

An anatomical study of the human cardiac veins with special reference to the drainage of the great cardiac vein

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Abstract

Background: The coronary sinus (CS) has become a clinically important structure especially through its role in providing access for different cardiac procedures. Historically, cardiac vascular studies have focused mainly on the coronary artery circulation. **Aims and Objectives:** anatomical study of the human cardiac veins with special reference to the drainage of the great cardiac vein. **Methodology:** This cross sectional study was carried out in the formalin fixed human cadaveric hearts available in the department of Anatomy at tertiary health care centre six month period i.e. January 2016 to July 2016. The statistical analysis was done by SPSS 19 version software. **Result:** In our study we have seen that Coronary Sinus formed majority in Great cardiac vein with left marginal vein i.e. 79.17%, Great cardiac vein with oblique vein of left atrium in 12.50%, Great cardiac vein with posterior vein of left ventricle in 8.33 %. In Tributaries of coronary sinus Great cardiac vein present in 22, Left marginal vein-23, Posterior vein of left ventricle-24, Oblique vein of left atrium in 21, Middle cardiac vein-23, Small cardiac vein- 20 cadaveric specimens. As per the Length of coronary sinus sinus in millimeters (Mean± standard deviation) Great cardiac vein with left marginal vein (23 specimens)- 53.82 ± 11.56, Great cardiac vein with posterior vein of left ventricle (5 specimen)-53.06 ± 5.32, Great cardiac vein with oblique vein of left atrium (6 specimen)- 34.52± 7.2. **Conclusion:** Variation is the law of nature. Every human is unique anatomically to such an extent that even identical twins are not exactly alike so study of these variations is of much value in understanding the heart physiology, clinical knowledge.

Key Words: Cardiac vein, Coronary sinus, Great cardiac vein, drainage of the great cardiac vein.

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Received Date: 20/04/2018 Revised Date: 23/05/2018 Accepted Date: 26/06/2018

DOI: <https://doi.org/10.26611/1001635>

Access this article online

Quick Response Code:



Website:

www.medpulse.in

Accessed Date:
29 June 2018

INTRODUCTION

The coronary sinus (CS) has become a clinically important structure especially through its role in providing access for different cardiac procedures. Historically, cardiac vascular studies have focused mainly on the coronary artery circulation. Although not studied to the extent of the coronary arteries, the coronary venous

system is important in many electrophysiological procedures, including arrhythmia ablation, biventricular pacing, and for deployment of an array of cardiac devices.¹⁻³ The advent of advanced invasive and interventional cardiac treatment and management tools for common disorders like heart failure has made understanding of CS anatomy necessary.⁴⁻⁶ There is also an increased interest in the CS as an access point for interventionalists for ablation procedures of an arrhythmia source and for mapping.⁷⁻⁹

MATERIAL AND METHODS

This cross sectional study was carried out in the formalin fixed human cadaveric hearts available in the department of Anatomy at tertiary health care centre six month period i.e. January 2016 to July 2016 The right atrium was opened by dissection to study the opening of the coronary sinus. The width of the coronary sinus

How to cite this article: S Vinoth, M A Parimelazhagan, S Sivakumar. An anatomical study of the human cardiac veins with special reference to the drainage of the great cardiac vein. *MedPulse – International Journal of Anatomy*. June 2018; 6(3): 37-39.

<http://www.medpulse.in/Anatomy>

orifice in right atrium was measured using Vernier Calipers in millimeters. The presence and shape of thebesian valve were noted. The coronary sinus orifice was examined for the presence of any ridges, networks or membranes. The length of coronary sinus was measured with vernier calipers from the point where the great cardiac vein and left marginal vein opened into the coronary sinus in the left posterior atrioventricular groove upto the opening of coronary sinus in right atrium in millimeters. All the tributaries of coronary sinus were traced by dissection. The veins forming the coronary sinus were noted. Any variations in the formation and tributaries of coronary sinus were noted. The statistical analysis was done by SPSS 19 version software.

RESULT

Table 1: Distribution as per the formation of Coronary Sinus

Great cardiac vein with left marginal vein	19	79.17
Great cardiac vein with oblique vein of left atrium	3	12.50
Great cardiac vein with posterior vein of left ventricle	2	8.33
Total	24	100.00

Coronary Sinus formed majority in Great cardiac vein with left marginal vein i.e. 79.17%, Great cardiac vein with oblique vein of left atrium in 12.50%, Great cardiac vein with posterior vein of left ventricle in 8.33 %.

Table 2: Distribution as per the Tributaries of coronary sinus

Tributaries of coronary sinus	Present	Absent
Great cardiac vein	22	2
Left marginal vein	23	1
Posterior vein of left ventricle	24	0
Oblique vein of left atrium	21	3
Middle cardiac vein	23	1
Small cardiac vein	20	4

In Tributaries of coronary sinus Great cardiac vein present in 22, Left marginal vein-23, Posterior vein of left ventricle-24, Oblique vein of left atrium in 21, Middle cardiac vein-23, Small cardiac vein- 20 cadaveric specimens.

Table 3: Distribution as per the Length of coronary sinus

Formation of coronary sinus	Length of coronary sinus in millimeters (Mean± SD)
Great cardiac vein with left marginal vein (23 specimens)	53.82 ± 11.56
Great cardiac vein with posterior vein of left ventricle (5 specimen)	53.06 ± 5.32
Great cardiac vein with oblique vein of left atrium (6 specimen)	34.52± 7.2

As per the Length of coronary sinus in millimeters (Mean± standard deviation) Great cardiac vein with left

marginal vein (23 specimens)- 53.82 ± 11.56, Great cardiac vein with posterior vein of left ventricle (5 specimen)-53.06 ± 5.32, Great cardiac vein with oblique vein of left atrium (6 specimen)- 34.52± 7.2.

DISCUSSION

Cardiac veins. Although there have been numerous studies on the various heart vessels, the coronary artery has so far received the most attention (Adachi 1927)¹⁰. According to Koizumi *et al.* (2000)¹¹, they classified the distribution pattern of the coronary artery into 12 types, and explained the morphogenesis of a single coronary artery by the development of each part. Variation is the law of nature. Every human is unique anatomically to such an extent that even identical twins are not exactly alike. Like in all others, each of the twins has own unique fingerprints. Even a lay person can make out that there are wide differences between persons. Some of the variations are of considerable clinical significance, e.g. differences in the anastomotic arrangement between the arteries at the base of the brain, while others may not have much significance, e.g. an extra belly to a particular muscle or the marked difference in the arrangement of the superficial veins even on the two sides of the body (Romanes G J, 1986)¹². Many variations pertaining to the coronary arterial system have been described but less attention has been paid to the coronary venous system. In the current scenario, there are therapeutic options for arrhythmias and for heart failure that use the coronary venous system to access target areas. The venous system is also a useful conduit for delivery of percutaneous transcatheter treatment. Variability in terms of valves, diameter, angulation, extent of muscular sleeves, proximity to other cardiac structures, and cross-over spatial relationship with branches of coronary arteries have implications for practitioners seeking to make use of the system (Ho S Y *et al.*, 2004)¹³. Also retrograde cardioplegia is achieved through the cardiac veins during cardiac surgeries. Hence any variation in the veins of the heart is significant. In our study we have seen that Coronary Sinus formed majority in Great cardiac vein with left marginal vein i.e. 79.17%, Great cardiac vein with oblique vein of left atrium in 12.50%, Great cardiac vein with posterior vein of left ventricle in 8.33 %. In Tributaries of coronary sinus Great cardiac vein present in 22, Left marginal vein-23, Posterior vein of left ventricle-24, Oblique vein of left atrium in 21, Middle cardiac vein-23, Small cardiac vein- 20 cadaveric specimens. As per the Length of coronary sinus in millimeters (Mean± standard deviation) Great cardiac vein with left marginal vein (23 specimens)- 53.82 ± 11.56, Great cardiac vein with

posterior vein of left ventricle (5 specimen)- 53.06 ± 5.32 , Great cardiac vein with oblique vein of left atrium (6 specimen)- 34.52 ± 7.2 . These findings are similar to R. Manoranjitham¹⁴ they found In 93.33% specimens the coronary sinus was formed by the union of great cardiac vein and left marginal vein. In 3.33% specimens it was formed by the union of great cardiac vein and posterior vein of left ventricle, and in 3.33% specimens it was formed by the union of great cardiac vein and oblique vein of left atrium. The left marginal vein was absent in 2 specimens and small cardiac vein was absent in 1 specimen. The mean length of coronary sinus was $54.98 + 12.2\text{mm}$. The mean width of coronary sinus ostium was $9.35 + 3.24\text{mm}$. The Thebesian valve was present in 93.33% specimens and it was semilunar in shape.

CONCLUSION

Variation is the law of nature. Every human is unique anatomically to such an extent that even identical twins are not exactly alike so study of these variations is of much value in understanding the heart physiology, clinical knowledge.

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Source of Support: None Declared
Conflict of Interest: None Declared