

Kugels Artery

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Abstract

Aim of the Study: The existence of Kugels artery has been rarely reported in literatures. In this study, I have explained the existence and course of Kugels artery. This will be helpful for the cardiologists to analyse the role of Kugels artery in the pathogenesis of valvulitis and lesions of the commissures and the base of the Heart. Kugels anastomotic artery has been described as a constant circumflex branch usually from its anterior part traversing the interatrial septum to establish direct or indirect anastomosis with the right coronary artery. Its existence has been questioned. *Materials and Methods:* 32 Heart specimens were dissected. The origin course and termination of Kugels artery was traced. *Results and Conclusion:* Out of 32 hearts specimens dissected, Kugels artery was found in 8 hearts. The main supply to the atrioventricular node is from the posterior interventricular branch of right coronary artery. Various studies explain that Kugels artery is an accessory blood supply to the atrioventricular Node. Kugels artery is said to terminate near the crux. Here it acts as a source of collaterals with atrioventricular nodal artery.

Keywords: Kugels Artery; Collateral Circulation; Anastomotic Artery.

Introduction

The existence of Kugels artery is still a controversy. Even the textbook of Gray's anatomy questions its existence. Hence, the present study is to find out, whether such an artery exist. Kugels artery was first reported by Kugel and Gross in their original paper [1]. It may form a Y shaped anastomosis, the stem of the Y is represented by inter auricular septum posteriorly. Two wings of the Y form the anterior wall of both auricles and encloses the roots of pulmonary artery and aorta. The left wing of the Y together with the stem in majority of cases carries the *Arteria Anastomotica Auricularis Magna* [2].

It presents 3 anastomotic variations mostly it penetrates the left atrial wall, passes backwards along the inferior border of the atrial septum to the crux. In few cases kugels artery is found to originate from the sinoatrial nodal artery. In few cases a branch from right coronary artery and a branch

from left circumflex artery joins to form the Kugels artery close to the level of atrioventricular nodal artery. Very rarely small branches from right coronary artery anastomosis with small branches from left circumflex artery at the level of crux [3]. Occasionally it supplies the aortic cusp of the mitral valve. Mitral valve procedures exposes the mitral valve and sub valvular structures. The superior septal approach of mitral valve, causes damage to sinoatrial nodal artery resulting in cardiac rhythm disturbances, ending in the necessity for pacemaker implantation. Ablation procedures done for treating arrhythmias damages atrioventricular nodal artery ending in complete AV block. Contrast radiograms has been taken and the kugels artery was found to be present anterior to circumflex artery coursing towards the crux. Radiographic identification of coronary artery has been reported in 6 cases with coronary artery disease [4].

As kugels artery might come as a branch from sinoatrial nodal artery or it acts as an accessory blood supply to AV node, it is more likely for the kugels artery to get damaged during mitral valvular surgeries or ablation procedures [5]. Kugels artery has also been reported to form coronary arteriovenous fistula with the coronary sinus [6]. It plays an important role in the pathogenesis of mitral and aortic lesions, commisural lesions and lesions at the root of the aorta [7]. It should be taken into

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consideration in many cardiac surgical procedures involving the aortic root [8]. Obstruction of right coronary arteries and left circumflex arteries reduces the blood flow at the level of crux. This proves the kugels artery as an appropriate collateral channel [9].

So in this study, I have studied about the existence and the course of kugels artery.

Materials and Methods

Thirty Two heart specimens were dissected. Origin of the Left coronary artery was traced. Identified the Circumflex and Anterior interventricular branch, and looked for any branch arising from the circumflex artery. It was traced till the point where it pierces the Interatrial septum.

Results

Out of 32 heart specimens dissected, Kugels artery was found in 8 hearts.

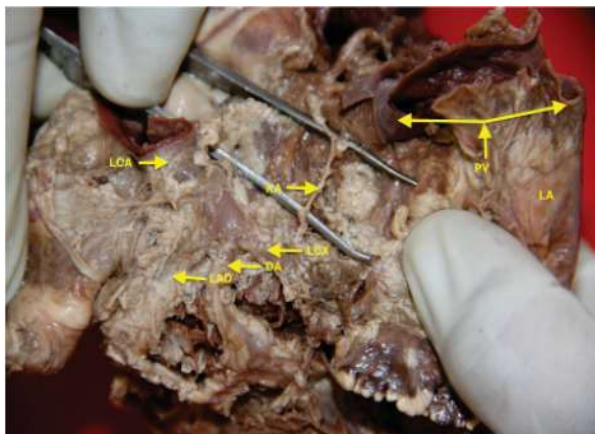


Fig. 1:

A branch from circumflex branch of left coronary artery passed in front of the left auricle and left atrium and at the back of route of pulmonary trunk and ascending aorta.

Then it pierced the interatrial septum.

In the Figure 2 heart specimen also a branch was found to originate from the circumflex branch of left coronary artery.

This branch was also found to pass in front of the left auricle and left atrium and pierce the interatrial septum.

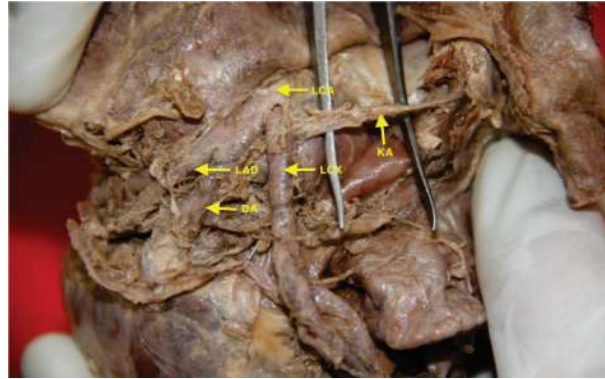


Fig. 2:

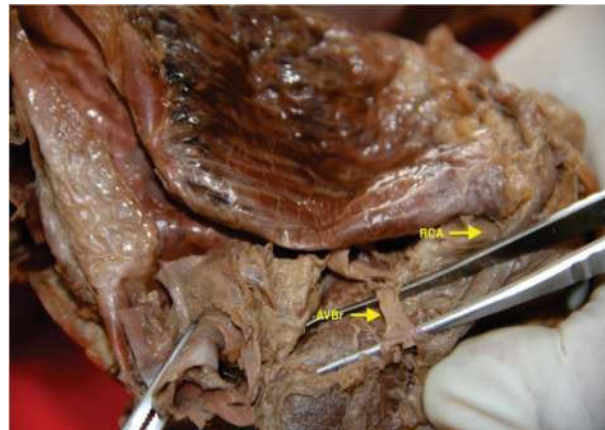


Fig. 3:

Some studies say that it anastomosis with atrioventricular nodal artery.

The AV nodal artery was traced from behind, but the anastomosis was not seen.

Discussion

Various study says that Kugels artery is an anastomotic artery.

Kugel MA and Gross were the first to report kugels artery in his original article, so the artery was named after him. Because of huge caliber and the site of occurrence of the kugels artery in relation to the auricle and the atrial septum, he also named it as Arteria anastamoticaauricularis magna [1]. Text book of Grays Anatomy describes Kugels artery as a constant Circumflex branch from its anterior part traverses the interatrial septum to establish direct or indirect anastomosis with RCA [2]. Christos et al. found Kugels Artery in 6 out of 100 hearts, out of which in 2 hearts it originated from LCA and ended in RCA, in 1 heart from RCA to RCA and in 1 heart

started from RCA through SA nodal Artery and ended in LCA [3].

Kugels Artery is said to terminate near the crux where it acts as a source of collaterals with AV nodal artery (6%) [4]. Subbaraobopana et al have reported the 3 anatomic variations of Kugels artery [7]. Divyaprakash et al have studied about the arterial blood supply to SA node and AV node through coronary angiography. In this study they have reported that the SA node is supplied by Kugels artery in few cases [8].

Kumaari et al. have dissected 41 hearts and studied the existence of Kugels artery in the population of kerala. 20% of the population of kerala showed the presence of kugels artery [9]. Viyamma et al. have done a study on human coronary arteries based on gross anatomy and coronary casts in 115 hearts and have reported the anastomoses of kugels artery with AV nodal artery [10]. Thomas has described in his study that kugels artery links the anterior and posterior ventricular coronary tree. It holds a reasonable value in collateral circulation to the ventricles and serves as an accessory supply to the AV node [11].

In the present study, the origin of the artery was from the circumflex branch of left coronary artery. It took a course behind the root of Pulmonary trunk and ascending aorta, in front of left auricle and left atrium and terminated by piercing the inter atrial septum.

Conclusion

Kugels artery is said to be constant in its existence though it shows variation in its course and anastomoses. It acts as a source of collaterals and its presence might decrease the ischaemic consequence [1]. Various studies have reported the anastomoses of kugels artery with AV nodal artery. This is helpful for the physicians in various diagnostic and therapeutic procedures involving this area of the heart [3]. Radio frequency ablation and biventricular pacemaker insertion has the potential risk of damaging the important anastomotic network [5]. Out of 32 hearts dissected Kugels artery was able to be traced in 6 hearts. In all 6 hearts the anastomoses was not able to be made out. But kugels artery was found to originate from circumflex branch of left coronary artery, courses in front of left auricle and left atrium, behind ascending aorta and pulmonary trunk and was traced till it pierced the interatrial septum. So the kugels artery has proved its existence. The cardiothoracic surgeons and the physicians should always have

the presence of Kugels artery in mind while doing valvular surgeries or ablation procedures for arrhythmias, to avoid injuring the kugels artery. The radiologists and physicians should always bear in mind about kugels artery while performing various diagnostic and therapeutic procedures, to avoid complications due to the injury to kugels artery.

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