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INTRASCROTAL ANOMALIES RELATED TO TESTICULAR TORSION IN NIGERIANS: AN ANATOMICAL STUDY

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Objective: The abnormalities that predispose to torsion are often bilateral. They include horizontally lying testis, bell-clapper deformity (BCD), long mesorchium, well-developed spiral cremasteric muscle and ectopic testis. The pattern and incidence of intrascrotal anomalies that predispose to testicular anomalies in Nigerians have not been studied. Our objective was to define and document this.

Material and Methods: The scrotal sacs of fifty cadaver scrotums and inguinal canals from patients aged between 35 and 57 years (mean age: 42 years) were examined. The parameters studied were the location (scrotal or canalicular), alignment (horizontal, vertical), mesorchium (height and width), cremasteric muscle development (well or poorly developed) and parietal tunica vaginalis investment of the testis (normal, intermediate or BCD).

Results: Forty-nine testes had descended to the scrotal position; all were anchored by the ligamentum testis. The canalicular position was noted to be present in one cadaver. Forty-eight testes lay vertically. 16% of the testes had BCD, while intermediate tunica investment was noted in 12%. The most common type of epididymal and testicular relationship was Type I (84%). The mesorchium was normal in all specimens examined.

Conclusion: The most common anomaly in our study was that of tunica investment, and this is usually bilateral. The need for bilateral orchiopexy in cases of testicular torsion is further strengthened since the anatomic anomalies are usually bilateral.

Key Words bell clapper deformity, alignment, mesorchium, torsion

INTRODUCTION

Testicular torsion (TT) is a urological emergency, which was first encountered by Delasiauve (a Frenchman) in 1840, while exploring a condition he had thought pre-operatively to be a strangulated hernia[1]. TT is a very painful condition that leads to permanent reduction or loss of fertility (bilateral) if not treated promptly.

Torsion of the testis accounts for over 50% of all scrotal conditions in young adults and can occur anytime throughout life[2]. It has been observed in the newborn and the elderly[3,4], however, it is more frequent in teenagers and young adults[2]. The vanishing testis syndrome may be secondary to testicular torsion[5].

A normal, fully descended, correctly situated and properly fixed testis rarely undergoes torsion. Intrascrotal anomalies are needed for torsion to occur[2]. TT usually results from changes in the implantation of the tunica vaginalis or epididymal disjunction[6]. If the tunica is implanted too high, the testis can present excessive mobility (bell clapper testis)[6]. The mesorchium unites the testis to the epididymis[6,7]. In cases of epididymal disjunction or elongation, the mesorchium is long and can predispose to TT. This anomaly is frequent in cryptorchism[7-10]. Other anomalies include horizontally lying testis, bell-clapper deformity (BCD), long mesorchium, well-developed spiral cremaster muscle and ectopic testis. These abnormalities are often bilateral.

What triggers testicular torsion in an abnormal testis is not totally clear. Exercise, sexual foreplay, an abnormal position during sleep or when sitting, sudden closing of the thighs,

Table 1: Intrascrotal Anomalies

Parameter	No. of Testes	%
Position		
Scrotal	49	98%
Canalicular	1	2%
Alignment		
Horizontal	2	4%
Vertical	48	96%
Ligamentum testis		
Present	50	100%
Absent	-	-
Cremasteric muscle		
Well-developed	3	6%
Poorly developed	47	94%
Tunica vaginalis		
Normal	36	72%
Intermediate	6	12%
High (BCD)	8	16%
Long mesorchium	-	-

tight pants, coughing, defecating, cold and perhaps mild trauma may be additional factors[2,11,12]. The testis can undergo torsion whilst the patient is asleep and there may be a history of one or two short prodromal episodes of pain. This suggests periods of torsion and detorsioning[12].

It has been postulated that patients with a unilateral vanishing testis as well as those who have experienced intravaginal torsion often have a contralateral BCD[13]. Guiney et al. noted intravaginal torsion occurring in 20% of neonates with testicular torsion[14]. TT in infancy is thought to be mainly due to abnormal attachments of the testis to the tunica vaginalis[15]. Rarely the testis alone may rotate, when the epididymis and testis are joined only at the upper pole of the testis. This accounts for less than 5% of all cases of TT. A strong abdominal wall muscle contraction causes the cremasteric muscle to contract. The spiral attachment of the cremasteric muscle favours rotation around the vertical axis. Straining during defecation, lifting of heavy weights and coitus are all possible precipitating factors to strong cremasteric muscle contraction.

Studies on the anatomic aspects of the tunica vaginalis and the association with epididymal anatomy and its anomalies in patients with testicular torsion are scarce[6,16]. The aim of this study was to define the pattern and incidence of intrascrotal abnormalities related to testicular torsion in Nigerians.

MATERIAL AND METHODS

A total of 50 formalin-fixed male adult cadavers with a mean age of 42 years (range: 35-57 years) collected at the department of Anatomy, College of Medicine, University of Ibadan, Nigeria, were used for the study.

The scrotal sacs were entered by a longitudinal scrotal incision. The inguinal canal was also opened when the testis and spermatic cord were not located in the scrotal sac. The alignment (horizontal, vertical), presence or absence of ligamentum testis, mesorchium (length and width) and parietal tunica vaginalis covering of the testis (normal, intermediate or high) were noted, as well as the development of the cremasteric muscle (well or poorly developed).

In the normal testis, the parietal tunica surrounds the entire testis and most of the epididymis. A small area of the epididymis and entire spermatic cord are outside the parietal and visceral tunica vaginalis. In the intermediate type, the tail of the epididymis lies within the tunica vaginalis while the entire spermatic cord lies outside the tunica vaginalis. In the BCD the testis, epididymis and part of the spermatic cord are inside the tunica vaginalis. The anatomy of the tunica vaginalis and the relationship between testis and epididymis were classified according to the following previously described system[17,18]:

- Type I: epididymis united to the testis by its head and tail;
- Type II: epididymis totally united to the testis;
- Type III: disjunction of epididymal tail;
- Type IV:disjunction of epididymal head;

- Type V: total disjunction between epididymis and testis
- Type VI: epididymal atresia.

RESULTS

Forty-nine pairs of testes had descended to the scrotal position. The canalicular position was noted to be present in one cadaver on the left side. Forty-eight pairs lay vertically, one lay horizontally within the scrotal sac. The testis found in canalicular position lay with its longitudinal axis along the length of the inguinal canal, with the head of the epididymis lateral. (Table 1)

Three testes had an associated well-developed cremasteric muscle. The ligamentum testis anchored all intra-scrotally located testes. Of the fifty testes, 16% had BCD. Intermediate investment was observed in 12% and normal testicular investment in 72% of the testes (Table 1). The side had no effect on the incidence of anomalous investment. (Table 2)

The average height and width of the mesorchium was 12.3 mm (10-17 mm) and 5.2 mm (4-7 mm), respectively. The attachment between the testes and the epididymis was quite strong.

The most common type of testicular-epididymal relationship was Type I (Table 3). There was no abnormally long testis.

Table 2: Distribution Pattern of the Tunica Investment

Investment	Right	Left	Total
Normal	18	18	36
Anomalous	7	7	14
Total	25	25	50

Table 3: Frequency of the Various Types of Testicular-Epididymal Relationship

Type	Number	%
I	42	84%
II	6	12%
III	2	4%
IV-VI	0	0%

DISCUSSION

The testis normally descends from its antenatal intra-abdominal position into the scrotum before birth, guided by its gubernaculum and ensheathed in the processus vaginalis. At birth or shortly afterwards, the proximal part of the processus disappears and the distal part wraps round the testis, covering all except its posterolateral (dorsal) aspect. The posterior region of the testis is not covered by tunica vaginalis. United to the lower pole region of the testis and the epididymal tail, there is the testicular gubernaculum or its remnant, the testicular ligament, which is covered by tunica vaginalis only in its anterior and lateral portions. The ligamentous remnant of the gubernaculum anchors the testis to the scrotal wall. The testis and epididymis develop separately but normally fuse with no intervening mesentery.

Two distinct anatomic forms of testicular torsion are recognized: torsion of the spermatic cord and torsion of the mesorchium. Twisting of the cord can occur within the tunica vaginalis (intravaginal torsion) or affect the entire length of the cord (extravaginal torsion). Extravaginal torsion occurs almost exclusively in neonates. Of all the aforementioned types of testicular torsion, intravaginal torsion of the spermatic cord is the commonest variant encountered in practice.

The most common intrascrotal anomaly we noted was that of BCD (Table 1). Caesar et al. noted an incidence of 12% in an autopsy series[16], while Parker and Robinson found this deformity in 35% of 40 studied cases[12]. Muschat described the association of BCD with testicular torsion[15]. When the testis, epididymis and part of the cord are completely invested by the visceral tunica vaginalis, the testis is suspended like a clapper in a bell (BCD) and can be rotated with ease.

Ishizuka et al.[19] attempted to classify the manner in which the testis is covered by the parietal tunica vaginalis in intravaginal torsion by the extent of the fixation of the epididymis to the posterior aspect of the scrotum. BCD was documented in six of ten patients presenting

with testicular torsion. The remaining four testes were classified in an intermediate group and were observed to have the lower border of the reflected tunica vaginalis behind the posterior margin of the inferior aspect of the epididymis. The anatomic variant described in the intermediate group was also shown to predispose the testis to a limited amount of mobility potentially leading to intravaginal torsion.

We found a total of 28% anomalous insertion of the tunica. When these anomalies are present they occur bilaterally.

Maldescent of the testis occurs in less than 1% of adolescents and young adults[2]. We noted this in one case in our series.

Cases of torsion due to long mesorchium most often occur as a consequence of anomalies of epididymal disjunction or elongated epididymis, conditions that are highly frequent in cryptorchism[6-10]. Parker and Robinson noted that 33% of their studied cases with testicular torsion had a long mesorchium[6]. Torsion of the mesorchium is rare compared with torsion of the spermatic cord[11]. It occurs in cases where the testis lies on a mesentery away from the epididymis. The height, width and strength of the mesorchium found in our study are unlikely to favor torsion of the testis.

The incidence of intrascrotal anomaly in our study was 28%. This suggests that this subset of the population may be at risk for torsion of the testis. Since the incidence of testicular torsion in the general population is far less than 28%, other factors in addition to anatomical predisposition must have been involved. Hence early diagnosis still remains the main preventive step against the complications of testicular torsion.

Anatomical relations between testis and epididymis in patients with testicular torsion evidenced a pattern that is not different from patients without anomalies[16-19]. Type I and II relations were observed in approximately 96% of cases with testicular torsion. The most frequently found anatomical relation between testis and epididymis in the study group was Type I.

In conclusion, the most common anomaly in our study was that of tunica investment, and this is usually bilateral. The need for bilateral orchiopexy in cases of testicular torsion is further strengthened since anatomic anomalies are usually bilateral.

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RESUME

Les anomalies intra scrotales associées à la torsion testiculaire chez les Nigériens - une étude anatomique

Objectif: Les caractères anormaux qui prédisposent à la torsion testiculaire sont souvent bilatéraux. Ils incluent des testicules ascenseurs horizontalement, difformité du bell-clapper (BCD), un long mesorchium, un muscle cremasterien en spirale bien développé et testicules ectopiques. Le type et la fréquence d'anomalies intra scrotales qui prédisposent aux anomalies testiculaires chez les Nigériens n'ont pas été étudiés. Notre objectif était de définir et documenter ceci. **Matière et méthodes:** Les scrotums et les canaux inguinaux de cadavres de patients d'âge entre 35 et 57 années (âge moyen: 42 années) étaient examinés. Les paramètres étudiés étaient l'emplacement (scrotal ou canaliculaire), l'alignement (horizontal, vertical), le mesorchium (hauteur et largeur), le développement du muscle cremasterien (bien ou peu développé) et le développement de la tunica vaginalis pariétal des testicules (normal, intermédiaire ou BCD). **Résultats:** Quarante-neuf testicules étaient descendus en place dans le scrotum; tous ont été ancrés par les ligaments testiculaires. Le siège canalaire était présent chez un cadavre. Quarante-huit testicules sont disposés verticalement. 16% des testicules avaient un BCD, cependant le développement intermédiaire de la tunica vaginalis a été noté chez 12%. Le type le plus commun de rapport entre l'épididyme et le testicule était le Type I (84%). Le mesorchium était normal dans tous les spécimens examinés. **Conclusion:** L'anomalie la plus commune de notre étude était le développement intermédiaire de la tunica vaginalis, et c'est bilatéral habituellement. L'orchidopexie bilatérale dans les cas de torsion testiculaire est nécessaire parce que les anomalies anatomiques sont bilatérales habituellement.

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