0 and 1were majority patients in both groups. After PCI TIMI flow grade 3 was in majority Group II and Group I (95.6% vs. 82.2%, p=0.04).

After pPCI, complications were more commonly developed in group I than group II, of which vascular access site complications and bleeding were significantly higher in group I than group II ((15.6% vs. 4.4% and 11.1% vs. 2.2% ; respectively).

The above table explains that angiographic success and procedural success in group-I 93.3% and 91.1%. On the contrary, angiographic success and procedural success in group-II were 95.5% and 93.3. Difference of above parameters between two groups is insignificant (p>0.05).

Overall outcome defined as the presence of any one cardiovascular related complication. It was found that composite / overall outcome (28.8 % vs 13.3 %, p= 0.03) and overall net adverse clinical events were significantly higher in group I patients compared to group II patients (20.0% vs 8.8%, p=0.04).

The mean duration of hospital stay (in days) was more in group I than group II patients and it was reached statistically significant (p=0.03).

Here, it was found that the out of all above mentioned variables, only of the 3 variables, ageee60 years, diabetes mellitus and female gender were found to be the significant predictors of adverse in-hospital outcome with ORs being 1.59, 2.75 and 1.94 respectively. So, it concluded that female sex was also an independent predictor for the development of in-hospital outcome together with age and diabetes mellitus.

Table-XIII

Distribution of the patients according to in-hospital adverse outcomes (N=90)

Outcomes variables	Group I (n = 45)		Group II (n = 45)		Total (n=90)		p value
	Number	%	Number	%	Number	%	
Cardiogenic shock	5	11.1	4	8.9	9	10.0	0.72^{ns}
Heart failure	5	11.1	4	8.9	9	10.0	0.72^{ns}
Vascular access site complications	7	15.6	2	4.4	9	10.0	0.04^{s}
Bleeding	5	11.1	1	2.2	6	6.7	0.03^{s}
Significant arrhythmia	4	8.9	2	4.4	6	6.7	0.40^{ns}
Stroke	0	0.0	0	0.0	0	0.0	
Re-infarction	4	8.9	3	6.7	7	7.8	0.69^{ns}
Cardiovascular death	4	8.9	3	6.7	7	7.8	0.69^{ns}

Group I= Female patients with acute STEMI, Group II= Male patients with acute STEMI
ns= Not significant (p>0.05), s= Significant (p<0.05)
p value reached from chi-square test and Fisher's exact test (for cell frequency <5)

Table-XIV

Distribution of the study patients by angiographic and procedural success (N=90)

Procedure results	Group I (n = 45)		Group II (n = 45)		Total (n=90)		p value
	Number	%	Number	%	Number	%	
Angiographicsuccess	42	93.3	43	95.5	85	94.4	0.30^{ns}
Procedural success	41	91.1	42	93.3	83	92.2	0.18^{ns}

Group I= Female patients with acute STEMI, Group II= Male patients with acute STEMI
p value reached from Fisher's exact test (for cell frequency <5)
ns= Not significant (p>0.05)

Table-XV

Comparison of patients by overall outcomes (N=90)

Outcomes	Group I (n = 45)		Group II (n = 45)		Total (n=90)		p value
	Number	%	Number	%	Number	%	
Composite/overall	13	28.8	6	13.3	19	21.1	0.03^{s}
Overall MACE	5	11.1	3	6.7	8	8.8	0.45^{ns}
Overall NACE	9	20.0	4	8.8	13	14.4	0.04^{s}

Group I= Female patients with acute STEMI, Group II= Male patients with acute STEMI
MACE= Major adverse cardiac events, NACE= Net adverse clinical events
p value reached from chi square test
s = Significant (p<0.05), ns = Not significant (p>0.05)

Table-XVI

Comparison of the study patients according to hospital stay(N=90)

Hospital stay (days)	Group I (n = 45)		Group II (n = 45)		Total (n=90)		p value
	Number	%	Number	%	Number	%	
≥3 days	28	62.2	25	55.6	53	58.9	
<3 days	17	37.8	20	44.4	37	41.1	
Mean±SD	4.4±1.2		2.6±0.4		3.5±0.8		0.03[s]

Group I= Female patients with acute STEMI, Group II= Male patients with acute STEMI
p value reached from unpaired t test
s = Significant (p<0.05)

Table-XVII

Multivariate binary logistic regression analysis for determinants of adverse in-hospital outcome after primary percutaneous coronary intervention(N=90)

Variables of interest	Regression coefficient (β)	P value	OR	95% CI of OR
Agee"60 years	0.462	0.04[s]	1.59	1.015 – 4.562
Increased BMI	0.267	0.14[ns]	0.87	0.112 – 10.217
Diabetes mellitus	0.754	0.01[s]	2.75	1.011 – 7.833
Hypertension	0.131	0.11[s]	1.02	0.177 – 3.327
Pain to door time	0.003	0.21[ns]	1.00	0.089 – 7.812
Door to balloon time	0.027	0.15[ns]	0.94	0.041 – 6.241
Pain to balloon time	0.141	0.10[ns]	1.11	0.104 – 8.201
Stent diameter	0.017	0.19[ns]	0.89	0.201 – 4.363
Stent length	0.012	0.24[ns]	0.84	0.051 – 3.120
Troponin I	0.242	0.09 [ns]	1.20	0.247 – 9.201
Female sex	0.631	0.04[s]	1.94	1.008 – 18.201

Dependent variable: presence of adverse in-hospital outcome;
Independent variables: ageee60 years, increased BMI, diabetes mellitus, hypertension, pain to door time, door to balloon time, pain to balloon time, stent diameter, stent length, troponin I and female gender
S = Significant, NS = Not significant

Discussion:

This prospective observational study was conducted in the Department of Cardiology, NICVD, Dhaka. The aim of the study was to evaluate the gender influence on in-hospital outcomes of ST-segment elevation myocardial infarction (STEMI) patients who underwent primary percutaneous coronary intervention (pPCI). A total of 90 patients were included in the study. The patients were divided into two groups on the basis of sex; patients with female sex were categorized as group- I and those with male sex were categorized as group- II.

The mean age of females was significantly higher than males (61.8±10.9 versus 56.5±10.7years, p=0.02) that was slightly lower than the patients population of Italian study by Luca et al. [18](72±13 versus 63±12 years, p<0.0001) and German study by Heer et al [19] (72 vs. 67 years, p<0.001) which was possibly due to the fact that Bangladeshis are unduly prone to develop coronary artery disease (CAD) which is often premature in onset and follows a rapidly progressive course and results in angiographically more severe coronary artery diseased[2].

Smoking was significantly higher in group II patients which was also observed exclusively in Indian populations among males (68.9%) observed by Patted SV[20]and was also supported by some Western studies (Vaccarino et al.[21]). Females (group II patients) had significantly worse baseline risk factors than men, particularly hypertension, diabetes and BMI. Several other studies have made similar observation (Fu et al.[22] ; Luca et al.[18]; Srinivas et al.[23]). According to the clinical parameters, the two group of study populations showed no significant differences that indicates two group of study subjects were nearly homogenous.

The mean plasma glucose level and mean serum creatinine level were observed insignificant difference

between two groups (group I vs group II; 10.4±3.1 vs. 8.2±2.8 mmol/L, p=0.34 and group I vs group II; 1.09±0.34 vs 1.13±0.32 mg/dl, p=0.65 ; respectively). On admission troponin I level was also found higher in group I patients compared to group II patients (14.89±20.48 vs. 8.25±7.92) with significant difference (p=0.04). You et al.[24]also found statistically significant difference (p<0.01) in troponin I on admission. Troponin I correlate with severity of myocardial infarction and it is a traditional predictor of poor prognoses in patients with AMI (Antman et al.[25]).

Heart failure in terms of Killip-Kimball classification at admission was studied; class-'! 80%(75.6% vs. 84.4 %respectively in female and male), class-a! 11.1%(15.6% vs. 6.7% respectively in female and male) class-b! 4.4% (4.4% vs. 4.4%respectively in female and male) and class-c! 4.4% (4.4% vs. 4.4%respectively in female and male) with statistically insignificant difference between the groups (p>0.05) that was supported in studies done by Fu et al.[22]; You et al.[24]; and Barbosa et al.[16]

The mean duration of chest pain to door time was observed significantly higher in females than in males (Female vs Male ; 281.90±88.70 vs. 240.33±80.81 min, p=0.04 ; respectively) and the mean duration of chest pain to balloon time was also observed significantly higher in females than in males (359.77±80.83 vs.312.00±76.02 min respectively in female and male, p=0.02). Fu et al.[22] found pain to door time higher among females than in males (7.00 vs. 4.5 hours) and Barbosa et al.[16] also showed higher pain to door time (181±154 vs. 125±103 min) and pain to balloon time(550±498 vs. 438±340 min) among females than in males.

Distribution of SVD (20% vs. 33.3% respectively in female and male), DVD (40% vs. 31.1%respectively in female and male) and TVD (40% vs. 35.6% respectively in female and male) had statistically insignificant difference (p>0.05) between two groups, though multivessel disease was more common among the female sex. Fu et al.[22]found statistically significant difference (p<0.001) of SVD (19.82% vs. 32.07%), DVD (34.80% vs. 34.67%) and TVD (45.37% vs. 33.25%) distribution between two groups. Lee et al.[26]also found statistically significant difference (p<0.001) of SVD (39.5% vs. 48.1%), DVD (33% vs. 29.3%) and TVD (24.8% vs. 20.3) distribution. In our country, according to Islam and Majumder[2]; the coronary artery disease follows a rapidly progressive course of atherosclerosis and rapidly developing more severe coronary artery diseases. Therefore, our study did not reveal significant difference in terms of involved vessels.

Distribution of study patients in respect to the infarct related artery (LAD- 46.7% vs. 48.9%; LCX- 15.6% vs. 17.8%; RCA- 37.8% vs. 33.3%respectively in female and male) had statistically insignificant difference (p>0.05) between female and male patients. Barbosa et al.[16]also found insignificant difference of culprit vessels involvement in between two groups(LAD- 49% vs. 40.8%; LCX- 17.6% vs. 19.7%; RCA- 33.3% vs. 37.6%; LM- 2% vs. 1.3%). Tamis-Holland et al.[27]also found in their study that infarct-related artery did not differ between men and women.

Length of stent in between two groups differed insignificantly (25.24±5.12 vs. 26.61±5.11 mm respectively in group '! and group a!; p>0.05). Stent diameter also showed insignificant difference (2.80±0.19 vs. 2.91±0.22 mm; p>0.05). Both observations were supported by Fu et al.[22]and Barbosa et al.[16].

Before PCI majority of patients had TIMI 0 flow in both groups with insignificant difference (Group-I vs Group-II=53.3% vs.48.9%; p>0.05). After PCI TIMI 3 flow was established in majority of Group I and Group II (82.2% vs.95.6%) which differed significantly(p<0.05) between two groups. Lee et al.[26] also found that final TIMI 3 flow was more common in men than in woman (92.6% vs. 86.8%, p<0.001). HORIZONS-AMI trial shows patients with TIMI 3 flow grade are expected to have higher survival rates and fewer complications following primary PCI (Caixeta et al.[28]).

In this study angiographic and procedural success did not differ significantly between the groups; which was also observed in studies done by Srinivas et al. [23]. Despite this, women had greater incidence of adverse in-hospital outcome variables studied, particularly bleeding (11.1% vs. 2.2%; p=0.03) and vascular access site complications (15.6% vs. 4.4%; p=0.04). Furthermore, as per GUSTO bleeding classification, significantly more young women had severe bleeding in comparison to young men (6.3% vs. 1.1%) (Srinivas et al. [23]).

The higher risk of bleeding among women might be partly related to the lack of weight or body mass dose adjustment of most antithrombotic drugs, and also to a lower use of radial access among women who, compared with men, have smaller radial arteries that may be more prone to spasm, which is a major cause of radial procedure failure (Dehghani et al.[29]). Furthermore, young women had insignificantly smaller coronary arteries as reflected by the smaller diameter stents implanted in them (2.80±0.19mm vs.2.91±0.22mm for females and males respectively). Chandrasekhar, et al.[30]

also reported smaller stent diameters in females (2.94±0.5 vs. 3.1±0.5mm in females and males respectively).

Females had higher incidence of in-hospital MACE in our study (11.1% vs. 6.7% for women and men respectively), though the difference was not statistically significant (p>0.05).You et al.[24] also observed no significant difference in major in-hospital complications constituting MACE (5.13% vs.5% respectively). Alternatively, Heer et al.[19];Luca et al.[18] and Lee et al.[26] reported a statistically significant increase of post-PCI in-hospital mortality following STEMI in females, with female sex found to be an independent predictor of MACE.

Consequent to a significantly greater bleeding risk and insignificant increase in MACE, both groups were evaluated for net adverse clinical events (NACE), a term first defined in the HORIZONS-AMI study, and found that women had significantly higher incidence of short term NACE (20.0% vs.8.8% respectively in female and male; p<0.05), largely owing to their increased rates of major bleeding. Females in developed countries with STEMI undergoing PCI have a significantly increased risk for short-term NACE(Chandrasekhar et al.[30]. Fu et al.[22] also found significantly higher incidence of short-term NACE in females than males (5.28% vs. 2.07%; p=0.02).

Mean hospital stay was significantly higher in group I than in group II patients (4.4±1.2 vs 2.6±0.4; p=0.03). The duration of hospital stay is influenced by in-hospital outcome with poor in-hospital outcome prolonged hospital stay.

In this study female sex was an independent predictor of adverse in-hospital outcomes in STEMI patients on multivariate logistic regression analysis. Both Luca et al.[18] and Heer et al.[19]found female sex being an independent predictor of mortality, vascular complications and MACE. Older age (ed60 years) and diabetes mellitus also emerged as independent predictors of adverse outcome among STEMI patients undergoing primary PCI. The presence of greater co-morbidities among females is a contributing factor to their adverse outcomes, as observed by Barbosa et al.[16] and Luca et al.[18].

Conclusion:

This study demonstrates that female sex is associated with more prevalence of conventional coronary artery disease risk factors except smoking, in comparison to male sex. Ischaemic time in terms of pain to balloon time is longer in females than in males. However angiographic and procedural success does not differ between the sexes. On the other hand, in patients undergoing primary PCI, female sex is associated with more in-hospital adverse outcomes, particularly bleeding and vascular access site complications. Although no statistically significant difference was observed for MACE, female sex had significantly higher rates of NACE i.e, a composite of MACE and major bleeding. Female sex together with ageed60 years and diabetes mellitus were an independent predictor for the development of in-hospital adverse outcomes in STEMI patients undergoing primary PCI.

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Original article

In-hospital Outcome and Angiographic Profile of Elderly Patients with Non ST-Segment Elevation Myocardial Infraction

Md. Sazzad Masum[1], Fazila-Tun-Nesa Malik[2], Md. Mamunuzzaman[3], Subas Caandro Datta[4], Muhammed Aminur Razzaque[5], Mohammad Bazlur Rashid[6], Pinaki Ranjan Das[7], Md. Mahbub Alam[8]

Abstract:

Background: Non ST - segment elevation myocardial infarction is heterogeneous in its presentation and is a major life-threatening cause of emergency medical care and hospitalization. Patients with non ST-segment elevation myocardial infarction are at risk for adverse cardiac events and if associated with increased age, it become a strong predictor of adverse cardiac events in patients with non ST-segment elevation myocardial infarction.

Objective: To find out in - hospital outcome and severity of coronary artery disease of older patient with non - ST segment elevation myocardial infarction.

Methods: This was a descriptive cross sectional study. The study was carried out in the department of cardiology, National Heart Foundation Hospital and Research

Institute from June 2011 to May 2012. Patients of non ST - segment elevation myocardial infarction admitted at National Heart Foundation & Research Institute who fulfill the inclusion criteria were the study population. Patients were recruited by nonrandom sampling. One hundred and thirty four patients were recruited in this study. Data were prospectively collected in a pre - designed data collection form and analyzed by using SPSS - 16 software.

Results: In this study patients had a greater prevalence of hypertension, diabetes mellitus. Chest pain and shortness of breath were common presentations observed in study patient during admission. They had a lower left ventricular ejection fraction than their younger counter parts. Older group was associated with an increased risk of triple vessel disease. In-hospital complications were significantly higher in older patients. Duration of hospital stay was longer in older patients.

Conclusion: Older patients with non- ST segment myocardial infarction strongly predicts adverse in-hospital outcome and severe coronary artery disease profile. Older patients should alert physicians to an increased risk of morbidity and mortality, which may in turn support more judicious treatment including appropriate utilization of cardiovascular diagnostic tests and therapeutics used in current cardiovascular care to optimize outcomes in these high-risk patients.

Keywords : *Elderly patients, non ST-segment elevation myocardial infarction, coronary angiography*

(Bangladesh Heart Journal 2022; 37(1): 52-58)

1. Junior Consultant of Cardiology , 250 Bed Bangamata Sheikh Fazilatunnesa Mujib General Hospital, Sirajganj, Bangladesh.
2. Professor and Chief of Interventional Cardiology, Dept. of Cardiology, National Heart Foundation & Research Institute, Dhaka Bangladesh.
3. Assistant Professor of Cardiology, Shaheed M. Monsur Ali Medical College, Sirajganj, Bangladesh.
4. Resident physician, 250 Bed Bangamata Sheikh Fazilatunnesa Mujib General Hospital, Sirajganj, Bangladesh.
5. Assistant professor of Cardiology, National Institute of Cardiovascular Diseases and Hospital, Dhaka, Bangladesh.
6. Assistant professor of Cardiology, National Institute of Cardiovascular Diseases and Hospital, Dhaka, Bangladesh.
7. Assistant professor of Cardiology, National Institute of Cardiovascular Diseases and Hospital, Dhaka, Bangladesh.
8. Assistant professor of cardiology, Sylhet MAG Osmani Medical College, Sylhet.

Address of Correspondence: Dr. Md. Sazzad Masum, Junior Consultant of Cardiology, 250 Beded Bangamata Sheikh Fazilatunnesa Mujib General Hospital. Sirajganj, Bangladesh. Email : smasum93@gmail.com

DOI: https://doi.org/10.3329/bhj.v37i1.60104

Introduction:

Coronary heart disease (CHD) is a worldwide health epidemic. Globally of those dying from cardiovascular diseases, 80 percent are in developing countries[1]. Between 1900 and 2020, CHD mortality is expected to increase by 12.0 percent in women and by 13.7 percent in men in developing countries. It is estimated that the annual number of deaths caused by CHD in developing countries will rise to11.1 million in 2020. [2]

Cardiovascular diseases are leading causes of morbidity and mortality in the

industrialized countries and also in the developing countries, including Bangladesh. The incidence of myocardial infarction seems to be higher in Bangladesh than the developed countries among the smokers. Epidemiologic research has identified risk factors that increase the likelihood of coronary heart disease events. When risk factors coexist, they multiply the risk of CHD several fold .[3]

Patients with acute coronary syndrome(ACS) are in major health problem & represent a large number of hospitalizations annually.[4] ACS is a major source of mortality and morbidity both during and after hospitalization[5]. Non ST-segment elevation myocardial infarction and unstable angina are more heterogeneous in their presentation. Non ST-segment elevation myocardial infarction is distinguished from unstable angina by the presence of elevated serum levels of cardiac biomarkers.[6]

Non ST-segment elevation myocardial infarction is characterized by an imbalance

between myocardial oxygen supply and demand. Angiographic, intravascular ultrasound and angioscopic studies indicate that non ST-segment elevation myocardial infarction usually results from coronary artery narrowing caused by a nonocclusive thrombus that has developed on a disrupted atherosclerotic plaque with a subsequent cascade of pathologic processes that decrease coronary blood flow.[6]

The number of patients with non ST-segment elevation myocardial infarction increased in a linear fashion with increasing age.[7]

Age had a adverse prognostic significance, with a 1.7 fold increased risk for every 10 years[8].

Older patients tend to have more severe coronary disease than their younger

counterparts, and a worse outcome[9]. Prevalence of multivessel disease, including left main increased with age and the proportion of patients with >2 vessels with significant stenosis increased in older age group [10].

Increasing age is a strong predictor of adverse events in patients with coronary heart disease, including patients undergoing coronary revascularization.[10]

Smaller coronary artery luminal diameter potentially reflects neointimal thickening; which has been recognized as an important early step in the development of atheromatous plaque. Hence, the likely presence of neointimal thickening as reflected by small coronary artery luminal diameter may represent a manifestation of more severe atherosclerotic vascular disease, corresponding to the increased CAD morbidity and mortality observed in South Asians relative to other ethnic groups.[11]

Materials and Methods:

This is a descriptive cross sectional study. The study was carried out in the department of cardiology, National Heart Foundation Hospital and Research Institute, Mirpur, Dhaka, Bangladesh from June 2011 to May 2012. Patients of non ST-segment elevation myocardial infarction admitted at National Heart Foundation & Research Institute who fulfill the inclusion criteria were the study population. It was a nonrandom sampling. A total number of 134 patients of both sexes were included in this study. Ethical consideration was taken from ethical consideration committee of National Heart Foundation Hospital and Research Institute.

Statistical Analyses:

After processing of all available data, statistical analysis of their significance was done. Obtained data were expressed in frequency, percentage, mean and

standard deviation as applicable. Logistic regression was done. The whole

analyses were done with the help of computer based SPSS (Statistical Programme for Social Science) version 16.0. p value of < 0.05 was considered as significant.

NSTEMI[6]

NSTEMI is defined by electrocardiographic ST- segment depression or prominent T wave inversion and/or positive biomarkers of necrosis (e.g. troponin) in the absence of ST-segment elevation and in an appropriate clinical setting (chest discomfort or angina equivalent).

Older Age [12]

The ageing process is of course a biological reality which has its own dynanic, largely beyond human control. In developed world, chronological time plays a paramount role. The age of 60 roughly equivalent to retirement ages in most developed countries, is said to be the beginning of old age. Although defining old age is different in many society, older age may be defined as the point age at which the active contribution is no longer possible.

Severity of Coronary Stenosis [19]

- 0-Normal coronary artery
- 1-Irregularities of the vessel
- 2-Narrowing of less than 50%
- 3-Stenosis between 50% and 75%
- 4-Stenosis between 75% and 95%
- 5-Total occlusion.

Results:

In this study, 134 patients of non ST – segment elevation myocardial infarction were included and the mean age of these patients were nearly 57 ± 11.82 years ranges from 40 years to 80 years and 114 (85%) were male.

Table-I

Socio-demographic study of the study patients (n=134).

Age	Number (n)	Percentage (%)
≤40	09	6.70
41-50	33	24.60
51-60	38	28.40
61-70	42	31.30
≥70	12	9.00
Mean	57.71	
SD	1.82	
Sex		
Male	114	85.00
Female	20	15.00
Risk factors		
Smoking habit		
Yes	74	55.00
No	60	45.00
Hypertension		
Yes	95	70.89
No	39	29.10
Diabetes mellitus		
Yes	71	53.00
No	63	47.00
Dyslipidaemia		
Yes	31	23.00
No	103	77.00
Family history of ihd		
Yes	26	19.00
No	108	81.00

The socio-demographic study of the study patients shows that most of the patients belonged to 61-70 years which was 31.3%. The mean age of the patients was 57.81. Among the study population 85% was male and 15% was female. Regarding risk factors hypertension, smoking and diabetes mellitus were the common risk factors.

Table-II

Clinical presentation of study patients (n=134)

Clinical presentation	Number (n)	Percentage
Chest pain		
Yes	130	97.00
No	4	3.00
Shortness of breath		
Yes	34	25.00
No	100	75.00
Syncope		
Yes	1	0.75
No	133	99.25
Vomiting and sweating		
Yes	114	85.00
No	20	15.00

Here, the most common clinical presentation was chest pain (97%) followed by vomiting and sweating (85%) and then shortness of breath (25%) in the study population

Table-III

Distribution of the study patients (n=134) by severity of coronary artery lesion.

Percentage of lesion	Number (n)	Percentage
LM		
Normal	110	82.10
<50%	8	6.00
50%-75%	5	3.70
75%-99%	11	8.20
100	0	0.00
LAD		
Normal	18	13.40
<50%	6	4.50
50%-75%	13	9.70
75%-99%	83	61.90
100	14	10.40
LCX		
Normal	50	37.30
<50%	10	7.50
50%-75%	5	3.70
75%-99%	55	41.00
100	14	10.40
RCA		
Normal	58	43.30
<50%	5	3.70
50%-75%	9	6.70
75%-99%	40	29.90
100	22	16.40

LM: Left Main, LAD: Left Anterior Descending, LCX: Left Circumflex, RCA: Right Coronary Artery.

The severe coronary artery lesion (75% to 99% occlusion) were most commonly involved in all arteries and it was 8.2% in LM, 61.9% in LAD, 55% in LCX and 40 % in RCA respectively.

Table-IV

Distribution of patients according to in hospital outcome (n=134)

Outcome	Number (n)	Percentage
Heart failure	29	21.60
Cardiogenic shock	15	11.20
Arrythmia	9	6.70
Mitral regurgitation	56	41.80
Death	1	0.70

In hospital outcome of the study population shows the common adverse events were mitral regurgitation (41.8%), heart failure (21.6%) and cardiogenic shock (11.2%)

Table-V

Distribution of study patients developing heart failure according to age

	Heart failure		P value
Age	Yes	No	.01^{S}
	29	105	
Mean±SD	63.65±7.45	56.20±12.31	

S = Significant, P value obtained from unpaired t- test

Among study population, elderly aged patients (mean age 63.65 ± 7.45) developed heart failure significantly.

Table-VI

Distribution of study patients according to cardiogenic shock

	Cardiogenic shock		P value
Age	Yes	No	.540^{NS}
	15	119	
Mean±SD	57.53±11.92	57.84±11.86	

NS=Non significant, P value obtained from unpaired t test.

In this study 15 patients developed cardiogenic shock which was not statistically significant.

Table-VII

Distribution of study patients according to arrythmia

	Arrythmia		P value
Age	Yes	No	.078^{NS}
	9	125	
Mean±SD	50.00±21.79	57.84±11.79	

P value obtained from unpaired t test.

In this study 9 patients developed arrythmia . Here, we found that there was tendency to develop arrythmia

Table-VIII

Distribution of study patients according to mitral regurgitation

	Mitral Regurgitation		P Value
Age	Yes	No	.05^{S}
	56	78	
MEAN±SD	61.19±9.97	55.38±12.49	

S= significant, P value obtained from unpaired t test.

In this study 56 patients developed mitral regurgitation which was statistically significant. It also states that older age group (mean age, 61.19±9.97) were more prone to develop mitral regurgitation.

Table-IX

Distribution of study patients according to number of vessel involvement

Number of vessel involvement	Age	P value
1 (n=51)	54.0±10.9	.001^{S}
2 (n=42)	56.4±13.5	
3 (n=41)	63.9±8.2	

S=Significant, P value reached from one-way ANOVA. 1 = SVD, 2 = DVD, 3 = TVD

The study patients according to number of vessel involvement shows that gradually the older age group developed more severe vessel involvement which was statistically significant

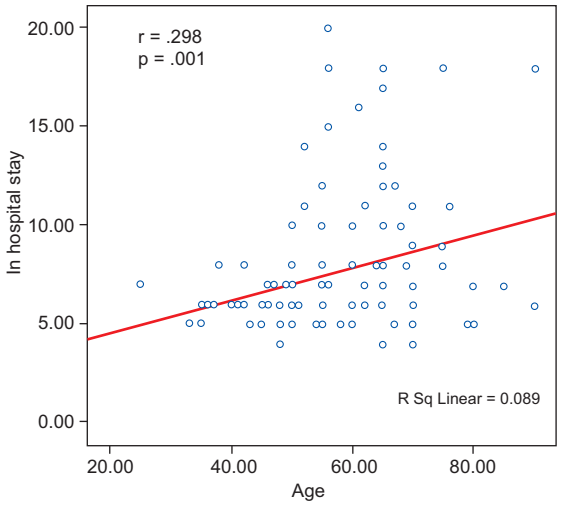

Fig.-1: *The figure shows that there is positive correlation between age and hospital stay among the study population (r=.298 ; p=.001)*

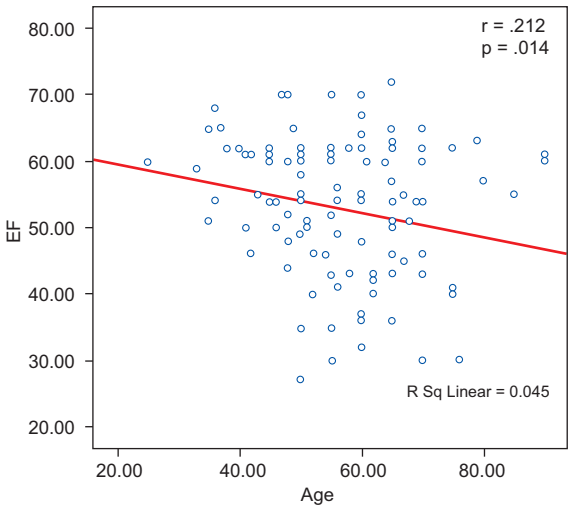

Fig.-2: *The figure shows that there is negative correlation between age and ejection fraction, that means increasing age was associated with reduced ejection fraction (r=.212; p=.014).*

Table-X

Distribution of the study patients by in-hospital complications

Complication	≤40 years		40-59 years		≥60 years	
	n	%	n	%	n	&
Present	2	22.20	17	24.30	43	78.20
Absent	7	77.80	53	75.70	12	21.80

Regarding in hospital complications, 22.2% patients had adverse in-hospital events in d" 40 year age group, 24.3% patient in 41-60 year age group and 78.2% patient in e" 60year age group during their hospital stay. Older patients had more adverse in-hospital events than others.

Table-XI

Result of logistic regression analysis

A step wise logistic regression model was done with in-hospital complications as dependant and old age, hypertension, diabetes mellitus and smoking as independent variables. However, only age remain in the final model in stepwise logistic regression.

Variable	B	SIG	Exp (B)	95.0% C.I. for EXP (B)	
				Lower	Upper
Age	.096	.001^{S}	1.101	1.055	1.150
Hypertension	-.542	.238^{NS}	.582	.237	1.431
Diabetes	.560	.178^{NS}	1.751	.774	3.961
Smoking	-.313	.444^{NS}	.732	.329	1.629
Constant	-5.53	.001	.004		

Here, out of old age, hypertension, diabetes mellitus and smoking, only old aged patients had higher risk of developing in-hospital complications.

Discussion:

In this study the most of the patients belonged to 61-70 years which was 31.3%. The mean age of the patients was 57.81. Among the study population 85% was male and 15% was female. Regarding risk factors hypertension (70.89%), smoking (55%) and diabetes mellitus (53%) were the common risk factors. In this study male: female ratio was 5.7:1. These findings were also close to the study done by Malik, et al. [13], where the ratio was 7.9:1. The smaller percentage of female patients in our country may be due to protective effect of estrogen, less incidence of smoking in female and social negligence towards the female for seeking medical help. Hypertension was the commonest risk factor in this study which was also found by Salim[14] although Malik, et al.[23] found smoking was the leading risk factors in about 81.8% of patients.

During admission, the most common clinical presentation was chest pain (97%) followed by vomiting and sweating (85%) then shortness of breath (25%) in the study population. These findings were also very much close to the study done by Malik, et al.[15] where chest pain (92.6%), nausea and vomiting (56.9%) and breathlessness (62%). Regarding ejection fraction, there was decrement in left ventricular ejection fraction with increased age with non-ST- segment elevation myocardial infarction.

Regarding Coronary artery involvement, the mean age of SVD was in 54.0±10.9 , DVD was in 56.4±13.5 and TVD was in 63.9±48.2 which were statistically significant. Wennberg, et al. [16] found the prevalence of multi-vessel disease, including left main increased with age and the proportion of patients with >2vessels with significant stenosis is increased from 32.4% of those were non older age group to 57.9% in older age group.

Regarding severity of lesion of the study patients, the most common lesion in all arteries was 75-99%, which was 8.2% in LM, 61.9% in LAD, 41% in LCX and 29.9% in RCA. This findings were supported by Veeranna, et. al[17]., who also found severe occlusion (> 80 % occlusion) in patients with non ST elevation myocardial infarction.

The common adverse events were mitral regurgitation (41.8%), heart failure (21.6%) and cardiogenic shock (11.2%) in this study. Avenzum, et , al.,[18] found in their study, incidence of heart failure increased with age (68.4% vs 22.6%), cardiogenic shock more common in

the oldest compared with non older group (9.8% vs 1.6%). rates of death (18.4% vs 1.3%).

In this study we found that increase duration of hospital stay with increasing age which was supported by Fox, et, al.,[19] higher in older patients.

In this study showed that, 22.2% patients had adverse in-hospital events in <40 year age group, 24.3% patient in 41-60 year age group and 78.2% patient in >60 year age group during their hospital stay. Older patients had more adverse in-hospital events than others which was also seen by Madhavan, M, V et al.,[20] . One patient (.7%) die from in hospital complication, he was suffering from triple vessel coronary artery disease and waiting for CABG.

Conclusion:

Old age was associated with an increased risk of triple vessel disease in contrast the prevalence of single vessel disease was higher in younger patients. In-hospital complications were significantly higher in older patient. Patients with non ST elevation myocardial infraction with old age had longer hospital stay.

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Original article

Implantation of Permanent Pacemaker and COVID-19 co-infection: Strategy for Management at a Dedicated Cardiac Hospital in Bangladesh

Iftekhar Alam[1], Khandaker Shaheed Hossain[2], Md Mamunur Rashid[3], Newaz Ahmed[4], Lipi Debnath[5], Md Sadaqul Islam Sikder[6], Md Monir Hossain Khan[7], Mir Jamal Uddin[8]

Abstract:

Background: The pandemic existence of corona virus disease 2019 (COVID -19) in the year 2020 has initially limited the number of intervention in cardiac diseases in our country. The need for placement of permanent pacemaker is a medical emergency but in patients with concomitant COVID -19, it's a double edged sword. The treatment strategy and planning for this group of patients with high degree atrioventricular block (AVB) or sinus node disease (SND), needing permanent pacemaker is the fundamental concern along with the safety of the attending cardiologists and other staff members. In this study we sought to comprehend the treatment strategies in patients requiring pacemaker with simultaneous COVID-19 co-infection.

Methods: This study was done at the National institute of cardiovascular diseases (NICVD), Shere Bangla Nagar, Dhaka from 10th March 2020 to 9th September 2020. During these six months all patients waiting for permanent pacemaker implantation were screened for COVID-19 by real time polymerase chain reaction (RT PCR). The positive cases were included in the study and managed according to the in hospital protocol.

Results: A total of 98 patients had permanent pacemaker implanted during this period, among them12 patients (12.24%) were tested positive for COVID-19. Average age of the patients was 68±7.6 years and 66.7% was male and 33.3% was female. The mean duration of RT PCR positive status was 20.6±6.4 days (range 14 to 29 days) and the mean duration of indwelling TPM was 21.25±7.05 days (range 17 to 30 days). There was no TPM related complication following PPM implantation.

Conclusions: Conservative approach of medical management with TPM for stabilization of the patients with corona virus disease is a safe option for delayed PPM implantation after improvement of the patients. In hospital treatment protocol with facilities for isolation and treatment of COVID is the mainstay of the treatment strategy.

Keywords: *COVID-19, RT PCR, Pacemaker, High degree atrioventricular block (AVB), sinus node disease (SND).*

(Bangladesh Heart Journal 2022; 37(1): 59-64)

Introduction:

In this study our main issue was to provide and maintain a standard protocol for the treatment of patients requiring pacemaker with concomitant COVID 19 infection. As a high volume cardiac hospital, a lot of procedures are done at NICVD regularly but in the initial days after detection of COVID 19 in Bangladesh, there was a sudden decline of

1 Assistant Professor, Department of Cardiology, National Institute of Cardiovascular Diseases, Dhaka
2 Professor, Department of Cardiology, National Institute of Cardiovascular Diseases, Dhaka.
3 Professor, Department of Cardiology, National Institute of Cardiovascular Diseases, Dhaka.
4 Assistant Professor, Department of Cardiology, Sheikh Hasina National institute of Burn & plastic Surgery, Dhaka
5 Junior Consultant, Department of Cardiology, National Institute of Cardiovascular Diseases, Dhaka.
6 Assistant Professor, Department of Cardiology, National Institute of Cardiovascular Diseases, Dhaka
7 Assistant Professor, Department of Cardiology, National Institute of Cardiovascular Diseases, Dhaka
8 Professor and Director, National Institute of Cardiovascular Diseases, Dhaka.
Address of Correspondence: Dr Iftekhar Alam, Assistant Professor, Department of Cardiology, National Institute of Cardiovascular Diseases, Dhaka. Bangladesh. Mobile: +8801720056180, e-mail: iftekhar1029@gmail.com.

DOI: https://doi.org/10.3329/bhj.v37i1.60105

in-hospital patients and number of procedures. During this period few cases of pacemakers were installed and some of the patients exhibit symptoms related to COVID 19. At that time e.g. late March and April 2020, there was limited available facilities for RT PCR in Bangladesh, samples from suspected patients were collected from our center and RT PCR was done at a different lab facility, usually it took 2 to 3 days to get the report. Among the symptomatic patient's reports of two post PPM patients and three patients on TPM came positive. Moreover, several of our staff members including doctors, nurses and technicians became infected with COVID 19.

As we all know, corona virus disease 2019 (COVID-19) was initially reported from Wuhan, Hubei province of China in December 2019 and novel corona virus, a SARS-CoV-2, was identified as the pathogen.[1] The World Health Organization (WHO) at the end of January 2020, declared the outbreak of SARS-CoV-2 as a pandemic.[2] In Bangladesh first COVID 19 case was detected on 8th march 2020. During the initial days there was a generalized havoc in the community and to reduce the spread of the disease a country wide lock down was imposed. Maintenance of social distance, use of face mask, hand washing and restriction of movement were the early response concerning containment of the spread of COVID 19 in Bangladesh.

Following initial reports in Wuhan, China, the subsequent global spread has involved more than 215 countries.[3] As a resource deprived developing country this pandemic has put us in a state of massive disaster both economically and socially. During this period there is significant limitation on healthcare system, which includes restriction of movements, physical distension, lack of proper medical facilities and also resources. Furthermore, there was a stress factor among the healthcare providers due to safety issues associated with exposure, morbidity and personal protection. As a tertiary care cardiac hospital we don't have that luxury of safety or protection, most cardiovascular cases are acute in onset and warrants immediate management. Initially we deferred all elective invasive procedures; only emergency invasive procedures were performed.

High-degree atrioventricular block (AVB) and sinus node dysfunction (SND) are the most common indications for permanent pacemaker therapy. Conservatively treated (i.e. non-paced) patients with high degree AVB have notably poorer survival compared with pacemaker-treated patients.[4, 5] Studies have been undisputed in finding improved quality of life in patients receiving pacing therapy.[6, 7]

The prevalence and incidence of pacemaker implantation are unknown in our country. There is considerable variability in reported pacemaker implant rates between European countries.[8] There is a continuous growth in the use of pacemakers due to the increasing life expectancy and ageing of populations.[9] The estimated number of patients globally undergoing pacemaker implantation has increased steadily up to an annual implant rate of 1 million devices. Degeneration of the cardiac conduction system and changes in intercellular conduction can be manifestations of cardiac pathology or non-cardiac disease, and are most prevalent in older patients. Therefore, most patients requiring cardiac pacing are elderly, with >80% of pacemakers being implanted in patients above the age of 65 years.[10]

In the era of COVID-19, the management of heart disease patients with the concomitant virus infection has not been completely defined. Moreover, as other known cardiotropic virus in case of myocardial involvement , the hypothesis that COVID-19 could lead to the exacerbation of conduction system disorders, or sinus node disease or new-onset high degree AV block, is actually under study, surprisingly only few cases have been described.[11] In this study we are concerned with the patients requiring pacemaker with concomitant COVID 19 infection. There are only few case reports are published regarding this issue, but no comprehensive study is found. As far, this study is the first effort to formulate a working protocol to manage patients with high grade AVB and SND with COVID infection in Bangladesh.

Method:

We conducted this observational study, at NICVD, the premier super specialty cardiovascular hospital at Dhaka, Bangladesh, which is open all days round the clock providing emergency and routine cardiac care for both indoor and outdoor patients. All patients admitted at this center from March 8, 2020 to August 10, 2020 requiring permanent pacemaker implantation for various causes e.g. complete or high grade AV block, sick sinus syndrome, EOL of pacemaker etc. were included in this study. All admitted patients were subjected to meticulous history taking and physical examination. All demographic and anthropometric data were recorded. Baseline investigations were sent along with RT PCR for COVID 19. Taking utmost precautions and personal protection with PPE on duty doctors or residents at CCU performed TPM through right femoral route and patients were sent to designated ward waiting for RT PCR report.

As per our initial experience, an in hospital protocol was followed for all patients requiring pacemaker. Pacemaker

was installed in those patients, whose RT PCR report was negative immediately, the COVID positive cases were shifted to dedicated COVID isolation ward with in-situ TPM. This group of patients were evaluated and treated for COVID 19. Haematological and biochemical tests including CBC, CRP, Serum ferretin, D-dimer and X-ray chest was done routinely and repeated as required. RT PCR for COVID 19 was done after improvement of the patients and when they become negative PPM was implanted.

PPM implantation was done by standard protocol, after aseptic preparation of the operative field venous access via the left subclavian or preferably left axillary vein obtained by puncture method for transvenous lead implantation, pre-operative imaging e.g. venography was used in some cases for venous access. Adequate device pocket for implantation of pacemaker was created subcutaneously 2-3cm below the left clavicle by a 5-6cm horizontal incision with proper surgical technique and meticulous haemostasis. Lead was inserted via peelable vascular access sheath with a dilator, active fixation leads were used for RV and passive fixation pacemaker lead in RA was used for duel chamber pacemakers. Lead position for ventricular pacing was at the RV apex and in some case in septum. RA lead was positioned at right atrial appendage. Pocket irrigation at the end of the procedure with normal saline and antibiotic was done to eliminate possible contaminants and debris from the wound before closure. After connecting the pacemaker it was inserted inside the pocket and the wound was closed in layers with vicryl and silk from inside out.

This study was approved by NICVD Ethics Committee. Informed consent was obtained from all participants. The numerical data obtained from the study were analyzed; continuous variables were expressed as mean values ± standard deviation. Categorical variables were expressed as frequencies with percentages where appropriate. Statistical analysis was carried out by using SPSS 23.0 (Statistical Package for the Social Sciences by SPSS Inc., Chicago, IL, USA, 2015).

Results:

The study population consisted of 12 patients waiting for PPM implantation with COVID co-infection. The mean age of the study population was 68.33±7.64 years and 66.7% were male. Among these patients 41.75% presented with history of syncopal attack and 58.25% had episodes of dizziness (Table I). Among these patients 75% admitted with CHB, 16.7% with SSS/SND and 8.3% with EOL status (Figure 1).

Fever and cough was the prominent features of COVID in this group of patients (66% and 83% respectively) and 16.7% patients required high flow oxygen for hypoxia. Nausea was another prominent feature (66%) but diarrhea was not a presenting complain (Table II). In table III laboratory investigations showed total count of WBC, CRP, D-dimer and serum Ferretin was high and lymphocyte count was low among the patients. Duration of RT PCR positive status was 20.6±6.4 days (range 14-29 days) and mean duration of TPM was 21.25±7.05 days (range 17 to 30 days) before PPM (Table IV). 75% patients were treated with dual chamber pacemaker and the rest with VVIR (Figure2).

Table-I

Baseline Characteristics (n=12)

Parameters	Frequency	Percentage	Mean ± SD
Age	-	-	68.33±7.64
Sex			
Male	8	66.7%	-
Female	4	33.3%	-
Symptoms			
Syncope	5	41.75	-
Dizziness	7	58.25	-
Risk factors			
HTN	8	66.7%	-
DM	7	58.3%	-
Smoking	5	41.75	-
Dyslipidaemia	9	75.0%	-
F/H of CAD	6	50.0%	-

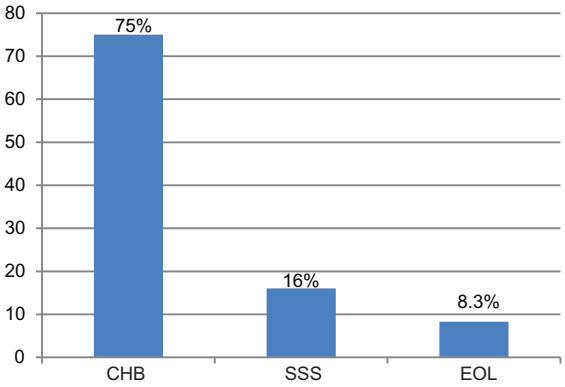

Fig.-1: *Distribution of patients according to presentation at admission*

Table-II
Distribution of symptoms of patients related to COVID 19

Variables	Frequency	Percentage
Fever	8	66.7%
Cough	10	83.3%
SOB	3	25.0%
Hypoxia	2	16.7%
Diarrhea	-	-
Nausea	8	66.7%
Rhinorrhoea	5	41.7%

Table-III
Distribution of clinical and biochemical variables

Parameters	Frequency	Mean ± SD
Heart rate (bpm)	12	37.42±3.96
SBP (mm of Hg)	12	128.33±14.03
DBP (mm of Hg)	12	79.88±11.28
TC of WBC(10^9/L)	12	10.21±2.29
Lymphcyte (%)	12	17.33±3.79
CRP(mg/L)	10	8.00±3.38
S. creatinine(mg/dl)	12	1.11±0.19
D-dimer(mcg/ml)	09	1.46±1.23
S. Ferretin(ng/ml)	09	452.75±163.39
Na^+(mEq/L)	12	143.25±2.95
K^+(mEq/L)	12	3.66±0.16

Table-IV
Duration of RT PCR status and TPM in Patients

Parameters	Range	Mean ± SD
Time to become RT PCR negative (Days)	14 – 29	20.6±6.40
Duration on TPM (Days)	17 – 30	21.25±7.05

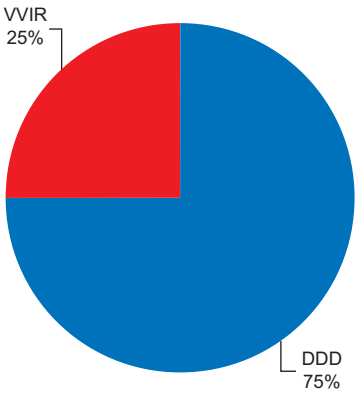

Fig.-2: *Distribution of type of pacemaker used in COVID 19 positive patients*

Discussion:

This is evident that, patients with cardiovascular disease with associated COVID-19 infection are at a higher risk of mortality, and treatments of this group of patients are demanding.[12] The European Society of Cardiology (ESC) Guidance and Italian position paper about the treatment of cardiovascular (CV) disease in COVID 19 infection patients have been published.[13, 14] The suggested management of atrioventricular (AV) conduction disorder patients is not similar between these two guidelines. During this period in our center we formulated our own strategy to tackle this situation, which does have similarities with the above mentioned studies.

These guidelines have proposed different approaches about the management of AV conduction disorders. It is amazing that, there are very few papers or data available in this specific setting, on extensive search the available papers are mostly about single or in some instances multiple case reports. In this article we considered a group of cases and attempted to formulate a strategy to manage patients requiring permanent pacemaker with concomitant COVID-19 co-infection. The ESC recommendation suggested a conservative medical approach with isoprenaline and atropine and the implantation of temporary PM (TPM), leading the potential PPM after recovery from the COVID-19 infection.[13] On the other hand, the Italian position paper recommends avoiding the TPM for preventing the risk of infection and thereby preferring early PPM implantation.[14]

In this conflict-ridden ground, our approach was conventional and simple, all patients admitted for PPM initially TPM was done and they were housed in the dedicated COVID isolation ward. RT PCR negative cases under went PPM implantation and positive cases are treated till they were RT PCR negative. After recovery from COVID if they were afibrile PPM was done at the earliest convenience. Our approach is supported by the consensus to prevent cardiac implantable electronic device (CIED) infections; it is recommend generally to wait for 24 hours since an febrile patient becomes afibrile, especially in viral diseases as this group of patients are seldom associated to the CIED infection.[15]

There is documented evidence that in survivors of COVID, the duration of COVID-19 viral shedding found in media for 20 days, up to a maximum of 37 days in some reports.[16] In our study mean duration of RT PCR positive status was 20.6±6.4 days (range 14-29 days). The patients on TPM are up to 2.5 times more prone to develop an infection before the PPM implantation.[17] There are reported higher mean complication rates in patients with

indwelling TPM, such as lead's dislodgement with malsensing or malpacing, pneumothorax, and cardiac perforation.[18] In this study the mean duration of TPM was 21.25±7.05 days (range 17 to 30 days). Repeat repositioning of the TPM lead was big concern for us, as there was a higher risk of viral contagion every time of intervention both for the patients and the operators.

Rivetti et.al. reported the first case of a COVID-19 Infection patient with symptoms of AV block treated with early PPM implantation. In their opinion this approach allowed them to preserve all the medical equipment and the other patients from the potential viral contagion in a non COVID-19 hospital and to obtain the best outcome for the patient by transferring the patient to a dedicated COVID-19 facility.[19] Ignatiuk et.al. in March 2020 reported a case about a 78-year-old man with second degree 2:1 atrioventricular block, and ventricular rate of 46 bpm with COVID-19 pneumonia, was treated by conventional management and isoprenaline. Three weeks after admission, when the clinical picture substantially improved, permanent pacemaker was implanted.[20]

Although, these case reports are dissimilar, regarding the timing of PPM, they abstain from placing a TPM for prevention of complication. In our case series, TPM was the mainstay of our treatment modality, we do not consider pharmacological methods or early PPM for stabilizing our patients. Prolong TPM although may be hazardous but in our case proper patient care, regular monitoring and follow-up ensured safety of our plan. Apart from some glitches of TPM repositioning, there was no complications among the patients after placement of PPM.

Conclusion:

After three waves of COVID-19, currently trend of infection is on a decline, but world scenario is changing rapidly, next wave may come at any time with enhanced vigor. Conflicting guidelines may change; protocol that we followed although the total sample number is undersized but still can pave ways for a better patient care.

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Original article

Pattern of Admission, Management and In hospital Outcome of ACS Patients during COVID-19 pandemic - A study in Tertiary Care hospital

Muhammed Aminur Razzaque[1], Mohsin Ahmed[2], Md. Shaheen Kobir[3], CM Kudrat-E-Khuda[4], Hasan Mahmoud[5] Md. Shariful Islam[6], Sayeedur Rahman Khan[7], Mainul Islam[8], Arjun Kumar Ghosh[9], Mehdi Hasan[10]

Abstract:

Aim: This study aimed to evaluate the impact of coronavirus disease2019(Covid-19) outbreak on admissions for acute coronary syndrome (ACS) and related mortality, severity of presentation, major cardiac complications, and outcome in tertiary care hospital (NICVD).

Method: This is a cross sectional observational study on ACS admitted patients during the 1st and 2nd phase of COVID-19 from 1st June to 31st August in the year 2020 and 2021 who were COVID negative (RT PCR). Using a control of ACS admitted patients during corresponding period of year 2019 from registry.

Results: During the 1st phase of COVID (July to August 2020) 736 ACS patients were enrolled where as during 2nd phase (July to August 2021) 722 ACS patients were enrolled. Mean age were 52±8 vs 53±11 years. Demographic variables such as age, sex and risk factors are almost identical in all groups. Our study showed 46% decline in admission in ACS patients comparing same period of 2019. Though some inclination in 2021 still it showed 13% decline in ACS patient admission in comparison to 2019. There was substantial increase in percentage of patient suffering from STEMI in 2020(42% vs66% vs46%). Short time in hospital complications were more pronounced in 2020. During the study period average death rate was higher than the year 2019 (8.6% vs 5.8%). There was significant decline in numbers of interventions(CAG and PCI) for CAD during first phase of Covid which raised during second phase(429 vs 2151). Total number of interventions done of 1884 patients in 2019 whereas 2151 patients were undergone in the year 2021.

Conclusion: The Covid-19 outbreak affects hospital admission for acute coronary syndrome. During the first phase of the pandemic, significantly less patients with ACS admitted, but those admitted presented with a higher mortality, more complications and a worse short time outcome. Therefore ,our data indicate that Covid-19 had relevant impact on non-infectious disease status, such as acute coronary syndrome.

Key Word: *ACS, COVID-19, Admission pattern.*

(Bangladesh Heart Journal 2022; 37(1): 65-71)

Introduction:

The coronavirus disease 2019 (Covid 19) pandemic has a significant impact on the health care systems with an enormous socio economic burden worldwide.[1] Since December 2019, the novel severe acute respiratory

1. Assistant Professor, Cardiology, National Institute of Cardiovascular Diseases and Hospital, Dhaka.
2. Associate Professor, Cardiology, National Institute of Cardiovascular Diseases and Hospital, Dhaka.
3. Assistant Professor,Cardiology, National Institute of Cardiovascular Diseases and Hospital, Dhaka.
4. Assistant Professor,Cardiology, National Institute of Cardiovascular Diseases and Hospital, Dhaka.
5. Junior Consultant, Cardiology, National Institute of Cardiovascular Diseases and Hospital, Dhaka.
6. Assistant Registrar,Cardiology, National Institute of Cardiovascular Diseases and Hospital, Dhaka.
7. Medical Officer,Cardiology, National Institute of Cardiovascular Diseases and Hospital, Dhaka.
8. Assistant Registrar,Cardiology, National Institute of Cardiovascular Diseases and Hospital, Dhaka.
9. Medical Officer,Cardiology, National Institute of Cardiovascular Diseases and Hospital, Dhaka.
10. Medical Officer,Cardiology, National Institute of Cardiovascular Diseases and Hospital, Dhaka.

Address of Correspondence: Dr. Muhammed Aminur Razzaque, Assistant Professor, Cardiology, National Institute of Cardiovascular Diseases and Hospital, Dhaka.

DOI: https://doi.org/10.3329/bhj.v37i1.60106

syndrome coronavirus 2 (SARS CoV 2) has spread around the globe starting from Wuhan, China.[2] The World Health Organization (WHO) confirmed mid of August 2020 that there are >5 million people infected with SARS CoV 2 and over 340 000 deaths worldwide.[4] Because of the exponential growth of infections in the early phase of the pandemic, hospitals from countries all over the world including China, the USA, Spain, and Italy were struggling to cope with Covid 19 patients.[3] In many places, there was a lack of intensive care unit resources including mechanical ventilators, personal protective equipment supplies, and medical staff.[4] As a result of the experience from these Covid 19 hotspots, many countries decreed a lockdown of public life with the goal of social distancing to control the expansion of the virus. [5] Many countries have reported a significant decline in the hospitalization rates for acute myocardial infarction (AMI) during the time of COVID-19 pandemic with average rate of decline ranging from 13 to 48%. [6]

Bangladesh is one of the affected countries in the world by COVID-19 pandemic with more than 1.95 million cases. The Government of Bangladesh implemented strict nationwide lockdown in phases starting from 25th March 2020 to limit the spread of the pandemic. The government directed different hospitals to focus on COVID-19 crisis. This approach may have resulted in unintended compromises in acute cardiac care across the country. The impact of COVID-19 on AMI admissions in low- and middle-income countries including Bangladesh is largely unknown. Observational studies from Northern Italy showed a significant decline in the number of ACS cases presenting to hospitals. The incidence rate ratio decreased by 30% as compared to the previous year and the decrease was seen in all forms of ACS admissions including STEMI, NSTEMI and unstable angina. [7] Recent studies from Europe, the USA, Asia, and New Zealand have not only shown a decrease in hospital admissions for AMI, but also an increase in time to medical contact, decrease in interventions, and increase in out of hospital cardiac arrest during the pandemic period. [8]

Possible Mechanisms Linking COVID-19 To AMI:

Several mechanisms associated with COVID-19 may be involved in AMI. Type 1 AMI can be triggered in patients with COVID-19 by a pro-inflammatory state, which may promote destabilization of a coronary atherosclerotic plaque, a phenomenon already observed during influenza outbreaks. [9] Notably, viral infections have been shown to activate inflammatory cells of the coronary plaque and to upregulate metalloproteinases and peptidases, which, in turn, may disrupt plaque cap exposing the highly thrombogenic core to the blood [10] Another potential mechanism is the mismatch between reduced oxygen supply and increased myocardial oxygen demand due to sympathetic system activation, tachycardia, hypotension, and hypoxemia in the setting of acute respiratory insufficiency, which may be responsible for Type 2 AMI [11] Moreover, other mechanisms related to specific features of SARS-CoV-2 infection have been advocated to explain AMI in patients with COVID-19. In particular, the endothelial and microvascular injuries induced by SARS-CoV-2 may further enhance inflammation, resulting in coronary vasospasm, thrombosis, and myocardial perfusion defects. [12]Moreover, the low platelet count often described in patients with COVID-19 suggests an increased consumption due to great platelet activation and thrombus formation. Indeed, the cytokine storm associated with viral infection induces, together with the imbalance of endothelial function, significant activation of platelets, granulocytes, and microvesicles, which, in turn, produce tissue factors. Of note, it has also been demonstrated that plasma microvesicles-associated thrombin generation can still be present in patients with COVID-19 despite prophylactic anticoagulation. [13]

Another possible mechanism implicated in the association between SARS-CoV-2 and AMI is the pro-inflammatory state. Since the association between infection and acute coronary atherothrombosis has been established for a variety of pathogens and sites of infection, it is likely that the causal agent and the host response could have a crucial role in eliciting an inflammatory pattern that may trigger AMI. Atherosclerotic plaques contain inflammatory cells that proliferate, secrete cytokines, and stimulate smooth muscle cells to form a fibrous cap. Thus, an inflammatory status generates circulating cytokines that may activate inflammatory cells in atherosclerotic plaques, enhancing plaque vulnerability and the possibility of its rupture, leading to coronary thrombosis[14]. Of note, there are multiple reports of microvascular involvement in different organs of patients with COVID-19, leading to ischemic stroke, deep vein thrombosis, pulmonary embolism, and arterial thrombotic events. [14] The COVID-19 has more far-reaching cardiovascular implications than the pathophysiological effects of the disease per se. In fact, all countries have developed containment strategies based on social distancing, and it is well-known that the lack of human relationships and reduced interaction with other people are major risk factors for cardiovascular mortality. A previous meta-analysis includes 181,000 subjects demonstrated that the risk for AMI increases by almost 30% in lonely and socially isolated people. [15] The adult cohort studies reported initial evidence of a clinically meaningful increase in anxiety, depression, mental health disturbance, and disruption of well-being during the lockdown for SARS-CoV-2 spread containment, all of which have been associated with an increased AMI risk. [16]

Results:

During the 1st phase of Covid (July to August 2020) among 9693 admitted patients in NICVD 736 patients were

enrolled who were diagnosed as ACS patients. Similarly, during 2nd phase of Covid (July to August 2021) out of 15547 admitted in NICVD 922 ACS patients were enrolled. Highest patients stood in the age group of 40-60 years (47.6% vs 45.1%). Most of them were male 1458(84%) and female were 287(16%) which were almost similar in both phases. Patients were suffering from multiple comorbidities (Hypertension 50%, Smoking 41%, Diabetes 35%) during 1st phase. Comparing with the 1st phase during 2nd phase 52% ,40% and 37% were hypertensive, diabetic and smoker respectively.

Table-I

Baseline characteristics of patients admitted with Acute Coronary Syndrome (ACS)

characteristics	Year (2019) n=84	Year (2020) n=736	Year (2021) n=922
Age (in year) (mean ± SD)	56 ± 10	52 ± 8	53 ± 11
Male	707(84%)	618(84%)	747(81%)
Female	137(16%)	118(16%)	175(19%)
Diabetes	320(38%)	258(35%)	341(37%)
Hypertension	370(44%)	368(50%)	479(52%)
Dyslipidemia	320(38%)	302(41%)	369(40%)
Smoking	101(12%)	103(14%)	138(15%)

During both phases almost all patients presented with chest pain. Duration of chest pain less than 12 hours (56% vs 71%). Patients more than 12 hours were (44% vs 29%) while comparing in both groups. Raise of Troponinl >.1 ng/dl were 71% vs 69% whereas Troponinl <.1 ng/dl were 29% vs 31%. Among the enrolled patients during the 1st phase 66% were diagnosed as STEMI, 23% as NSTEMI and 11% as Unstable Angina. Whereas during 2nd phase 46% were diagnosed as STEMI, 29% as NSTEMI and 25% as unstable angina.

Table-II

Comparison of ACS admission during same time frame

	Year (2019)	Year (2020)	Year (2021)	P-value
STEMI	354(42%)	486(66%)	424(46%)	0.61
NSTEMI	278(33%)	169(23%)	267(29%)	0.43
Unstable Again	211(25%)	81(11%)	231(25%)	0.35

Regarding getting thrombolytics in STEMI significant difference in number of patients (70%vs 56%). All patients with NSTEMI, Unstable Angina and STEMI with delayed arrival were heparinized. In hospital complications such as left ventricular failure (38% vs 23%), cardiogenic shock (20% vs 7%), arrhythmia (4% vs 3%), complete heart block (6% vs 4%). Average death rate was higher in 1st phase (8.6% vs 5.8%)

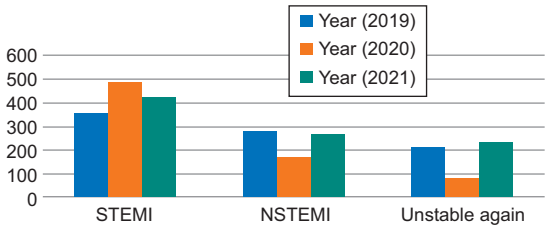

Fig.-1: *Comparison of ACS admission during same time frame*

Table-III

Comparison of outcome between patients admitted in 2019, 2020 and 2021 study period

	Year (2019)	Year (2020)	Year (2021)	P-value
Left ventricular failure	227(27%)	280(38%)	212(23%)	0.05
Cardiogenic shock	101(12%)	147(20%)	65(07%)	0.03
Arrhythmia	42(05%)	29(04%)	28(03%)	0.01
Complete heart block	59(07%)	44(06%)	37(04%)	0.08
Mortality	45(5.4%)	63(8.6%)	53(5.8%)	0.04

There was significant decline in numbers of interventions (CAG and PCI) for CAD during first phase of Covid which raised during second phase (429 vs 2151). Total number of interventions done of 1884 patients on 2019 whereas 2151 patients were undergone in the year 2021.

Table-IV

Comparison between cardiac intervention of ACS done on 2019, 2020 and 2021

	Year (2019)	Year (2020)	Year (2021)
CAG	1335	301	1495
PCI	509	128	656
Total	1844	429	2151

Comparing with the same duration in 2019 total number of admitted patients were 18067 which revealed 46% declined in admission during 1st phase and 13% declined in 2nd phase of Covid.

Table-V

Previous studies reporting about the deadline in ACS/MI admissions during covid-19 pandemic

Authors	Country	No of centres	No of patients	% Decline	Study duration (weeks)
Braiteh et al	USA	4	180	41% (ACS)	8
Metzler et al	Austria	19	725	39% (ACS)	4
Rodriguez et al	Spain	81	260	40% (PCI for STEMI)	1
Secco GG et al	Italy	3	84	52% (ACS)	4
Rattka M et al	Germany	1	52	25% (AMI)	4
Tsioufis K et al	Greece	1	39	P value - <0.001	8
De Rosa S et al	Italy	54	319	48% (AMI)	1
Filippo O D et al	Italy	15	547	50% (ACS)	6
Tam C Fet al	Hong Kong	1	7	STEMI	2
Garcia et al	USA	9	138	38% (STEMI activations)	12

Numbers not available

Discussion:

Though there were multiple reports from various countries about the decline in ACS admission during Covid-19 pandemic,[17] (table V) this is the first report from Bangladesh addressing this issue.

The Italian society of Cardiology multicenter register, which compared acute MI incidence in a week with the equivalent period in 2019, observed a drastic reduction of 48.4% (p< 0.001) and complications (RR = 1.8; 1.1–2.8; p = 0.009) during the pandemic, compared to 2019. [18] Then, Metzler et al. conducted an Austrian nationwide retrospective survey involving 17 primary PCI centers for 27 days during COVID-19 outbreak, founding a relative reduction from the beginning to the end of this period of 39.4% in admission for all subtypes of ACS. [19] Interestingly, the decline in hospital admissions for STEMI was seen in all geographic areas of the United States, irrespective of COVID-19 incidence, implementation of lockdown, and level of SARS-CoV2 testing.[20] Later on, nationwide analysis of acute coronary syndrome admissions conducted in other geographical areas that had lockdown restrictions, such as England, France, Greece, and California showed the same concerning trend. Finally, Mohammad et al. [21] recorded a nationwide significant decline in AMI presentation during the COVID-19 pandemic as compared to the corresponding period of previous years (2015–2019) also in Sweden.

During the study period in 2020 ,9693 patients were admitted (age58±12 years) which is 46% decline in admission compared to same period in previous year. On the other hand, during second phase of Covid in 2021 declined in admission was 13% comparing to year 2019. Several hypotheses has been postulated to explain this decline in admission for cardiac emergencies. NICVD is a tertiary care hospital and it is not only center of treatment of heart disease of capital city but lots of patients are referred from different divisions of Bangladesh. As Dhaka was the mostly infected zone of Covid, patients from different zones were fear of getting in contact Covid-19 infected patients for seeking acute medical care. Due to lockdown scarcity of transport also played a key role. Significant decrease in air pollution and less job stress were implicated for the decrease in ACS admissions. On the other hand, comparing to 1st phase during the 2nd phase some inclination in the admission rate was due to improvement of knowledge about Covid, its complications and management. Moreover, though increase in infection rate, there was some relaxation of lockdown during 2nd phase.

There was no significant difference between the baseline characteristics of patients admitted in 2019 and 2020 (Table I). Highest patients stood in the age group of 40-60 years (47.6% vs 45.1%). Most of them were male 618 (84%) and female were 287(16%) which were almost similar in both phases. Patients were suffering from multiple comorbidities (Hypertension 50%, Smoking 41%, Diabetes 35%) during 1st phase. Comparing with the 1st phase 52%, 40% and 37% were hypertensive, diabetic and smoker respectively. Clinical observations made in England about the characteristics of patients with AMI during the pandemic lockdown showed that they were younger, less frequently diabetics, and less likely to have a history of prior cerebrovascular disease, as compared to those admitted during the previous year. [22] On the other hand, a Swedish registry reported no difference (both at a nationwide level and in Stockholm) in age, gender, and comorbidities in patients with AMI

during the pandemic. [21]In line with the Swedish observation, both a French registry by Mesnier et al. [23] and a single-center German study by Primessnig et al. [24] showed that age, gender, and prevalence of risk factors did not differ between the pre-pandemic and pandemic period in patients with AMI.

An observation common to studies was that during the pandemic a higher percentage of patients were admitted with STEMI as compared to NSTEMI.A large database of 99 English hospitals showed that, on average, hospitalization for NSTEMI was reduced by 50% and by 25% for STEMI. [25] Likewise, a multicenter observational survey examining 319 consecutive patients with AMI in the week with the highest peak of COVID-19 spread in Italy reported a decrease in hospital admission by 27% for STEMI and by 65% for NSTEMI. [26] Among the enrolled patients during the 1st phase 66% were diagnosed as STEMI,23% as NSTEMI and 11% as Unstable Angina. Whereas during 2nd phase 46% were diagnosed as STEMI,29% as NSTEMI and 25% as unstable angina. The greater reduction in NSTEMI admissions might have several explanations. There is the chance that patients with NSTEMI did not seek medical help because their symptoms were less severe precordial pain or chest discomfort, thus increasing their reluctance to expose themselves to the in-hospital risk of COVID-19 infection. In addition, an association between increasing age and pre-existing comorbidities and a poorer outcome following COVID-19 infection was largely emphasized by the media at the start of the pandemic, affecting the choice of some patients with NSTEMI to remain at home, since they considered themselves at high risk in case of infection due of their older age and concomitant illnesses.

During both phases almost all patients presented with chest pain. In STEMI patients, duration of chest pain less than 12 hours (56% vs 71%). Patients with chest pain more than 12 hours were (44% vs 29%) while comparing both groups. Time from symptom onset to first medical contact was substantially delayed in STEMI and NSTEMI patients during e COV compared with pre COV. Forty three per cent of STEMI patients presented within the first 12 h from symptom onset to first medical contact in the pre COV time, while only 23% of STEMI patients did that in the e COV period. However, in pre COV, only 6% of STEMI patients presented after 72 h, while in e COV, 27% did, which was an increase of 21% (p = 0.04). In NSTEMI patients, 33% presented within the first 12 h to the hospital in pre COV, while only 16% of them did in e COV. Indeed, 28% of NSTEMI patients presented after 72 h during e COV compared with only 6% in pre COV, which was again an increase of >20%[28]. This delay in symptom onset to first medical contact may due to patient·s reluctance to come to hospital for medical care, fear of getting infected with COVID and scarcity of transport in lockdown. Raise of Troponinl >.1 ng/dl were 71% vs 69% where Troponinl <.1 ng/dl were 29% vs 31%. Regarding getting thrombolytics in STEMI significant difference in number of patients (70% vs 56%).

An important observation made during the COVID-19 pandemic was that patients with STEMI had greater enzymatic infarct size, as assessed by the peak of troponin or creatine kinase levels (lower left ventricular ejection fraction [28], higher intracoronary thrombotic burden and, therefore, more frequent in-hospital complications.[29] Indeed, a higher rate of cardiogenic shock, need for inotropic and mechanical hemodynamic support, and an increased incidence of life-threatening ventricular arrhythmias after successful revascularization of the culprit artery were found in patients with AMI admitted during the COVID-19 pandemic, with higher early mortality.[25] In particular, De Rosa et al. [25] found that in-hospital mortality for STEMI increased to 14% during the pandemic as compared to a 4% rate in the same period of 2019. In their work, De Rosa et al. found that major complications (cardiogenic shock, left ventricular failure, life-threatening arrhythmias cardiac rupture, and severe mitral regurgitation) were also increased from 10% of the previous year to 19%). Our study shows, In hospital complications such as left ventricular failure (38% vs 23%), cardiogenic shock (20% vs7%), arrhythmia (4% vs 3%), complete heart block (6% vs 4%). Moreover, a study carried out in London found that not only higher in hospital mortality in patients with STEMI but also a raised length of stay during the peak of the pandemic (1 march to 30 April 2020) compared to those observed during the corresponding 2019 period.[30] In our study average death rate was higher in 1st phase (8.6% vs 5.8%) and it was also higher than the year 2019 (8.6% vs 5.8%). According to Showkathali. R, et al. there was no difference in in-hospital mortality (IHM) between the two-study period of 2020 and 2019 respectively (8.7% vs 6.3%). However, the duration of hospital stay is longer (4.5 vs 4 days) and patients were discharged with more cardiac medications (5.6 ± 1.9 vs 4.6 ± 1.6) compared to last year. [31] The significant delay in hospital presentation of patients with STEMI reported during COVID-19 may have resulted in a higher rate of complications and, consequently, in-hospital mortality. There was significant decline in numbers of interventions for CAD during first phase of Covid which raised during second phase (929

vs 2151). Total number of interventions done of 1844 patients on 2019 whereas 2151 patients were undergone in the year 2021. A single-center study from Hong Kong showed a decrease in the number of primary PCI as well as an increase in the time to first medical contact and time to revascularization. [32] A recent large analysis from 9 high volume centers across the United States of America also suggested a 38% reduction in cardiac catheterization laboratory activations for STEMI during the pandemic period. [33]

Conclusion:

The Covid-19 outbreak affects hospital admission for acute coronary syndromes. During the first phase of the pandemic, significantly less patients with ACS admitted, but those admitted presented with a higher mortality, more complications and a worse short time outcome. Therefore, our data indicate that Covid-19 had relevant impact on non-infectious disease status, such as acute coronary syndrome.

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Case report

Successful Repair of a Post-opcabg Distal Ascending Aortic Pseudoaneurysm through Lateral Thoracotomy – A Case Report

Saikat Das Gupta[1], Sultan Sarwar Pervez[2], Jagadananda Roy[3], Bhabesh C Mandol[4], Mozibul Hoque[5], P K Chanda[6]

Abstract:

A large ascending Aortic pseudoaneurysm is a rare life threatening complication after off pump coronary artery bypass surgery. We herein describe such a case of massive ascending Aortic pseudoaneurysm, with impending rupture which was adherent to undersurface of sternum, was successfully treated by us at Square Hospitals Limited.

(Bangladesh Heart Journal 2022; 37(1): 72-76)

Introduction:

Pseudoaneurysm, (false aneurysm) of the thoracic aorta usually results from transmural disruption of the aortic wall, and the leak is contained by surrounding mediastinal structures. Previous cardiac surgery is one of the most frequent cause[1]; (occurs in fewer than 0.5% of all cardiac surgical cases)[2] Other causes are trauma[3] or infection[4], vasculitis, and artherosclerosis[3]. Pseudoaneurysms are usually located at earlier anastomotic sites, aortototomy sites, cannulation and venting sites[5]. infection, poor anastomotic technique, and intrinsic aortic wall disease are also associated.

Surgical treatment may differ according to pathologic features of the pseudoaneurysm, and surgical interventions can be challenging, in the presence of infection or previous cardiac surgery. Aortic pseudoaneurysm has a high mortality rate due to the high pressure of the edematous aortic wall, which usually causes the rupture[6,7]. A result this disease should be treated as soon as it is diagnosed. We hereby describe a case of large thoracic aortic pseudoaneurysm with a high risk for rupture during median sternotomy successfully treated by us in a post OPCAB male patient.

Case Report:

Mr. X, 54 years, male diabetic, hypertensive gentleman got admitted to our hospital with a pulsatile chest wall swelling, diagnosed as a case of pseudo aneurysm of ascending aorta. He had a h/o CABG×03 grafts on January, 2020 elsewhere. Later on he developed chest wound infection that required multiple procedures to heal on July, 2020 and then he developed dysphagia and CT scan of chest revealed pseudo aneurysm of distal

1. Junior Consultant, Department of Cardiac Surgery, Square Hospitals Limited,
2. Associate Consultant, Department of Cardiac Surgery, Square Hospitals Limited,
3. Associate Consultant, Department of Cardiac Anesthesia, Square Hospitals Limited,
4. Consultant, Department of Cardiac Anesthesia, Square Hospitals Limited,
5. Senior Consultant, Department of Cardiac Anesthesia, Square Hospitals Limited,
6. Senior Consultant, Department of Cardiac Surgery, Square Hospitals Limited.

Address of Correspondence: Dr. Saikat Das Gupta, Junior Consultant, Department of Cardiac Surgery, Square Hospitals Limited, West Panthapath, Dhaka 1205. 5B, Ritz Lutfunnesa, Road-03, Plot-02, Mirpur-02, Dhaka-1216, Bangladesh. Phone:+8801715739487, E-mail: saikatdasgupta@ymail.com

DOI: https://doi.org/10.3329/bhj.v37i1.60107

ascending Aorta. Endovascular closure of aneurysm with glue and gel foam was attempted on Sep, 2020 but failed and the very next morning patient developed stroke with right sided hemiparesis (RSH).

General examination revealed emaciated patient, with mild anemia with dull chest pain, not radiating but only relieved by drugs (NSAIDs). He also developed dysphagia and hoarseness of voice for last six months.

Fig.-1: *X-ray Chest PA view showing gross dilatation of Aorta*

Pre-operative Blood Routine Examination, RBS, ECG, S. Electrolytes were normal except CRP (256) and ESR (113 mm at the end of 1st hour). Serum Total Protein, S. Albumin, TSH (1.13) were normal too. No growth was seen in blood CS.

Pre-operative echocardiogram showed large aneurysmal sac (58×78 mm), anterior to ascending aorta communicating with it via a narrow neck (8mm), 35 mm distal to aortic annulus. Spontaneous echo contrast seen in aneurysmal sac. Grade I AR, Trivial TR (PASP-50 mm of Hg). Fair LV systolic function (LVEF-55%). Good RV function. No pericardial effusion / intra-cardiac thrombus seen.

On Nov 2020, after optimization of patient condition, patient was brought to OT and after proper positioning CPB was established through right fem-fem cannulation after achieving ACT. With deep hypothermic circulatory arrest at 22 °C, Aorta was approached through right antero-lateral thoracotomy at 4th ICS using MIDCAB retractor. Pseudoaneurysm was found hugely dilated & adherent with undersurface of the sternum. LV vent was introduced through right superior pulmonary vein from outside of pericardium.

Aneurysm was decompressed and entry point was secured with double patch (Dacron with glutaraldehyde treated pericardium). Wound was packed with gauze pieces and chest closed in layers keeping drain tubes. Discharging sinus tract of previous MS wound was excised off and wound was packed with povidone soaked gauze piece. On the subsequent day chest wound was re-opened through previous incision, gauze pack removed and one minor bleeding point seen and secured with polypropylene and pledgets. After hemostasis chest was closed in layers.

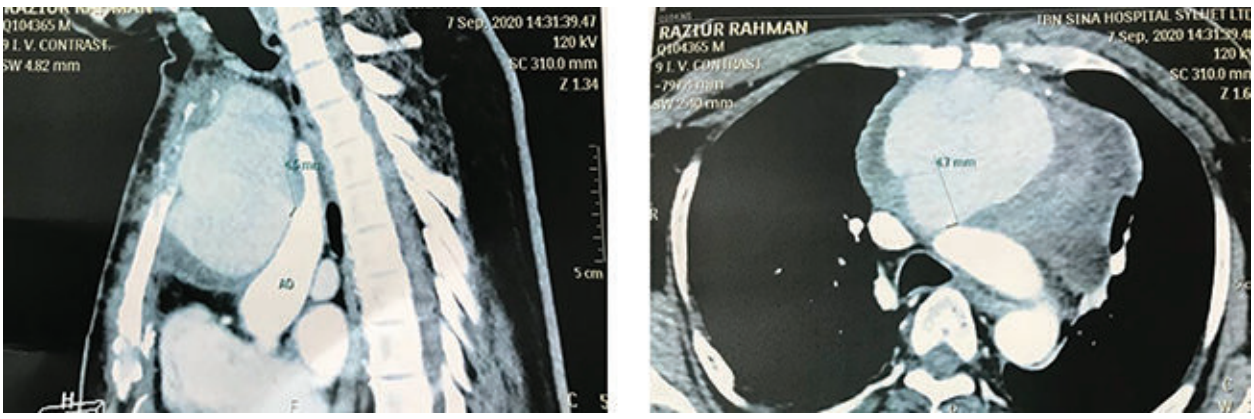

Fig.-2: *Pre-op CT scan showing adherence of aneurysm with posterior wall of sternum*

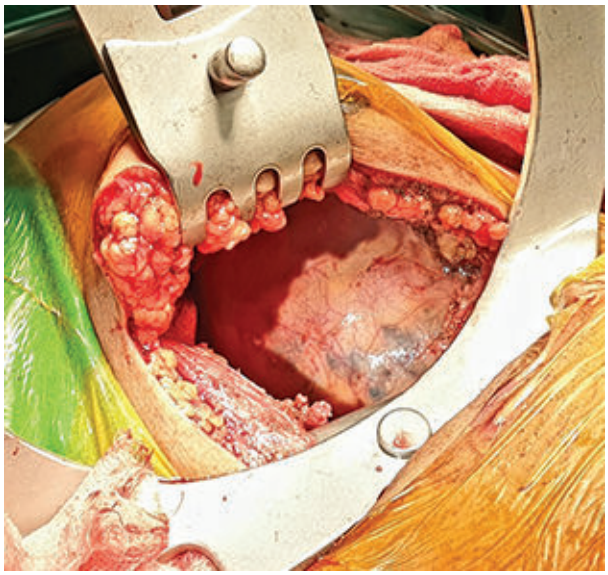

Fig.-3: *Per-operative picture showing large aneurysm just before decompression and repair*

Fig.-4: *Per-operative picture showing on going patch repair while aneurysm is decompressed*

His post-operative days in ICU and step down was eventless. He was extubated from mechanical ventilation on 2nd POD without any residual abnormality.

Post-operative blood investigations showed nothing abnormal and ESR came down to 20mm at the end of 1st hour and CRP came down to 7.2. Post-operative S. Creatinine became normal on 7th POD which raised up to 2.3 mg/dl on 1st POD.

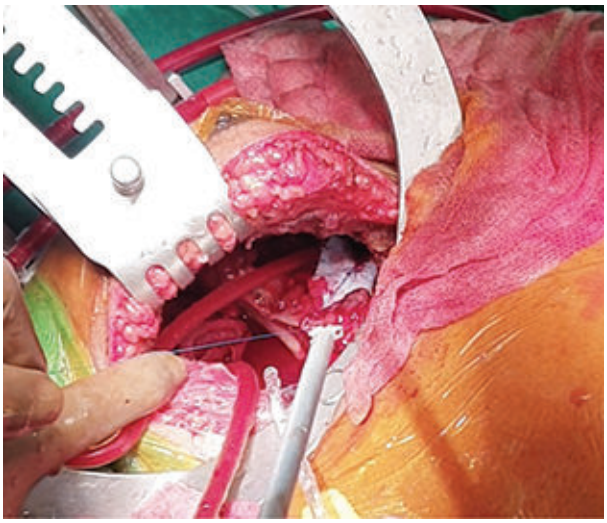

Fig.-5: *Per-operative picture showing on going patch repair while aneurysm is decompressed*

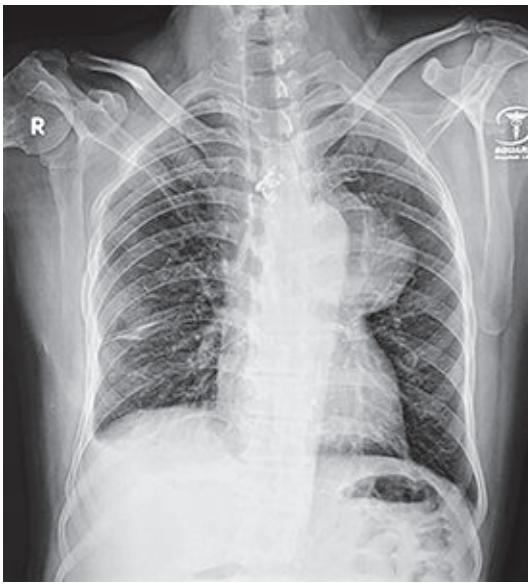

Fig.-6: *Post-operative X-ray showing remaining aneurysmal sac just before discharge*

Post-operative echocardiogram showed status post patch closure of aneurysm. No residual flow noted across aorta. Mild AR, Trace TR (PASP-35 mm of hg). Normal LV systolic function (LVEF-60%). Good RV function. No pericardial effusion / intra-cardiac thrombus seen.

Discussion:

A large ascending Aortic pseudoaneurysm is a rare life threatening complication following OPCAB surgery. We

herein described a case report of a pseudoaneurysm with a high risk for rupture during median sternotomy. The massive pseudoaneurysm in our patient was dilated and widely adherent to the posterior sternum. In our case, a safe redo sternotomy was to be the crucial factor for a successful reoperation. But, redo sternotomy may injure the aneurysm in our case, causing rupture so we chose to approach the aorta through lateral thoracotomy rather than median sternotomy.

This days endovascular procedures have been more commonly used for the treatment of aortic arch pseudoaneurysm[6,8,9,10]. Compared with conventional open surgery, endovascular stent-grafting is less invasive, needed no dissection, less bleeding and a relative shorter procedural time and length of hospital stay. However, long-term clinical outcome of this operation have not been confirmed so far[6,8,11]. In this patient endovascular closure with glue and gel foam was attempted with failure and moreover patient developed CVD with RSH on the subsequent day. We, once considered thoracic endovascular aortic repair (TEVAR) with stent, but in this case TEVAR appeared to be difficult as a result of the narrow access arteries, high flow zone, the large aneurysm and adhesion from the past sternotomy. As a result, in spite of the advancement of endovascular surgery, we had to choose surgical treatment.

In any re-do surgery a safe strategy for establishment of CPB is to be sought pre-operatively and thus appropriate perfusion strategy was crucial for successful treatment. According to Malvindi et al, an elective CPB should be started before redo-surgery in the presence of less than 2 cm retrosternal space[12]. One key thing was that, we believed rapid cooling by CPB may result in ventricular fibrillation (VF) before the brain is cooled sufficiently, as a result we spent more than 30 min for systemic cooling at 22°C.

McCullough[13] et al. conveyed that at 25°C the safe duration of hypothermic circulatory arrest is 14 min. Even due to rupture of the aneurysm during entering the chest or due to uncontrolled left ventricle distension after developing VF, if the cerebral perfusion was stopped, there is ample time to open the aneurysm and introduce selective cerebral cannulas from the aortic lumen under circulatory arrest at 25°C.

The pseudoaneurysm is associated with a high mortality rate of 61% if not treated surgically, due to documented rupture[14]. Conventional open surgery for pseudo-aneurysm remains a surgical challenge and it's also associated with a high rate of mortality (7–17%) and neurological complications (4–12%)[6,8,15,16]. Long-term survival after surgical treatment yet to be known. In our case patient was doing excellent at 6 months' follow-up.

Conclusion:

Aortic pseudoanerysm is rare life threatening disease. Proper planning with such complex cases like elective CPB with controlled cooling and availability of appropriate instrument provides the team with the confidence to deal with any complications that may arise. Surgical team should be proficient and experienced enough to deal such cases. Involvement of other specialties is required in some cases, like nephrology, neurology, and hematology, due to various postoperative complications.

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Case report

Congenitally Corrected Transposition of Great arteries with AV block -cohabitation of structural and electrical cardiac abnormality: a case report

Abdul Wadud Chowdhury[1], Azizul Haque[2], Kazi Nazrul Islam[3], Mohammad Gaffar Amin[3], Abu Taher Md. Mahfuzul Hoque[3], Sudhakor Sarker[4], Mohammod Ali[4], Pratyay Hasan[5]

Abstract:

Congenitally Corrected Transposition of Great Arteries (c-TGA) is an anomaly with atrioventricular and ventriculoarterial discordance where left atrium connects to right ventricle and right atrium to left ventricle. However in this case of double inversion, aorta carries saturated blood and pulmonary artery carries venous blood. So, normal physiological circulation is maintained. Our patient, a 38-years-old Bangladeshi male presented with palpitation, dizziness and effort intolerance (NYHAII) during exertion since childhood, which has recently become much worse. However, he had no history of central cyanosis, chest pain or syncope. We diagnosed him as a case of Corrected TGA and second-degree AV block with intermittent complete heart block.

A Dual chamber permanent Pacemaker was inserted without any complications. No invasive treatment including corrective surgery was performed because patient's cardiac function was almost normal. Patient became totally asymptomatic after pacemaker implantation

(Bangladesh Heart Journal 2022; 37(1): 77-80)

Introduction:

Congenitally corrected transposition of great arteries (c-TGA) is a rare heart disease with an incidence of 1 in 33,000 live births and prevalence of 0.05% of all congenital heart malformations.[1] It occurs most frequently in males with a ratio of 1.5:1.[2] Congenitally corrected transposition of the great arteries (c-GTA) is characterized by transposition of great arteries and inverted ventricles, atrioventricular valves and conduction system but normal atrial situs.[2] The cause of the malformation is not currently known,[3,4] although a familial association has been found.[5] More than 90% of cases of c-TGA have other associated anomalies like VSD, PS, tricuspid valve or mitral valve anomalies.[6–8] These patients may remain asymptomatic for many years and usually diagnosed in later decades of life due to abnormal ECG, echocardiography, cardiac computed tomography or cardiac MRI. They may also present with severe life threatening complications like systemic ventricular

1. Professor and Head, Department of Cardiology, Dhaka Medical College & Hospital
2. Junior Consultant, Department of Cardiology, Dhaka Medical College & Hospital
3. Assistant Professor, Department of Cardiology, Dhaka Medical College & Hospital
4. Junior Consultant, Department of Cardiology, Bangladesh Specialized Hospital (BSH)
5. Indoor Medical officer, Department of Medicine, Dhaka Medical College & Hospital

Address of Correspondence: Prof. Dr. Abdul Wadud Chowdhury, Professor and Head, Department of Cardiology, Dhaka Medical College & Hospital, Email- drwadud65@gmail.com

DOI: https://doi.org/10.3329/bhj.v37i1.60108

dysfunction, heart block and ventricular arrhythmia.[9] No treatment is required for patients with isolated c-TGA (without other defects), which is not commonly found,[6–8] because their life expectancy has been reported to be near normal.[10] But patients with other malformation or heart block i.e either structural or electrical abnormality, require corrective surgery or pacing according to the type of defects.

Case Report:

We present a case of non-diabetic, hypertensive, non-smoker, male patient of 38 years who presented with complaints of aggravated effort intolerance, fatigue, palpitation and slow heart rate (between 40 to 50 beats/min) for 1 month. According to the patient he had been suffering from recurrent effort intolerance and fatigue during exertion since his childhood. But he gave no history of generalized bluish discoloration during exertion, fever, chest pain or syncope. His birth history was uneventful and all members of his family are healthy. In 2011 he was first diagnosed as a patient of Congenitally Corrected Transposition of great arteries with intermittent complete heart block. He was advised for permanent pacemaker implantation. But patient did not follow the advice. Recently patient again became symptomatic with same complaints in more aggravated form.

Investigations showed- normal hemogram (Hb-14.5 gm/dl, ESR- 02mm in first hour, normal total and differential count of WBC). Thyroid function was normal (h.TSH-2.12 micro IU/ml), serum creatinine - 0.9mg/dl and serum electrolyte was normal (Na-141mmol/L, K- 3.5 mmol/L, Cl- 100mmol/L, TCO2- 28mmol/L). Patient was mildly dyslipidemic (total cholesterol – 195mg/dl, HDL-38 mg/dl, LDL-137mg/dl, TG- 113mg/dl).

Resting ECG showed bradycardia (HR 45 beats/min) with 2:1 AV block (Fig 1). 24 hours Holter ECG showed occasional first, second and intermittent complete heart block and significant number of extrasystole.

Echocardiography showed hypertrophied & dilated morphological RV on left side, from which aorta originated; small morphological LV on right side from which main pulmonary artery originated; dilated LA due to moderate TR, good biventricular systolic function & levocardia, situs solitus, but no VSD (Fig-2,3,4). Systemic ventricular EF was 62% (morphological RV).

Patient was implanted with a dual chamber permanent pacemaker. There was some difficulty during temporary pacemaker (TPM) insertion done before PPM implantation. As the right atrium connects to morphological LV through mitral valve, it was quite difficult to insert the TPM lead. The positioning of ventricular lead of the permanent pacemaker was also difficult, because it enters the morphological LV instead of the usual RV. However, a good result with stable efficient pacing was achieved by using a screw-in ventricular lead. (Fig-5) After implantation, patient quickly achieved relief of his symptoms. At follow up, he was completely asymptomatic and happy.

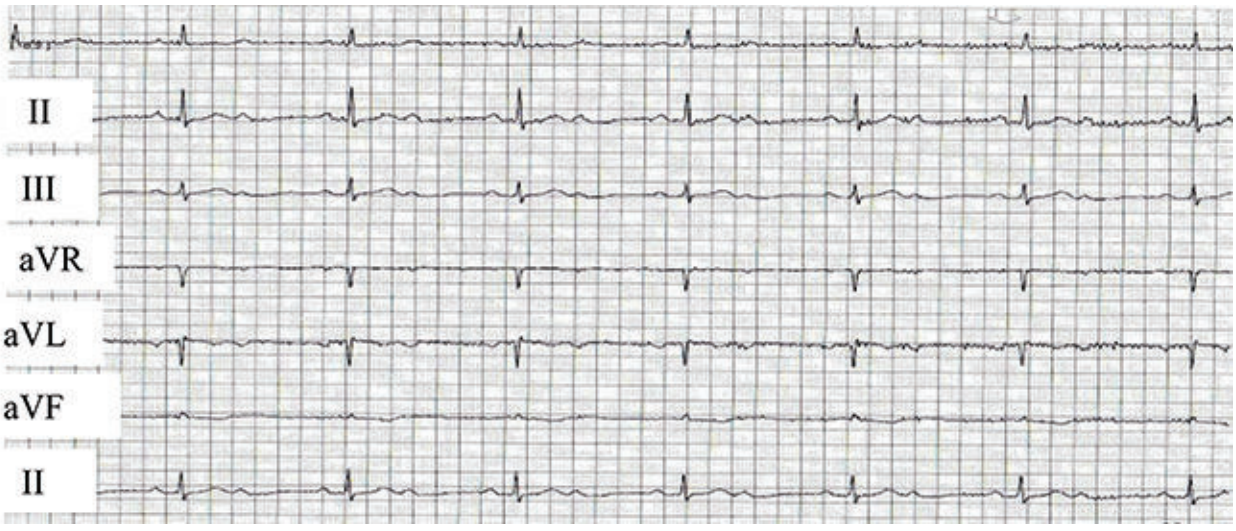

Fig.-1: *Resting ECG showed 2:1 AV block*

Fig-2: *A4CH view- showed AV discordance*

Fig-3: *PSAX view- showed AO anterior to PA*

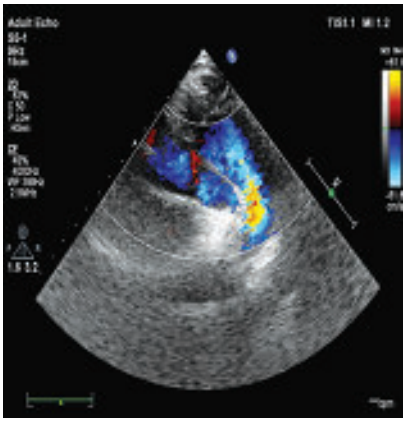

Fig-4: *CMF shows two parallel flow indicating TGA.*

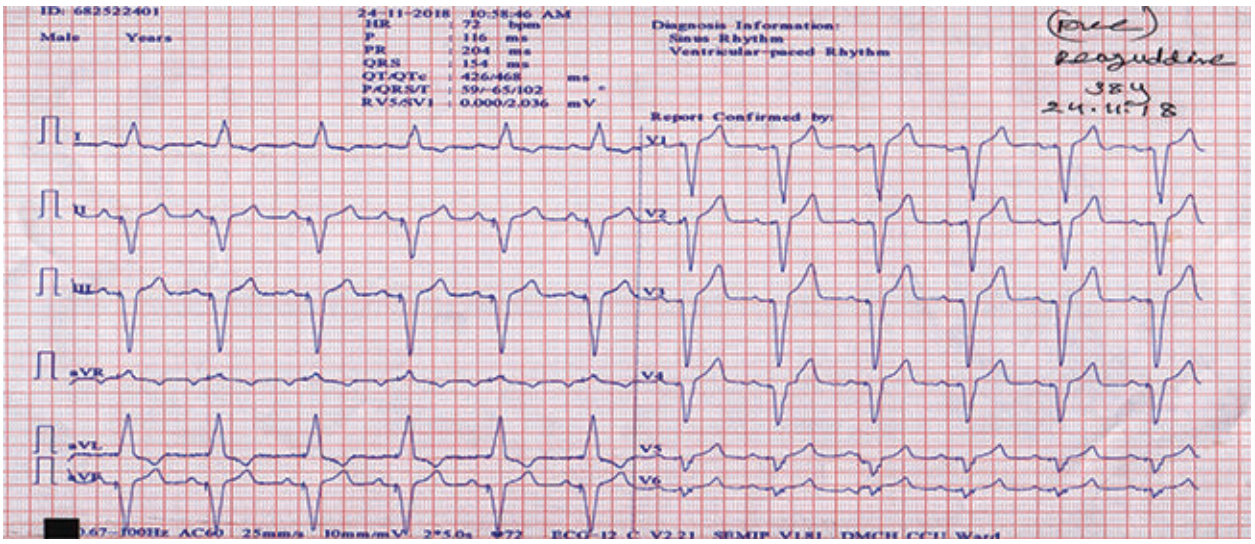

Fig.-5: *Resting 12 lead ECG after permanent pacemaker implantation showing atrial tracking & ventricular pacing.*

Discussion:

Corrected TGA is associated in approximately 70-80% cases with VSD and in 30-50% cases with pulmonary stenosis. Ttricuspid valve abnormality is present in almost 90% cases.[4,8,11–13] Ebstein like anomaly of the tricuspid valve occur in 20-53% cases.[12,13] Conduction and coronary anomalies are also found. Prognosis depends on AV conduction, arrhythmia, structural anomalies, and degree of hemodynamic dysfunction. A multicenter study of congenitally corrected transposition of the great arteries demonstrated that 25% of patients without associated cardiac lesions and 67% of patients with other cardiac abnormalities developed congestive heart failure by the age of 45.[7] During embryological development, left handed looping of the heart tube results in AV discordance and aorto-pulmonary septum fails to rotate 180^0 resulting in ventriculoarterial discordance. Blood however flows in effective sequence due to double inversion; hence it is called corrected TGA.

In c-TGA, usually the sinoatrial (SA) node is located in its normal position. The AV node is typically located along the anterosuperior margin of the VSD and is usually accompanied by an elongated His bundle and a second subsidiary AV node may exist in some cases.[4,11,12] With progression of age, complete heart block may ensue with progressive incidence of 2 percent per year.[4] With ventricular inversion, conduction bundles are also inverted and this makes electrical activation from right to left. This causes characteristic ECG findings of Q waves in the inferior leads and an absence of Q waves in the

left-sided precordial leads,[13] which may be misinterpreted as an inferior myocardial infarction.[4] Also reentrant tachyarrhythmias and Wolff-Parkinson-White syndrome may be noted.[4]

Without serious conduction defect there are two treatment options, one is periodic follow-up with echocardiography for worsening ventricular function or aggravation of TR, and other is corrective surgery.[14] With progressive conduction defect, patient would require permanent pacemaker implantation. During this procedure difficulty may occur as one has to pass the lead from RA to LV (instead of RV) through a bicuspid mitral valve (instead of tricuspid valve). We also faced this problem during pacing of the patient. ACE inhibitor or beta blocker has not been well studied in corrected TGA population. Therefore most of the patients received conventional systemic LV protection strategies.[12] This patient was prescribed ARB for the hypertension and ventricular dysfunction protection. In such cases, for periodic follow up, only echocardiography is not adequate as RV (which is acting as LV) has multiple coarse trabeculations. Therefore, cardiac magnetic resonance imaging is considered as an additional tool for measurement of ejection fraction in patients with corrected TGA.

Conclusion:

In congenitally corrected TGA, double discordance of AV and ventriculoarterial connections maintain normal circulation unless presence of other malformations complicates the condition. This case presented with effort intolerance despite normal systemic ventricular function (morphologic RV, EF-62%) due to second degree and intermittent complete AV block and those symptoms improved after implantation of permanent pacemaker.The prognosis of corrected TGA without associated cardiac anomalies depends on the appearance of anatomical tricuspid regurgitation and subsequent development of systemic (morphological right) ventricular dysfunction and advanced heart block. We plan to follow up this patient to detect any future systemic ventricular dysfunction by echocardiography and, if necessary, by cardiac MRI.

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Case report

Left Atrial Appendage Giant Aneurysm- A Case Report

Md. Akhter Hossain[1], Md. Badruzzaman[2], Md. Mainul Kabir[4], Md. Jahirul Islam[5], Md. Alamgir Hossain[5], Md. Rowshon Masud[6]

(Bangladesh Heart Journal 2022; 37(1): 81-83)

Background:

Aneyrysm of left Atrial appendage (LAAA) is a rare cardiac anomaly. It was first identified in 1960.[1] As severe complications like thromboembolic events, rhythm disorders and CCF surgical management is recommended. The authors presented a 24 years old boy who was hospitalized with a LAAA. It was detected incidentally by CT Scan of the chest. The patient underwent operation with removal of aneurysm under cardiopulmonary bypass.

Case Presentation

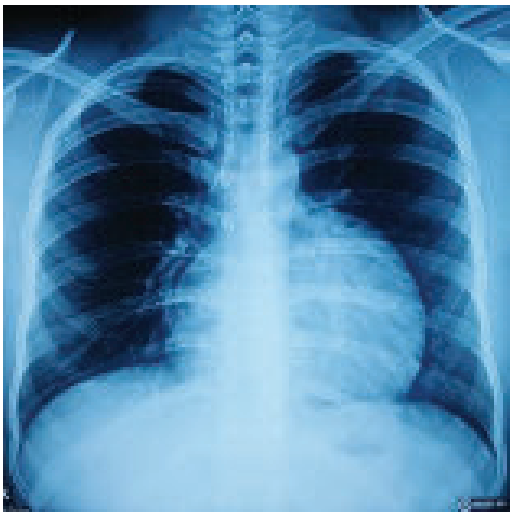

Fig.-1: *Preoperative X-Ray Chest*

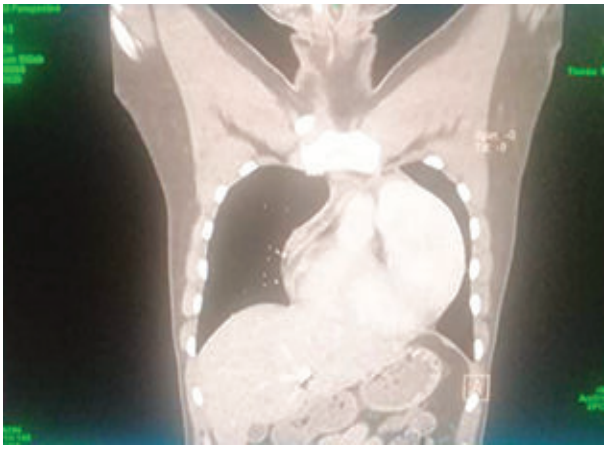

Fig.- 2: *Preoperative CT scan of the chest*

Masum Billah of 21 years boy was attended in outpatient department with non specific presentation. A Thoracic X-ray was done and suspected as a case of posterior mediastinal mass. A contrast CT scan was done and diagnosed as a case of giant LAAA (90 mm × 75 mm). For Cardiac evaluation Echocardiography was done and revealed large 90 mm x 70 mm LAAA enlarged compressing the left ventricle. The other findings of Echocardiography was within normal limit.

Doing all necessary investigations the patient was scheduled to undergo surgery on 04/10/2020.

1. Chief Consultant, Cardiac Surgery, Asgar Ali Hospital.
2. Jr. Consultant, Cardiac Surgery, Asgar Ali Hospital
3. Jr. Consultant, Cardiac Surgery, Asgar Ali Hospital
4. Associate Consultant, Cardiac Surgery, Asgar Ali Hospital
5. Consultant, Radiology and imaging, Asgar Ali Hospital
6. Associate Consultant, Cardiology, Asgar Ali Hospital

Address of Correspondence: Dr. Md. Badruzzaman, Asgar Ali Hospital; Mobile no: 01674030914; Email: badruzzaman2008@gmail.com

DOI: https://doi.org/10.3329/bhj.v37i1.60109

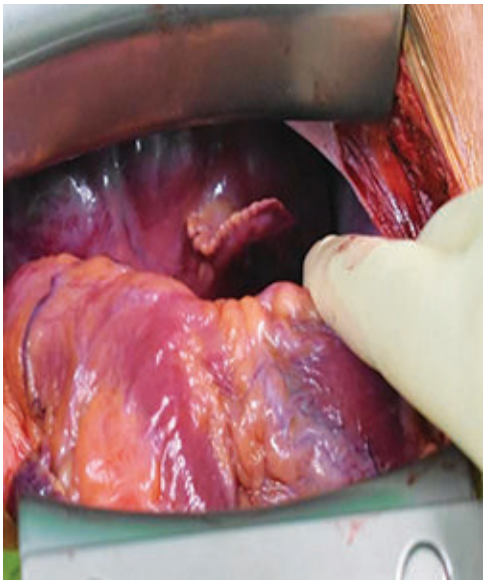

Fig.-3: *Peroperative view*

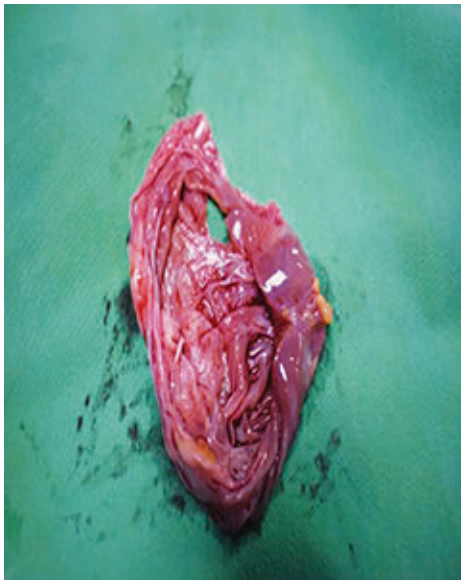

Fig.-4: *No thrombus found*

Median sternotomy was done. With aortic and bicaval cannulations Cardiopulmonary bypass was established. After pericardiotomy giant thin-walled LAAA was identified. The aneurysm was incised and no thrombus was found inside (Figure 4). After excision the base of the LAAA was sutured using 5/0 polypropylene . Precaution was taken to avoid the injury of left circumflex coronary artery. No evidence of other cardiac anomalies were identified during the operation.

Fig.-5: *Post operative X-Ray chest*

In postoperative ward the patient was uneventful. He was asymptomatic with sinus rhythm in one month postoperative visit. An echocardiography confirmed a normal size of the LA and no evidence of any residual leak or blood clot (Figure 5).

Discussion:

Aneurysms may occur in either the left or right atria. or both[2,3] It may be associated with other cardiac anomalies, such as tricuspid atresia[4]. Longer than 65 mm is defined as a “giant” LAAA[5].

Usually aneurysm arises in the third decade of life. The quickly enlarging aneurysm compresses near by cardiac structures and causes clinical symptoms. The symptoms includes palpitation, dyspnea, arrhythmia, and thromboembolism.[2]

The LAAA arises by dysplastic changes of pectinate muscles and the related bundles of muscles of the LA[6]. In Neonates and infants a large aneurysm compresses the pulmonary veins and air way. So they are more likely to develop congestive heart failure and respiratory dystress. are more likely to develop congestive heart failure and respiratory distress[7,8]. Transthoracic echocardiography is gold standard for the diagnosis of LAAA, thrombosis or other cardiac anomalies. But transesophageal echocardiography shows more detailed evaluation of the structure of the left atrial appendage[9]. Other imaging techniques, like CT scan and magnetic resonance imaging (MRI), may be done

for more accurate anatomic definition of the LAAA. Diagnostic criteria for LAAA are (1) origin from an otherwise normal-sized LA; (2) well-defined communication with the LA; (3) location within the pericardium; and (4) distortion of the LV by the aneurysmal body[10].

For the prevention of fatal cardiovascular events , e.g. stroke surgical intervention is recommended though the patient is asymptomatic[11].

Some authors have recommended that asymptomatic patient with LAAA may be managed conservatively some years and frequent follow-up[12-14]. But surgical management is highly recommended in case of a LAAA with serious complications or other coexisting abnormalities.

There are no gold standard surgical method options like neck-ligation, purse-string techniques, and stapling, with or without aneurysmal excision [15]. Median sternotomy is usually favorable in situations requiring other surgical procedures, like surgical thrombectomy, the Maze procedure in persistent atrial fibrillation[16], and in mitral regurgitation requiring the valvuloplasty[7]. Otherwise minimal invasive approach may be an alternative to median sternotomy for LAAA surgery[17,18]. However, though good surgical outcome, the optimal strategies for the LAAA are still under debate.

Conclusion:

Though the LAAA is a rare cardiac anomaly this is associated with fatal complications. The Echocardiography or CT scan are the main tools to diagnose the patient.. In some situations although medical treatment can be considered, Early surgical management is generally recommended to prevent these complications, even in asymptomatic cases.

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