



ANOMALOUS LEFT SIDED DOUBLE GONADAL VEINS: EMBRYOLOGICAL PROSPECTIVE AND CLINICAL SIGNIFICANCE

Dr. Motiram Khandode

Senior Resident, Department of Anatomy, Maulana Azad Medical College, New Delhi

Dr. Preeti Goswami*

Associate Professor, Department of Anatomy, Maulana Azad Medical College, New Delhi *Corresponding Author

Dr. Sabita Mishra

Professor and Head of Department, Department of Anatomy, Maulana Azad Medical College, New Delhi

ABSTRACT The Duplication of gonadal veins is mainly found more on left compared to right side. Present case reports left sided double gonadal vein draining into left renal vein and its embryological perspective in adult male cadaver. Objective of this work is describing a case of left sided duplication of gonadal veins, where two veins were draining to left renal vein. The presence of variations on the local of drainage of gonadal vessels has clinical importance for comprehension of origin of varicocele, infertility, as well as the recurrence of them after surgical procedures. Hence it's become very important, the knowledge of variation of gonadal veins for interventional radiologist as well as to laparoscopic surgeons.

KEYWORDS : Gonadal vein, Varicocele, Infertility, Interventional radiology, Laparoscopic surgery

INTRODUCTION

Anatomical variation/anomalous means the presence of body structure infrequently but functioning active, having no prejudice of vital functions of the organism.[1] In the present era of invasive interventions procedures such as laparoscopic surgery, interventional radiology and transplantation of kidney, the variation of gonadal veins are great clinical importance. [2]

In living, kidney doner gonadal vein is a very readily available material for vascular reconstruction. In renal vein elongation extension of gonadal vein has been described as simple and safe method. [3]

The testicular vein emerges posterior aspect of testicle and drains the epididymis, after joining to pampiniform plexuses which represent anteriorly to the ductus deferens. This venous plexuses is drainage for three to four veins which pass through the inguinal channels and become two veins, which ascend anteriorly to the ureter and follow the path of testicular artery. The right testicular vein drains to the inferior vena cava, in an acute angle under the renal vein. The left testicular vein drains to the left renal vein in at right angle. [4] This anatomical difference is responsible for relative weak hemodynamic circulation in left testicular vein and considered to be a cause for frequent/incassant left side varicocele. [5]

Varicocele is the dilatation of pampiniform plexuses veins, common on left side pathology in approximately 15% male population including children. [6] It can be important cause for male infertility, nearby 41% of infertile male patient present with varicocele. [7]

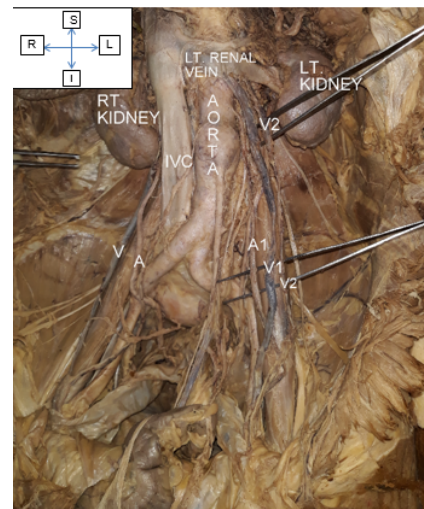
Anomalous gonadal veins may reflect complicated embryogenesis in this area. The gonadal vein presents numeric variations as well as its site of drainage, which attribute to the various clinical conditions such as varicocele, pelvic congestion syndrome. However very little found in the literature or scarcity of literature about the gonadal veins and their anatomical variations. It's become very important to report the present case.

BACKGROUND

MATERIAL AND METHODS

While performing routine adult male cadaveric dissection in Maulana Azad Medical College, New Delhi for undergraduate medical student of abdominal cavity we encounter left side double gonadal veins draining to left renal vein. The anterior abdominal wall was incised and opening of abdominal cavity was done as per Cunningham's manual of dissection. Peritoneal cavity and viscera were defined and studied. Removal of stomach, liver, jejunum, ileum with their mesentery, transverse colon with mesocolon was done. The posterior parietal peritoneum was defined and stripped off exposing the retroperitoneal structures like Inferior vena cava, abdominal aorta,

sympathetic chains, suprarenal and kidneys with fascial coverings, psoas muscle with its fascia. Left renal hilum was cleared precisely to visualize and delineate hilar structures. The pattern of extra hilar confluence of tributaries in forming left renal vein with respect to its number and relation to left renal arterial branches was studied. Left suprarenal vein, left inferior phrenic vein were traced from above. The pattern of termination of left gonadal vein in to left renal vein was traced out and found presence of double gonadal veins terminating or drains at right angle to left renal vein. Left kidney was lifted from underlying psoas major and quadratus lumborum muscle, turned medially to expose the posterior part of renal pelvis. Careful clearing pad of fat from retroperic area was done to visualize the presence or absence of retroperic veins or venous anastomosis. Left psoas major muscle defined and its fascial coverings stripped off. The left renal venous trunk was followed across the aortic terrain and as preaortic (normal).



Photograph No. 1. Showing left sided double gonadal veins. IVC – Inferior Vena Cava, V – Right gonadal vein, A – Right Gonadal Artery, V1 – Left gonadal vein, V2 – Accessory left gonadal vein, A1- left Gonadal Artery

[Direction Symbols: S - Superior, I - Inferior, R - Right, L - Left]

Embryological basis

As per literature and available data right gonadal vein develops from distal part of right sub-cardinal vein. Gonadal vein develops from caudal part of sub-cardinal vein and it drains into the supra-cardinal anastomosis. On the right side, this supra-cardinal anastomosis and also a small segment of vein are incorporated into the formation of renal segment part of inferior vena cava, so the right gonadal vein

usually drains into inferior vena cava (IVC). On the left side, supra-sub cardinal anastomosis forms part of left renal vein where the left gonadal vein drains. [8] The development of gonadal vein closely related to development of renal vein and IVC. Duplication of left side gonadal vein may be due to altered anastomotic channel of post-cardinal, supra-cardinal and sub-cardinal veins.

DISCUSSION

The anatomy and variation of the gonadal veins become very important because of evolution of new operative techniques within the abdominal cavity for operations like varicocele, renal transplantation and undescended testes. [9]

In laparoscopic surgery of abdomen most of the complications are due to unfamiliar anatomy in the operative area. [10]

Knowledge of the variations of gonadal vessels may provide safety guidelines for surgeons and radiologists to perform operative techniques. [11]

Anatomic variations of the testicular veins are frequent, especially number of left side gonadal vein and angle of termination of these veins.

Nayak (2008), described duplication of the gonadal vessels, but together with the duplication of renal veins. In 34 corpses analyzed for Duques et al. (2002), were present a single testicular/ovarian vein in 85.2% and double in 8.8% cases. [12]

These anatomical variations related to testicular veins are more frequently found on the left side. In the study of Asala et al. (2001), 32 of 150 dissected corpses had variations, and 6 of these 32 the variation were present in both sides. [13]

The variations were more frequent in the left side in the work of Favorito et al. (2007) too, with duplication in 15% of the cases. In the right side were found only 5% of duplication. [14]

The dilatation of pampiniform plexus lead to originates the pathological condition varicocele [15]. The varicocele affects in major number the left testicle, causing a deficit in the spermatogenesis because of an alteration of testicle temperature. About 41% of the infertile male population presents varicocele. Yang et al., study confirms that variations of the testicular veins can result on the persistence of varicocele, also hindering retroperitoneal surgical procedures and the own varicocelectomy. [15, 16].

The variation found in the gonadal vessels could be derived from alterations in the embryological origin of these vessels. The gonadal veins are originated from the sub-cardinal vein of fetus, however only in its distal position, when dysplasia occurs in the sub-cardinal venous system, between the 7th and 8th month of intrauterine life, this ANOMALOUS formations of gonadal vein can be present. [17]

CONCLUSION

Anomalous double gonadal veins present in an individual may increase incidence of varicocele, infertility, etc. Hence this case report is important to through light on embryological basis of anomalous gonadal veins and knowledge about variation of testicular vein may prevent intra-operative or post-operative complications after performing laparoscopic surgery in patients.

List of Abbreviations used

IVC - Inferior Vena Cava, V - Right gonadal vein, A - Right Gonadal Artery, V1 - Left gonadal vein, V2 - Accessory left gonadal vein, A1 - left Gonadal Artery Direction Symbols: S - Superior, I - Inferior, R - Right, L - Left

Competing interests: None

Acknowledgements

Our sincere thanks to Department of Anatomy Maulana Azad Medical College New Delhi especially to Dr. Dinesh Kumar Professor and Dissection Hall staff who made brilliant work of preservation of cadaver and made it available for dissection; without their unconditional support this work would have been a distant reality. End notes

REFERENCES

1. Ruiz, C. R. Anatomia Humana Básica - Para estudantes da Área da Saúde. 1a ed. São Caetano do Sul, Difusão, 2010.
2. Gupta R, Gupta A, Aggarwal N. Variations of gonadal veins: Embryological prospective and clinical significance: Journal of clinical and diagnostic research 2015;9(2):AC08-AC10.
3. Veeramani M, Jain V, Ganpule A, Sabnis RB, Desai MR. Donor gonadal vein reconstruction for extension of the transected renal vessels in living renal transplantation. Indian J Urol. 2010;26(2):314-16.
4. Sushan Standring, Gray's Anatomy, 41th Ed., Churchill Livingstone 2015. pp.
5. Itoh M, Moriyama H, Tokunaga Y, Miyamoto K, Nagata W, Satriotomo I, et al., Embryological consideration of drainage of the left testicular vein into the ipsilateral renal vein: analysis of cases of a double inferior vena cava. Int J Androl. 2001;24(3):142-52.
6. Akbay E, Cayan S, Doruk E, Duce MN, Bozlu M: The prevalence of varicocele and varicocele-related testicular atrophy in Turkish children and adolescents. BJU Int. 2000; 86: 490-3.
7. Beck EM, Schlegel PN, Goldstein M: Intraoperative varicocele anatomy: a macroscopic and microscopic study. J Urol. 1992; 148: 1190-4.
8. Sharma, SK]Salwan, Anomalous Right Testicular Artery and Vein, J Clin Diagn Res .2011,5(8):1631 -33.
9. Pushpa Dhar, Kumud Lal. Main and accessory renal arteries – A morphological study. J Anat Embryol. 5;110:101–10.
10. Brohi RA, Sargon MF, Yener N. High origin and unusual suprarenal branch of a testicular artery. Surg Radiol Anat. 2001;23:207–08.
11. Punita Sharma, Surinder Kumar Salwan. Anomalous right testicular artery and vein: embryologic explanation and clinical implications. Journal of Clinical and Diagnostic Research. [serial online] 2011;5:1631-33. [cited: 2014 Dec 13]
12. Nayak, B. S. Multiple variations of the right renal vessels. Singapore Med. J., 49(6):e153-5, 2008.
13. Asala, S.; Chaudhary, S. C.; Masumbuko-Kahamba, N. & Bidmos, M. Anatomical variations in the human testicular blood vessels. Ann. Anat., 183(6):545-9, 2001.
14. Favorito, L. A.; Costa, W. S. & Sampaio, F. J. Applied Anatomic Study of Testicular Veins in Adult Cadavers and in Human Fetuses. Int. Braz. J. Urol., 33(2):176-80, 2007.
15. Yang, C. Y.; Xue, H. G.; Tanuma, K. & Ozawa, H. Variations of the bilateral testicular veins embryological and clinical considerations. Surg. Radiol. Anat., 30(1):53-5, 2007.
16. Favorito, L. A.; Costa, W. S. & Sampaio, F. J. Applied Anatomic Study of Testicular Veins in Adult Cadavers and in Human Fetuses. Int. Braz. J. Urol., 33(2):176-80, 2007.
17. FERNANDES, J. R.; STRUFALDI, M. B.; MACHADO, B. S.; NASCIMENTO, S. R. R.; WAFAR, N. & RUIZ, C. R. Duplicación bilateral de las venas gonadales: reporte de caso. Int. J. Morphol., 30(4):1487-1489, 2012.]