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ARS Medica Tomitana - 2025; 1(31): pag. 21 - 26
doi: 10.2478/arsm-2025-0004

LEFT GONADAL VEIN

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ABSTRACT

Our study on 51 cases was performed by dissection and injection of plastic mass followed by corrosion with NaOH, on formalinized human cadavers and on organic blocks aorta-inferior vena cava-right and left kidneys. The trajectory of the gonadal veins was in all cases rectilinear, in 47.06% of cases being oriented supero-medially, and in 52.04% of cases being vertical. At the termination the gonadal vein made with the corresponding renal vein an open lateral angle ranging between 37-900. The termination of the gonadal vein in the renal vein was most frequently on its postero-inferior surface, an aspect encountered in 54.90% of cases. The gonadal vein ended in the renal vein closer to the aorta (56.86% of cases). Compared to the termination of the left inferior adrenal vein, the gonadal vein ended laterally from it in 58.82% of cases, in 33.33% of cases ending at the same level as it, and in 4 cases (7.84% of cases) it ended laterally from the inferior adrenal vein. The caliber of the gonadal vein at the termination in the renal vein was found to be between 1.3-3.2 mm, the average being 2.04 mm. The present study examines the morphological features of the left gonadal veins, providing insights into the increased prevalence of varicocele on the left side. Anatomical knowledge of testicular vein variations and their spatial relationships with neighboring vessels is crucial for urologists and vascular surgeons, as it aids in the accurate diagnosis of urogenital conditions and helps prevent complications during retroperitoneal surgeries and imaging procedures.

Keywords: left gonadal vein-termination, ovarian veins, kidney-aorta-inferior vena cava.

Introduction

The right and left gonadal veins are represented by the testicular (spermatic) vein in males and the ovarian vein in females, resulting from the panpiniform plexus. They vascularize the testicle and epididymis in males, being the spermatic veins, and in females, the ovary and part of the uterus, being the utero-ovarian veins. The testicular veins originate in the testicular capillaries through short veins that converge towards the testicular mediastinum, called central veins. Other veins go to the periphery of the lobules on the albuginea, they are the peripheral veins that reach the testicular mediastinum where they join with the central veins and pass through the spermatic cord towards the medial edge of the epididymis. In the spermatic cord, the veins are arranged in two bundles: the posterior or post-differential venous bundle (which goes to the deep inferior epigastric vein) and the anterior (pre-differential) venous bundle, which is at the origin of the testicular vein. The morphological peculiarities of the left testicular veins explain why the occurrence of varicocele is more frequent on the left side: the left spermatic vein ends perpendicularly in the left renal vein, having a slower flow and generally causing venous stasis in the left gonad (figure 1, 2);

Figure 1. The left gonadal vein, has a rectilinear course, being slightly oblique supero-medially, ends in the renal vein on its lower surface, being located at the end on the left antero-lateral face of the aorta; the suprarenal vein, with an oblique infero-medial course, ends in the renal vein on its upper surface, its termination being on the right antero-lateral face of the aorta, the caliber of the gonadal vein is 2.3 mm, being equal to the caliber of the suprarenal vein; the gonadal vein forms an angle of 370 with the renal artery, and an angle of 98o with the suprarenal vein, both open laterally.

Figure 2 Left gonadal vein with a straight vertical path, ending on the lower surface of the inferior venous branch (closer to the aorta), lateral to the end of the adrenal vein, which has an oblique infero-medial path, ending on the upper surface of the renal vein, at the level of the left anterolateral flank of the aorta; the caliber of the gonadal artery is 2.9 mm, and of the adrenal artery 2.2 mm; the gonadal artery makes an angle of 90° with the renal artery, and an angle of 124° with the adrenal artery, both open laterally.

Above it ends the inferior adrenal vein on the same side, which has a current opposite to the testicular vein and presents an increased amount of catecholamines (1) the left renal vein passes through a muscular clamp given by the muscle of Treitz (suspensory muscle of the duodenum) and through an arterial clamp, the aortic-mesenteric clamp (1, 2); rarity, even absence of the terminal valve or its insufficiency when present (3); the left gonadal vein may be compressed by the descending colon and the lower border of the pancreas (4-8) (figure 3).

Figure 3. The gonadal vein, with a supero-medial course, ends on the inferior surface of the renal vein (halfway between the aorta and the kidneys), with which it makes an angle of 810; the inferior suprarenal vein, with a straight, oblique infero-medial course, ends on the superior surface of the renal vein, on the left lateral surface of the aorta, medial to the gonadal vein; the left gonadal vein has a caliber of 1.6 mm, and the suprarenal vein has a caliber of 2.9 mm.

The ovarian veins, originating from the capillary networks, form a network in the medullary portion. From here, through flexuous veins, with a varicose appearance, they reach

the hilum of the organ. After receiving a series of veins originating from the uterus, the ovarian veins receive the subtubal venous network, then ascend alongside the ovarian artery towards the abdomen, exchanging anastomoses between them (the panpiniform plexus).

After crossing the inguinal canal and entering the pelvis, the panpiniform plexus gives rise to two gonadal veins, which ultimately unite to form a single trunk, on the left flowing into the inferior surface of the left renal vein, and on the right directly into the inferior vena cava (3-7, 9-11).

Description of the termination of the left gonadal vein in the renal vein, observing the level and place of its termination, the direction, the angle it forms with the renal vein into which it flows, the venous caliber at the level of termination in the renal vein. These characteristics were compared with the termination of the left inferior adrenal vein in the renal vein, also measuring the angle that is formed between the two veins at the level of their termination.

Material and methods

Our study was performed on 51 cases, using as working methods dissection on formalinized cadavers and organic blocks kidney-aorta-inferior vena cava-renal veins and arteries. We also used on the organic blocks injection of plastic mass (Technovit 7143), followed by corrosion with NaOH.

Results

The course of the gonadal veins was in all cases rectilinear, in 24 cases (47.06% of cases) being oriented supero-medially, and in 27 cases (52.04% of cases) being vertical. At the termination, the gonadal vein made with the corresponding renal vein an open lateral angle ranging between 37-900.

The termination of the gonadal vein in the renal vein was most frequently on its postero-inferior surface, an aspect encountered in 28 cases (54.90% of cases). In 19 cases (37.25% of cases) the gonadal vein ended on the inferior surface of the renal vein, and in 4 cases (7.84% of cases) on the antero-inferior surface. Compared to the aorta-kidney distance, the gonadal vein ended in the renal vein closer to the kidney in 29 cases (56.86% of cases), in 8 of these cases ending on the left anterolateral face of the aorta, and in 4 cases on the left lateral face of the aorta. In 22 cases (43.14% of cases) the gonadal vein ended in the renal vein halfway between the aorta-kidney distance.

Compared to the termination of the left inferior adrenal vein, the gonadal vein terminated laterally to it in 30 cases (58.82% of cases), in 17 cases (33.33% of cases) terminating at the same level as it, and in 4 cases (7.84% of cases) it terminated laterally to the inferior adrenal vein. At termination, the gonadal artery formed an angle of 84-180o with the inferior adrenal artery (figure 4, 5).

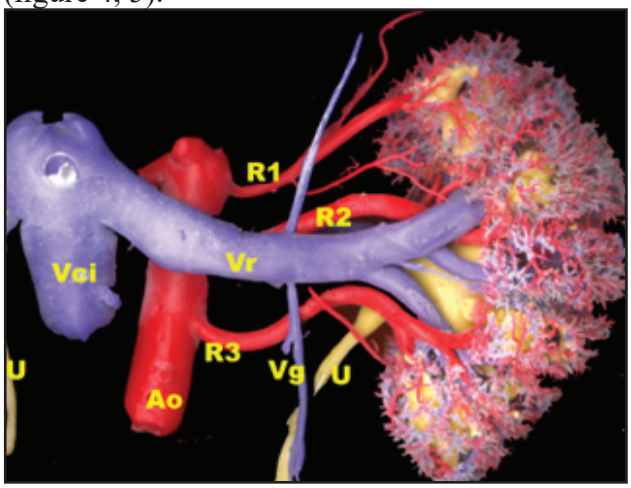

Figure 4 - Triple left renal arteries; the renal vein is located between the middle and inferior renal arteries, the left gonadal vein has a straight course and ends perpendicularly on the postero-inferior surface of the renal vein, at the middle of the aorta-kidney distance; on its ascending path, the gonadal vein passes anterior to the inferior renal artery; the gonadal vein has a caliber of 1.4 mm; the inferior adrenal vein ends perpendicularly on the postero-superior surface of the renal vein, at the same level as the gonadal vein, forming an angle of 1800 between the two veins; the caliber of the adrenal vein is 1.2 mm.

The caliber of the gonadal vein at termination in the renal vein was found to be between 1.3-3.2 mm, the average being 2.04 mm.

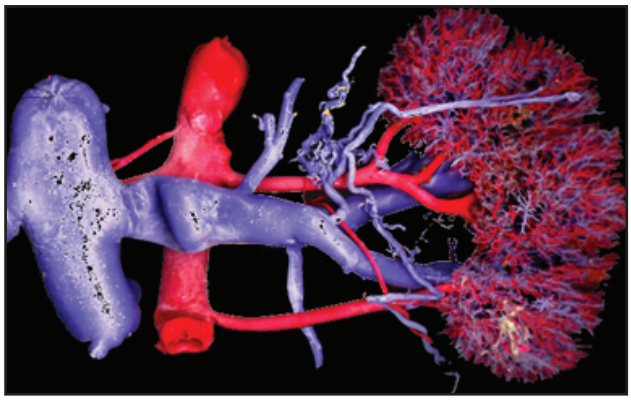

Figure 5. Double left renal arteries, the renal vein being located between the two arteries, closer to the superior artery; the gonadal vein has a rectilinear course, ending perpendicularly on the postero-inferior surface of the renal vein, halfway between the aorta and the kidney; in its ascending course passing posterior to the inferior renal artery; it has a caliber of 2.1 mm; the suprarenal vein has an oblique infero-medial course, ending on the postero-superior surface of the renal vein, closer to the aorta, making an angle of 81° with the aorta; it has a caliber of 3.0 mm.

Discussions

According to (12), variations in gonadal vessels are more common than previously thought, with both arterial and venous variations being more common on the left side (20.73% and 24.61%), than on the right side (12.69% and 18.4%).

Finds that anatomical variations account for approximately 30% and may be variations in origin, caliber, obliquity and relationships with other structures (13). Variation in the testicular vein was found in cadavers in 21.3% of cases, more frequently on the left side (14), and (15) finds variations in the number of left testicular veins in 18% of cases.

We found the gonadal veins present in all 51 cases. According to (12, 16), the right gonadal veins always end in the inferior vena cava, but (13) reports the possibility of the right gonadal vein ending in the renal vein or at the junction of the right renal vein and the inferior vena cava. The termination of the right testicular vein in the right renal vein, or in a right additional renal vein, was also reported by (14, 17-19). The left gonadal vein always ends in the single left renal vein, we found that in 49 cases (96.08% of cases) it ends in the trunk of the renal vein and only in two cases (3.92% of cases) it ends in the inferior branch of origin of the left renal vein.

According to most authors (1, 2, 4-8, 12, 16, 19-23), the left testicular vein opens into the corresponding renal vein at a right angle, rarely at an acute or obtuse angle.

According to (24), the termination of the gonadal vein in the renal vein formed a right angle in 42% of cases (we found it in a higher percentage by 5.06% of cases), an acute angle in 42% of cases (we found it in a higher percentage by 10.04% of cases), and an obtuse angle in 16% of cases (we did not find any case in which the gonadal vein made an obtuse angle with the renal vein in which it ended).

We did not find any case with double left gonadal veins, an aspect reported by (17, 25, 26), authors who describe cases of double left gonadal veins, which end separately in the renal vein on the same side. (27) finds a single left gonadal vein in 87.1% of cases, in 12.9% of cases it is double. The caliber of the left gonadal vein is found by (27) to be between 3.0-3.6 mm, (being larger than the one found by us by 0.6-1.2 mm), and (28) finds it to be between 3.51-3.99 mm (being larger than the one found by us by 1.47-1.95 mm).

Comparing the course of the gonadal vein with the course of the inferior suprarenal vein, we found that in 26 cases (52.0% of cases) the gonadal vein had a supero-medial oblique course, and the inferior suprarenal vein had an infero-medial oblique course. In 12 cases (24% of cases) the gonadal vein had a vertical course, and the inferior suprarenal vein had an infero-medial oblique course, in 9 cases (18% of cases) both veins had a vertical course. and in 4 cases (8% of cases), the gonadal vein had a vertical course, and the inferior suprarenal vein had an infero-medial oblique course.

Comparing the caliber of the two veins, we found that in 26 cases (52% of cases), the gonadal vein had a larger caliber by 0.1-1.4 mm, in 21 cases (42% of cases), the inferior adrenal vein had a larger caliber by 0.1-1.4 mm, and in 4 cases (8% of cases), the two veins had the same caliber.

An angle between the gonadal and inferior adrenal veins was formed at their termination in the renal vein, ranging from 84-180^0.

Conclusions

The anatomical variations of the vascular return to the gonads are not necessarily very special, however the authors are unanimous in emphasizing the importance of knowing this type of vascular variants, since they are often encountered in retroperitoneal surgery: partial nephrectomy, transplantation and angiographic procedures. Clinicians, internists and surgeons, must be familiar with the anatomy of the variations in order to provide an accurate diagnosis during preoperative studies and to avoid surprises in abdominal surgical procedures. This study on the left gonadal veins provides information on the morphology of the left gonadal veins, involved in the occurrence of varicocele more frequently on the left side. (29): "anatomical knowledge of testicular venous variations and their special relationships with adjacent vessels are indispensable for urologists and vascular surgeons to recognize the causes of urinary and genital disorders and to avoid complications of retroperitoneal operations and radiological examinations".

The various differences with the data from the consulted literature could be explained by the number of cases studied and the working methods used, the minimum and maximum values of the monitored benchmarks being frequently found in only one case. We also assume the existence of some differences related to the geographical area in which the study was performed.

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