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ANATOMY OF THE VALVES OF HUMAN OVARIAN VEINS

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ABSTRACT

In this study, we used mesoscopy to examine the ovarian veins of 30 female corpses for the presence of valves and cusps. One hundred and thirty-one valves were observed in the ovarian veins examined. Most of the valves (91/131 valves or 69.4%) occurred in the distal third of the vein, followed by 27/131 valves (20.6%) in the middle third and, 13/131 valves (10.0%) in the proximal third. The valves consisted of one to five cusps, with most being bicuspid (121/131 or 92.4%): most bicuspid valves (88/121 valves or 72.7%) occurred in the distal third, 24/121 (19.8%) occurred in the middle third and 9/121 (7.4%) were found in the proximal third. Six tricuspid valves (6/131 or 4.5%) were observed, 5 in the distal third and 1 in the proximal third. Only one pentacuspid valve (0.8%) was found in a distal third, whereas three unicuspid valves (2.3%) occurred in the middle third (two cases) and proximal third (one case).These observations confirmed the existence of valves in ovarian veins and suggest that pelvic varicocele may develop when the valves become incompetent, and this may lead the patient to suffer pelvic pain.

Key words: anatomy, ovarian veins, pelvic pain, valves, varicocele

INTRODUCTION

There have been few anatomical studies of human adult ovarian veins in the last 160 years. Castaño [2] described the existence of a single ostial valve in the opening of the right ovarian vein into the inferior vena cava.This valve was considered to be completely incompetent and had atrophic cusps. Other authors have reported the absence of valves in ovarian veins and concluded that the veins of the pampiniform plexus and those which emerge from it do not represent valves [4,6,10]. Testut [10] recognized the presence of bicuspid valves (paired) and reported that unicuspid valves (solitaries) were rare whereas tricuspid valves were even rarer. This author classified the valves into parietal and ostial valves, the latter being less frequent. Valves were more common in small veins than in large ones and in deep veins than in surface veins. Testut [10] highlighted the importance of the valves in directing the blood flow.

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A knowledge of the existence of these valves may have clinical applications, since untreatable pelvic pain may result from pelvic varicocele, i.e. varicose widening of ovarian veins. The differential diagnosis of pelvic pain of uncertain origin must consider possible anatomical abnormalities of the ovarian venous system, and some reports have tried to correlate pelvic varicosities with pelvic pain [11].

The aim of this work was to determine the number of valves and cusps in ovarian veins, in order to improve our understanding of the clinical importance of these structures. These valves are often the anatomical and pathological basis of gynecological conditions, such as pelvic varicocele, which cause local pain [11].

MATERIAL AND METHODS

The material used consisted of 26 blocks of viscera containing the respiratory, digestive and urogenital systems from the corpses of adult women 20 to 78 years old.The material was obtained from autopsies done in the Departamento de Anatomia Patológica of the Faculdade de Ciências Médicas da Santa Casa de São Paulo, and from corpses (n=4) in the Laboratório de Anatomia Descritiva e Topográfica, Departamento de Morfologia of the Universidade Federal de São Paulo- Escola Paulista de Medicina. Racial differences were not considered because of the extensive racial intermixing in the general population.

The dissection was retroperitoneal in all cases. Both left and right veins were dissected (30 from each side) from tissue fixed for seven days in a 10% formaldehyde solution. The course of the ovarian veins received special attention, with care being taken to determine the anatomical source at the confluence of the most distal veins of the pampiniform plexus of each side. The dissection extended along the ovarian vein up to the left renal vein and down to the inferior vena cava. Each ovarian vein was studied by mesoscopy of its internal surface using an Olympus magnifying glass (10X magnification), after longitudinal sectioning. A Zeiss optical microscope was used to obtain photomicrographs (magnification of 30-40X). The mesoscopical examination allowed determination of the presence of valves in the proximal, middle and distal thirds of the ovarian veins. The number and position of the valves with their respective cusps were recorded.

Statistical analysis

The chi-squared (X^2) test for tables of proportional data was used to compare the results for the right and left sides. A "p" value of 0.05 indicated significance.

RESULTS

Table 1 shows the distribution of the valves along the proximal, middle and distal portions of the veins. A total of 131 valves were observed, most of which (69.4%) occurred in the distal third of the veins. The arrangement of the valves was the same for both sides, but there was a numerical prevalence on the left side (76/131 valves or 58%), of the 60 veins examined, only one (a right vein) showed no valves.

Table 2 shows the number of cusps associated with the valves. Most of the cusps (92.4%) were bicuspid (Fig. 1). Very few were tricuspid (5.3%) and even fewer were unicuspid (2.3%) (Fig. 2). There was only one case of a pentacuspid valve (0.8%) in the distal third of a right vein (opening) (Fig. 3). Some valves appeared to be atrophic because of their reduced size (Fig. 4). There was no uniformity in the intervals between valves along the veins.

Table 1. Distribution of valves in the right and left ovarian veins according to the anatomical region.

Region	Right vein		Left vein		Total	
	Nº	%	Nº	%	Nº	%
Proximal	4	7.3	9	11.8	13	10.0
Middle	11	20.0	16	21.1	27	20.6
Distal	40	72.7	51	67.1	91	69.4
Total	55	100.0	76	100.0	131	100.0

X^2 test = 0.83; p = 0.66

Table 2. Number of valve cusps in the right and left ovarian veins according to the anatomical region.

Number of cusps	Right vein			Left vein			Total			
	P	M	D	P	M	D	P	M	D	%
1	-	1	-	1	1	-	1	2	-	2.3
2	3	10	38	6	14	50	9	24	88	92.4
≥ 3	-	-	3	1	-	3	1	-	6	5.3
Total	3	11	41	8	15	53	11	26	94	100.0

D = distal, M = middle and P = proximal regions.

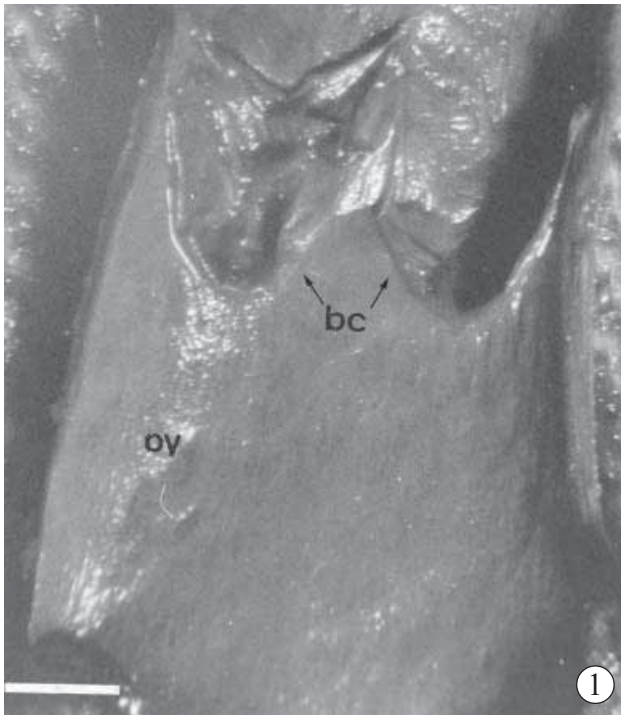

Figure 1. Internal surface view of the distal third of a right ovarian vein showing a bicuspid valve (arrows). ov – ovarian vein; bc – bicuspid valve. Bar = 300 μm.

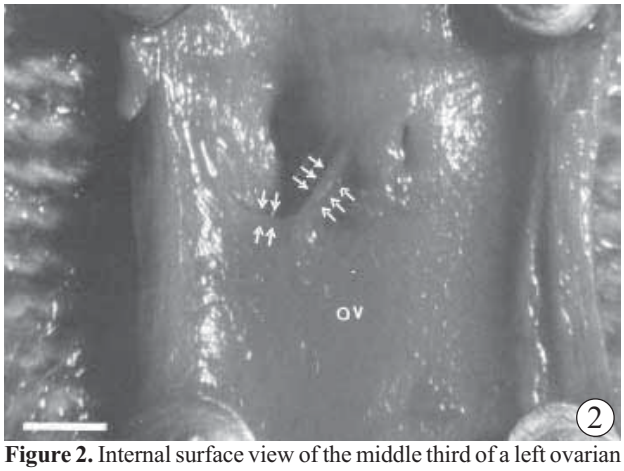

Figure 2. Internal surface view of the middle third of a left ovarian vein (ov) showing a unicuspid valve (arrows) occupying only part of the wall vessel. Bar = 200 μm.

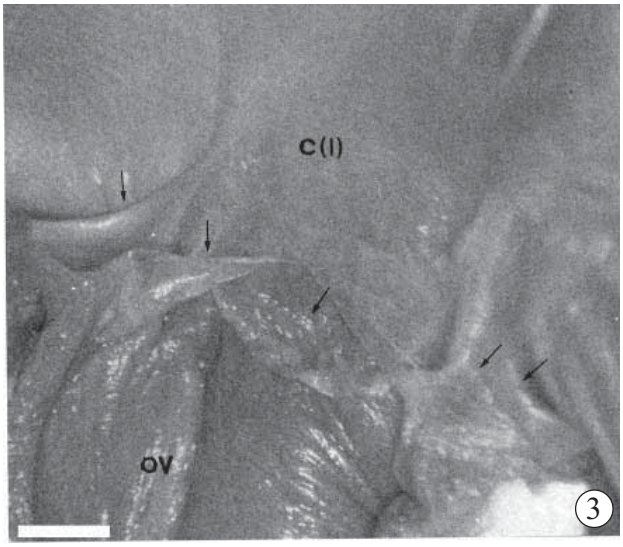

Figure 3. Internal surface view of the opening of a right ovarian vein into the inferior vena cava showing a pentacuspid valve (arrows). C (I) – inferior vena cava (inner); ov – ovarian vein. Bar = 200 μm.

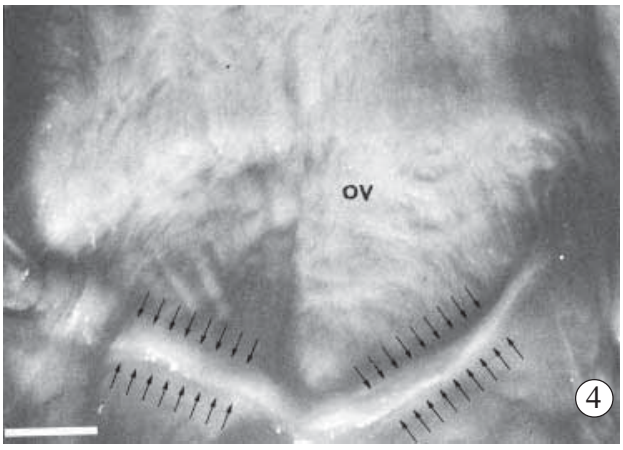

Figure 4. Internal surface view of the proximal third of a left ovarian vein showing an atrophic cusp (arrows) occupying all of the wall vessel. ov – ovarian vein. Bar = 300 μm.

DISCUSSION

The presence of valves close to the opening of smaller tributary veins and the possibility that valves could show early atrophy (reduced size) was recognized by Emge [4]. As shown here, the veins of the pampiniform plexus and those that emerge from it do not have valves. There was a single valve near the opening of the right ovarian vein into the inferior vena cava, as also observed by Emge [4], Chiarugi and Bucciante [3], Braithwaite [1] and Glenister [6]. This valve could be completely incompetent.

Gray and Goss [7] reported that bicuspid valves were most common, followed by tricuspid and, more rarely, unicuspid valves. Similarly, Testut [10] drew the attention to the presence of bicuspid valves (paired), and reported that there are rarely unicuspid valves (solitary) and, even more rarely, tricuspid valves. In agreement with this author, we observed no regular interval between the valves of the ovarian veins. In contrast, Chiarugi and Bucciante [3] reported that the interval between two valves was not irregular but was equal to or a multiple of a fundamental distance. In the case of the ovarian vein, there are no valves, except a single ostial valve in the opening of the right ovarian vein into the inferior vena cava.

Observations based on vaginal ultrasound [8] have revealed that an ovarian venous diameter equal to 10 mm at its widest point is suggestive of pelvic congestion syndrome, and that the normal average diameter of pelvic vessels is 5 mm. The pelvic varicocele, particularly the left side, is susceptible to disease. This difference in susceptibility probably reflects the anatomical variations between the two sides.

Wishahi [11] reported that the right ovarian veins enter the inferior vena cava at an acute angle, and that the "suction" exerted by the inferior vena cava facilitates the circulation of ovarian blood in the right side. Lechter and Alvarez [9] and Giacchetto *et al.* [5] reported that when the right ovarian vein ended in the right renal vein, there was blood stasis, with circulatory collapse in both pampiniform plexuses.

Kennedy and Hemingway [8] reported an average ovarian vein diameter of ≤ 1 cm before its opening, a diameter of 3.8 mm when there were competent valves and 7.5 mm if both were incompetent. These authors established 5 mm as the upper limit for a normal diameter, with the right ovarian vein usually being wider than the left.

Emge [4] suggested that the absence of valves together with a weak venous wall could explain the development of varicose veins in the broad ligament of uterus.

Wishahi [11] dissected testicular and ovarian veins and reported that the ovarian vein always arose as a single stem which, at the level of L4, was divided in medial and lateral branches.

Our results revealed the presence of numerous valves, preferentially on the left side, most of which were bicuspid, were located in the distal third of the veins. These findings suggest a greater physiological need for valves in the left ovarian veins to allow better

control of blood reflux on this side, perhaps because the left ovarian vein drains into the left renal vein at a straight angle. On the right side, the inferior vena cava exerts local suction which enhances blood circulation in the right ovarian vein.

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