



BARBARA DUDA, JANUSZ JERZEMOWSKI, ANNA ORKWISZEWSKA, EWA ROGOWSKA

MAIN TRIBUTARIES OF THE CORONARY SINUS IN THE SELECTED PRIMATES HEART

ABSTRACT: *The coronary sinus collects blood from the heart walls. Only few authors have described the coronary sinus in the primates' heart. Its main tributaries are: great cardiac vein, the posterior vein of the left ventricle, the oblique vein of the left atrium, the middle cardiac vein and the small cardiac vein. Material consisted of 50 adult representatives of various primates hearts (Prosimiae – 2, Platyrrhinae – 16, Catarrhinae – 32), fixed in a formalin/ethanol solution. Classical macroscopic anatomical methods were used. During examination of the main tributaries of the coronary sinus, the topography of their outlet portions was evaluated. In the examined material, the great and middle cardiac veins as well as the posterior vein of the left ventricle were always observed. The remaining tributaries of the coronary sinus were less stable. The outlet portions of the main veins of the heart were characterized by significant variability.*

KEY WORDS: *Primates heart – Coronary sinus*

INTRODUCTION

The coronary sinus (S. C.) is the remnant after left horn of the venous sinus. It lies on the surface of the heart atrium in the coronary sulcus between the left atrium and left ventricle as an extension of the great cardiac vein and opens into the right atrium. The coronary sinus collects blood from the heart walls. Its main tributaries are: great cardiac vein (VCMa), the posterior vein of the left ventricle (VPVS), the oblique vein of the left atrium (VOAS), the middle cardiac vein (VCMc) and the small cardiac vein (VCP) (*Figure 1*).

The concept of coronary sinus was initially introduced in 1839 by Reid, as noted by Maros *et al.* (1983). Adachi, as noted in Razaczyk-Pakalska (1970), carried out studies of heart veins on more numerous material (160 human hearts respectively).

At present the coronary sinus plays an important clinical role with regards to the development of new diagnostic as well as therapeutic techniques and methods in the area of cardiology (Kozłowski *et al.* 1995, Kozłuk *et al.* 1995, Mohl 1987). Therefore it is the subject of study of many

authors (Malhotra *et al.* 1980). Only few authors have described the coronary sinus in the primates' heart (Duda *et al.* 1995, Kuta, Grzybiak 1995). During examination the main tributaries of the coronary sinus as well as the topography of their outlet portions were evaluated.

MATERIAL AND METHOD

Material consisted of 50 adult representatives of various primates hearts (*Table 1*) fixed in a formalin/ethanol solution collected by Clinical Anatomy Department of Medical Academy in Gdańsk. Classical macroscopic anatomical methods were applied and in the case of small hearts a binocular magnifying glass was used.

RESULTS

The great and middle cardiac veins as well as the posterior vein of the left ventricle occurred in all examined hearts. However, the oblique vein of the left atrium was observed

TABLE 1. Comparison of tested hearts in various species of Prosimiae and Simiae.

Ordex	Subordex	Genus	Species	Number
PROSIMIAE		<i>Nycticebus</i>	<i>coucang</i>	2
SIMIAE	PLATYRRHINAE	<i>Cebus</i>	<i>capucinus</i>	1
		<i>Saimiri</i>	<i>sciureus</i>	15
	CATARRHINAE	<i>Cercocebus</i>	<i>galeritus</i>	1
		<i>Erythrocebus</i>	<i>patas</i>	10
		<i>Macaca</i>	<i>mulatta</i>	7
		<i>Papio</i>	<i>cynocephalus</i>	13
		<i>Pan</i>	<i>troglydites</i>	1
Total				50

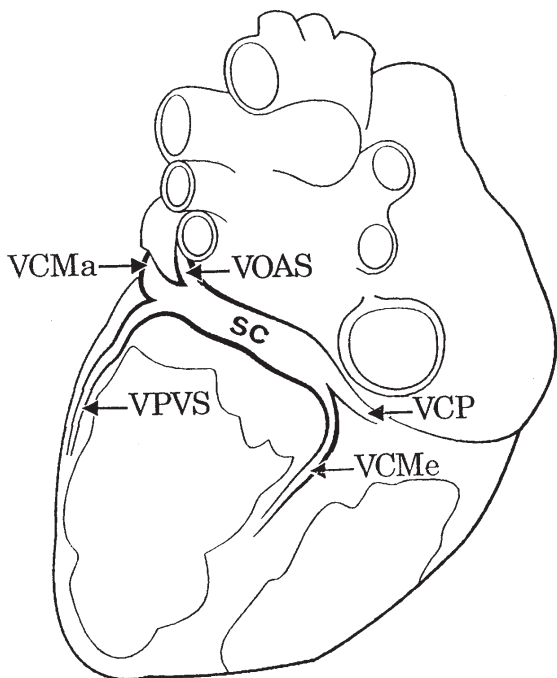


FIGURE 1. Main tributaries of the coronary sinus.

in 56% of hearts (*Saimiri sciurens* – 1, *Cercocebus galeritius* – 1, *Erythrocebus patas* – 5, *Macaca mulatta* – 7, *Papio cynocephalus* – 12 and *Pan troglodytes* – 1) and the small cardiac vein in 30% (*Saimiri sciurens* – 1, *Erythrocebus patas* – 5, *Macaca mulatta* – 3, *Papio cynocephalus* – 5). The great cardiac vein invariably opens into the coronary sinus. Its lumen narrowing was observed between both vessels (Figure 2). The posterior vein of the left ventricle was characterized by great variability with regards to number (1–3) as well as to the location of its outlet. In the examined material one posterior vein of the left ventricle was found most often (84%) (Figure 3), less frequent were two veins (10%) (Figure 4) and the least three (6%) (Figure 5). Two veins were observed in hearts of two *Erythrocebus patas*, one *Macaca mulatta* and one *Saimiri sciurens* and three veins in hearts of *Catarrhinae*: two *Erythrocebus patas* and one *Papio cynocephalus*. In hearts with one posterior vein of the left ventricle the vein always directed into the coronary sinus. However, when two veins occurred, only in approximately 8% did they direct themselves into the coronary sinus, and in 2% the

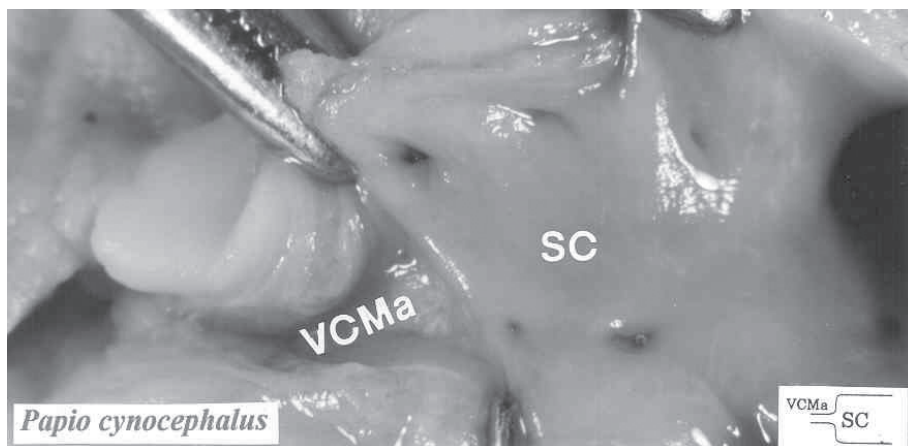


FIGURE 2. The ostium of the great cardiac vein into the coronary sinus.

FIGURE 3. The ostium of the posterior of the left ventricle into the coronary sinus.

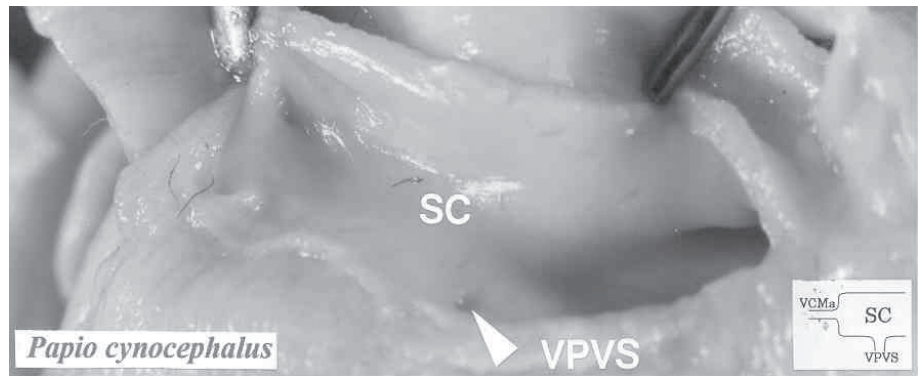


FIGURE 4. The ostium of two posterior of the left ventricle into the coronary sinus.

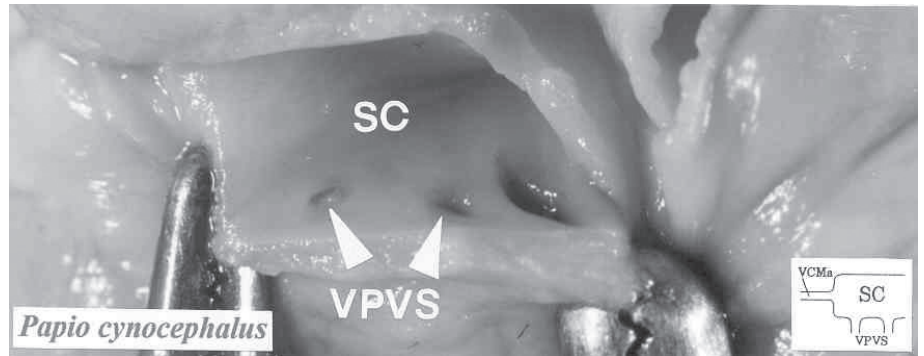


FIGURE 5. The ostium of three posterior of the left ventricle into the coronary sinus.

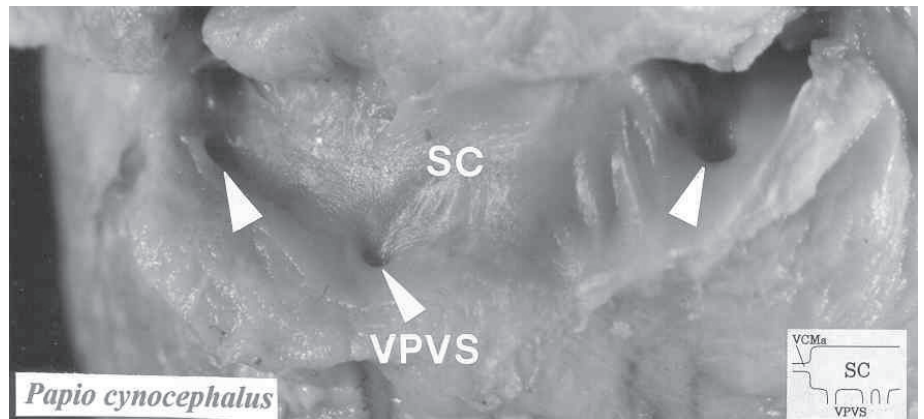
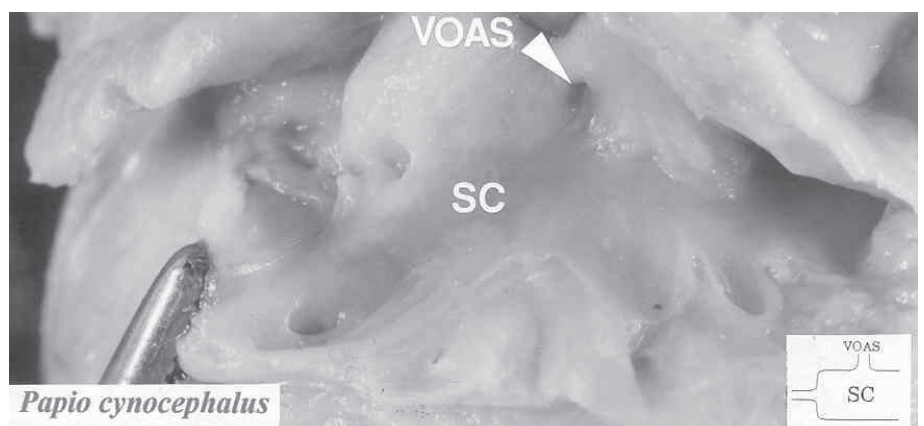


FIGURE 6. The ostium of the oblique vein of the left atrium into the coronary sinus.



right posterior vein of the left ventricle joined the coronary sinus and the left one directly flowed into the great cardiac vein. In hearts with three veins they concluded in the coronary sinus. The oblique vein of the atrium always

opened into the initial portion of the coronary sinus (Figure 6). The middle cardiac vein generally directed itself into the terminal portion of the coronary sinus. It was also observed that this vein opened directly into the right atrium

in 12% of hearts. The small cardiac vein generally ended at the terminal portion of the coronary sinus near the outlet of the middle cardiac vein. Middle and small veins will be worked out in a separate study.

In the examined material the great and middle cardiac veins as well as the posterior vein of the left ventricle were always observed. The remaining tributaries of the coronary sinus were less stable. The outlet portions of the main veins were characterized by significant variability.

DISCUSSION

Many authors describe the morphology of the coronary sinus in human hearts. Many others conduct researches considering its clinical significance, but only some do it on hearts of *Prosimiae* and *Simiae*. Kuta, Grzybiak (1995) mainly dealt with occurrence and configuration of Thebesius valve. Whereas Duda *et al.* (1995) observed occurrence and morphology of valves in the lumen of the coronary sinus.

Researches of other authors confirm that the main heart vein is found (Ratajczyk-Pakalska 1970, Warwick *et al.* 1989) in 100% of humans and other primates and invariably directs towards the coronary sinus. Only Poirier and Charpy, as noted in Ratajczyk-Pakalska (1974), found a variety of the main vein opening directly to the left atrium. Back veins of the left ventricle are always present in examined hearts of *Prosimiae* and *Simiae*, but in human hearts they are not stable. In all primates they occur in variable numbers (1–3) and are most approximate to human hearts (1–4). Three veins were only observed in human and *Catarrhinae* hearts and four only in human hearts (Duda, Grzybiak 1999). Ratajczyk-Pakalska (1974) revealed that openings of the hearts were different in humans and animals. In pigs the openings always direct themselves to the coronary sinus and in humans depending on their number they ended in the coronary sinus or the main heart vein or in both those vessels. In the hearts with a single back vein of the left atrium the vein always went to the coronary sinus. Such a case took place in both hearts of humans and pigs. Results of our studies on monkeys equal with the author's studies. Moreover (Maros *et al.* 1983) found in 7.4% of the examined human hearts that when three or four parallel located veins occurred they went straight to the coronary sinus, which confirms our observations on monkeys. The oblique vein of the left atrium, called Marshall Vein, according to Roberts (1959) is formed from the third left Cuvier canal which atrophies in the early embryonic period and similarly to the coronary sinus is formed from the left embryonic corner of the venous sinus. Both in human and animal hearts it belongs to not stable vessels. Besides in some animals in the place of the left atrium oblique vein and azygos vein occur. Development of the left side azygos veins system in primates was the subject of works by Grzybiak *et al.* (1976), Szostakiewicz-Sawicka *et al.* (1975). This vein

supplements the intracaudal main vein, it is formed under the lumbar section of the spine and is situated on its left side.

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Barbara Duda
 Janusz Jerzemowski
 Anna Orkwiszewska
 Ewa Rogowska
 Jędrzej Sniadecki Academy of Physical
 Education and Sport
 Department of Anatomy and Anthropology
 1 Wiejska Street
 80-336 Gdańsk, Poland
 E-mail: bduda@awf.gda.pl