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TOPOGRAPHIC AND ANATOMICAL FEATURES OF THE MEMBRANOUS PART OF THE INTERVENTRICULAR SEPTUM OF THE HUMAN HEART

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Resume. The article presents data from a topographic-anatomical study of the membranous part of the interventricular septum of 30 adult hearts. Morphometric data are presented and the features of the syntopy and variants of the shape of the membranous part of the interventricular septum are established.

Keywords: heart, human, topography, membranous part of interventricular septum

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ТОПОГРАФО-АНАТОМИЧЕСКИЕ ОСОБЕННОСТИ ПЕРЕПОНЧАТОЙ ЧАСТИ МЕЖЖЕЛУДОЧКОВОЙ ПЕРЕГОРОДКИ СЕРДЦА ЧЕЛОВЕКА

Аннотация. В статье представлены данные топографо-анатомического исследования перепончатой части межжелудочковой перегородки 30 сердец взрослого человека. Приведены морфометрические данные, установлены особенности синтопии и показаны варианты формы перепончатой части межжелудочковой перегородки.

Ключевые слова: сердце, человек, топография, перепончатая часть межжелудочковой перегородки.

Introduction. The interventricular septum is a critical component of cardiac anatomy, separating the right and left ventricles and facilitating unidirectional blood flow. Among its structural regions, the membranous part stands out as the thinnest and most anatomically intricate zone. The membranous part of the interventricular septum (MPIVS) holds substantial clinical importance. Its anatomical configuration—including location, shape, and spatial relationships with the valvular apparatus—directly influences the development of conditions such as ventricular septal defects, semilunar valve dysfunction, and complications during surgical procedures [1–4].

In cardiac surgery, this region serves as an essential landmark for valve repair and congenital defect correction. Its proximity to the atrioventricular conduction system demands precise diagnosis and surgical accuracy, as structural disturbances can result in rhythm disorders or compromised hemodynamics [2, 4].

Although numerous studies have addressed the membranous portion of the interventricular septum, the body of consolidated morphometric data—encompassing its dimensional parameters, morphological characteristics, and syntopic relationships in adult human hearts—remains fragmented. This evidentiary gap underscores the necessity for integrative research to elucidate the structural variability and spatial correlations of this region [1].

Aim: To identify morphological aspects of the membranous part of interventricular septum (MPIS). To show the different morphological variations of the membranous part of the interventricular septum.

Material and methods. The study was conducted on 30 autopsy human adult hearts (ages 52–94) available at the Normal Anatomy Department, fixed in formalin.

Morphological method was used to study various shapes and topography of MPIS (fig. 1A). The position of the membranous part of interventricular septum vis-à-vis the leaflets of the valves was studied and recorded (fig. 1B). Morphometric method was used to study its length, width, and thickness. The data were analyzed using Microsoft Excel and Statistica 10.0.

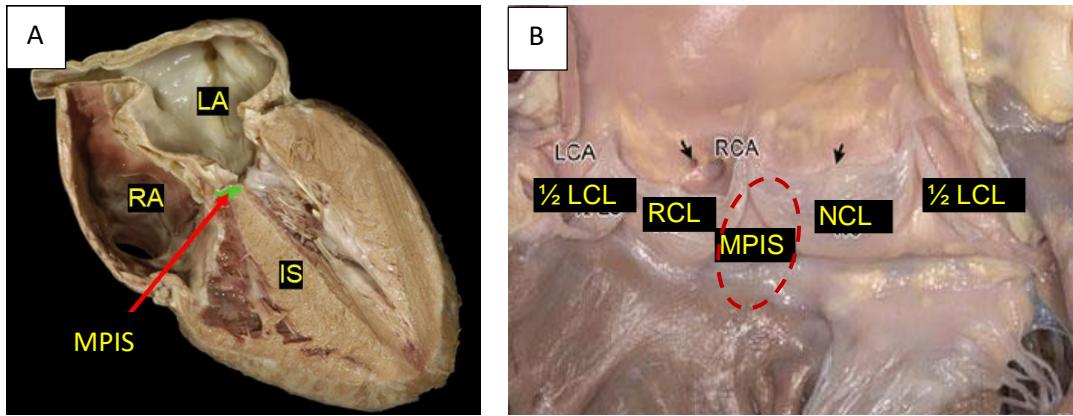


Fig. 1 A– Cross section of the human heart; B– Side view of the aorta

MPIS — Membranous Part of Interventricular Septum

LA — Left Atrium; RA — Right Atrium; IS — Interventricular Septum;

RCL — Right Coronary Leaflet; LCL — Left Coronary Leaflet

NCL — Non-Coronary Leaflet

Results and discussion. Morphometric evaluation of the membranous part of the interventricular septum yielded the following median values and interquartile ranges: length is 17,00 (14,00; 21,00) mm, width is 14,00(13,00; 17,00) mm, and thickness is 1,35 (0,75; 1,75) mm. However, the measurements of MPIVS exhibit sexual dimorphism. In females, the MPIS length is 15,00 (13,00; 21,00) mm, the width is 15,00 (12,00; 19,00) mm, and the thickness is 1,50 (0,80; 1,70) mm. In males, the MPIVS length is 16,50 (14,00; 19,00) mm, the width is 14,00 (13,50; 17,00) mm, and the thickness is 1,45 (1,05; 1,90) mm.

A positive correlation ($\rho = 0.46$) was observed between MPIVS length and width, indicating that as the length increases, the width also tends to increase proportionally.

In contrast, correlation analysis revealed a negative relationship between MPIS thickness and the thickness of both the aortic and pulmonary walls. Specifically, an inverse correlation was observed between MPIVS thickness and aortic wall thickness ($\rho = -0.39$) as well as between MPIVS thickness and pulmonary wall thickness ($\rho = -0.56$). This indicates that as the thickness of either the aortic or pulmonary walls increases, the thickness of the MPIVS tends to decrease, and vice versa.

Three main shapes were found—oval, rectangular, and triangular (fig. 2). The most common were the oval and triangular shapes, each being present in 31% of the cases. Second to them was the rectangular shape, showing up 24% of the time.

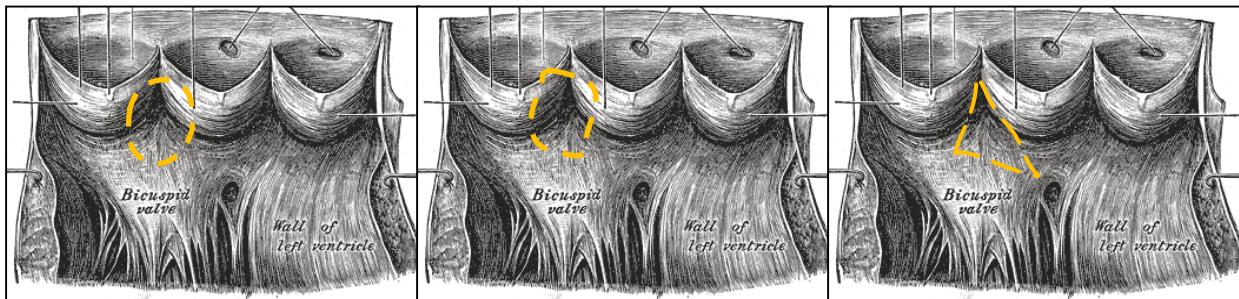


Fig. 2 – Different variants of topography of the membranous part of interventricular septum

1 — Oval Shape; 2 — Rectangular Shape; 3 — Triangular Shape

Some other shapes with much lesser frequencies were also noticed (fig. 3). These included shapes like pentagonal or trapezoid, but they were much less recurrent than the main three shapes.

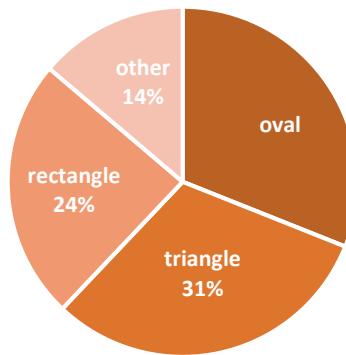


Fig. 3. Distribution of the membranous part of interventricular septum shapes

As for the position of the membranous part of interventricular septum, eight variants were recorded. (Table 1)

Table 1.
Different positions of the membranous part of interventricular septum

	Behind RL	Behind LL	Behind the commissure of RL and LL	Total
In front of RCL	29%	-	7%	36%
In front of the LCL	4%	14%	11%	29%
In front of the commissure between RCL and LCL	21%	4%	11%	36%
Total	54%	18%	29%	

The table shows the bivariate distribution of the position concerning the aortic leaflets on one side and the pulmonary leaflets on the other side. These cases depend greatly on the relationship between the leaflets of both valves.

The most frequent being between the right leaflet and right coronary leaflet (29%), followed by between the left leaflet and left coronary leaflet (14%), and between the commissure of the right and left leaflet, and the commissure between right and left coronary leaflets (11%). In 46% of the cases, five other positions with much lesser frequencies were recorded. (fig. 4)

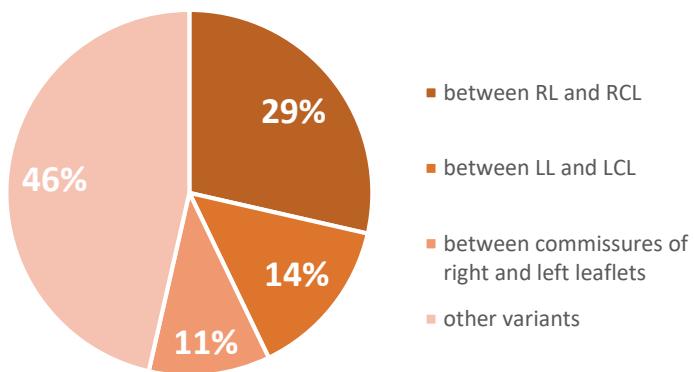


Fig. 4. Different positions of the membranous part of the interventricular septum

Conclusions. Morphological analysis of the membranous part of the interventricular septum revealed three predominant geometric configurations: oval (31%), triangular (31%), and rectangular (24%).

Eight distinct topographical variants regarding the anatomical position of the membranous part of interventricular septum were identified. The most frequently encountered configuration (29%) was located between the right leaflet of the pulmonary valve and the right coronary leaflet of the aortic valve.

A positive correlation was established between the membranous part of interventricular septum length and width ($\rho=0.46$), suggesting a proportionate increase in one parameter relative to the other.

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