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Case Report

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RIGHT SUPERIOR TESTICULAR ARTERY ORIGINATING FROM A TRIFURCATING BRANCH OF RIGHT RENAL ARTERY AND ITS ASSOCIATED ANOMALIES - A CASE REPORT

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ABSTRACT

Anatomical variations in the testicular vessels may be encountered during renal transplantation surgery. We report a case of a double testicular artery on the right side. One arising from the right renal artery (RRA) as the lateral most branch of a trifurcating vessel. The second testicular artery was originating from the abdominal aorta. Two testicular veins were observed on the right side, each draining into the right renal vein (RRV) on its superior and inferior aspects. The left testicular artery originated from the abdominal aorta and ascended to hook around the inferior division of duplicated left renal vein (LRV). To our knowledge, such a unique combination of duplicated testicular vessels on one side with a trifurcation from the RRA with the right suprarenal gland receiving blood supply from a trifurcating vessel as well as the superior testicular artery (STA) was not reported earlier.

KEYWORDS: Arching testicular artery, Duplicated testicular artery, Duplicated testicular vein, Renal Vein, Suprarenal artery.

INTRODUCTION

Surgeries involving kidneys require an excellent knowledge about variations of renal vessels and its branches and tributaries. Reporting of variations of testicular vessels is necessary, as unrecognised variations may lead to errors in the diagnosis and surgical procedures involving both testicular and renal vessels. This case report focuses on variations of testicular vessels of the both sides. Generally, testicular arteries arise from the abdominal aorta and descend inferolaterally to enter the deep inguinal ring and supply the corresponding testis. The right testicular vein ascends from the testis, enters the abdominal cavity through the deep inguinal ring and terminates in inferior vena cava (IVC) while the left testicular vein follows the same course but finally drain into the left renal vein (LRV). Variations in the origin and course of testicular arteries were studied by Notkovich who classified testicular arteries based on their site of origin. [1] Variations noticed in the origin, branching pattern and termination of testicular vessels are discussed here.

CASE REPORT

During routine dissection of a 70-year-old male, formalin fixed cadaver for undergraduate teaching in the department of anatomy, JIPMER, Pondicherry, India, in the year 2017, the following variations were observed in the testicular vessels.

On the right side, we observed two testicular arteries, (described as superior and inferior); and two testicular veins (described as lateral and medial) (Fig 1a). The RRA gave rise to a vessel, from its superior aspect, about 3.5 cm from the right margin of the abdominal aorta. This vessel immediately trifurcated after its origin. From the trifurcation, the medial branch supplied the superior mesenteric ganglion, the middle branch supplied the right suprarenal gland and the lateral branch continued as one of the testicular artery [right superior testicular artery (STA)]. The right STA then passed laterally posterior to the right renal vein (RRV), where it gave rise to another artery, which ascended and supplied the right suprarenal gland (Fig 1b). Further, the right STA joined the right lateral testicular vein (LTV), anterior to the middle of the right kidney and passed in a common fascial sheath. They descended anterior to the lower pole of right kidney, right quadratus lumborum, right iliacus, right psoas major and exited through the right deep inguinal ring. Near its termination, the artery became tortuous and divided into two to supply the upper and lower pole of right testis. The right LTV was arising from the middle pole of right testis as a plexus and when traced above, found draining to the RRV on its superior aspect.

Another testicular artery [right inferior testicular artery (ITA)], originated directly from the abdominal aorta from the right side, 3cm inferior to the origin of superior mesenteric artery. It coursed laterally, posterior to the IVC and joined the right medial testicular vein (MTV) at the lower pole of the right kidney. Both the right ITA and right MTV descended in a common fascial sheath passing anterior to the Gerota's fascia and right psoas major and exited through the right deep inguinal ring and terminated in the middle pole of right testis. The right MTV was arising along with LTV as a plexus and when traced proximally was seen to be draining into the RRV on its inferior aspect (Fig 1a, 2).

On the left side, we observed a duplicated LRV. The left testicular artery originated from the left side of abdominal aorta 2.8cm inferior to the origin of superior mesenteric artery. The artery then ascended and hooked around the lower division of duplicated LRV to descend downwards, anterior to the left psoas muscle along with left testicular vein in a common fascial sheath and exited the abdominal cavity through the left deep inguinal ring.

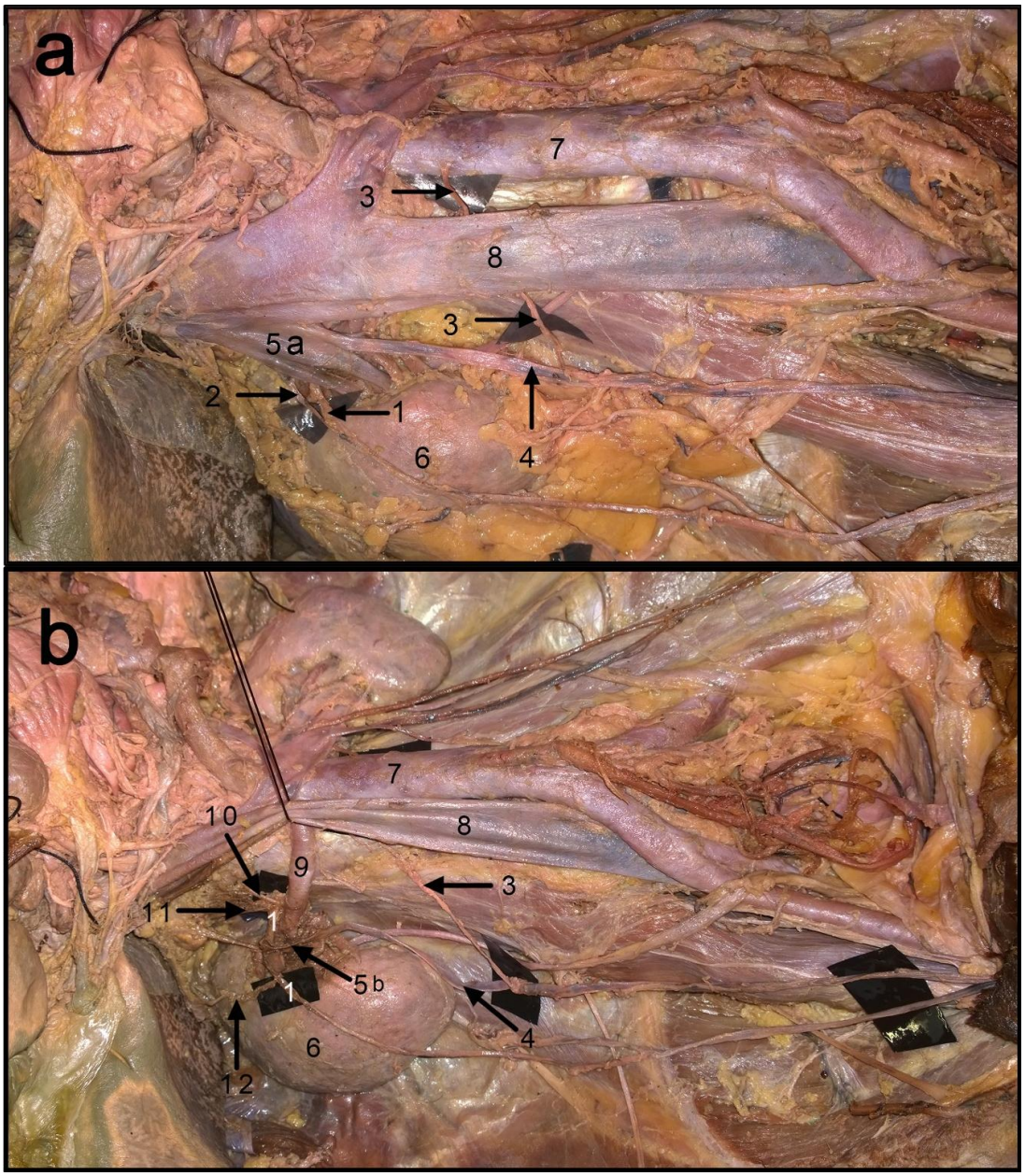

Fig 1a Duplication of right testicular vessels. 1 – Right superior testicular artery, 2 – right lateral testicular vein, 3 – right inferior testicular artery, 4 – right medial testicular vein, 5a – right renal vein, 6 – right kidney, 7 – aorta, 8 – IVC. **Fig 1b** Trifurcating origin from the right renal artery. 1 – right superior testicular artery, 3 – right inferior testicular artery, 4 – right medial testicular vein, 5b – right renal vein cut and reflected, 6 – right kidney, 7 – aorta, 8 – IVC, 9 – right renal artery, 10 – artery to superior mesenteric ganglion, 11 – right inferior suprarenal artery, 12 – additional right inferior suprarenal artery from testicular artery.

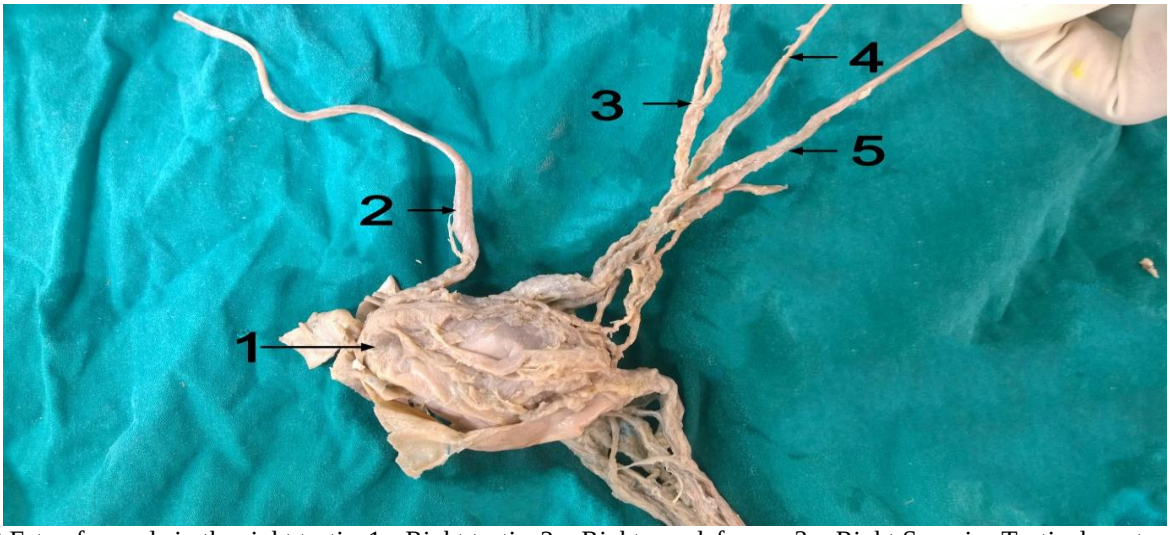

Fig 2 Fate of vessels in the right testis. 1 - Right testis, 2 – Right vas deferens, 3 – Right Superior Testicular artery, 4 – Right Inferior Testicular artery, 5 – Right Testicular Vein and bifurcated at its termination to supply upper and middle pole of the left testis. The left testicular vein was originating as a plexus from the middle pole of left testis and terminated in left renal vein. There was no duplication of left testicular vessels as observed on the right side (Fig 3a).

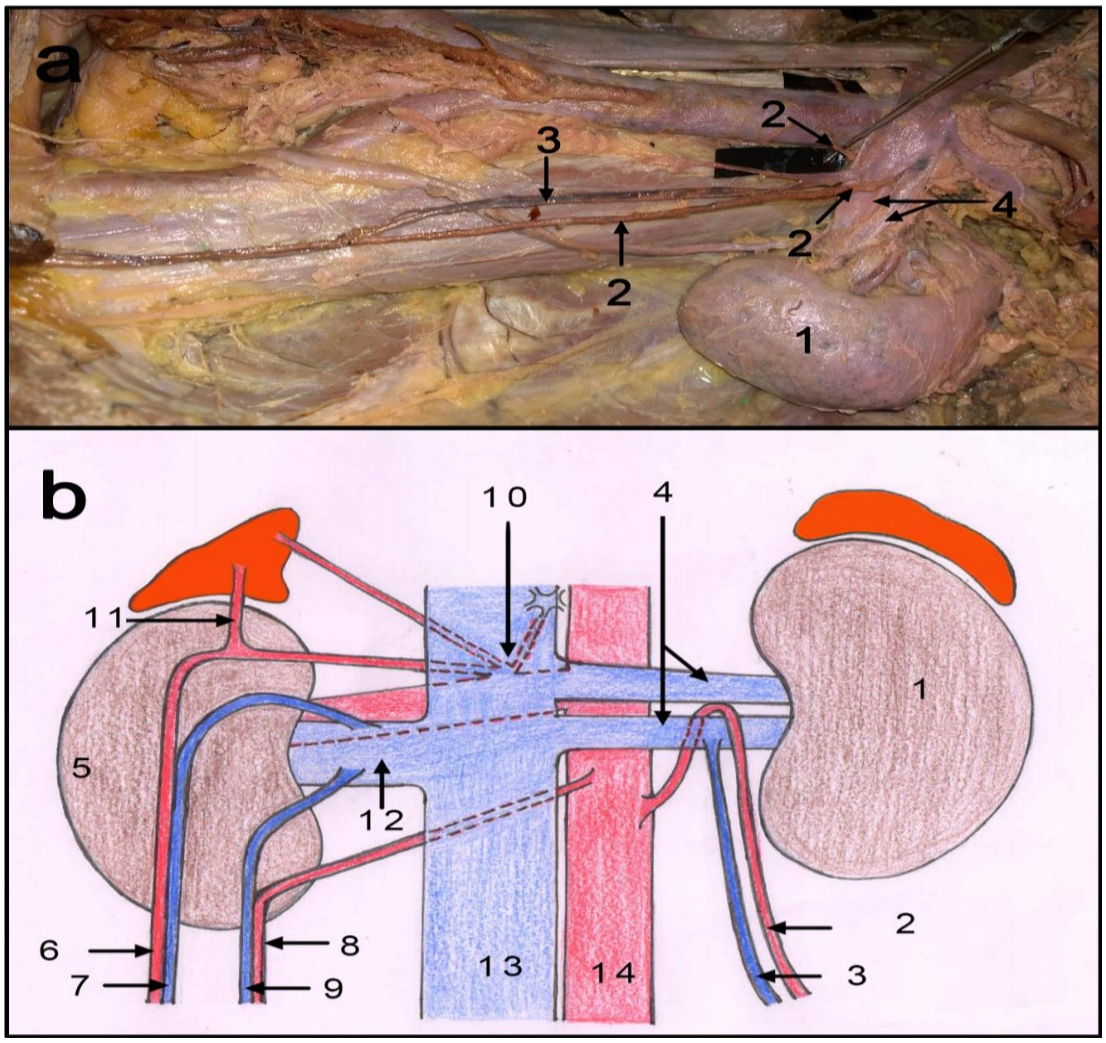

Fig 3a: Arching left testicular artery around the left renal vein. 1 – left kidney, 2 – left testicular artery, 3 - left testicular vein, 4 - upper and lower divisions of duplicated left renal vein. Fig 3b Pictorial representation of variations of testicular vessels. 1 – left kidney, 2 – left testicular artery, 3 – left testicular vein, 4 – upper and lower divisions of duplicated left renal vein, 5 – right kidney, 6 - right superior testicular artery, 7 - right lateral testicular vein, 8 - right

inferior testicular artery, 9 - right medial testicular vein, 10 – trifurcation from right renal artery, 11 - additional right inferior suprarenal artery from testicular artery, 12 – right renal vein, 13 – IVC, 14 – aorta

Table 1: Comparison of earlier reported variations with the present case.

S No	Author	Duplicated testicular artery			Origin of suprarenal artery from testicular artery	Testicular artery arching over renal vein	Duplicated testicular vein
		Side	Normal artery	Accessory artery			
1.	Asala S et al [5]	Right	Abdominal aorta	Abdominal aorta	Right inferior suprarenal artery		Unilateral complete duplication on right or left side (different cases).
							Unilateral partial duplication on left side terminating as a single vein.
							Bilateral duplication
2.	Çiçekcibaşi AE et al [6]	Right 3case.	Abdominal aorta	Abdominal aorta			
			Abdominal aorta	Suprarenal artery			
			Abdominal aorta	Suprarenal artery			
3.	M. C. Rusu[2] (Bilateral)	Left	Single artery from abdominal aorta duplicated after arching			Left	
		Right	Abdominal aorta	Suprarenal artery			
4.	Pai M M et al[1]	Right	Abdominal aorta	Renal artery			
5.	Nayak S R et al[4]	Right	Abdominal aorta	Renal artery	Right inferior suprarenal artery	Left	
6.	Paraskevas G K et al[3] (Bilateral)	Right	Abdominal aorta	Renal artery		Left accessory testicular artery	
		Left	Abdominal aorta	Abdominal aorta			
7.	Jyothsna P et al[7]	Left	Abdominal aorta	Abdominal aorta	Left inferior suprarenal artery		
8.	Xue H G et al[10]						Right medial vein to IVC Right lateral vein to junction of the IVC and right renal vein
							Partially duplicated left testicular veins terminated into the left renal vein as a single vein.
9.	Present study	Right	Abdominal aorta	Right renal artery as a lateral most branch of trifurcation	Right inferior suprarenal artery	Left	Right medial and lateral vein to right renal vein

DISCUSSION

Precise knowledge of anatomical variations in origin and termination of gonadal vessels are important to avoid complications in surgeries ranging from renal transplant to a drainage of psoas abscess. We are reporting a case of rare variation of gonadal vessels which was observed during dissection of the posterior abdominal wall.

Abnormal origin of testicular arteries, double testicular arteries and abnormal branches from testicular arteries had been reported earlier. Based on its relation to renal vein, Notkovich in 1956 had classified testicular artery into Type I – the artery passes laterally and downwards after arising from the aorta below the level of the renal vein. Type II – the artery passes anterior to the renal vein after arising from aorta above the renal vein. Type III –

the artery passes upwards to arch around the renal vein after its origin from the aorta below the level of the renal vein. [1] Type III is the rarest variety and we observed a similar variation in the left testicular artery (Fig 3a).

Arching of the testicular artery were reported by various authors. Rusu M C observed arching of left testicular artery around left renal vein before dividing into medial and lateral testicular arteries. [2] Paraskevas G K et al reported an accessory left testicular artery originating just above the origin of the left renal artery and arching around LRV before descending. [3] Nayak S R et al also reported arching left testicular artery over the lower tributary of LRV proper. [4] In the index case, there was a duplication of the LRV; and the left testicular artery arched around the inferior division of LRV.

Right sided duplicated testicular arteries with accessory artery originating from the abdominal aorta, renal arteries or suprarenal were reported by Pai M M et al[1], Nayak S R et al[4], Asala S et al[5] and Çiçekcibaşi AE et al.[6] A case of left sided double testicular artery with both originating from abdominal aorta was reported by Jyothsna P et al.[7] Rusu M C[2] and Paraskevas G K et al[3] reported cases of bilateral duplicated testicular artery. Nayak S R et al[4] and Asala S et al[5] reported the origin of right inferior suprarenal artery from testicular artery. Jyothsna P et al reported left inferior suprarenal artery arising from the left testicular artery. [7] In the index case, there were two testicular arteries on the right side. The right STA originated as the lateral most branch of a trifurcation from the superior surface of the RRA. The right STA gave off an inferior suprarenal artery to the right suprarenal gland. Such pattern was not reported earlier. However, the right ITA originated from the abdominal aorta. The superior artery bifurcated near its termination and supplied the upper and lower poles of right testis, while the inferior testicular artery terminated at the middle pole. Both vessels became tortuous near its termination. Mostafa et al based on their study on eighty testes reported variations in the termination of testicular arteries.[8]

The lateral and medial divisions of right testicular veins were arising from the middle pole of right testis as a plexus. The right LTV emerged through the deep inguinal ring along with the artery and ascended to end in the superior border of RRV. The right MTV also emerged through the deep inguinal ring along with the artery and ascended to end in the RRV on the inferior border. The right testicular veins generally drain into the IVC directly. Ahlberg et al reported that right gonadal veins drain into RRV in 10% men and 7% women. [9] Asala S et al noticed three types of duplication of testicular veins on both right and left sides. In one type, the veins were duplicated throughout their course and drained separately into a single renal vein or renal vein and accessory renal veins. In another type, a double left testicular vein joined before draining into the LRV. In the third type, there was a bilaterally duplicated testicular vein. The right veins joined together to drain into IVC and left veins drained into renal and accessory renal vein or into the LRV.[5] Bilateral duplicated testicular veins were reported by Xue H G et al, where right veins drained to IVC and junction of IVC and renal vein and left veins joined and drained into the LRV.[10] The reported cases of abnormal origin, course and duplication of testicular vessels are summarised in Table 1.

Variations in gonadal vessels are attributed to the complex steps involved during the development. Nine Lateral mesonephric arteries are divided into cranial, middle and caudal branches with longitudinal anastomotic channels connecting them. During development of gonads, lateral mesonephric arteries and their anastomotic channels undergo various stages of involution. Modifications in such disappearing vessels will lead to variations in testicular, renal and suprarenal vessels. Generally, caudal branches disappear except for one, which differentiates into testicular artery. If cranial lateral mesonephric arteries persist it will result in a higher origin of testicular artery. If more than one lateral mesonephric arteries persist, then duplication or triplication of testicular arteries can occur. There is an ascent of kidneys and descent of developing gonads. Renal vessels are developed from middle lateral mesonephric arteries. If kidney along with its renal vein ascends to higher level than the origin of gonadal artery, then the gonadal artery will take an arched course above the renal vein. Kidneys on the left side ascend higher than that of right side which explains the higher frequency of gonadal artery arching on the left side.[3,11] Persistence of a segment of longitudinal anastomosis between the cranial lateral mesonephric arteries which will give rise to inferior suprarenal and testicular arteries may be the reason for inferior suprarenal artery arising from the right testicular artery. Failure of involution of any part of intersubcardinal anastomosis during development results in duplication of testicular veins.[10]

In conclusion, we report a unique case were the right testicular artery is duplicated, with the accessory artery originating as a trifurcation from RRA, the accessory testicular artery giving an additional inferior suprarenal artery, the duplication of right testicular veins and both draining into RRV and the left testicular artery arching around the inferior division of a duplicated LRV (Fig 3b). Such a combination in a single case has not been reported in the literature to our best knowledge which makes this case an exclusive one. Knowledge of duplicated testicular arteries is essential before attempting angioplasties in the region and to prevent misinterpretation of angiographies. Incomplete interruption of testicular veins due to unnoticed duplicated testicular vein results in failure of varicocelectomy. Renal vascular hypertension could result due to arching of testicular artery around the renal vein. Renal artery embolization done for treating renal tumors could jeopardize the blood supply to the organs supplied by branches arising from renal artery like

testicular, suprarenal arteries and artery to superior mesenteric ganglion as observed in the present case.

CONFLICT OF INTEREST

We declare no conflict of interests.

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