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Journal of Invasive and Clinical Cardiology

INSTRUCTION TO AUTHORS

A. Introduction

The Journal of Invasive and Clinical Cardiology is a biannual, peer-reviewed journal and aims to publish work of the highest quality from all sub-specialties of Cardiology. The aim of the publication is to promote research 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. 3 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). Number of 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 15 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 Journal of Invasive and Clinical Cardiology 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 up to 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 are appropriate, 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 Journal of Invasive and Clinical Cardiology 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 Journal of Invasive and Clinical Cardiology and suggestions may be made to the authors by the Editorial Board to improve the scientific value of the journal.

D. Editorial Process

Journal of Invasive and Clinical Cardiology 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. Journal of Invasive and Clinical Cardiology follows the guidelines on editorial independence produced by the International Committee of Medical Journal Editors (ICMJE). All manuscripts correctly submitted to Journal of Invasive and Clinical Cardiology 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 Journal of Invasive and Clinical Cardiology, 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 Journal of Invasive and Clinical Cardiology 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 lowercase 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 U.S. 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*

The authors are responsible for the accuracy and completeness of the references and their citations in the text.

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;42 Suppl 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;66 Suppl 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. Proc Natl Acad Sci 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.
8.

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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Multivessel versus Culprit Lesion Percutaneous Coronary Intervention in ST-Segment Elevation Myocardial Infarction: What is the Verdict?

Tan Huay Cheem

J Inv Clin Cardiol 2020; 2(1): 1-3

Multivessel coronary artery disease (CAD) occurs in 30 to 50% of all patients with ST-segment elevation myocardial infarction (STEMI) and is known to be associated with worse outcomes compared with single vessel disease (1-2). The pioneer of multivessel CAD, Dr Geoffrey Hartzler, had recommended that balloon angioplasty be performed as an early staged procedure for such patients in the early years (3). Indeed, early studies such as SWISS II had demonstrated that silent ischemia on stress testing after acute myocardial infarction (AMI) was associated with increased cardiac death and major adverse cardiac events (4).

There are arguments for and against multivessel CAD PCI in the acute setting. Since AMI represents a generalised pathophysiological derangements of endothelial dysfunction, coagulation and inflammation which can instigate weakening of fibrous cap and has the potential to destabilise plaques throughout the coronary vasculature, proponents would argue that there is 'no better time than present' to treat the other lesions. The patients would have been 'captive audience' who are already on antithrombotic therapy. Multivessel PCI will have the potential benefits of improving hemodynamics, reduce ischemia, prevent reinfarction and passivate a 'hot' vessel. Healthcare system wise, this strategy can lead to fewer procedures, reduce admission and decrease total cost of care. Opponents will, on the other hand, say that treatment of non-infarct related artery (IRA) constitute higher risk by extending the 'theatre of operation' where any further ischemic insults and complications will be poorly tolerated. There is potential for increased hemodynamic and electrophysiologic instability as well as risk of contrast induced nephropathy from increased volume of contrast media used. Furthermore, the highly thrombotic milieu and the systemically vasoconstricted state may lead to overestimation of the non-IRA lesions and under-sizing of stents.

Early meta-analysis and systematic review involving mostly registry studies had indicated that there is a trend towards improved long-term survival when multivessel CAD PCI were performed as a staged procedure (5). Between 2013 and 2019, there have been 5 well publicised randomised controlled trials (RCT) that were performed comparing the two strategies of treatment of STEMI patients with multivessel disease, namely multivessel vs culprit lesion-only PCI. They are the PRAMI (6), CvLPRIT (7), DANAMI-3-PRIMULTI (8), COMPARE-ACUTE (9) and COMPLETE (10) trials. Three of the trials used angiographic criteria of 50% to 70% stenosis for inclusion criteria while 2 (DANAMI, COMPARE-ACUTE) used physiologic fractional flow reserve (FFR) <0.80 for determination of lesion significance. COMPLETE trial is far the largest RCT enrolling more than 4000 patients and showed that complete (multivessel) revascularisation reduced hard endpoints of death or MI at a median of 3-year follow-up. This is supported also by the 5-year follow up findings of CvLPRIT trial which showed similar significant reduction of death or MI (11). In trials such as COMPARE ACUTE which employed FFR-guided strategies, the benefit of complete revascularisation was driven by ischemia driven revascularisation (IDR). One meta-analysis did not show any difference in major bleeding, stroke and contrast induced nephropathy between these two treatments (12).

What should be the best way to choose non-IRA lesions for PCI? Should it be based on angiographic assessment or use of physiologic FFR testing? The question is does selection of lesions by FFR predict flow severity (and predominantly follow-up IDR need), whereas angiographic selection (providing they are >70%), by default, identify complexity and vulnerability? Plaque morphology should also be factored to predict hard endpoint outcomes.

Professor Tan Huay Cheem, Senior Consultant, Department of Cardiology, National University Heart Centre, Singapore

Specifically, thin-cap fibroatheroma (TCFA) is associated with increased plaque rupture since this thin cap separates the necrotic thrombogenic core from the lumen rendering it more 'vulnerable. The PROSPECT study demonstrated highest major adverse cardiac event (MACE) rates at 3.4 years in coronary lesions that had a combination of minimum lumen area (MLA) <4.0 mm2, high plaque burden (>70%) and TCFA (13). Perhaps additional imaging such as virtual histology (VH)-IVUS, optical coherence tomography [OCT] or near-infrared spectroscopy [NIRS] should be added to our armamentarium for non-IRA lesion assessment to predict vulnerability.

The optimal timing of staged PCI of the non-IRA lesion was attempted to be answered by the COMPLETE trial. The key finding was that the treatment effect of complete revascularisation on the primary endpoint of death or MI was consistent irrespective of the timing of non-IRA PCI (that is whether the procedure was undertaken as an inpatient or as a staged procedure within 45 days post-discharge). Because the timing of the staged procedure was at the discretion of the operators and not randomised, there was substantial and irreconcilable bias that may have influenced the results (14). This trial unfortunately still does not robustly define the optimal time of non-IRA PCI.

The current AHA/ACC STEMI guidelines state that PCI of a non-IRA may be considered in selected patients with MVD who are hemodynamically stable, either at the time of primary PCI or as a planned, staged procedure (Class IIb, Level of Evidence: B) (15). The 2017 European Society of Cardiology guidelines, on the other hand, gave it a higher recommendation by stating that routine revascularization of non-IRA should be considered before discharge in STEMI patients with MVD (Class IIa, Level of Evidence: A) (16).

From the published literature, it is obvious that conservative (medical) management of multivessel CAD is simply not good enough. The real question is not whether complete revascularisation should be performed but rather when. There are even more questions related to treatment of non-IRA lesions that still remain unanswered. These include whether complete revascularisation should be performed during index procedure or staged, during in-hospital or more than 30 days later; how should the complexity of the residual disease be better defined (for example chronic total occlusion, left main etc), how should lesion be stratified for ischemia, should additional imaging modality be used to assess lesion vulnerability and how should patient's comorbidities and preference be factored in the final decision. Indeed, complete revascularisation should not be routinely performed ad hoc during STEMI, but based on individual and careful patient and lesion assessments.

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1. Wald DS, Morris JK, Wald NJ, et al. PRAMI Investigators. Randomized trial of preventive angioplasty in myocardial infarction. N Engl J Med2013; 369: 1115–23.
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3. Kahn JK, Rutherford BD, McConahay DR et al Results of primary angioplasty for acute myocardial infarction in patients with multivessel coronary artery disease. J Am Coll Cardiol 1990; 16: 1089-1096.
4. Erne P, Schoenenberger AW, Burckhardt D et al. Effects of percutaneous coronary interventions in silent ischemia after myocardial infarction: the SWISSI II randomized controlled trial. JAMA. 2007; 297: 1985-91.
5. Bainey KR, Mehta SR, Lai T, et al Complete vs culprit-only revascularization for patients with multivessel disease undergoing primary percutaneous coronary intervention for ST-segment elevation myocardial infarction: A systematic review and meta-analysis et al Am Heart J 2014; 167: 1-14.e2
6. Wald DS, Morris JK, Wald NJ, et al. Randomized trial of preventive angioplasty in myocardial infarction. N Engl J Med 2013; 369: 1115–23.
7. Gershlick AH, Khan JN, Kelly DJ, et al. Randomized trial of complete versus lesion-only revascularization in patients undergoing primary percutaneous coronary intervention for STEMI and multivessel disease: the CvLPRIT trial. J Am Coll Cardiol 2015; 65: 963–72.
8. Engstrøm T, Kelbæk H, Helqvist S, et al. Complete revascularisation versus treatment of the culprit lesion only in patients with ST-segment elevation myocardial infarction and multivessel disease (DANAMI-3–PRIMULTI): an open-label, randomised controlled trial. Lancet 2015; 386: 665–71.
9. Smits PC, Abdel-Wahab M, Neumann FJ, et al. Fractional flow reserve-guided multivessel angioplasty in myocardial infarction. N Engl J Med 2017; 376: 1234–44.
10. Mehta SR, Wood DA, Storey RF, et al. Complete revascularization with multivessel PCI for myocardial infarction. N Engl J Med 2019; 381: 1411–21.
11 Gershlick AH, Banning AS, Parker E, et al. Complete vs Lesion-Only Revascularization in Patients with STEMI and Multivessel Disease: CvLPRIT Trial. J Am Coll Cardiol 2019; 74: 3083-3094

12. Atti V, Gwon Y, Narayanan MA, et al. Multivessel versus culprit-only revascularization in stemi and multivessel coronary artery disease: meta-analysis of randomized trials. J Am Coll Cardiol Intv 2020; 13: 1571–82.

13. Stone GW, Maehara A, Lansky AJ, et al on behalf of PROSPECT Investigators. A prospective natural-history study of coronary atherosclerosis. N Engl J Med. 2011; 364: 226-35

14. Wood DA, Cairns JA, Wang J, et al on behalf of the COMPLETE Investigators. Timing of staged nonculprit artery revascularization in patients with ST-segment elevation myocardial infarction: COMPLETE trial. J Am Coll Cardiol 2019; 74: 2713–23.

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16. Ibanez B, James S, Agewall A, et al. 2017 ESC guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: the Task Force for the Management of Acute Myocardial Infarction in Patients Presenting With ST-Segment Elevation of the European Society of Cardiology (ESC). Eur Heart J 2018; 39: 119–77.

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ORIGINAL ARTICLE

Association of Dyslipidemia and CRP with Severity of Coronary Artery Disease

Md. Mesbahul Islam[1], Mohsin Ahmed[2], Mohammad Arifur Rahman[3], Md. Matiur Rahman[4], Shariful Islam Ratan[5], Sayeedur Rahman Khan Rumi[5], Muhammad Bayazid[6], Md. Nahid Hasan[7], Bikash Chandra Das[8], Tanveer Ahmed[4]

Abstract:

Background: Dyslipidemia & local inflammation are the two major determinants of cardiovascular disease (CVD). Atherosclerosis leads to inflammation which is triggered by dyslipidemia. In this study we have tried to find out the association between dyslipidemia & CRP with the severity of coronary artery disease.

Method: This cross sectional study was performed on 668 patients of ischemic heart disease in the Department of Cardiology, Dhaka Medical College Hospital, Dhaka, who were underwent coronary angiography from January 2017 to December 2017. CRP value were divided into normal (<6 mg/L), borderline (6-10 mg/L) and high (>10 mg/L). Dyslipidemia was defined as total cholesterol >5.2 mmol/L (200 mg/dl), LDL > 3.4 mmol/L (130 mg/dl), HDL <0.9 mmol/L (35 mg/dl), or triglycerides

>1.7 mmol/L (150 mg/dl), or a combination there of. After performed Coronary angiography the extent of disease was divided into insignificant CAD of (<50% stenosis), significant CAD considered as >50% stenosis and single vessel, double vessel, triple vessel CAD and normal coronaries. The relationship between CRP and dyslipidemia with the severity of CAD was recorded by Chi square test. P value <0.05 was considered as statistically significant.

Results: Most (65.0%) of the patients belonged to age 41-60 years. The mean age was found 51.4±10.7 years. Majority (82.3%) of patients were male. Among risk factors, highest 267 (40.0%) patients had hypertension followed by 209 (31.3%) diabetes mellitus, 204 (30.5%) smoker, 189 (28.3%) H/O ischemic heart disease and 251 (37.6%) dyslipidemia. High CRP was found 140(55.8%) in dyslipidemia and 185(44.4%) in without dyslipidemia group. The difference was statistically significant (p<0.05). The relationship of dyslipidemic and CRP were significantly associated with the severity of coronary artery disease. Multi variable logistic regression was found high HbA1c, high CRP, diabetes mellitus and dyslipidemia were statistically significant (p<0.05) in severe CAD (Double and triple vessel) patient.

Conclusion: Screening of patients with dyslipidemia and CRP levels should be done to identify those patients with an increased risk for future development of atherosclerosis cardiovascular events and treating the condition effectively, therefore, would have a considerable impact on the outcome of the CAD patients.

Key word: Dyslipidemia, CRP, CAD.

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Introduction:

Despite important advances in the diagnosis and treatment of coronary artery disease, it is still among the most common causes of death and disability in the world, which endangers global health. Coronary artery disease (CAD) is the principal cause of

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disability and mortality worldwide, and its prevalence is increasing around the world.[1]

Elevated concentration of circulating total cholesterol (TC), low-density lipoprotein (LDL), non-high-density lipoprotein (non- HDL), and triglycerides (TG), and reduced HDL, in addition to other well known risk factors such as obesity, smoking, diabetes, and hypertension, are associated with the development of atherosclerotic disease.[2-4]

The excess burden of CAD among South Asians appears to be primarily due to dyslipidemia.[5]

An analysis from the INTERHEART Study[6] showed about 10 mg/dl lower mean LDL-C levels in Asians compared with non- Asians, a greater proportion of Asian had LDL-C ≤100 mg/dl, HDL-C levels were slightly lower among Asians compared with non-Asians. There was low HDL-C among South Asians in comparison to rest of Asia.[6]

C-reactive protein (CRP), a marker of systemic inflammation, is emerging as an independent risk factor for cardiovascular disease.[7–9] High CRP levels have been linked to an increased risk of thrombotic events including myocardial infarction.[9-11] Elevated CRP levels have also been linked to an increased risk of later development of diabetes.[12,13]

To provide further insight into the role of inflammation in the development of cardiovascular disease, we sought to elucidate the link between dyslipidemia and inflammation.

Methodology:

This cross sectional study was performed on 668 patients of ischemic heart disease (CSA, UA, NSTEMI and STEMI) in the Department of Cardiology, Dhaka Medical College Hospital, Dhaka, who were underwent Coronary angiography from January 2017 to December 2017. The patients' demographic variables, such as age and sex, west and hip circumference and angiography results were recorded. After explaining the aims of the study and obtaining the patient's approval for participation blood samples were sent. CRP value were divided into normal (<6 mg/L), borderline (6-10 mg/L) and high (>10 mg/L).[14] Dyslipidemia was defined according to the American Heart Associations classification corresponding to the 95th percentile in a American population as total cholesterol >5.2 mmol/L (200 mg/dl), LDL > 3.4 mmol/L (130 mg/dl), HDL <0.9 mmol/L (35 mg/dl), or triglycerides

>1.7 mmol/L (150 mg/dl), or a combination there of.[15] After performed Coronary angiography the extent of disease was divided into insignificant CAD of (<50% stenosis), significant CAD considered as >50% stenosis[16] and single vessel, double vessel, triple vessel CAD and normal coronarys artery. The relationship between CRP with dyslipidemia was recorded by Chi square test. Statistical Package for the Social Sciences (SPSS) version 23.0 for windows was used to analyze the data. Categorical variables were expressed as proportions (percentages) and numerical data was expressed as means (standard deviations) and ranges. P value <0.05 was considered as statistically significant.

Results:

This cross sectional study was performed on 668 patients of ischemic heart disease (CSA, UA, NSTEMI and STEMI) in the Department of Cardiology, Dhaka Medical College Hospital, Dhaka, who were underwent Coronary angiography from January 2017 to December 2017. Most (65.0%) of the patients belonged to age 41-60 years. The mean age was found 51.4±10.7 years with range from 25-85 years. Majority (82.3%) patients were male and 390 (58.4%) patients were illiterate (Table-1). In risk factors, highest 267 (40.0%) patients had hypertension followed by 209 (31.3%) diabetes mellitus, 204 (30.5%) smoker, 189 (28.3%) H/O ischemic heart disease and 251 (37.6%) dyslipidemia (Figure-1). High CRP was found 140 (55.8%) in dyslipidemia and 185 (44.4%) in without dyslipidemia group. The difference was statistically significant (p<0.05) (Table 2). Severe CAD (double vessel and triple vessel) were found higher in high CRP than normal and borderline CRP group and also found higher in dyslipidemic patients. Which were statistically significant (p<0.05). Multi variable logistic regression was found high HbA1c, high CRP, diabetes mellitus and dyslipidemia were statistically significant (p<0.05) in severe CAD (Double and triple vessel) patient (Table-5).

Table-I

Demographic characteristics of the study subjects (n=668)

Demographic characteristics	Frequency	Percentage
Age (in years)		
≤40	123	18.4
41-60	434	65.0
>60	111	16.6
Mean±SDRange (min-max)	51.4±10.7(25–85)	
Sex		
Male	550	82.3
Female	118	17.7
Educational status		
Illiterate	390	58.4
Primary	110	16.5
Secondary	111	16.6
Higher	37	5.5
Graduate and above	20	3.0

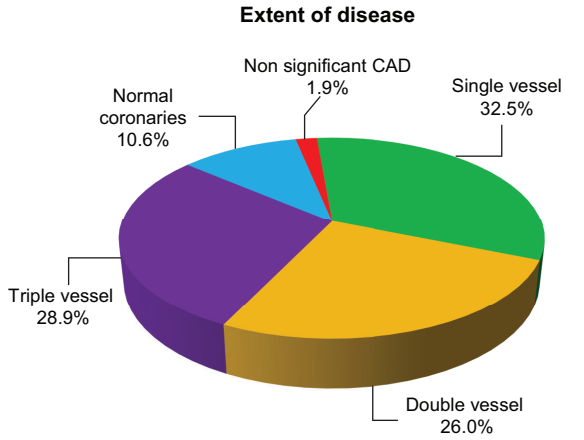

Fig.-1: *Distribution of the study subjects by clinical risk factors (n=668)*

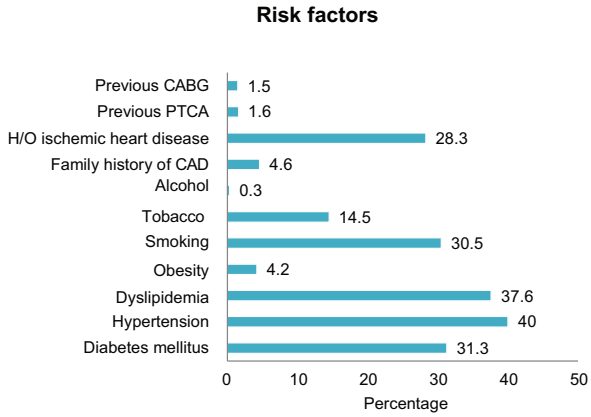

Figure 2: distribution of the study patients by extent of disease

Table-II

Relationship of dyslipidemia with CRP

CRP	Dyslipidemia		p value
	Yes (n=251) n (%)	No(n=417) n (%)	
Normal (<6 mg/L)	22 (8.8)	34 (8.2)	
Borderline (6-10 mg/L)	89 (35.5)	198 (47.5)	0.008[s]
High (>10 mg/L)	140 (55.8)	185 (44.4)	

Data were analyzed by Chi-square test, s= significant

Table-III

Relationship of dyslipidemia with extent of disease

Extent of disease	Dyslipidemia		p value
	Yes (n=251) n (%)	No (n=417) n (%)	
Single vessel	64(25.5)	153(36.7)	
Double vessel	76(30.3)	98(23.5)	
Triple vessel	78(31.1)	115(27.6)	0.048[s]
Normal coronaries	28(11.2)	43(10.3)	
Non significantCAD	5(2.0)	8(1.9)	

Data were analyzed by Chi-square test, s= significant

Table-IV

Relationship of CRP with extent of diseases

Extent of diseases	CRP			p value
	Normal (<6 mg/L) (n=56) n (%)	Borderline (6-10 mg/L) (n=287) n (%)	High (>10 mg/L) (n=325)n (%)	
Single vessel	24 (42.9%)	106 (36.9%)	91 (28.0%)	
Double vessel	8 (14.3%)	52 (18.1%)	106 (32.6%)	0.001[s]
Triple vessel	9 (16.1%)	64 (22.3%)	116 (35.7%)	
Normal coronaries	15 (26.8%)	60 (20.9%)	3 (0.9%)	
Non significantCAD	0 (0.0%)	5 (1.7%)	9 (2.8%)	

Data were analyzed by Chi-square test, s= significant

Table-V

Multi variable logistic regression analysis for severe CAD

	Adjusted OR	95% CI		P Value
		Lower	Upper	
HbA1c (≥ 6.5)	0.261	0.025	0.882	0.023[s]
CRP (>10 mg/L)	30.222	8.874	99.389	0.001[s]
Diabetes mellitus	0.103	0.011	0.953	0.045[s]
Hypertension	1.059	0.268	4.181	0.935[ns]
Dyslipidemia	3.165	1.183	8.467	0.022[s]
Smoking	0.547	0.143	2.092	0.378[ns]
Constant	0.007	-	-	0.001[s]

Data were analyzed by multi variable logistic regression, s= significant, ns= not significant

Discussion:

Recently, inflammation has been implicated in the development and progression of atherosclerosis. From the pathological viewpoint, all stages i.e. initiation, growth and complications of the atherosclerotic plaque, may be considered as inflammatory responses to vascular endothelial injury.[17]

In this present study it was observed that most (65.0%) of the patients belonged to age 41-60 years. The mean age was found 51.4±10.7 years with range from 25-85 years. Majority (82.3%) patients were male and 390 (58.4%) patients were illiterate. Similar report Muhammad et al.[18] found mean age of the study population was 51.5±9.5 years and most (65.7%) of the patient were male.

In this study, among the risk factors highest 267 (40.0%) patients had hypertension followed by 209 (31.3%) diabetes mellitus, 204 (30.5%) smoker, 189 (28.3%) H/O ischemic heart disease and 251 (37.6%) dyslipidemia. This findings were also consistent with others studies.[18-20]

In this study, high CRP was found 140(55.8%) in dyslipidemia and 185(44.4%) in without dyslipidemia group. The difference was statistically significant ($p<0.05$). These findings support the hypothesis that dyslipidemia can induce an inflammatory reaction at blood vessels which is a hall mark feature for development of atherosclerosis.[21]

In my study, severe CAD (double vessel and triple vessel) were found higher in high CRP than normal and borderline CRP group and also found higher in dyslipidemic patients. Which were statistically significant ($p<0.05$). Dyslipidemia and raised CRP levels were significantly ($p< 0.001$) higher in young CAD patients.[22] When compared to patients with minimal angiographic coronary disease and single-vessel, dyslipidemia was more prevalent among those with more severe coronary diseases (double vessel disease, three-vessel disease, and those who had undergone a bypass). CAD patients had higher triglyceride levels but lower HDL levels than those with normal or minimal angiographic findings; the differences, however, was not statistically significant.[23]

Multi variable logistic regression was found high HbA1c, high CRP, diabetes mellitus and dyslipidemia were statistically significant ($p<0.05$) in severe CAD (Double and triple vessel) patient.

Conclusion:

It could be concluded that dyslipidemia and CRP are directly linked with CAD identified by coronary angiography. Thus screening of patients with dyslipidemia and CRP levels should be done to identify those patients with an increased risk for future development of atherosclerosis cardiovascular events and treating the condition effectively, therefore, would have a considerable impact on the outcome of the CAD patients.

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Triglyceride to High Density Lipoprotein Cholesterol Ratio in Acute Myocardial Infarction and Its Relationship with Angiographic Severity

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Abstract:

Background: In acute myocardial infarction (AMI) the extent of the coronary artery lesion is evaluated by coronary angiogram (CAG). Recent evidences suggest that, ratio of triglyceride and high-density lipoprotein cholesterol (TG/HDL-C) could be a non-invasive marker for the prediction of the extent of coronary artery lesion. The aim of this study was to evaluate the association between TG/HDL-C ratio and the extent of coronary artery lesion assessed by coronary CAG among AMI patients.

Objective: The aim of this study was to assess relationship between TG to HDL-C ratio and extent of coronary artery lesion in AMI patients.

Materials & Method: This cross-sectional study was carried out in the Department of Cardiology, Chittagong Medical College Hospital in 224 admitted AMI patients. Blood samples were taken within 24 hours of admission following AMI for fasting lipid profile assessment, (total cholesterol (TC), HDL-C, low-density lipoprotein cholesterol (LDL-C) and TG). Each patient was undergoing CAG within 2 to 6 weeks of the events and angiographic findings were classified according to presence of significant stenosis, number of vessel involved and Gensini score.

Results: The subjects consisted of 197 males and 27 females with a mean age of

51.24 (±11.22) years. Mean value of TC was 185.74 (±41.96) mg/ dL, TG was 222.17 (±99.05) mg/dL, HDL-C was 38.92 (±5.46) mg/dL, LDL-C was 127.99 (±36.94) mg/dL, TG/HDL-C was 5.91 (±2.99), median Gensini score was 28 (Range:1-146). Analysis of receiver operating characteristic curves showed that only TG/HDL-C and TG were useful for detecting high Gensini score (score >42), with the former more area under the curve (AUC: 0.611; 95% CI: 0.531-0.691; p=0.008). The TG/HDL-C was an independent predictive factor (Odds ratio: 2.706; 95% CI: 1.397-5.242; p = 0.003) for the presence of significant coronary artery lesion on CAG. Linear regression analysis revealed that, age and TG/HDL-C ratio significantly predicted Gensini score.

Conclusion: TG and HDL-C ratio was independently associated with extent of coronary artery lesion.

Key words: TG/HDL-C ratio, AMI, Angiographic Severity,

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Introduction:

Around the world, cardiovascular disease (CVD) is recognized as the leading cause of death (accounting for approximately 31% of all deaths) and is predicted to remain as such in 2030.[1] Myocardial infarction (MI) is one of the most common form of CVD.[2] World Health Organization forecasts an increase of 11% in the burden of CVD by 2030, bringing the worldwide number of MI and stroke to approximately 36.2 million.[3]

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Although the incidence of MI is decreased in the industrialized nations partly because of improved health systems and implementation of effective public health strategies, nevertheless the rates are surging in the developing countries such as South Asia, parts of Latin America, and Eastern Europe.4 Due to lack of national population-based surveys or central administrative health data it is hard to find accurate information on the prevalence of MI in Bangladesh. However, a recent review observed a high CVD prevalence along with an upward trend in Bangladeshi adults.[5]

"Dyslipidemia" refers to an abnormality within the lipid profile, encompassing a variety of disorders related to elevations in total cholesterol (TC), low density lipoprotein cholesterol (LDL-C), or triglyceride (TG), or conversely, lower levels of high-density lipoprotein cholesterol (HDL-C). The dyslipidemia may present as a single disorder affecting only one lipoprotein parameter, or may represent a combination of lipoprotein abnormalities, such as elevated TG and low HDL-C.[6]

The third Adult Treatment Panel (ATP) Guidelines of the US National Cholesterol Education Program (NCEP 2001) recommend a full fasting lipoprotein profile, including TG, TC, HDL-C, and LDL-C. According to ATP III guideline dyslipidemia is considered with Serum TC > 200 mg/dl, TG >150 mg/dl, LDL-C >100 mg/dl, HDL-C <40mg/dl (male) and <50mg/dl (female). Although the guidelines only provide for evaluation of individual lipid fractions, the application of ratios such as TC/HDL-C and TG/HDL-C may offer a refined risk assessment by simultaneously considering both anti-atherogenic and atherogenic lipid parameters.

Selective coronary angiography remains the gold standard to determine the extent of CAD, because it is the only technique that can simultaneously provide both functional and anatomic information for the estimation of ischemic burden of CAD.[7]

Significant CAD was defined as ≥70% stenosis in any of the three major epicardial coronary arteries or a left main coronary artery stenosis ≥50% Patients were grouped as having single vessel disease (SVD), double vessel disease (DVD) and triple vessel disease (TVD) according to the number of vessel involvement.[8]

To determine the severity of CAD Gensini score was also estimated in the study. Gensini score is a widely used angiographic scoring system for quantifying the severity of CAD.[9]

Several studies have reported the condition of dyslipidemia among CAD patients of Bangladesh but the study assessing association between TG to HDL-C ratio and severity of CAG findings among MI patients.[10-11]

There are few studies on TG/HDL-C ratio in AMI and their Angiographic correlation in Bangladesh. The relevance of this study is to correlate relationship of TG/HDL-C in AMI and to see their angiographic severity. In developing countries like Bangladesh, coronary angiogram facility is limited to the tertiary care hospitals and specialized hospital. If we can find any relation between TG/HDL-C ratio and severe coronary artery lesion, then that will helpful to influence the decision of a strategy on invasive investigation in patients with AMI. So we can predict invasive investigation by non-invasive way, which will in long run reduce morbidity and mortality due to coronary artery disease in our country.

Materials and Methods:

Study design and patients:

This is a hospital based Cross-sectional study was conducted on 224 patients of AMI admitted in Department of cardiology, Chittagong Medical College & Hospital, Chattogram, Bangladesh and underwent CAG within 2-6 weeks of events during May 2019 to April 2020.

Purposive sampling was done. Patients were excluded on the background of refusal to give consent, severe comorbid condition like renal failure, liver failure, stroke.

Study procedure:

In this study, patients with acute myocardial infarction were assessed during their admission for the eligibility in the study. After inclusion an informed written consent was taken from the patient. Demographic profile of the patient including age, sex and occupation and major risk factors like diabetes, hypertension, dyslipidemia, smoking, family history of CAD, were recorded. The body height was measured in the standing position without shoes. Weight was measured similarly without shoes and heavy dresses.

With all aseptic precautions 5 ml of fasting blood sample was drawn and sent to biochemistry laboratory for analysis. Fasting lipid profile was determined on the day of blood collection in enzymatic kinetic method by Siemens Dimension EXL 200 auto analyzer made in Germany. Then TG/HDL-C ratio should be calculated as more than 4 and less than 4.

Subsequently patients were undergoing coronary angiography after the AMI events as per the hospital protocol. Coronary Angiography was performed in Cath lab of cardiology ward by SHIMADZU BRANSIST alexa C12 (ceiling mounted angiographic machine) made in Japan. Coronary angiogram was obtained for each

coronary vessel in ≥2 projections in cardiology ward. Analysis of the coronary angiograms was performed visually by an experienced operator. The severity of the CAD was assessed by vessel score and Gensini score.

Data analysis:

The statistical analysis was carried out by using Statistical Package for Social Sciences (SPSS-23). Quantitative or continuous variables were described as mean ± standard deviation median (range). Means were compared using independent sample t-test between two groups. Qualitative or categorical variables were described as frequencies and proportions. Proportions were compared by using chi-square test.

Correlation between two variables was determined by Pearson correlation coefficient. A ROC curve was used to determine the diagnostic performance of TG/ HDL-C ratio in the prediction of the extension of coronary artery lesion. Binary logistic regression and linear regression analysis were conducted to determine the independent predictive factors for severe CAG findings. Theses analysis included the variables which were found to have significant association with CAG findings in bivariate analysis. Statistical significance and confidence interval were set at $p<0.05$ and 95% level respectively.

Results:

The present cross sectional study intended to investigate the relation of TG to HDL- C ratio with angiographic severity of CAD in patient's admitted with AMI. Finally, 224 patients admitted with AMI and had CAG were included in the analysis. The findings obtained from data analysis are presented below:

The mean age of 224 patients with AMI was 51.24±11.22 (Range: 26-70) years and 87.9% of participants were men. Regarding occupation majority of the men were either doing institutional service or un-institutional job and in women majority were housewife (Table I).

In the 224 AMI patients most prevalent risk factor was dyslipidemia present in 211 (94.2%) of patients followed by smoking in 174 (77.8%), overweight and obesity in 131 (59%), DM in 82 (37%), hypertension in 73 (33%) and family history of CAD in 59 (26%) of patients (Figure 1).

Out of 224 patients with AMI 148 of them were diagnosed as NSTEMI (66.1%) and other 76 (33.9%) were diagnosed as STEMI (Figure 2).

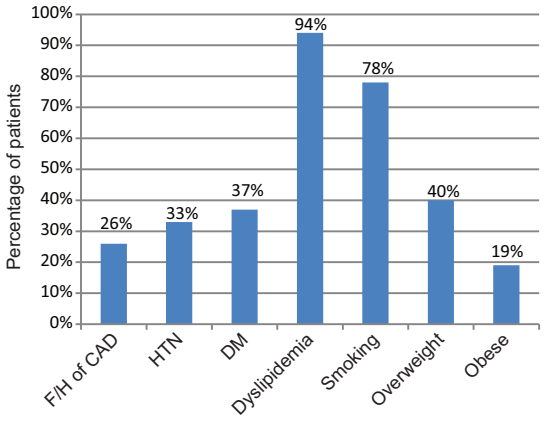

Fig.-1: *Distribution of risk factors of CAD among AMI patients (n=224)*

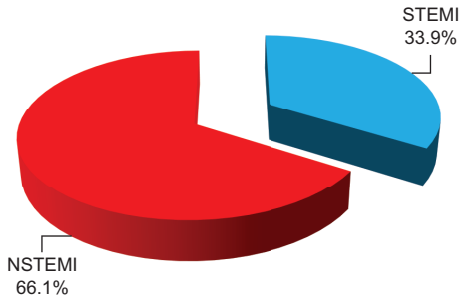

Fig.-2: *Distribution of the patients by AMI type (n= 224)*

Table-II

Lipid profile of the patients (n=224) s

Parameters	Mean (±SD)
Total cholesterol (mg/dl)	185.74±41.96
LDL cholesterol (mg/dl)	127.99±36.94
HDL cholesterol (mg/dl)	38.92±5.46
Triglyceride (mg/dl)	222.17±99.05
Triglyceride /HDL-C	5.91±2.99

Table II shows that, mean LDL-C, and mean TG values were higher than the expected normal values (<100mg/dl and <150mg/dl respectively) among the studied patients. Similarly mean HDL-C level was lower than the expected normal values (e"40 mg/dl for male and e"50mg/dl for female). However, mean TC value was within the expected normal range (<200mg/dl) in the studied AMI patients. Mean TG/HDL-C ratio was also higher than the normal expected value <4.

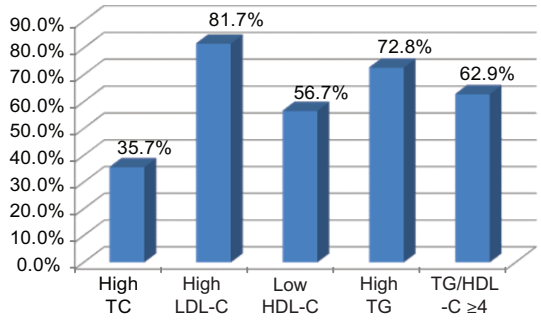

Fig.-3: *Prevalence of abnormal lipid sub-fractions and ratio among AMI patients (n=224)*

Among the lipid sub fractions most prevalent lipid abnormality was high LDL-C present in 183 (81.7%) of patients followed by high TG present in 163 (72.8%), low HDL-C in 163 (56.7%) and high TC in 80 (35.7%) patients (Figure 3). About 63% (141/224) patients had TG/HDL-C ratio e"4. Only 13 (5.8%) patients had normal lipid profile in all sub fractions and had TG/HDL-C ratio <4.

Table-III

Angiographic profile of the patients (n=224)

Characteristics		Frequency (%)
Significant CAD	Present	153 (68.3)
	Absent	71 (31.7)
	Single vessel	110 (49.1)
No of involved vessel	Double vessel	55 (24.6)
	Triple vessel	59 (26.3)
Median (Range)		28 (1-146)
	Low (score ≤20)	45 (33.5)
Gensini score	Intermediate (score 21-42)	78 (34.8)
High (score >42)		71 (31.7)

Data are expressed as frequency (percentage) if not otherwise mentioned.

Out of 224 AMI patients underwent CAG, majority (68.3%) have significant obstruction in angiogram. About half of the patient's had SVD. About one fourth of the patients had double vessel and triple vessel diseases each. Patients' were divided into tertile according to their Gensini score, and 45 (33.5%) patients were in lowest tertile of Gensini score had score equal to or below 20 and 71 (31.7%) patients were in highest tertile had score >42 (Table III).

Table-V

Bivariate association between CAG findings and TG/HDL-C category in AMI patients (n=224)

TG/HDL-C of the patients

Variables	<4 (n=83)	≥4 (n=141)	p value
Significant CAD			
Present	40 (48.2)	113 (61.7)	0.001*
Absent	43 (51.8)	28 (38.3)	
Number of vessel involved			
Single	50 (60.2)	60 (42.6)	
Double	18 (21.7)	37 (26.2)	0.027*
Triple	15 (18.1)	44 (31.2)	
Gensini tertile			
Low	32 (38.6)	41 (29.1)	
Medium	35 (42.2)	48 (34.0)	0.021*
High	16 (19.3)	52 (36.9)	

a <40 mg/dl for male and <50mg/dl for female. Data are expressed as frequency (percentage); *p value derived from Chi-square test. Significant values are in bold face.

Table V shows that association between angiographic findings of the AMI patients and their TG/HDL-C pattern. It shows that, patients with TG/HDL-C e"4 have severe CAG findings in terms of all the three characteristics like, significant stenosis, vessel number and Gensini tertile compared to the patients with TG/HDL-C <4.

The scattered plot in Figure 4 shows that, among the 224 AMI patient's TG/HDL-C had a positive

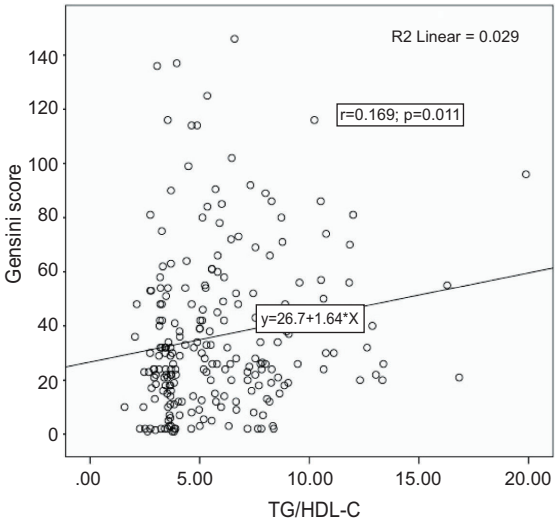

Fig.-4: *The relationship between TG/HDL-C and Gensini scores (n=224)*

correlation with Gensini score. It indicates that, as the TG/HDL-C ratio increases the Gensini score of the AMI patients also increase. This positive correlation was statistically significant (p=0.011).

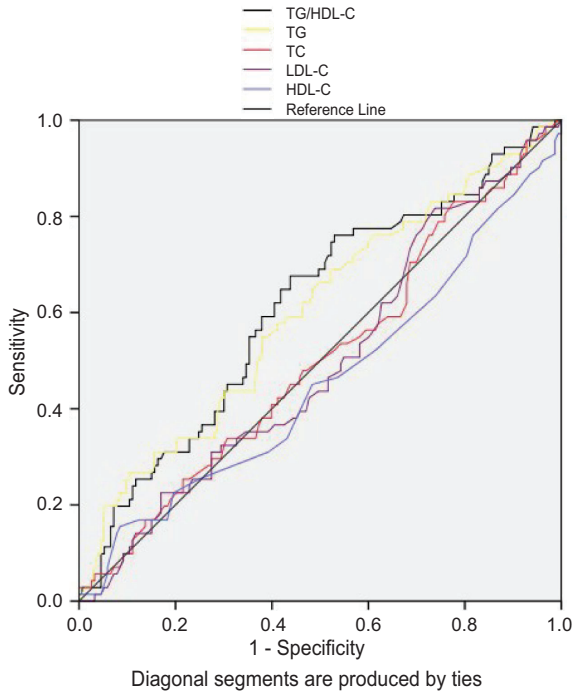

Fig.-5: *ROC curves for TG/HDL-C ratio and individual lipid sub-fractions in predicting for high Gensini score (>42) in AMI patients (n=224).*

Table-VII

Area under the curve (AUC) with 95% CI for different lipid parameters for predicting high Gensini score (n=224)

Variables	AUC	95% CI of AUC		p value
		Lower limit	Upper limit	
TG/HDL-c	0.611	0.531	0.691	0.008
TG	0.600	0.519	0.680	0.016
TC	0.503	0.421	0.585	0.946
LDL-C	0.496	0.415	0.577	0.919
HDL-C	0.455	0.370	0.539	0.274

CI: confidence interval

ROC analysis demonstrated a significant diagnostic value of TG/HDL-C ratio and TG level of the AMI patients to detect AMI patients having high Gensini score (Figure 4 and Table VII).

Discussion:

The present study observed the mean age of the AMI patients was 51.24±11.22 years ranging from 26 and 70 years. Previous studies from Bangladesh reported similar age distribution of patients with AMI with mean age around 51 years with maximum number of the patients in the age range of 51-60 years. 10-12 In contrast to these findings from Bangladesh, studies from India reported comparatively higher mean age like 62.74 ± 13.6 years, 13 56.06 ±11.29 years,14 and 56.75 ± 10.47 years. 15 Moreover, western study has reported higher mean age as compared to these studies conducted in Asia such as study (68 years).[16]

With regard to sex distribution, 87.9% of our study population was male and only 12.1% was female (male: female ratio of 7.2:1), showing a clear male preponderance. Similar sex ratio with male predominance were also observed by other studies.[10-12]

Regarding the traditional risk factors, it was found in the current study that, most of the patients of AMI (211/224; 94.2%) had unrecognized dyslipidemia. Similar to this finding reported such high prevalence (85.1% and 82.1% respectively) of unrecognized dyslipidemia among the admitted patients for first time AMI.[12,17] Followed by dyslipidemia the other risk factors in descending order were smoking (77.8%), overweight and obesity (59%), DM (37%), hypertension (33%) and family history of CAD (26%). Amin et al., (2014) reported that smoking was found in the highest (65.3%) number followed by hypertension (51.7%), overweight (50.8%), DM (42.4%) and family history of CAD (10.2%). Major CAD risk factors were noted to be very prevalent in the present study, which is similar to previous published data evaluating the prevalence of these risk factors in Bangladesh.[18-19]

The present study demonstrated that, among the lipid sub fractions most prevalent lipid abnormality was high LDL-C present (81.7%), followed by high TG (72.8%), low HDL-C (56.7%) and high TC (35.7%). Several studies have reported varying prevalence and type of dyslipidemia. The prevalence of high TG (28-72.2%), high LDL cholesterol (23.3-44.5%), low HDL (27-72.2%) and high TC (19-38.7%) were observed from different region of India and Bangladesh.10,11,21 These variations can be explained by differences in the study population with respect to age and sex distribution, inclusion of patients with CVD and population or hospital-based study.

In the current study coronary angiographic severity was assessed by presence or absence of significant obstruction, number of vessel involvement and Gensini score calculation. It was observed that 68.3% patients had significant obstruction.

Regarding vessel involvement 49.1% had SVD, 24.6% DVD and 26.3% TVD. Almost similar result has been observed by other study. 14,16

This study showed that patients with TG/HDL-C ≥4 have severe CAG findings in terms of all the three parameters like, significant stenosis, vessel number and Gensini tertile compared to the patients with TG/HDL-C <4. About 38.3% patients without significant obstruction had high TG/HDL-C ratio (e”4) whereas 61.7% patients with significant obstruction had high TG/HDL-C ratio (e”4).

The multivariate analysis by binary logistic regression showed that a subject with TG/HDL-C value ≥4 had higher odds of having significant coronary lesion than AMI patients with TG/HDL-C vale <4 (adjusted OR=2.706; 95% CI=1.397-5.242).

Previous reports have shown that high TG/HDL-C ratios correlate independently with presence of angiographic coronary artery disease (defined as stenosis >70%) among men and women even after adjustment for traditional risk factors, including diabetes. 22-24 The present study was also able to reproduce this finding in AMI patients and extend the observation to demonstrate that the TG/HDL-C ratio was also associated with coronary artery disease severity as expressed by a Gensini score.

Conclusion:

In this study high TG/HDL-C ratio (≥4) correlated with severity of CAD in terms of Gensini score and significant obstruction. High TG/HDL-C ratio was found as the most important predictor of severe coronary heart disease among all the lipid variables examined.

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Mortality of Patients Admitted in Coronary Care Unit at Rural Area in Bangladesh

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Abstract:

Background: There is limited information about mortality of patients admitted to a coronary care unit (CCU) in Bangladesh is available.

Objective: The aim of this study was to evaluate reasons for admission, sex ratio and mortality pattern of CCU admission.

Materials and methods: The data of 346 patients admitted to the CCU of a secondary care centre, Monno Medical College hospital at Manikganj in Bangladesh from 1 August 2019 to 31 July 2020 were collected. Data that were extracted from the patients included reason for admission, gender and outcome including death.

Result: A total of 346 patients, comprising 235(68%) males and 111(32%) females were admitted to the CCU of Monno medical college hospital. The most common cause of admission was acute coronary syndrome (59%). The majority 269(77.7%) was more than 50 years. Twenty nine (29) patients was died. This figure accounted for 8.38% of all the patients admitted to the CCU. Majority of patients that died were those with ACS and age greater than 50 years were associated with death in the study patients.

Conclusion: The mortality (8.38%) among CCU patients is comparable to the report elsewhere. The reason for admission in CCU was ACS and non-ACS. Acute coronary syndrome (ACS), and age greater than 50 years were independent predictors of death.

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Introduction:

Cardiovascular disease is now recognised as the leading cause of death worldwide[1] and such as a number of the patients with cardiovascular conditions will require acute coronary care. Coronary care is increasingly becoming a very vital part of management of critically ill patients even in rural areas where facilities are limited. The care of critically ill patients due to cardiovascular disease is undoubtedly one of the most burdensome and difficult aspect of medical science. Because coronary care attract a huge cost on the part of the health facilities and patients care givers. But promt, management can reverse the condition and have good chance of surviving the patients with coronary care support. Like in the other part of the world[2], the demographics or statical data of Bangladeshi population is progressively changing due to rapid socioeconomic growth, so admission in CCU due to cardiovascular disease and recorded mortality is also progressively increasing. The rapid socioeconomic growth which generate a tremendous shift in life style such as sedentary life style and increase consumption of high calorie food, has resulted in increase rate of cardiovascular disease and associated risk factors including hypertension, diabetes mellitus and dyslipidaemias. Consequently the region witnessed a significant change in the cardiology work load for most of the secondary and tertiary health facilities necessitating incorporation with coronary care unit over the years. Coronary care unit of Monno medical college hospital was established in 2014 which is a six- bedded unit with continuous monitoring facilities, defibrillator support, well equipped CCU beds and well trained cadiac team that have access to key cardiac investigations and bed side procedures but the percutanious coronary intervention (PCI) and cadiac surgery are not available. This type of study will assist and help the health care

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planners and providers in establishing an efficient health care policies and delivery system even in rural areas of Bangladesh. Besides presence of such data will also help to improve the approach of management of acute cadiac conditions.

Methods:

This retrospective study reviewed the admission into the coronary care unit of a secondary care centre at Monno medical college hospital, Manikganj in Bangladesh from 1 August 2019 to 31 July 2020. The hospital is well equipped 6-bedded CCU which admits patients with acute cardiac conditions, electronic records of all CCU admission, transfer out, discharge, leave against medical advice (LAMA) and deaths were utilized for the purpose of this study. Data extracted from records including diagnosis, age, gender and outcome including death. Outcome was classified as discharges, referred, LAMA and death. Ethical approval was waived by the Ethical committee of the hospital. As this is retrospective observational study, confidentiality and anonymity was maintained.

Data Analysis:

Data analysis was carried out from electronic records of all admission of the hospital. Analysis of P-value on the basis of Z-score was carried out by using Z-score calculator. P<0.05 was adopted as statistically significant level.

Results:

During the period of the study, a total of 346 patients comprising 235(68%) males and 111(32%) females, were admitted onto the CCU (Table-1). The most common cause of admission was acute coronary syndrome (59%), majority, 269 (77.7%) of whom were above 50 years of age (Table-1). Twenty nine (29) patients died accounting for 8.38% of all the patients admitted in CCU and 19 patients referred or LAMA for better management which accounting for 5.49% (Table-3). Acute coronary syndrome (P-value= 0.0198) and age greater than 50 years (P-value=0.03156) are associated with death in this study. Presence of co-morbidities on admission and during the illness were also associated with death. However after adjusting for confounder like acute coronary syndrome and age greater than 50 years were independent predictors of death in the study patients (Table-4).

Table-I

Patients Demographics

Basal Characteristics	N=346	%
Male	235	68%
Female	111	32%
Age > 50 years	269	77.7%
Age < 50 years	77	22.3%
ACS	204	59%
Non-ACS	142	41%

Table-II

Distribution of diagnosis of the patients by their age group.

Age	ACS	Non-ACS	Total
> 50 years	163	106	269
< 50 years	41	36	77
Total	204	142	346

Discussion:

Table-III

Distribution of Death by their diagnosis and age group

Outcome	Alive/Discharge	Referred/LAMA	Died	TotalN=346
ACS	168	13	23	204
Non-ACS	130	6	6	142
Total	298	19 (5.49%)	29 (8.38%)	

Table-IV

Distribution of death by their diagnosis and age group.

		Total	Died	
Age	>50 years	269	28	P-Value= 0.03156
	<50 years	77	2	
Diagnosis	ACS	204	23	P-Value= 0.0198
	Non-ACS	142	6	

To the best of our knowledge, the current study is the first of its kind from rural area of Bangladesh to evaluate the mortality profile and outcome of the CCU admissions. In our study the overall mortality of CCU admission is 8.38%. This figure is comparable to what obtains elsewhere. In early 1990s Tesky et al reported a 13% mortality [7] but in 2018 Mahbub A. Al Ghamdi in Saudi Arabia [5] reported 7.7% mortality (P-value=0.38974). Katz et al in USA reported 7-8% mortality rate in the USA from 1989 to 2006 [8]. This study also showed that ACS was the most common cause of admission into CCU(59%), this finding was consistent with BLITZ-3 registry study that enrolled 6986 patients in Italy[5] and Dogan et all in Turkey showed that ACS accounted for 65% of all CCU admission [4]. However, ACS and age greater than 50 years independently predicts death in the study patients (Table-4). This finding is in keeping within REPORT of Chua and his colleague [9]. Overall, this study emphasizes the importance of a well designed and well equipped CCU in every corner of this country. Appropriate facilities for key cardiac investigations are mandatory. In addition noninvasive and invasive cardiac monitoring, PCI and cardiac surgery will have to be ensured for an effective operation of CCU.

Limitation:

This study represents the evaluation of a single CCU, secondary care centre in rural area and small size data. This may not represent the tertiary health care centre and may not generalised to whole country. Nevertheless, this study may adds knowledge about performance, health care resources allocation, mortality rate control guideline and importance of CCU to treat acute cadiac conditions.

Conclusion:

The primary reason for admission in CCU is acute coronary syndrome and mortality in CCU us comparable to imports elsewhere. Age greater than 50 years independent predictor of death in CCU.

Disclosure statement:

No potential conflict of interest was reported in this study. No financial support was taken from any company.

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Outcome of Transradial Percutaneos Coronary Intervention In Hospital Patients in Chattagram Medical College Hospital

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Abstract :

The transradial approach (TRA) is increasingly used worldwide for percutaneous coronary interventions (PCIs). Worldwide because of patients ease, comfort and preference.

Aim of the study is to see the outcome of first 150 trans-radial approach for Percutanious Transluminal Coronary Angioplasty (PTCA) cases through radial approach performed in CMCH with their inhospital and short term outcome.

It is prospective observational study and an early report of ongoing study. We tested 150 patients from July'17 to December'19 in cardiology ward of CMCH. Acute coronary syndrome (ACS) and stable angina patients are diagnosed in hospital. After initial stabilization of patients, Coronary angiogram (CAG) was done during index hospitalization and within 2-6 weeks after discharge. Significant symptomatic lesions treated by Percutanious Transluminal Coronary Angioplasty (PTCA). Assess the patient during procedure and subsequent inhospital stay and follow up at 1, 3, 6 month after discharge.

The study population consisted of 150 patients (133 men and 17 women) with a mean ± SD age of 56.4 ± 8.9 years. Patients diagnosed as Myocardial infarction (42), NSTEMI (60), UA (39) and stable angina (9) cases. CAG showed 124 patients single, 24 double lesion & 2 triple vessels diseases. PTCA were done 100% through Radial approach. Total target lesions were 180. Most of the lesion needs predilatation (167) before stent implantation. DES (Drug eluting stent) were deployed in most of the lesions 170 (98.8%), Bere metal stents (BMS) deployed rest of the patient (1.1%). Double stents needed 24 patients with stent mean diameters (mm) 3.3±0.4 and mean leangth of 14.68 mm±2. TIMI Grade 03 flow was in 170 patients (94.4%) (Table–VI). All the stent implantation procedures were successful except one. 148 patients cured & discharge successfully. One patient developed acute stent thrombosis and another one coronary artery perforation. One case (0.6%) of coronary artery dissection was managed conservatively by Eptifibatide (intregrelin). Other complications like- Cardiogenic shock (6), hypotension (10) arrhythmia (2 cases VT) and cardiac arrest (1) managed successfully. Local complication at vascular access site noted 4 (2.6%). Subsequent follow up (1, 3 months) shows significant improvement of quality of life and no mortality. In contrary, Jeroudi *et al*.[18] demonstrated PTCA angiographic and clinical success in 50 and 49 patients, respectively out of 54 octogenarian patients (93% and 91%, respectively). In our study angiographic and clinical success rate 95.5%, 93.3% respectively out of 150 patients.

This is relatively new centre with limited resource & facility. Outcome of procedure is encouraging. PCI is the choice of revascularization of modern cardiac era.

Keywords: RCA-Right coronary artery, LCX- Left circumflex artery, UA-Unstable angina, NSTEMI- Non ST elevated Myocardial Infarction, VT-Ventricular Tachycardia, CMCH- Chittagong Medical College Hospital.

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Introduction:

Percutaneous coronary intervention (PCI) can be performed via the femoral, brachial, or radial arteries. The femoral approach has traditionally been and still is the primary approach for many operators.

The transradial approach (TRA) is increasingly used worldwide for percutaneous coronary interventions (PCIs) because of less vascular & access site complication, patients preference and early mobilization and discharge. Multiple observational

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and randomized trials performed to date have shown fewer access site complications compared with the transfemoral approach,[1-3] and the radial approach has already been endorsed by many guidelines specially in Primary PCI in STE MI.[4-6]

Campeau et al first described the radial approach for coronary angiography in 1989.[7] The first transradial PCI was reported by Kiemeneij and Laarman in 1993.[8] Later, their group published the first series of balloon angioplasty and bare-metal stent implantation performed through the radial artery.[9,10]

The advantages of the radial approach include lower rates of bleeding and vascular complications,[11-13] in addition to lower mortality rates in certain patient subgroups.[11,14] The success rate is similar to that of the femoral approach,[13,15] particularly in experienced hands. Thus, learning to perform this approach is fundamental in the training of interventional cardiology specialists.

Percutanious Coronary Intervention (PCI) is one of the popular methods of revascularization for coronary artery disease. Worldwide PCI cases increasing day by day & which reduce the need for Coronary artery bypass grafting (CABG) of many patients. We want to see the success of transradial Percutanious Coronary Intervention (PCI) cases performed in CMCH with their inhospital and short term outcome.

Methods:

Study population & design:

It was a prospective, observational study. The study population consisted of patients with a diagnosis of acute coronary syndromes (ACS), who were admitted to coronary care unit (CCU), Department of Cardiology of Chittagong Medical College Hospital between July 2017 and December 2019 and who subsequently underwent Transradial coronary angiography within 2-6 weeks. A total of 150 Patients with acute coronary syndrome (ACS) and stable angina are diagnosed in hospital. After initial stabilization of patients, Transradial Coronary angiogram (CAG) was done after a subjective evaluation of the radial pulse, complemented by the objective evaluation of the Allen test in hospital within 2-6 weeks after discharge.

Significant symptomatic lesions treated by Percutanious Transluminal Coronary Angioplasty (PTCA). Data from hospital outcomes were collected during the hospitalization using standard forms. Data collected included clinical, angiographic, and procedural characteristics, as well as the clinical course until the time of hospital discharge. Assess the patient during procedure and subsequent in-hospital stay and follow up at 1, 3 & 6 months. Follow up evaluation done clinically by ECG, Echo and in selected cases by Troponin- I and if necessary by relook CAG.

Procedure:

The radial puncture was performed using the Seldinger technique, preferably on the right side. The puncture was made 1 cm proximal to the styloid process of the radius, using a tapered, hydrophilic Glidesheath introducer (Terumo Medical – Tokyo, Japan) specifically made for accessing the radial artery. Heparin was administered at a dose of 5,000 IU through intra-venous route, and its dose increased to 70 to 100 IU/ kg. And all patients received Verapamil & GTN through introducer to prevent vascular spasm. Immediately following the procedure, the sheath was removed and hemostasis was achieved using manual compression for most patients, few patients with the TR BandTM device (Terumo Medical – Tokyo, Japan) to compress the radial artery due to the cost and non availability.Coronary angiography films were reviewed by investigators. The infarct related artery was identified from total occlusion or significant stenosis (> 70%) of the LAD, RCA or LCX or their major branches, or from arteriographic evidence of intraluminal thrombosis.[15]

PCI challenges:

Initial challenge was learning curve of the operators and non availability of hard wares. Also different subset of patient having anatomical variations such as excessive radial tortuisity and radial loops. Initially simple cases were done, gradually difficult cases like Left Main, ostial lesion, CTO and also bifurcation lesion were performed. Patient's general status such as frailty, co-morbidities, functionalities of their cardiovascular and other systems or local factors related to coronary lesions such as the complexity of these lesions was also a challenge.[16]

Data collection and definitions:

Patient demographics, procedural variables, and in-hospital outcomes were obtained from review of the cardiac catheterization laboratory database and medical records.

Definitions of procedural complications, According to the

1998 coronary interventional document10, procedural complications are divided into six basic categories: death, MI, emergency CABG, stroke, vascular access site complications and contrast agent nephropathy.

The composite endpoint of in-hospital death, periprocedural myocardial infarction (MI), ischemic stroke, or major bleeding was compared between the two groups. The individual components of the composite outcome and the incidence of vascular complications were also compared.

As a rule, all deaths were considered cardiac unless a noncardiac cause could be clearly established by clinical and/or pathological assessment.

Periprocedural MI was defined as the presence of new Q waves in two or more contiguous leads or an elevation of the creatine kinase MB fraction (CK-MB) at least three times above the normal upper limit.

Major bleeding was defined as a hemorrhagic stroke, or any bleeding that caused hemodynamic changes and required treatment. Vascular complications included hematomas greater than 5 cm, pseudoaneurysms, arteriovenous fistulas, or bleeding episodes requiring transfusion or surgery.

Angiographic success- A successful PCI produces substantial enlargement of the lumen at the target site. Previously defination was the achievement of a minimum stenosis diameter reduction to <50% in the presence of grade 3 TIMI flow[17] with no dissection and with the residual stenosis < 20%. With the advent of advanced adjunct technology, including coronary stents, a minimum stenosis diameter reduction to <20% has been the bench mark of an optimalangiographic result.

Procedural success- A successful PCI should achieve angiographic success without in hospital major clinical complications eg. Death, myocardial infarction, emergency coronary artery bypass surgery during hospitalization.[17,18]

Clinical success- clinically successful PCI includes anatomic and procedural success with relief of signs and or symptoms of myocardial ischaemia after the patient recovers from the procedure.[19,20]

Statistical Analysis:

SPSS (Statistical Package for the Social Sciences by SPSS Inc., Chicago, IL, USA, 2007) for Windows was used for statistical analysis. Categorical variables were described as frequencies and percentages and compared using the chi- squared or Fisher's exact test, as appropriate. Continuous variables were calculated as the means and standard deviations, and were compared using Student's *t*-test. All tests were two-tailed, and a P-value < 0.05 was considered statistically significant.

Results and observations:
Study population

Between July 2017 and December 2019, a total of 150 consecutive patients with ACS & stable angina who underwent PCI through transradial route were included in this study. Demographic data and clinical characteristics for all 150 patients are summarized in Table - I. Mean patient age was 56.4±8.9 years (range 40–85), and 133 patients (88.6%) were male. In this study 79 (52.6%) had history of hypertension, 68 (45.3%) were smokers, 86 (57.3%) were diabetic, 74 (49.3%) had hyperlipidaemia.

Table-I

Co-morbid conditions and demographic distribution of the patients

Baseline characteristics of study population (n=150)

Demography/other features	Frequency	Percentage
Age (mean ± SD), years	56.4±8.9	
d"50 years	68	45.33%
>50 years	82	54.66 %
Gender		
Male	133	88.66 %
Female	17	11.33%
Co-Morbid Conditions		
Hypertension	79	52.66%
Diabetes Mellitus	86	57.33%
Smoker	68	45.33%
Hyperlipidaemia	74	49.33%

(SD, standard deviation)

Fourty two 42 (28.0%) patients had previous history of myocardial infarction, and 80 (40.0%) had an index episode of non-ST elevation myocardial infarction, 39 (26.0%) unstable angina and 9(6%) had stable angina. The mean value of left ventricular ejection fraction (EF) was 48.7±5.1% (shown in table-II).

Table-II

Clinical Characteristics of study population.

Clinical Feature (n=150)

Clinical Characteristics	Frequency	Percentage
Previous MI	42	28.0%
Non ST MI	60	40.0%
UA	39	26.0%
SA	09	6.0%
Echocardiography		
EF (%)		48.7±5.1%

(EF=ejection fraction, MI=myocardial infarction, NSTEMI=non-ST-elevation myocardial infarction,

SA=stable angina pectoris, UA=unstable angina)

Lesions characteristics

The angiographic characteristics of the coronary lesions are summarized in Table III. One hundred two of 150

patients (68.0%) had a right dominant system, while left dominant and co-dominant systems were seen in 23 patients (15.3%) and in 25 patients (16.6%), respectively. Syntax score was 28.1±6.1, and the majority (98, 65.3%) was intermediate scores (23-32).

The target vessel was left anterior descending artery 92 (51.1%) in the majority of cases, followed by right coronary artery 47 (26.1%) and the left circumflex (LCx) coronary artery or obtuse marginal (OM) branch 41 (22.7%). In two cases (1.3%) the indication for use was chronic total occlusion (CTO).

Most common was single vessels disease 124 (82.6%), Double vessels diseases 24 (16.0%) and 3-vessel disease were 2 patients (1.3%).

Table-III

Lesions Characteristics of the study populations (n=150)

Lesions Characteristics	
Patients	N-150 (%)
Coronary artery anatomy	
Right dominant system	102 (68%)
Left dominant system	23 (15.3%)
Co-dominant system	25 (16.6%)
Syntax score	28.1±6.1
Low (0-22)	18 (12.0%)
Intermediate (23-32)	98 (65.3%)
High (≥33)	34 (22.6%)
Target Lession	N-180(%)
LAD	92 (51.1%)
LCX	41 (22.7)
RCA	47 (26.1%)
Proximity/ location of lesion, n-180 (%)	
Proximal	96 (53.3%)
Mid	46 (25.5%)
Distal	38 (21.1)
Disease extent, N-150 (%)	
1-vessel disease	124 (82.6%)
2-vessel disease	24 (16.0%)
3-vessel disease	02 (1.33%)

Procedural characteristics

The procedural characteristics are summarized in Table-IV. We treated 180 target lesions, including 178 de novo lesions (98.8%) and 2 in-stent restenosis (1.1%), in 150 patients. One hundred eighty stents were implanted in 150

patients (1.14 stents per patient). A total of 150 patients (100.0%) were treated via the right radial route. Selection of the route was at the operator's discretion. Before insertion of the sheathless GC, a 5-Fr introducer sheath was successfully used in all the patients (100%) patients. The original 6-Fr sheathless GC selected was used to complete the PCI in 150 cases. Total target lesions was 180 where In-stent restenosis in 2 (1.1%) cases. Total number of stents needed 180 where double stent needed 30 (16.6%) cases and mean stent diameter 3.3±0.4.

Table-IV

Procedural characteristics of the study populations (n=150)

Procedural characteristics	Results
Transradial route	
Right radial artery	150 (100%)
Types of 6-Fr catheters used (N-150)	
EBU	53 (35.3%)
XB	27 (18.0%)
JL (Left)	23 (15.3%)
JI (Right)	25 (16.6%)
AL	17 (11.3%)
HS	05 (03.3%)
Total target lesions	180
De novo lesions	178 (98.8%)
In-stent restenosis	1 (0.6%)
Mean contrast volume, mL	170.8±35.7
Fluoroscopy time, min	23.1±6.3
Total number of stents implanted	180
Number of stents implanted/patient	1.2±0.8
Mean stent diameter, mm	3.3±0.4

(EBU- Extra back Up, XB- Xtra back up, AL=amplatzer left, JL=judkin, HS= Hockey Stick)

All the stent implantation procedures were successful except two. Two cases developed In-stent re-stenosis. Drug Eluting stents (DES) were deployed in most of the patient 98.8% (Table-5) with mean diameters (mm) 3.3±0.4 and mean leangth of 14.68 mm+2. (Table-V)

Table-V

Characteristic of deployed stents in the target vessels (n =150)

Parameters	Total no	Percentage
Types		
Bare metal	02	(1.1%)
Drug eluting	178	(98.8%)
Diameter (N-180)		
2.5 mm	32	(17.7%)
2.75 mm	37	(20.5%)
3.00 mm	52	(28.8%)
3.5 mm	35	(19.4%)
4.0 mm	24	(16.0%)
Mean diameter = 3.3 ±0.4 (mm)		
Length (mm) :		
Range (10-20)	46	25.5%
Range (20-30)	96	53.3%
Range (30-40)	38	21.1%
Meanlength = 14.68mm ± 2		

Procedural outcome

Immediate angiographic success rate was 100% in all patients, with radial approach. Peri-procedural non-STelevation myocardial infarctions occurred in 1 patient (0.6%), which was considered as PCI-related myocardial infarction because of a diagonal branch occluded during the procedure.

Table-VI

TIMI flow of the target vessels (n=150)

Parameter (TIMI flow)	Before procedure Number (%)	After procedure Number (%)
Grade -0	0 (0%)	0 (0%)
Grade -1	35 (19.4%)	1 (0.5%)
Grade -2	145 (80.5%)	9 (5%)
Grade -3	0 (0%)	170 (94.4%)

148 patients cured & discharge successfully. 2 patients faced complications with acute stent thrombosis and perforation with cardiac arrest. Vascular access site local complication (Bleeding, Hematoma etc.) was very minimum 2.6%. Other Complications occurred during and after procedure were **c**ardiogenic shock (6), hypotension (10) arrhythmia (2 cases VT) and failed PTCA (1) managed successfully.

Table-VII

Result of stentangioplasty of study population (n=150)

Results	Total number	Percentage
Clinical success	168	93.3%
Angiographic success	172	95.5%
Procedural success	170	94.4%

Table-VIII

Procedure related complications of study population (n = 150).

Parameters	Total number Patient	Percentage
Local / Puncture site (Bleeding, Hematoma, etc.)	04	2.6
Cardiogenic Shock	06	4
Acute stent thrombosis	1	0.6
Coronary artery dissection	1	0.6
Acute MI	1	0.6
Hypotension	10	6.6
Major arrhythmias (e.g. VT. VF)	2	1.3
Failed PTCA	1	0.6

Subsequent follow up (1, 3 & 6 months) shows significant improvement of quality of life and no mortality. During follow up, we evaluate patients clinically, ECG, Echo and troponin-I (if need CAG). Eleven patients complaints chest pain, seven patients complaints palpitation with dyspnea and managed medically. One case needed hospital admission then done CAG and managed conservatively. Rest of all patients improved successfully.

Discussion|:

The radial approach is an attractive alternative to the classical femoral approach for CAG and PCI. The radial artery is very superficial, making it easy to puncture, and bleeding is controlled by compression. There are no major nerves or veins near the radial artery, thus minimizing the risk of nerve and vascular injuries.[21,22]

The benefits of TRA have been documented in many studies. These benefits include less bleeding,[23-30] lower morbidity, early ambulation, lower total hospital costs,[23, 31] patient preference and comfort, same-day discharge is possible, less chance of developing ischemia due to dual blood supply of the hand, and easy access for the patients with myocardial

infarction (MI) and aortic aneurysm.[23,32,33]] The approach is advantageous for people with severe occlusive aortoiliac disease or difficulty lying down (e.g., due to back pain, obesity, or congestive heart failure).[21,34]

As has been shown in several studies, the radial access permits treatment of the same type of patients and lesions as femoral access provides.[24,30,34-38] The radial artery readily accommodates 6-F sheaths, and sheathless 7-F techniques have recently been described.[39,40]

Thus, there is no limitation to performing complex PCI successfully via the radial approach 41. High-risk subsets such as unprotected left main coronary artery,[42] bifurcational lesions, and chronic total occlusions[43] can all be readily addressed through radial access.[41]

Results from our study show that the transradial PCI was associated with high procedural success rates (94.4%) and favorable clinical outcomes for all patients.

In our study, Elective stenting was done in most (80%) of patients. Similar elective stenting have also been reported by Moussa et al, Colombo et al[44] and Kimura et al[45] (70%, 67% and 71% respectively). This study showed stentingas modality of treatment for suboptimal PTCA, acute vessel closure, dissection during PTCA and restenosis following PTCA similar to those reported as an indications for stenting by various authors.[46-49] Hence unlike PTCA, this success of intracoronary stenting is not influenced by lesion morphology.

In our study, Check angiogram of them were done which showed normal functioning of the stents. Thrombus containing lesions have been considered as contraindication for stentangioplasty. Stents were successfully deployed in two patients containing thrombus in LAD (Mid) and LCX (distal) after treatment with low molecular weight heparin. Studies have shown that presence of angiographicaly visible thrombus as a risk factor for subsequent stent thrombosis Vascular access site local complication (Bleeding, Hematoma etc.) was very minimum 2.6%. Studies have shown that presence of angiographicaly visible thrombus as a risk factor for subsequent stent thrombosis.[50] However, other have represented coronary stenting as safe and effective therapy for thrombus containing lesion.[50,51]

Recently developed drug eluting stents have reduced the incidence of restenosis drastically to 8 to 10%. Ten years follow up of initial Cohort of patients treated PTCA revealed 89.5% survial rate (95% with single vessel disease, 81% in-patients with multivessel disease).[52] In our study in-tent restenosis occurred in 2 (1.3%) cases.

Currently, it is well established that TRA nearly abolishes access-site complications in all patients. All studies comparing TRA versus TFA have demonstrated a reduction in major bleeding with TRA, both in the elective and the acute setting.[53, 54,55] When accesssite complications still occur after TRA, they usually have a benign course and do not influence the prognosis of patients.[53] Surgical intervention for the treatment of hematoma or arteriovenous fistulae has been rarely observed [56,57]. The incidence of complications in our study matches the literature findings.

The advantages of TRA extend to the elderly patients as well. In a recent meta-analysis of 777,841 elderly patients by Alnasser et al,[58] TRA compared to the TFA was associated with a significant reduction in vascular complications and stroke, but mortality benefit was seen only among patients presenting with STEMI.

Despite the aforementioned advantages, there are potential disadvantages to the TRA.[59] The TRA is technically more complex than the TFA due to the greater difficulty in cannulating the artery, the possibility of spasm, anatomical variations in the arteries of the upper limb, and the change in manipulation of the catheters that is necessary to cannulate the coronary arteries.[60-62] All these difficulties result in an increase in the length of procedural time and the need for a significant learning curve.[59,60,62] Some interventions may be technically challenging via the radial route due to the size of the technology required, e.g., large bore rotational atherectomy.[59,63] Moreover, TRA is usually more demanding and needs longer procedural time in elderly patients because of the frequent presence of specific vascular abnormalities such as tortuosity, calcifications, or arterial loops.[64]

In our study, Vascular access site local complication (Bleeding, Hematoma etc.) was very minimum 2.6%. Other Complications occurred during and after procedure were **c**ardiogenic shock 4%, hypotension

6.6%, arrhythmia 1.3% (2 cases VT) and failed PTCA 0.6% (1) managed successfully.

In our study angiographic and clinical success rate 95.5%, 94.4% respectively out of 150 patients. In contrary, Jeroudi *et al*.[65] demonstrated PTCA angiographic and clinical success in 50 and 49 patients, respectively out of 54 octogenarian patients (93% and 91%, respectively).

Limitation of the Study:

This is single center observational prospective study to assess the safety and short-term clinical and angiographic outcome of small number of patients. Further randomized trial may be needed for the better result.

Conclusions:

The TRA for CAG and PCIs is effective and safe and can be applied in the majority of cases. It dramatically reduces access site complications. The routine assessment of dual hand circulation before TRA might not be necessary; however more studies are needed to confirm our results.

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CABG vs PCI in Left Main Disease 2020: A Review Article

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Abstract:

Severe stenosis of the left main coronary artery (LMCA) generally occurs as a result of atherosclerosis and compromises the blood supply to a wide area of myocardium, thereby increasing the risk of serious adverse cardiac events. Revascularization for symptomatic significant left main (LM) coronary artery disease (CAD) has been the standard of care for more than 30 years. More recent advances in drug-eluting stents have begun to level the playing field between percutaneous coronary intervention (PCI) and coronary-artery bypass grafting (CABG), Current revascularization strategies for patients with significant LMCA disease include coronary artery bypass grafting (CABG) and percutaneous coronary intervention (PCI), both of which have a range of advantages and disadvantages. In general, PCI is associated with a lower rate of periprocedural adverse events and provides more rapid recovery, while CABG provides more durable revascularization. Most clinical trials comparing PCI and CABG for the treatment of LMCA disease have shown PCI to be non-inferior to CABG with respect to mortality and the serious composite outcome of death, myocardial infarction, or stroke in patients with low-to-intermediate anatomical complexities. Remarkable advancements in PCI standards, including safer and more effective stents, adjunctive intravascular imaging or physiologic evaluation, and antithrombotic treatment, may have contributed to these favorable results. This review provides an update on the current management of LMCA disease with an emphasis on clinical data and academic and clinical knowledge that supports the use of PCI in an increasing proportion of patients with LMCA disease.

Keywords: Coronary artery disease; Percutaneous coronary intervention; Coronary artery bypass; Angioplasty, balloon, coronary; Drug-eluting stents; Treatment outcome

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Introduction:

Obstructive left main coronary artery (LMCA) disease is associated with a high rate of morbidity and mortality as a result of compromised myocardial blood supply; therefore, revascularization by coronary artery bypass grafting (CABG) surgery has been regarded as standard treatment. Over the past 20 years, there have been considerable therapeutic developments in the technique of percutaneous coronary intervention (PCI) for the treatment of obstructive coronary artery disease (CAD), involving improvements in stent technology, procedural techniques and refinement, periprocedural anticoagulation, concomitant antiplatelet agents, and cardiovascular medication.[1, 2]

Several randomized clinical trials (RCTs) have been conducted to evaluate the potential therapeutic role of PCI as an alternative to standard CABG. With the introduction of first-generation drug-eluting stents (DESs), RCTs demonstrated that stenting achieved similar rates of mortality and hard clinical endpoints and a lower rate of stroke, although the rate of repeat revascularization was seen to be higher.[3-6] The development of second-generation DES was associated with improved efficacy and safety profiles compared with first-generation DES.[7, 8] Subsequent RCTs were conducted and PCI has achieved greater clinical recognition as a reasonable therapeutic modality.[9,10] These data may impact on future clinical guidelines for myocardial revascularization and will ultimately will lead to greater use of PCI worldwide. Importantly, when undertaking PCI of the LMCA, there is increasing awareness of the need to achieve optimal procedural outcomes through the use of available technologies, including safer and more effective stents, intravascular imaging, and physiological assessment.

This review provides an update on the current management of LMCA disease with an emphasis on clinical data and procedural knowledge to support the use of PCI in a growing proportion of patients.

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Randomized clinical trials

Key clinical trials comparing PCI and CABG from the first-generation DES era to the second-generation DES era are summarized in Table 1. The SYNTAX study was a key pivotal trial; in the LMCA subgroup, no significant differences were seen in the 5-year rate of major adverse cardiac and cerebrovascular events (MACCEs), mortality, or MI between PCI and CABG.4) However, the 5-year rate of repeat revascularization was higher after PCI and the rate of stroke was higher after CABG. The first LMCA-specific RCT (RECOMBAT) showed that the 5-year rate of MACCEs, death, MI, or stroke was similar between PCI and CABG, but the rate of target-vessel revascularization was significantly higher after PCI.6), 46) These trials prompted the initiation of two additional large-scale RCTs, EXCEL and NOBLE, which involved the use of contemporary DES.[9,10]

In the EXCEL study, the primary composite endpoint of death, stroke, or MI at 3 years was similar between PCI and CABG (p value for non-inferiority=0.02; p value for superiority=0.98).[9] PCI was associated with a lower incidence of major periprocedural adverse events (i.e., major arrhythmias, infections, reoperations, bleeding, or transfusions). PCI was also associated with a more rapid recovery and greater improvement in quality of life at 30 days than was CABG, although both procedures resulted in similar quality of life and angina relief at 3 years.11) In the NOBLE trial, the primary composite endpoint of all-cause mortality, nonprocedural MI, stroke, or repeat revascularization at 5 years was significantly higher after PCI than after CABG (29% vs. 19% exceeding the limit for non-inferiority, respectively). The difference in favor of CABG was statistically significant (p value for superiority=0.007) and was driven by significantly higher rates of nonprocedural MI, repeat revascularization, and stroke in the PCI arm.[10]

There may be several explanations for the inconsistent results seen in the EXCEL and NOBLE studies.[11] First, different types of DES were used. In EXCEL a thin-strut, fluoropolymer-based CoCr-EES was employed, which was associated with the lowest risk of stent thrombosis of all available DES.[12] The NOBLE study used first-generation, thicker-strut, stainless-steel, sirolimus-eluting Cypher stents (11%) or the biolimus-eluting Biomatrix Flex stent (89%). A substantial difference in the rate of definite stent thrombosis (0.7% in EXCEL vs. 3% in NOBLE) suggests the differential performance of stenting for LMCA disease. Secondly, the soft clinical endpoint of repeat revascularization was adopted as the key component of the primary endpoint in the NOBLE study. The majority of previous studies have consistently shown that the rate of repeat revascularization is significantly higher after PCI than after CABG. Therefore, the selection of this primary composite outcome may unfairly penalize the PCI stratum. The SYNTAX trial showed that the increase in repeat revascularization in the PCI group did not directly translate into an increase in the incidence of death or MI.[13] Thirdly, the definitions used for components of the primary composite outcomes differed between the studies, particularly the definition of MI. The Society for Cardiovascular Angiography and Interventions -defined clinically relevant MI definition was used in EXCEL,[14] while periprocedural MI was disregarded in NOBLE. Finally, in the NOBLE study, the rate of stroke was more than two times higher after PCI than after CABG, which is not in agreement with the findings of previous clinical trials comparing PCI and CABG. This observation lacks a clear explanation and biologic plausibility and is, therefore, likely to be due to a chance effect.[15]

Currently in the EXCEL (Evaluation of XIENCE versus Coronary Artery Bypass Surgery for Effectiveness of Left Main Revascularization) trial is the largest study comparing coronary artery bypass grafting (CABG) versus percutaneous coronary intervention (PCI) in the treatment of low-complexity left main disease. The 5-year outcomes have recently been published. The composite primary outcome occurred in 22.0% of the PCI patients and in 19.2% of the CABG patients (95% confidence interval, -0.9-6.5; p = 0.13), and the authors conclude that there is no significant difference between the two treatments.[16]

However, in the EXCEL trial, there was a significant excess mortality in the PCI arm (13.0% vs. 9.9%, odds ratio 1.38 [1.03-1.85]). The authors attribute this difference to chance because no difference was found in definite cardiovascular deaths. Although we agree that the analysis is underpowered and there was no adjustment for multiple testing, the large difference in the most important outcome cannot be simply ignored, especially because adjudication of the cause of death in open-label trials is notoriously open to bias.[17]

In addition, in the EXCEL trial, perioperative myocardial infarction (MI) was a main driver of the

primary outcome at 3 and 5 years, being in large part the cause of non-proportional hazards at 5 years and of the neutral results. In the EXCEL trial, the authors used an original definition that allows a purely enzymatic diagnosis of perioperative MI and increases by 100% the enzymatic threshold in the PCI group but not in the CABG group, clearly disadvantaging surgery. In fact, the rate of perioperative MI after surgery in similar trials that used the generally adopted universal definition were clearly lower: 1.7% in FREEDOM (Future Revascularization Evaluation in Patients with Diabetes Mellitus: Optimal Management of Multivessel Disease) and 2.9% in SYNTAX (Synergy Between Percutaneous Coronary Intervention With TAXUS and Cardiac Surgery) versus 6.2% in the EXCEL trial.

It is important to highlight that 1) all the cardiac outcomes in the EXCEL trial (including non-periprocedural MI whose definition was not substantially modified) are in favor of surgery, and 2) although the main rationale provided by the authors for the definition used was the prognostic relevance of periprocedural MI, in the EXCEL trial, no excess death was found in the surgical group despite a significantly higher incidence of perioperative MI.

Other relevant considerations come into play when interpreting the EXCEL results. Unlike the homogeneous PCI treatment arm in which all patients received everolimus-eluting stents, the CABG arm has important variations that should be factored in. Approximately 30% of patients in the surgical arm of the EXCEL trial underwent off-pump CABG, which, compared with on-pump CABG, was associated with a significantly increased risk of 3-year all-cause mortality (8.8% vs. 4.5%; hazard ratio 1.94; 95% confidence interval, 1.10-3.41).18 In addition, despite guideline recommendations for multiarterial grafting. 19, 20 only 24% of EXCEL patients received bilateral internal thoracic artery grafts, and fewer than 7% received radial artery grafts.[21]

In summary, the EXCEL results are to be interpreted with caution because of the study design features that disadvantage CABG. The modern-day CABG that achieves complete revascularization with multiarterial grafting remains a very competitive and durable therapy if not the gold standard intervention for patients with left main disease.[22]

Meta-analyses

In a meta-analysis of the four largest studies of LMCA revascularization with follow-up available at 3–5 years, incorporating data from the EXCEL and NOBLE trials, the hazard ratio (HR) for death, stroke, or MI with PCI compared with CABG was neutral (1.06) in a random-effects model (p=0.60).53) Based on individual patient data reconstruction, the Kaplan-Meier estimates of death, stroke, or MI at 5 years were 18.3% for PCI and 16.8% for CABG (p=0.52). No statistically significant subgroup interaction for this combined outcome was noted across studies based on the generation of DES used for PCI (p value for interaction=0.25). There were no significant differences in the pooled effects for death (HR, 1.04; p=0.77) and cardiac death (HR, 1.00; p=0.99). The endpoints of MI and stroke also did not differ between the PCI and CABG groups (HR, 1.48; p=0.17 and 0.87; p=0.72, respectively), but these outcomes were confounded by high heterogeneity across the trials. Repeat revascularization was consistently higher following PCI in all trials, leading to a pooled HR of 1.70 (p<0.001). In another meta-analysis, including all the six trials available to date, missing data were collected by the principal investigators, enabling further subgroup analyses.23) PCI was found to significantly reduce death, MI, or stroke by 36% within 30 days. PCI reduced periprocedural MI by 33%, but this effect was offset by 93% more spontaneous MIs beyond 30 days after the procedure. Cardiac death differed in relation to angiographic complexity in that it tended to be lower with PCI among patients with low SYNTAX scores and higher in patients with high SYNTAX scores.

A recent large-scale, pooled analysis of individual patient data reported a comparable treatment effect for PCI and CABG with regard to all-cause mortality up to 5 years in selected patients participating in RCTs.24) This analysis included 11 RCTs involving 11,518 patients who were assigned to undergo PCI (n=5,753) or CABG (n=5,765). The 5-year rate of all-cause mortality was 11.2% after PCI and 9.2% after CABG (HR, 1.20; 95% CI, 1.06–1.37; p=0.004). Interestingly, the 5-year all-cause mortality differed significantly between the two interventions in patients with multivessel disease (11.5% after PCI vs. 8.9% after CABG; HR, 1.28; 95% CI, 1.09–1.49; p=0.002), including in those with diabetes (15.5% vs. 10.0%, respectively; HR, 1.48; 95% CI, 1.19–1.84; p=0.0004), but not in those without diabetes (8.7% vs. 8.0%, respectively; HR, 1.08; 95% CI, 0.86–1.36; p=0.49). By contrast, the 5-year rate of all-cause mortality was similar between the two groups in patients with LMCA disease (10.7% after PCI vs. 10.5% after CABG; HR,

1.07; 95% CI, 0.87–1.33; p=0.52), regardless of diabetes status and SYNTAX score.[25]

Revascularization guidelines

Existing clinical practice guidelines continue to advocate CABG surgery as the singular class I indication for myocardial revascularization of LMCA disease. However, more recent RCTs and registry studies support PCI as a reasonable alternative in selected patients with less complex LMCA anatomy.

As new evidence has become available, guideline recommendations for LMCA revascularization have slowly evolved over time in both Europe and the US . Recently, the 2018 European Society of Cardiology guidelines incorporated compelling data from the EXCEL and NOBLE trials, as well as the results of the pooled analysis.[26] The 2018 European guideline indicates the same class of recommendation, but all evidence levels have been upgraded to level A. For PCI in LMCA with intermediate anatomical complexity, the previous class IIa recommendation was maintained in view of the incomplete 5-year follow-up in the two largest RCTs in this setting. In the future, the guideline will propose less restrictive indications for PCI, thereby expanding the patient pool that might be eligible for PCI. In addition, given that SYNTAX score was not an important factor for decision-making regarding optimal revascularization and to differentiate the comparative outcomes between CABG and PCI in the EXCEL and NOBLE studies, it may be debated whether the SYNTAX score can play a pivotal role in decision-making regarding LMCA revascularization.

The heart team approach

Regardless of which method of revascularization is used, current guidelines highlight the importance of a 'heart team' approach to the management of LMCA disease. The heart team evaluates the risks and benefits of PCI, surgery, or medical treatment alone, taking into account the patient's informed preference . In general, PCI offers more rapid recovery and a lower early adverse event rate, whereas CABG offers more durable revascularization. However, the relative outcomes of PCI vs. CABG can be attributed to a complex interplay of patient comorbidities, coronary anatomic complexity, and ventricular function, in addition to other less tangible factors such as operator expertise and compliance with medication. The complexity and extent of coexisting CAD with the intention of achieving complete revascularization should also be considered by the heart team. Previous evaluation has shown that major adverse cardiovascular events are higher in patients with incomplete revascularization than in those with complete revascularization regardless of the revascularization strategy.[27] The heart team approach is critical when evaluating the risks and benefits of surgery in high- and extreme-risk populations. Additional clinical factors that are not included in most risk models also need to be considered by the heart team when making management recommendations, including frailty, cognitive status, surgical recovery and social support, quality of life, life expectancy, patient preference, and any potential concerns regarding tolerance or adherence with long-term dual antiplatelet therapy.

Conclusions:

Over the past 20 years, significant advancements in stent technology, technical refinement, image and physiological guidance, and adjunctive drug therapy have led to progressive improvements in outcomes following PCI in patients with LMCA disease. In the contemporary clinical setting, LMCA PCI has become a viable option in daily practice not only for patients with less complex clinical and anatomic characteristics (i.e., isolated left main disease, ostial or shaft left main disease, or additional less complex CAD), but also for patients with complex clinical and anatomic characteristics (i.e., distal LMCA bifurcation or those with acute MI or unsuitability for CABG).

Which approach will be of most benefit to individual patients with LMCA disease should be decided by the local heart team, which comprises a general cardiologist, interventional cardiologist, and cardiac surgeon. The heart team will consider the clinical circumstances, any technical issues, and the likelihood of safely achieving complete revascularization with each procedure. It will also be important to consider the patient's own preference once the procedures have been explained in full.

Current joint European guidelines equivalently recommend PCI and CABG for patients with LM disease of low anatomic complexity (Class IA) and less strongly support PCI in lesions of intermediate (Class IIA) and high complexity (Class IIIA).

Generally, I believe the long-term outcomes with CABG are superior for more complex anatomic LM disease. PCI is preferable for patients with more noncardiac

comorbidities, particularly in the shorter term. A heart-team approach is helpful to balance these issues. Shared decision-making is essential for patients who strongly prefer a less-invasive initial approach despite higher risks for later events.

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Cardiac Hydatid Cyst in Patient with Rheumatic Heart Disease and Atrial Septal Defect. A Rare Complex Cardiac Case First Reported in Bhutan

Penjore Yeshey

Abstract

Hydatid disease commonly involves liver in the endemic regions. Cardiac involvement is very rare. It results from infestation with the larval form of the parasite-Echinococcus granulosus. Here, we present an 18-year-old girl student from Haa district referred to us by a general practitioner, with non-specific symptoms of exertional palpitation, dyspnoea and chest discomfort of one year duration. Our preliminary workup, including echocardiography indicate that she was suffering from a rare hydatid cystic disease of the heart. Incidentally, we also found that she had Rheumatic heart disease and atrial septal defect making it even a rarer mix of a cardiac case –" a perfect clinical cocktail ". We initially treated her medically, soon followed by complete excision of the cyst and direct closure of atrial septal defect under cardiopulmonary bypass, with excellent outcome.

Keywords: Atrial septal defect, cardiac hydatid cyst, cardiopulmonary bypass, echinococcosis, interventricular septum, rheumatic heart disease, echocardiography.

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Introduction:

Hydatid disease is a zoonosis parasitic infection caused by Echinococcus granulosus, E. multilocularis or E.vogeli.It has a worldwide distribution and still endemic in South Europe, South America, Africa, Turkey, Australia, New Zealand, and India (1,2). In Bhutan, hydatid cyst of liver, lungs and spleen were reported and treated in patients coming from districts like Bumthang, Trongsa, Wangdiphodrang, Gasa, Tashigang and Haa. In these districts people living in high altitude rear livestock as a means of their livelihood. There is no exact data on the prevalence and distribution of hydatid diseases in Bhutan. This is the first reported case of cardiac hydatid cyst in Bhutan.

Most often, dogs and other carnivores are the primary hosts and sheep are intermediate hosts, whereas humans are accidental hosts. Humans usually become infected by ingesting food, milk or water contaminated by dog feces containing the ova of the parasite. Most of them are filtered out by the liver or the lungs, but some escape into the systemic circulation.

The most common sites of hydatid cyst are the liver (50-70%), lungs (5-30%), muscles (5%), bones (3%), kidneys (2%), spleen (1%) and brain (1%) (3). Cardiac echinococcosis is a rare disease with an estimated prevalence of 0.5-2% (3).

The distribution of cardiac hydatidosis depends on the blood supply to that part of the heart. The coronary circulation is the main route by which the parasite larvae reach the heart. Due to rich coronary blood supply, the left ventricular wall is the most common cardiac location (60%), followed by the right ventricle (10%), pericardium (7%), left atrium (6-8%), right atrium (3-4%), and interventricular septum (4%) (3).

Cardiac echinococcosis often remains asymptomatic for 1-5 years, until the cyst has grown to a large size. Symptoms and signs depend on the size, site and the rapidity of growth of cyst. Symptoms are often vague like palpitation, fatigue, chest discomfort, etc. The cardiac cyst can rupture causing life threatening complications like cardiac tamponade, fatal arrhythmias, anaphylaxis, systemic infections, shock,

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and even sudden death has been reported (4,5). Unless otherwise contraindicated, surgery combined with medical therapy is the treatment modality of choice to achieve a favorable result. This management strategy offers can excellent outcome with no reported incidence of recurrence at subsequent follow up.

Case presentation:

An 18-year-old girl student from Haa district was referred to a cardiac clinic by a general practitioner with one year history of palpitation, exertional shortness of breath and chest discomfort. For the last six months, she was experiencing worsening of her symptoms, which compelled her to attend a clinic. She denies any history of fever, syncope, arthralgia, etc. There was no significant past medical or surgical history.

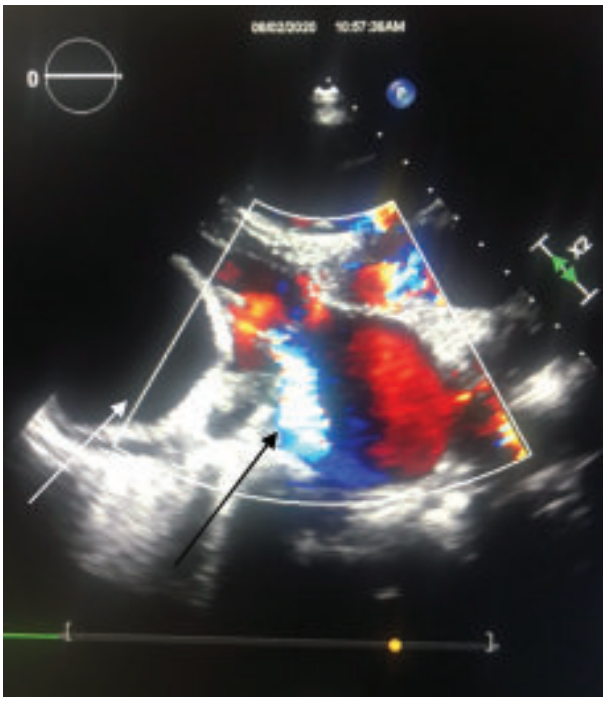

Fig.-1: *PLAX view showing large cyst, and posteriorly directed MR jet*

Her general physical examination reveals a well-built girl, without pallor, icterus, clubbing, edema, etc. She was afebrile and has normal jugular venous pressure. Her blood pressure was 110/70 mm of Hg, pulse rate-73/min, regular, respiratory rate-12 breaths/min. Cardiac examination reveals normal heart sounds with grade III/VI pansystolic murmur at apex radiating to axilla. No pericardial rub, third and fourth heart sounds were audible. Other systemic examinations were unremarkable.

Complete blood counts and urinalysis were normal. Blood biochemistries including, blood sugars are all within normal limits. Chest X-rays shows mild cardiomegaly, with normal lung fields. Resting electrocardiogram was normal.

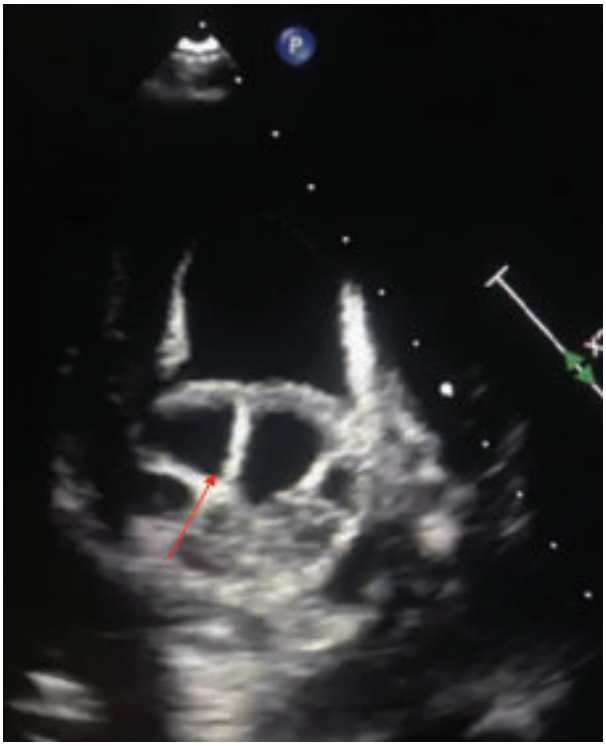

Fig.-2: *Apical 2 Chamber view showing a large multi-loculated cyst in left ventricle.*

Transthoracic echocardiography (Fig.1 and 2) shows rheumatic mitral valves with moderate MR, and a large (7.5cmx6.0cm) intraventricular cyst with numerous daughter cysts resembling the spokes of cart-wheel, attached to the basal and mid part of interventricular septum. Also, there was a small (8mm) secundum atrial septal defect (Fig. 3) with left to right shunt, without enlargement of the right sided chambers. There was normal biventricular function. The cyst was further evaluated with chest CT and cardiac MRI (Fig.4) scans, for better characterization and anatomical relations to the adjacent structures (6). It was subsequently confirmed by positive echinococcus IgG antibody titre of 22.51 (cut-off <11.00) and histopathological examination demonstrating daughter cysts, numerous protoscolices attached to germinal layer containing refractile hocklets and suckers from the operative tissue specimens.

Fig.-3: *4 Chamber off-axis view showing secundum ASD*

Fig.-4: *MRI scan showing huge cyst with daughter cysts in left ventricle.*

Medical treatment with Albendazole 400mg twice daily for 28 days followed by total excision of the cyst through open heart surgery was done with excellent outcome. She was advised to continue a further course of Albendazole 400mg twice a day for at least 6months to prevent recurrence of the cyst.

Her small atrial septal defect was also closed directly. For rheumatic heart disease she gets penicillin prophylaxis for secondary prevention.

Discussion:

Hydatid disease is still endemic in many parts of the countries like South America, South Europe, Africa, Australia, New Zealand, Turkey, India, etc. In Bhutan, hydatid disease of the liver, lungs and spleen are usually found in people coming from the districts like Bumthang, Haa, Trongsa, Wangdiphodrang, etc., where livestock rearing as a means of livelihood is commonly practised. The common parasite causing the human disease is Echinococcus granulosus. It commonly affects liver, lungs, muscles, bones, kidneys in that order. Cardiac involvement is very rare (0.5-2%) (3).

The distribution of cardiac hydatidosis depends on the blood supply to that part of the heart and coronary circulation is the main route by which the parasite larvae reach the heart. Due to rich coronary blood supply, the left ventricular wall is the most common cardiac location (60%), followed by right ventricle (10%), pericardium (7%), left atrium (6-8%), right atrium (3-4%), and interventricular septum (4%) (3).

Cardiac echinococcosis is often asymptomatic for many years (1-5 years) until the cyst grows into a large size. Symptoms and signs depend on the size, site and the rapidity of growth of cyst. Non-specific symptoms like palpitation, fatigue, chest discomfort, are often the presenting complaints. Unless the physician keeps cardiac hydatidosis as the possible differential diagnosis it can easily be missed. Diagnosis of cardiac hydatid cyst can be a challenge and the physician must maintain a high degree of suspicion, taking into consideration the geographic and occupational background of the patient. The cardiac cyst can rupture causing catastrophic complications like cardiac tamponade, fatal arrhythmias (8), anaphylaxis, systemic and pulmonary embolism, disseminated infections, shock, and even sudden death has been reported (7).

Diagnosis involves careful history taking, physical examinations, and relevant investigations, including imaging studies. Simple investigation like chest X-ray can be useful, especially when cardiac shadow shows some abnormalities. Echocardiography is the imaging modality of choice in the diagnosis of cardiac hydatid cyst. It helps in the exact localization of the

cyst, its size, number, and the daughter cyts. Associated valvular pathologies and congenital heart conditions can be easily assessed. In this case, we found that this patient also had rheumatic heart disease and atrial septal defect which made it a very rare combination. These additional conditions must have certainly contributed to the pathophysiology of the disease in this patient since she had at least moderate degree of mitral regurgitation, and shunt defect could have facilitated in the spread of larvae across the heart chambers. Additional imagings like CT and MRI scans are routinely done to get better information about lesion characteristics and to obtain the exact anatomical relations of the lesion with other adjoining structures(6). These information is critical for the operating surgeons.

Treatment is essentially surgical (9) involving complete removal of the cyst under cardiopulmonary bypass, as soon as the diagnosis is made. Surgery on such case demands technical expertise of the surgeon, and in the hands of experienced the outcome is excellent. During surgery care must be taken to avoid rupture of the cyst, dissemination of infection and anaphylaxis. After removing the germinative membrane, hypertonic (20-30%) saline is used as protoscolicidal agent to wash the cyst cavity followed by capitonnage procedure. Perioperative steroids are routinely used. Albendazole 400mg twice a day for 4 days before surgery is used and the same dose is continued for a duration of 3-6 months following surgery. Timely spaced serial echocardiographic follow up can be used to assess recurrence of the disease.

Conclusion:

Meticulous cardiac evaluation in any patient presenting with longstanding palpitation and chest discomfort is important. Cardiac hydatid cyst should be considered in the differential diagnosis of any cardiac mass lesion, especially in people coming from hydatid disease endemic regions. Simple cardiac imaging like echocardiography can be very useful in the diagnosis of a potentially life-threatening, but treatable condition. Medical management followed by complete excision of the cyst can offer the best result. Cardiac echinococcosis can occur in patients with preexisting rheumatic heart disease and atrial septal defect as a rare clinical manifestation as in this case. Such combination of a congenital, bacterial and parasitic infection affecting the same organ is a rare condition aptly referred to as “a perfect clinical cocktail”.

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Competing interests:

No conflict of interest

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