

Research Article - Basic and Applied Anatomy

A study of incidence of trifurcation of left coronary artery in adult human hearts

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Abstract

The aim of our present study is to determine the incidence of trifurcation of left coronary artery in 75 adult human hearts of Hyderabad, Karnataka region. The incidence of trifurcation of left coronary artery in our present study is 14.5%. Since the left main coronary artery supplies the majority of the left ventricle of the heart and as the diseases of left coronary artery are most common, the management of diseases involving the left coronary artery trifurcation is very challenging. Hence this study done involving trifurcation of left coronary artery will be helpful to the physicians, vascular surgeons and cardiac surgeons of this region.

Key words

Coronary artery, trifurcation, branching pattern.

Introduction

The left main coronary artery usually bifurcates into two branches, the left anterior interventricular artery and the left circumflex artery. In case of trifurcation, a median branch appears between the angle of left anterior interventricular artery and left circumflex artery.

The median branch of left coronary artery is also termed “arteria diagonalis Crainicianu” (Banchi., 1904; Crainicianu, 1922).Other terms used for this vessel are intermediate artery (Vieweg et al., 1975) and ramus obliques (Kalbfleisch et al., 1977).

The left coronary artery supplies a large myocardial area, its disease carries a high morbidity and mortality rate. Hence the complete and thorough knowledge of normal anatomy, variations and anomalies of coronary arteries is useful while performing coronary arteries bypass grafts and in myocardial reperfusion (Vieweg et al., 1975).

The coronary artery disease involving trifurcation of left coronary artery is a complex atherosclerotic process, as it may involve the main trunk of left coronary artery along with its branches or only branches with or without involvement of main trunk. The treatment of trifurcation disease is a complex procedure and requires a skilled interventional approach (Shammas, 2007).

Treatment of bifurcation and trifurcation disease is associated with reduced procedural success and increased long term complications. Trifurcation lesions are more challenging than bifurcation lesions.

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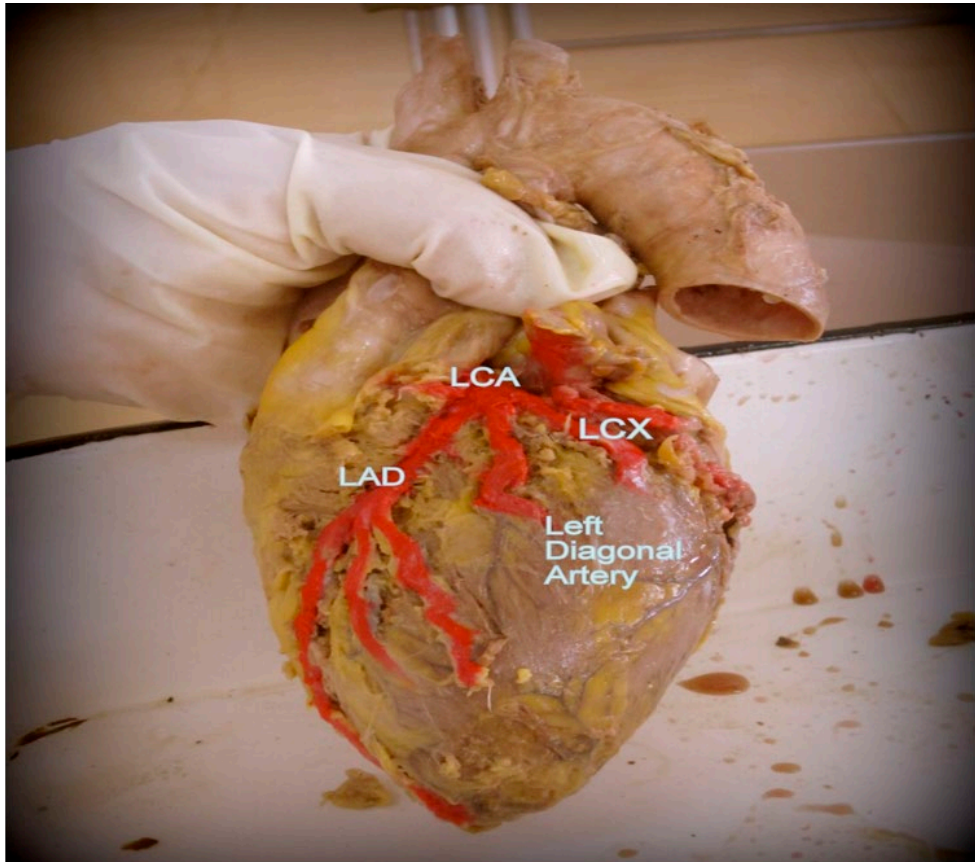


Figure 1. Trifurcation of left coronary artery. LAD: left anterior descending artery; LCA: left coronary artery; LCX: left circumflex artery.

Acute myocardial infarction involving left main coronary artery and its branches carries a high morbidity and mortality as the left coronary artery supplies a large cardiac area (Can et al., 2011).

As very little literature is available on trifurcation of left coronary artery, this study would be helpful to the physicians and cardiac surgeons working on this region.

Materials and methods

The study was carried on 75 adult human hearts. The specimens were obtained from the Department of Anatomy of Bidar Institute of Medical Sciences and also from nearby medical colleges of Hyderabad-Karnataka region. The thoracic cavity was opened and the great vessels were ligated. The origin of left coronary artery from left

anterior aortic sinus was noted. Any variation in the branching pattern of left coronary artery was also noted.

Results

In our study out of 75 cases, we observed trifurcation of left main coronary artery in 11 specimens i.e. in 14.6% cases.

Discussion

Developmentally, coronary arteries usually have a dual origin, one from the proximal and another from the distal part. The distal portion is formed first and is known as retiform vascular network, which is similar to capillary networks formed in the other parts of the body. This retiform network develops in atrioventricular and inter-ventricular grooves and forms a complete ring and makes connections with extracardiac great vessels and heart chamber. Further there is development and regression of some vessels and finally the coronary pattern develops. This theory explains the variations in the coronary artery embryologically (Ogden, 1968).

The observation of the incidence of trifurcation of the left coronary artery in our study is similar to the study done by Sinha et al. (2009), whereas in all other studies the incidence of trifurcation of left coronary artery was higher when compared to our study, i.e. Ballesteros et al. (2008: 42.2%), Baptista et al. (1991: 38.18%), Kalpana (2003: 40%), Das Hirak et al. (2010: 35%), Dombé et al. (2012: 35.9%), Fazliogullar et al. (2010: 44%), Dharmendra et al. (2013: 35.48%).

Conclusion

The left main trifurcation disease is treated with bypass surgery as the trifurcation stenting procedures carry a high risk of adverse effects. Hence the treatment of left main trifurcation disease is more complex. Knowledge of incidence of trifurcation of left coronary is useful in guidance of cardiac surgeries, interpretation of the occlusion and while performing interventional procedures.

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References

- Ballesteros L.E, Ramirez L.M. (2008) Morphological expression of the left coronary artery: A direct anatomical study. *Folia Morphol. (Warsz.)* 67: 135-142.
- Banchi A. (1904) Morfologia delle arteriae coronariae cordis. *Arch. Ital. Anat. Embriol.* 3: 87-164.
- Baptista C.A., Didio L.G., Prates J.C. (1991) Types of division of left coronary artery and the ramus diagonalis of the human heart. *Jpn. Heart. J.* 32: 323-335.
- Can M.M., Tanboga H., Karabay C.Y., Güller A., Akgun T., Turkyilmaz.E., Ozveren O.,
- Crainicianu A. (1922) Anatomische Studien über die Coronararterien und experimentelle Untersuchungen über die Durchgängigkeit. *Virch. Arch. Path. Anat.* 238: 1-75.
- Das H., Das G., Das D.C., Talukdar K. (2010) A study of coronary dominance in the population of Assam. *J. Anat. Soc. India.* 59: 187-191.
- Dharmendra P., Anitha T., Madan S., Londhe P. (2013) Clinically significant anatomical variations of the left coronary artery in human cadaveric hearts. *Int. J. Curr. Res. Rev.* 5: 39-44.
- Dombe D.D., Anitha T., Giri P.A., Dombe S.D., AMBIYE M.V. (2012) Clinically relevant morphometric analysis of left coronary artery. *Int. J. Biol. Med. Res.* 3: 1327-1330.
- Fazliogullari Z., Karabulut A.K., Unver Dogan N., Uysal I.I. (2010) Coronary artery variations and median artery in Turkish cadaver hearts. *Singapore Med. J.* 51: 775-780.
- Kalbfleisch H., Hort W. (1977) Quantitative study on the size of coronary artery supplying areas postmortem. *Am. Heart. J.* 94: 183-188.
- Kalpana R. (2003) A study on the principal branches of coronary arteries in humans. *J. Anat. Soc. India* 52: 137-140.
- Mutlu B. (2011) The treatment of acute myocardial infarction due to the occlusion of the left main coronary disease. *Cardiol. J.* 18: 77-82.
- Ogden J. (1968) The origin of the coronary arteries. *Circulation* 38 (suppl. 6): 150.
- Patel M.P., Dixit D.P., Gohil D.V., Singel T.C. (2012) A study of incidence of single coronary artery. *Int. J. Biol. Med. Res.* 3: 1348-1350.
- Shammas N.W. (2007) Trifurcating coronary artery disease: A proposed classification and treatment methodology. *J. Invasive Cardiol.* 19: 32-35.
- Sinha P., Mehrotra N., Jethani S.L., Bindal U. (2009) Histomorphological study of coronary artery. *J. Anat. Soc. India.* 58: 166-168.
- Vieweg W.V.R., Smith D.C., Hagan A.D. (1975) A clinically useful coding system for normal coronary artery anatomy. *Cathet. Cardiovasc. Diag.* 1: 171-182.