# Importance of anatomic variability of the coronary arterial orifices

*Koroner arter orifislerin anatomik değişkenliğinin önemi*

The aortic root is a frequent site of interventional procedures in both adults and children. Understanding the precise nature and relation of the anatomical structures composing the aortic root, including coronary orifices, is valuable in percutaneous and transcatheter therapeutic techniques for valve or device implantations as well as in various open-heart procedures. This interventional point of view lends importance to the clinical relevance of the study by Govsa et al. (1) published in this issue of Anatolian Journal of Cardiology. The authors studied hundred normal adult hearts postmortem. They assessed the anatomical relation of the coronary orifices in terms of their number, position, and shape as well as their relation with the sinotubular junction (STJ). The right and left coronary ostia were individually analyzed, and the distances from these ostia to the bottom of the aortic sinuses and to the commissures of the aortic leaflets were studied. Previous studies noted that preoperative knowledge of morphological characteristics of the coronary orifices and aortic root is important in the management of patients with different pathologies involving the aortic root and coronary arteries (2, 3).

Govsa and colleagues (1) described anatomical relation of the coronary orifices with landmarks in the aortic root. They noted that the right coronary sinus was the highest one, followed by the non-coronary and left coronary sinuses. They stated that, considering the distance between the commissures, the right coronary sinus was the largest of all three sinuses of the aortic root. In all the specimens, the right and left coronary arteries originated from the appropriate aortic sinuses; the main right coronary orifice (RCO) and left coronary orifice (LCO) were connected to the right and left aortic sinuses, respectively. However, the authors observed that both coronary orifices originated from below the STJ in 47% of the specimens. In other words, in almost half of the specimens, at least one coronary orifice may originate from the level of STJ or above this anatomical line. The authors noted that the left coronary artery arose below the sinotubular junction in 58% of the specimens, while 29% was located above the STJ and 13% arose at the STJ. On the other hand, the orifice of the RCA was located below the sinotubular junction in 78% of the specimens. It was above the STJ in 13%, and at the level the STJ in 9%. The potential clinical disadvantage of high origin of the coronary orifices lying above the STJ is myocardial ischemia and sudden death. Displacement and oblique course of coronary artery through the aortic wall introduces the potential for luminal narrowing, and may provoke disturbances in myocardial perfusion (4). As discussed in the study, this event is more prominent in the presence of a single coronary ostium giving two main coronary arteries (5). Additionally, the authors observed that the mean distances from the LCO and RCO to the bottom of the corresponding aortic sinus were 11.8±3.2 mm and 13.1±3.2 mm, respectively. They noted that these measures were similar to the results of previous studies. Moreover, in 75% of the cases, the diameter of the left coronary orifice (LCO) was greater than that of the right coronary orifice (RCO). These data are important for clinical and surgical practice, because coronary blood flow may be affected by changes in the diameter, position, and anatomic relations of the coronary ostia.

In the study, an accessory coronary orifice was discovered in 47% of the specimens on the left while it was evident in 54 specimens on the right side. Some cases presented with 2 or more accessory orifices with a decreasing ratio. Early diagnosis of anatomical unusual course of these coronary arteries before the operation is helpful in determining the surgical strategy. For example, preoperative diagnosis of an aberrant infundibular coronary artery crossing the pulmonary outflow tract may change surgical management of patients with small aortic root. In such cases, a posterior approach for aortic root enlargement should be preferred rather than an anterior approach. Besides, any operation involving aortic root such as Bentall procedure needs preoperative knowledge about the course of coronary arteries as well as the presence of an accessory coronary orifice or vessel, if present. Therefore, the authors also presented variations of the coronary orifices that would be valuable in the preoperative work-up of patients.

This study has some therapeutic implications in the management of aortic root pathologies from the surgical point of view. An abnormal localization or an accessory origin of the coronary orifices may disturb performing an aortotomy incision

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for aortic valve exposure, preparing a coronary button in root replacement, direct delivery of cardioplegia through the coronary orifices, and approaches for aortic root enlargement. The anatomical feedback about the height and width of the coronary sinuses and diameter of the STJ may help in choosing appropriate size of grafts for ascending aortic replacement and associated aortic valve sparing techniques including non-coronary cusp extension. Preoperative diagnosis of such coronary abnormalities is also very important in congenital heart surgery such as tetralogy of Fallot and transposition of the great arteries. Additionally, the knowledge of coronary anatomy is valuable in percutaneous and transcatheter therapeutic techniques for valve or device implantations, in addition to coronary interventions performed for myocardial revascularization. The awareness of anatomical relation of the coronary orifices may decrease the morbidity and mortality of such invasive procedures. Therefore, the study is a guide for interventions in cardiology and cardiac surgery.

Considering the study population, variations of coronary orifices may change in advanced age because aortic root pathologies and especially systemic hypertension are much more common in later decades of life. These morbidities may affect the presentation of abnormalities of the coronary anatomy. The authors designed a study population, in which the cause of mortality was either cardiac mortality or non-cardiac. Therefore, analysis of previous co-morbidities such as advanced age and hypertension would reflect the results of this study for a relatively homogenous group of patients. Moreover, it could be more helpful if the diameters of the ascending aorta were included in the study population.

In conclusion, the present study may help invasive cardiologists and cardiac surgeons in order to achieve a precise management of coronary as well as aortic root pathologies. Preoperative anatomical analysis of the coronary orifices may improve the outcome of interventional and surgical procedures.

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