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REVIEW

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Testicular torsion in Sub-Saharan Africa: a scoping review

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Abstract

Testicular torsion is a surgical emergency caused by rotation of the vascular pedicle of the testicle around its axis. If left untreated, testicular necrosis can set in, necessitating orchiectomy and loss of the testicle. The authors of this article reviewed articles on testicular torsion published in sub-Saharan Africa. The aim of this work is to establish the patient profile, consultation delay and orchiectomy rate in the sub-Saharan context. Data from the review will be compared with large non-sub-Saharan series and journals. Twenty-three articles were selected for review. All these articles were published between 1985 and 2022. A total of 1410 patients were included in the review. The average age was 19.7 years. The majority of patients were from urban areas. Risk factors for torsion were identified in 9 publications. The mode of hospital admission varied. Acute scrotal pain was the main symptomatology reported. The mean time in hours between onset of symptoms and consultation was 52.5 h. The left side was affected in 46.04% and the right in 49.81%. Four authors reported referral to a health center, and 8 authors reported scrotal ultrasonography. The rate of orchiectomy performed was found in 21 publications, the mean for the review as a whole was 46.4% with extremes of 13.2 and 72%. The orchiectomy rate was 52.4% in studies that reported an initial referral to a health center (patient transfer), versus 36.9% in studies that did not. In studies reporting ultrasound, the orchiectomy rate was 52.5%, compared with 36.9% in those not reporting ultrasound. On the basis of these results, we can formulate the following recommendations and actions: (i) further study of this pathology in sub-Saharan countries; (ii) raise public awareness of this pathology; (iii) train and retrain community workers and health center managers; and (iv) train general practitioners and surgeons in emergency scrototomy, orchidopexy and orchidectomy.

Keywords Acute scrotal pain, Testicular torsion, Emergency surgery, Orchiectomy, Sub-Saharan Africa

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1 Introduction

Testicular torsion is a surgical emergency due to rotation of the vascular pedicle of the testis around its axis, preventing blood flow to the testis and scrotal contents [1]. Typically, it presents spontaneously as a large, painful, acute bursa in an adolescent or young adult [2]. The main differential diagnoses are: orchiepididymitis, scrotal trauma, subacute testicular cancer, etc. [3]. Rotation and constriction lead to acute ischemia and then testicular necrosis if not managed rapidly [4]. It should always be considered as an absolute surgical emergency and a race against time [3, 5]. Mellick et al. [6], in a review reported a testicular salvage rate of 97.2% when the patient presented within the first 6 h of the onset of symptomatology and 7.4% after 48 h. In case of viability, the testicle is untwisted followed by orchidopexy. In case of necrosis, orchiectomy is required [7]. Because of the functional and medico-legal stakes, testicular torsion is a well-known surgical emergency in developed countries [8]. In Africa, there are few data on testicular torsion [9], and its incidence is slightly lower than in Western countries [10]. The primary objective of this review is to establish an epidemiological status defining the patient profile, consultation time and orchiectomy rate in the sub-Saharan context. Secondly, it will compare its data to large non-sub-Saharan series and reviews. Finally, at the end of the analysis, the authors will propose recommendations if needed and actions to be taken.

2 Methodology

2.1 Search strategy and eligibility criteria

The review was performed without time restriction. The academic databases searched included PubMed, Google Scholar, and African Journals Online. A total of 23 articles that met our inclusion criteria were used for this review. From these 23 articles, data extraction was performed. Literature search was performed in September 2022. The PICO definition used was as follows: P: Patients (patient managed for testicular torsion), I: Interventions (scrototomy, orchidopexy, orchidectomy), C: Comparison (epidemiology, presentation, and operative outcome compared to literature outside of sub-Saharan Africa), and O: Outcomes (time to presentation and final outcome of scrototomy). The following keywords were used: "torsion," "testis," "acute testicular pain", "testicular torsion," "acute scrotum," "TWIST," "orchidectomy", "suspected torsion," "Africa" and "sub-Saharan African countries." The search was limited to human studies in Sub-Saharan Africa with limitations on publication in English or French Languages. Conference abstracts were included.

Three reviewers to allow for an independent triple-check of articles and data. Comparative studies, prospective and retrospective cohort and cross-sectional studies were included. Review articles and conference abstracts, Incomplete or impossible to extract data, articles dealing with perinatal or purely pediatric torsion and case reports were excluded. References within and citations of all included articles were screened for completeness. Full texts were evaluated against predetermined criteria: (1) original research of (2) adult and pediatric males presenting with acute scrotum who were (3) evaluated using TWIST and (4) received a diagnosis of positive or negative TT. Disagreements over study eligibility were resolved by discussion between the reviewers.

2.2 Data extraction

Data from the articles were entered into a google form and extracted. Data including study location: country, town, center name and geographic area, article citation details, study design, study duration, population demographics, population history and physical evaluation, TT risk factors, patients paraclinical investigation, surgery details were extracted. The result was then tabulated for each article. Corresponding authors were contacted to retrieve elements missing from their manuscripts.

2.3 Outcome measures

The primary outcomes of interest were (1) epidemiologic characteristics of TT in sub-Saharan Africa, (2) Compare our findings with non-sub-Saharan own. The most represented age group and the average time between the onset of the symptomatology and the consultation were not uniformly reported. The most represented age group could not be analyzed in a grouped fashion. For the mean time to consultation, the analysis included studies that reported the mean time in hours.

2.4 Statistical analysis

Data from the articles were entered into a google form and extracted for analysis using Microsoft Office Excel Software 2021 for quantitative and qualitative. The analysis was univariate and bivariate. Results are expressed as mean and percentage. The mapping was generated by Bing Excel image.

3 Results

After an initial search and selection, 23 articles [2, 9, 11–31] were selected. All articles were published between 1985 and 2022. They covered epidemiology, clinical aspects, intraoperative findings and procedures performed. Publications came from: 1 from South Africa, 1 from Benin, 3 from Burkina Faso, 1 from Congo, 1 from

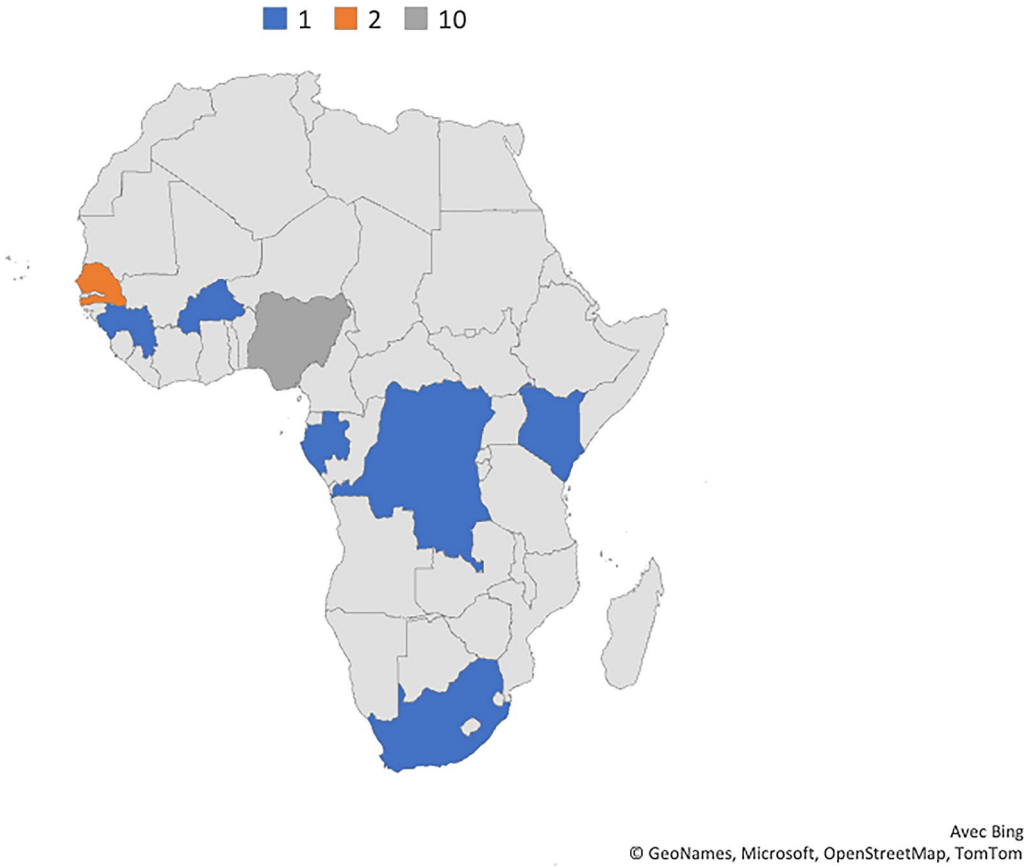

Fig. 1 Map of countries by number of publications studied

Gabon, 1 from Guinea Conakry, 1 from Kenya, 10 from Nigeria, 3 from Senegal and 1 from Uganda (Fig. 1).

All studies were retrospective and monocentric in 95.6% of cases. All centers were located in urban areas. A total of 1,410 patients were included in the review, with extremes of 22 and 308 patients. The mean age of the review was 19.7 years, with extremes of 17.2 and 27 years. Seven authors reported that the majority of their patients were from urban areas. In 14 publications, the patients' area of origin was not reported (Table 1).

Ten authors reported a history of spontaneously resolving scrotal pain, and a further 6 authors reported a history of scrotal surgery for testicular torsion. Risk factors for torsion were identified in 9 publications: cold, trauma and congenital anomalies. The mode of hospital admission varied: consultation, emergency and transfer. In 4 publications, the mode of admission was not reported. Acute scrotal pain was the main symptomatology reported in 22 publications. Twelve authors reported the average time (in hours) between onset of symptoms and consultation. The mean was 52.5 h, with extremes of 5 and 108 h. The side affected was reported by 20 authors: left in 46.04% and right in 49.81%. Bilateral involvement was reported in 4 publications. In 4 articles, patients were referred to a health center.

Of the articles studied, 8 reported scrotal ultrasound. The rate varied from 4.1 to 71%, with an average of 30.9% for the 8 authors.

The rate of orchiectomy performed was found in 21 publications; the average for the review as a whole was 46.4%, with extremes of 13.2% and 72%. For orchidopexy, the review average was 60.6%, with extremes of 28 and 93.7%. Sixteen authors reported contralateral orchidopexy in addition to the initial procedure. In 10 publications, early complications were reported (hematoma, orchitis, parietal suppuration/abscess, delayed healing). For late complications, only testicular atrophy was reported by 3 authors.

Table 2 shows data on duration, ultrasound and percentage of orchiectomy.

In publications reporting the notion of spontaneously resolving scrotal pain, the orchiectomy rate was 36.8%, compared with 43% in publications that did not. The orchiectomy rate was 52.4% in studies that reported an initial referral to a health center (patient transfer), versus 36.9% in studies that did not. When analyzing mode of

Table 1 Characteristics of the studies and epidemiological data

Author	Country	location of the centers	Year of publication	Duration of the study in months	Number of cases
Obi et al. [12]	Nigeria	Urban	2019	108	31
Bah et al. [2]	Guinea Conakry	Urban	2010	180	27
Ibrahim et al. [13]	Nigeria	Urban	2012	48	56
Kuranga et al. [14]	Nigeria	Urban	2002	120	87
Ogbetere et al. [15]	Nigeria	Urban	2022	60	22
Abu et al. [16]	Nigeria	Urban	2020	60	33
Sarr et al. [9]	Senegal	Urban	2010	94	58
Odzébé et al. [18]	Congo	Urban	2018	144	38
Ndang et al. [19]	Gabon	Urban	2018	48	43
Njeze et al. [20]	Nigéria	Urban	2012	120	22
Murithi et al. [21]	Kenya	Urban	2017	60	90
Ouattara et al. [22]	Burkina Faso	Urban	2020	84	31
Kaboré et al. [23]	Burkina Faso	Urban	2011	78	51
Diaw et al. [24]	Senegal	Urban	2020	36	55
Mukendi et al. [25]	South Africa	Urban	2020	156	308
Ugwu et al. [26]	Nigeria	Urban	2003	192	57
Ugwumba et al. [27]	Nigeria	Urban	2016	264	34
Kaboré et al. [17]	Burkina Faso	urbain	2021	132	74
Bello et al. [28]	Nigeria	Urban	2018	72	23
Diallo et al. [29]	Senegal	Urban	2019	48	55

Table 2 Epidemiological data, ultrasound and results of exploration

Author	Age mean	Percentage of patients who presented within the first 6 h	Ultrasound [%]	Ochidectomy [%]
Bah et al. [2]	19,5	40,7		18,5
Udeh et al. [11]	N/A	27	N/A	N/A
Obi et al. [12]	22,6	22,6	none	none
Ibrahim et al. [12]	23	1964	N/A	23,1
Kuranga et al. [14]	22,1	N/A	N/A	13,2
Ogbetere et al. [15]	19,7	13,6	4,5	40,9
Abu et al. [16]	25	33,3%	51,5	54,5
Kaboré et al. [23]	22	23	N/A	56,8
Sarr et al. [9]	21	00	12,06	51,3
Odzébé et al. [18]	20,2	N/A	71,05	44,7
Ndang et al. [19]	18,2		N/A	34,9
Njeze et al. [20]	22,7		N/A	25
Murithi et al. [21]	19		N/A	72
Ouattara et al. [22]	19	61,3	N/A	59,4
Kaboré et al. [17]	26	15,7	13,7	55
Diaw et al. [24]	21,7	12,7	33	47
Mukendi et al. [25]	17,2	N/A	N/A	63
Ugwu et al. [26]	22,7	N/A	N/A	61,4
Ugwumba et al. [27]	27	8,3	N/A	15,8
Bello et al. [28]	22	N/A	N/A	19
Diallo et al. [29]	20,03	25,4	N/A	16.3
Hodonou et al. [30]	N/A	15,1	N/A	18.1
Ibingira et al. [31]	N/A	N/A	N/A	63,7

admission and outcome of exploration, the orchiectomy rate was 29.2% in studies where the majority of patients were recruited via the emergency department, 56.8% by transfer, 48.9% via consultation. In studies where ultrasound was reported, the orchiectomy rate was 52.5%, compared with 36.9% in those where it was not. The mean orchiectomy rate was 19%, 48.4% and 44.1%, respectively, for studies reporting a mean time from symptom onset to consultation of less than 6 h, between 6 and 24 h and greater than 24 h.

4 Discussion

Acute scrotum is a common emergency presentation to surgical and emergency units. Diagnosis of TT is challenging and time critical.

In Indonesia, 80.2% of patients consulted after 6 h [32]. In Brazil, the overall mean delay in a study that included 21289 patients was 6 h. This mean delay varied according to the level of the center (5.2 h for primary facilities, 8.4 h for secondary facilities, and 10.1 h for tertiary centers) [33]. In France, the average presentation time reported in a multicenter study was 5 h [34]. In Morocco, in a study of neglected testicular torsions, the mean time to presentation was reported to be 86 h [35]. In a systematic review including 2116 patients, testicular recovery within the first 12 h was 90.4%, survival from 13 to 24 h was 54.0% and survival beyond 24 h was 18.1%. The authors of this review concluded that aggressive management of patients with symptomatology lasting for many hours should be encouraged [6]. All his previous studies cited reported an average delay in presentation. This shows the importance of this parameter in the management of testicular torsion. In our review, the delay was well over 24 h, but this should not delay investigation in the face of a typical history and presentation.

Torsion is a time-dependent event, and factors (distance from hospital and delay associated with transfer to hospital) that delay time to treatment result in a high rate of testicular loss [36]. El Mehdi et al. [35] reported that 15% of their patients with testicular loss were from rural areas. We found an association between the mode of admission and the probability of testicular salvage. The sooner the patient presents to a center with surgical expertise, the higher the rescue rate. In addition to the mode of admission, the area from which patients come and the location of the centers can impact the outcome of surgical exploration.

In our review, the orchiectomy rate was high in publications where the authors reported the performance of scrotal Doppler ultrasound. For medico-legal reasons, Pepe et al. [37] performed a Doppler ultrasound in any patient with an "acute scrotum". But a normal result does not contraindicate surgical exploration in case of suspected testicular torsion. Pinar et al. [38] reported that scrotal Doppler ultrasound before surgery was safe, feasible and useful in selected cases with suspected testicular torsion, but it should not delay surgery in cases of strong suspicion. In our context, it would be preferable to systematically explore urgently any scrotal pain suggestive of testicular torsion.

The rate of orchiectomy is highly variable in the literature: 7.6% in France [34], 23% in Australia [39] and 24.3% in Korea [40] and 100% [35] in Morocco. Testicular salvage depends on presentation, diagnosis and timely surgical intervention [40]. Lee et al. [40] in comparing their orchiectomy rate with other data in the literature pointed out the geographical size of the territory, the dense distribution of hospitals and health insurance allowing easy access to care centers. In this review, the average orchiectomy rate is 46.4% with extremes of 13.2% and 72%. Several factors may explain these figures in sub-Saharan Africa: delay in consultation, distance of referral centers from primary care centers, diagnostic erraticism, and access to care centers that require payment. In general, this rate may be related to the level of socio-economic development of the country.

Our review reports the performance of contralateral orchidopexy in 10 publications. A study that included 2912 patients evaluated the complications secondary to the performance of a systematic immediate contralateral orchidopexy. It was found that the group of patients in whom an immediate contralateral orchidopexy was performed had more early postoperative complications (scrotal hematoma and delayed healing) than patients who did not have an immediate contralateral orchidopexy. The authors of this publication concluded that the performance of immediate contralateral orchidopexy should be limited and should be performed after informing the patient of its risks and possible benefits [41]. In sub-Saharan Africa, to avoid the risk of testicular loss related to several factors, we believe that it would be preferable to perform contralateral orchidopexy if the conditions allow (absence of significant edema, absence of infectious complications). The patient's consent must be systematically obtained before this procedure and he must be informed about the possibility of immediate contralateral orchidopexy and its postoperative complications. A close and strict follow-up must be defined, in order to detect and manage any complication in time.

In the African environment, surgical emergencies are characterized by the inadequacy between the needs of the patients and the means of diagnosis and treatment [42]. In addition, there are problems of triage, diagnosis and decision making. The rapidity of adequate treatment, the execution of precise and rapid gestures with the minimum of therapeutic materials [11] are indispensable [43].

For this reason, it is important to train the first level staff on this urgent pathology. The learning, use and dissemination of predictive tools such as the Testicular Workup for Ischemia and Suspected Torsion (TWIST) score can contribute to increase [12] the suspicion of this pathology in front of any acute testicular pain [44]. Furthermore, this score has high positive and negative predictive values even when used by non-physicians [45]. This emergency scrotal surgery, which does not require too much technical skill, should also be taught to general practitioners practicing in remote areas and to general surgeons in secondary centers.

Several studies have shown that most parents and boys are unaware of the urgency of early assessment of acute scrotal pain, which in turn can lead to testicular loss due to delayed treatment [46]. The high rate of orchiectomy in our review calls for urgent community education in Africa. It is our responsibility as urologists and pediatric surgeons to devise effective strategies to educate our communities to reduce the risk of testicular loss and prevent the sequelae of delayed treatment of torsion.

5 Conclusion

Sub-Saharan Africa is a large geographic area with a predominantly young population. In this area, lack of accessible surgical care at the district level due to several factors has been identified as an underlying cause of delayed care [47]. Testicular torsion, one of the major urological emergencies that occur in adolescents, is rarely reported. This is reflected in the number of publications available. This review of 1410 patients from sub-Saharan Africa found that the delay between onset of pain and consultation is late and the rate of orchiectomy is high in some countries, up to 72%. Any acute scrotal pain must be considered as a torsion of the testicular cord until proven otherwise, because the vital prognosis of the testicle and fertility depends on the rapidity of the management. Its management should be one of the indicators of access to timely essential surgery, which are the goals of global surgery [48]. In sub-Saharan Africa, to improve the management of testicular torsion, we make the following recommendations: raise public awareness of testicular torsion, retrain health center managers on this emergency, and train general practitioners and surgeons to perform exploratory scrototomies.

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NAS, BM, MAM: study design and participation in all phases. DA, OJ, MM, RH, SM, GM, TA, ZOJ, DYJ, OU: data extraction and drafting. KR, CH, FFA: reading and correction. All the authors have contributed to the elaboration of the paper; and this from the conception to the final version.

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