

# Surgical practice among pediatric surgeons and pediatric urologists in the Kingdom of Saudi Arabia for the management of suspected testicular torsion

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## ABSTRACT

**الأهداف:** أجريت هذه الدراسة لمراجعة ومقارنة الممارسات السريرية والخبرات بين جراحي الأطفال (PS) وجراحي المسالك البولية للأطفال (PU) للعلاج.

**الطريقة:** أجريت هذه دراسة مقطعية مستعرضة في الفترة ما بين أغسطس 2016 ونوفمبر 2017م، على كل استشاري المسالك البولية للأطفال واستشاري جراحة الأطفال (ممن يتعاملون مع مثل هذه الحالات) في المملكة العربية السعودية. تم توزيع استبيان على المشاركين من خلال منصة Survs.com، عبر البريد الإلكتروني وعبر وسائل التواصل الحديثه.

**النتائج:** استخدم معظم جراحي المسالك البولية للأطفال (12/20، 60%) الموجات فوق الصوتية مع دوبلر قبل الاستكشاف الجراحي، في حين أن 29 (74.4%) من جراحي الأطفال قاموا بالاستكشاف الفوري دون عمل التصوير فوق الصوتي، وهو فرق ذو دلالة إحصائية ( $p=0.03$ ). كما وجد أنه في حال كانت الخصية عند الاستكشاف الجراحي محتقنه ولا يوجد علامات غرغرينا واضحة، فإن 27 من استشاري جراحة الأطفال (69.2%) يقومون بتثبيت الخصية ولا يستصلونها، 6 (15.4%) اتبعت سياسة النظرة الاستكشافية الثانية بعد 48 ساعة، و 6 (15.4%) يقومون باستصال الخصية. مقارنة بجراحي المسالك فإن 6 (30%) يقومون بتثبيت الخصية ولا يستصلونها، 8 (40%) يتبع سياسة النظرة الاستكشافية الثانية، و 6 (30%) يقومون باستصال الخصية. وهذا الاختلافات بين التخصصات ذا دلالة إحصائية ( $p=0.02$ ). كما وجد اختلافات أخرى ولكن ليست ذات دلالات مهمة.

**الخلاصة:** كانت هناك اختلافات كبيرة بين التخصصين في طريقة علاج التواء الخصية. هناك حاجة إلى صياغة مبادئ وأساسيات طبية توجيهية وطنية لممارسة موحدة في علاج مثل هذه الحالات وتدريب المدربين في برامج الزمالات على هذه الممارسات

**Objectives:** To review and compare clinical practice and experience among pediatric surgeons (PS) and pediatric urologists (PU) for the management of testicular torsion (TT) in the Kingdom of Saudi Arabia (KSA).

**Methods:** This was a cross-sectional study conducted between August 2016 and November 2017, among all PU and PS involved in the management of suspected TT in KSA. A questionnaire was distributed to participants through the Survs.com platform, and direct email when requested by participant.

**Results:** Most PU (12/20, 60%) utilized ultrasound with Doppler before exploration, while 29 (74.4%) PS performed immediate exploration without imaging, representing a statistically significant difference ( $p=0.03$ ). When the explored testis was dusky (not frank gangrenous), 27 PS (69.2%) performed fixation, 6 (15.4%) followed the second look policy, and 6 (15.4%) performed orchiectomy. With respect to PU, 6 (30%) performed fixation, 8 (40%) followed the second look policy, and 6 (30%) performed orchiectomy. The differences between the 2 specialties were statistically significant ( $p=0.02$ ). Most consultants in both specialties performed fixation of the contralateral testis during the same operation. Also, there is a variation in practice when there is other pathology than TT.

**Conclusion:** There were significant variations between the 2 specialties in the management of TT. National guidelines are needed to provide homogenous clinical practice and training of trainees.

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Spermatic cord torsion, commonly known as testicular torsion (TT), is a common emergency that requires precise assessment and urgent clinical decision making. Testicular torsion occurs predominantly in adolescents; however, it can occur at any age. In Korea, the reported incidence in males under 25 years is 2.9 per 100,000, while in Taiwan and the United States of America the incidence is 3.5 cases per 100,000 people per year and 4.5 cases per 100,000 males per year.<sup>1-3</sup> Testicular torsion represents approximately 17% of acute painful scrotum presentations, and TT is diagnosed in 40% of scrotal explorations for suspected TT.<sup>4-5</sup> The exact etiology is not yet known, although the anatomical 'bell clapper' deformity, weather changes, and familial history of TT have been suggested as risk factors.<sup>6-8</sup> It is universally accepted among surgeons that suspected TT requires urgent surgical exploration. This urgency, however, needs to be balanced with appropriate clinical assessment and proper judgement concerning the use of imaging in order to avoid unnecessary exploration. Nevertheless, there are different views and debates concerning management aspects pertaining to suspected TT and the necessity for contralateral exploration and fixation. Furthermore, proper decision making in case of negative exploration for TT has not been agreed upon in terms of whether it is better to fix versus not to fix the exposed testis and heterogeneity in practice exists.<sup>9</sup> In the Kingdom of Saudi Arabia (KSA), such cases are managed by PU if specialty is available in the hospital or by a PS if no PU. These specialists have different experiences and training background. Furthermore, survey studies evaluating clinical practice among medical professionals in KSA are scarce. This study was conducted to review and compare the clinical practice and experience of general PS compared to PU in suspected TT case management.

**Methods.** A cross-sectional survey study was conducted in KSA between August 2016 and November 2017 in order to ascertain views concerning best practices for TT management. The questionnaire was distributed to 114 consultants using the Survs.com platform and via direct emailing experts who requested an e-mail in order to participate in the survey. Only consultants, PS (who managed acute scrotal diseases) and PU, were requested to participate and answer the questionnaire. To be a consultant PS or PU in KSA,

commonly you need to undergo 5 years training program in general surgery or urology followed by 2 or 3 years. Pediatric urologists have been trained on use of ultrasound during their training program and they do ultrasound themselves if the radiologist will take time to come, so there will be no much delay

Participants were asked to complete a questionnaire that was validated based on previous surveys and feedback from 3 expert consultants with some modifications for the purposes of our study.<sup>9,10</sup> The questionnaire was piloted and tested to ensure reliability. The questionnaire composed of 5 sections, included demographic data, decision making in the approach to suspected TT, practice of fixation of the contralateral testis and timing of fixation, routine practice in case of negative exploration of TT and, the fixation technique and preferred suture used.

Only respondents who completed the questionnaire were included. Approval for the study was obtained from the Institutional Ethics Committee. A PubMed search was performed to identify similar studies and assess gaps in data on this topic.

**Statistical analysis.** Frequencies and ratios were used to express quantities and qualitative data. The Fisher's exact test, was used to compare between the 2 groups; for descriptive sample data, 95% confidence interval (CI) were calculated. Two tailed *p*-value of 0.05 was considered statistically significant. All statistical analysis were carried out using Statistical Package for Social Science (SPSS), Version 19.0 (IBM Corp., Armonk, NY, USA).

**Results.** In total, 114 participants were provided questionnaires; 82 participants responded, yielding an estimated response rate of approximately 72%. Only 59 (52%) respondents completed the survey; 39 (78%) were PS and 20 (22%) were PU. Questionnaires that were not completed were excluded.

Table 1 summarizes the approach to a patient presenting with acute scrotal disease and the expected management of TT that is not clearly gangrenous and remains dusky during exploration. The majority of PU (12/20, 60%) performed ultrasound with Doppler prior to exploration, compared to only 10/39 (25%) of PS, who commonly performed immediate exploration (95% CI: 13-42.1). The difference between PU and PS was statistically significant (*p*<0.03). When the findings upon scrotal exploration consisted of dusky testis but no apparent gangrene, the majority of PS (27/39, 69.2%) did not remove the testis but performed fixation without second look, while most PU (40%) followed the 48 hours second look policy (95% CI: 19.1-54.3).

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Six of 30 (20%) PS and 6 of 20 (30%) PU performed orchietomy. The difference in practice between PS and PU was statistically significant ( $p=0.02$ ).

Table 2 reports data on contralateral testis fixation in a 3-sided situation concerning exploration and timing of fixation. The majority of PS and PU performed the same practice with regard to fixing the contralateral testis depending on whether the explored testis was gangrenous or viable. Four out of 39 PS and one out of 20 PU did not fix the contralateral testis when the affected testis was found viable. There was no significant difference between the 2 groups regarding fixation of the contralateral testis whether the explored testis is viable ( $p=0.7$ ) or gangrenous ( $p=0.5$ ). When the finding was torsion of hydatid (Morgagni) cyst; most of both groups 35 PS (90%) and 17 PU (85%) did not fix the contralateral testis. There was no significant difference between the 2 groups ( $p=0.6$ ). Nineteen out of 20 (95%) of PU reported fixation of the contralateral testis

during the same operation, compared to 31/39 (79.5%) of PS. However, 8 (20.5%) PS performed fixation at a later time on an elective basis. This difference was not significant ( $p=0.1$ ).

Table 3 reports data on the practice of fixing the explored testis in case of negative scrotal exploration for TT. When the finding was torsion due to hydatid (appendix of the testis), 36/39 (71.8%) PS fixed the explored side compared to 11/20 (55%) of PU. These percentages were similar in cases of epididymo-orchitis or no pathology. Both specialties did not fix the contralateral testis in the above described situations. There was no statistical difference between the 2 groups' practices for fixation of explored testis in case of torsion due to hydatid ( $p=0.2$ ), epididymo-orchitis ( $p=0.11$ ), or no pathology ( $p=0.15$ ).

Table 4 reports the technique used for testicular fixation. Only 7.7% of PS and 5% of PU utilized

**Table 1** - Decision making practice among pediatric surgeons and pediatric urologists in case of suspected testicular torsion.

Cases	Pediatric surgeons (n=39)		Pediatric urologists (n=20)		P-value*
	n (%)	95% CI	n (%)	95%CI	
<i>Suspected case</i>					
Explore immediately without ultrasound	29 (74.4)	57.9 - 87	8 (40)	19.1 - 63.9	0.03
Ultrasound before exploration	10 (25.6)	13 - 42.1	12 (60)	36.1 - 80.9	
<i>TT that remained dusky at exploration</i>					
Always remove it	6 (15.4)	5.9 - 30.5	6 (30)	11.9 - 54.3	0.02
Never remove but fix it	27 (69.2)	52.4 - 83	6 (30)	11.9 - 54.3	
Follow the 48-hour second look policy	6 (15.4)	5.9 - 30.5	8 (40)	19.1 - 63.9	

\*Fisher exact test. TT - testicular torsion, CI - confidence interval

**Table 2** - Timing and practice of fixation of the contralateral testis among pediatric surgeons and pediatric urologists in case of testicular torsion.

Finding at operation	Fixation of contralateral normal testis	Pediatric surgeons (n=39)		Pediatric urologists (n=20)		P-value*
		n (%)	95% CI	n (%)	95% CI	
TT with gangrene	Yes	36 (92.3)	79.1-98.4	19 (95)	75.1-99.9	0.7
	No	3 (7.7)	1.6-20.9	1 (5)	0.1-24.9	
TT with viable testis	Yes	35 (89.7)	75.8-97.1	19 (95)	75.1-99.9	0.5
	No	4 (10.3)	75.8-97.1	1 (5)	0.1-24.9	
Torsion due to hydatid but normal testis	Yes	4 (10.3)	75.8-97.1	3 (15)	3.2-37.9	0.6
	No	35 (89.7)	75.8-97.1	17 (85)	84-86	
Timing of fixation of the contralateral normal testis	At the initial exploration	31 (79.5)	63.5-90.7	19 (95)	75.1-99.9	0.1
	Elective at later surgical session	8 (20.5)	9.3-36.5	1 (5)	0.1-24.9	

\*Fisher exact test. TT - testicular torsion, CI - confidence interval

sutureless fixation techniques, while 92.3% of the PS and 95% of the PU, used some form of suture fixation.

There is no statically significant difference ( $p=1$ ) of those who used suture fixation, the majority used absorbable sutures (PS: 30/39; 76.9%) versus (PU: 15/20; 75%). The minority used non-absorbable sutures. When sutures were used, 3/0 and 4/0 were preferable by both specialties, and 2-point or 3-point fixations were commonly used with no significant difference between the 2 groups ( $p=0.1$ ).

**Discussion.** In the absence of national guidelines for the management of suspected TT and considering the differences in training background of PU and PS, as well as current debate and heterogeneity in the clinical management of acute scrotal disease, this survey was conducted to evaluate routine practice and patient care.

However, the sample size of this survey is small. We aimed to include all PU and those PS who treat such cases; thus the cohort is representative with a response rate of 52%. The time is crucial in these cases and the use of imaging modalities to reach a proper diagnosis in order to avoid negative scrotal exploration should be balanced with the risk of testicular loss if there is TT for more than 6 hours, known as the golden time for testicular salvage.

Based on published animal studies, spermatogenesis is severely affected 4 to 6 hours after torsion and hormonal production is affected 10 to 12 hours after torsion.<sup>10</sup> In humans, testis viability is reduced after 6 hours, and in cases of acute scrotum, rapid treatment is required to avoid testicular ischemia.<sup>11</sup> Most delays occur when the surgeon performs ultrasound in order to exclude or prove the diagnosis of TT. In this survey,

**Table 3** - Practice of fixation of the explored testis among pediatric surgeons and pediatric urologists in case of negative exploration for testicular torsion.

Finding at exploration	Fixation of the explored testis	Pediatric surgeons		Pediatric urologists		P-value*
		n (%)	95% CI	n (%)	95% CI	
Torsion of Morgagni cyst (appendix of testis)	No	11 (28.2)	15 - 44.9	9 (45)	23.1 - 68.5	0.2
	Yes	28 (71.8)	55.1 - 85	11 (55)	31.5 - 76.9	
Epididymo-orchitis	No	36 (92.3)	79.1 - 98.4	15 (75)	50.9 - 91.3	0.11
	Yes	3 (7.7)	1.6 - 20.9	5 (25)	8.7 - 49.1	
No pathology	No	33 (84.6)	69.5 - 94.1	15 (75)	50.9 - 91.3	0.15
	Yes	6 (15.4)	5.9 - 30.2	5 (25)	8.7 - 49.1	

\*Fisher exact test. TT - testicular torsion, n - number, CI - confidence interval.

**Table 4** - Practice of fixation of the explored testis among pediatric surgeons and pediatric urologists in case of negative exploration for testicular torsion.

Fixation of the explored testis	Pediatric surgeons (n=39)		Pediatric urologists (n=20)		P-value*
	n (%)	95% CI	n (%)	95% CI	
<b>Incision</b>					
Transverse	21 (53.9)	37.2-69.9	5 (25)	8.7 - 49.1	0.05
Midline raphe	18 (46.1)	30.1-62.8	15 (75)	50.9 - 91.3	
<b>Method of fixation</b>					
Sutureless fixation	3 (7.7)	1.6-20.9	1 (5)	0.1 - 24.9	1.0
Fixation with suture	36 (92.0)	79.1-98.4	19 (95)	75.1 - 99.9	
<b>Sutures used for fixation</b>					
Absorbable	30 (76.9)	60.7-88.9	15 (75)	50.9 - 91.3	1.0
Non-absorbable	9 (23.1)	11.1-39.3	5 (25)	8.7 - 99	
<b>Suture size</b>					
3/0	13 (33.3)	19.1-50.2	4 (20)	5.7 - 43.7	0.1
4/0	15 (38.5)	23.4-55.4	14 (70)	45.7 - 88.1	
5/0	9 (23.1)	11.1-39.3	2 (10)	1.2 - 31.7	
Others	2 (5.1)	0.6-17.3	0 (0)		

\*Fisher exact test. CI - confidence interval

a significant difference was found between PS and PU regarding this point. Most PU performed an ultrasound to examine the testis before exploration, while most PS performed urgent exploration without imaging. This difference may be related to the experience of the urologist in performing ultrasound themselves or the availability of ultrasound service at night in high volume hospitals, where most PU work. This finding should be interpreted with caution, as we do not know the rates of negative exploration and orchiectomies in both groups, and thus cannot accurately judge the rate of delayed or unnecessary exploration. In a survey performed in Northwest England concerning TT practice management, only 4 of 29 consultant urologists performed ultrasound before exploration.<sup>12</sup> Doppler ultrasonography for the diagnosis of TT demonstrated 94% sensitivity, 96% specificity, 95.5% accuracy, a 89.4% positive predictive value, and a 98% negative predictive value.<sup>13</sup> Kalfa et al,<sup>14</sup> reported that twisted testis can be detected in 96% of cases with high-resolution ultrasonography and in 76% of cases with color Doppler ultrasound. Although ultrasound may prevent unnecessary exploration, it is still operator-dependent and usually not readily available at night and in an emergency room.

Another significant difference between groups involved cases in which intra-operative findings showed TT in which testis were found to be dusky but not clearly gangrenous. In these cases, most PU aimed to preserve the testis and perform a second look exploration after 48 hours; however, most PS fixed the testis without performing a second look. Woodruff et al,<sup>15</sup> reported a case in which the explored testis was looked subjectively dead and the decision was to fix it, post-operative follow up at 4 and 12 weeks for that case demonstrated normal testosterone levels and normal intratesticular blood flow by ultrasound. Rouzrokh et al,<sup>16</sup> reported that in 70 out of 124 boys who underwent scrotal exploration and second look surgery, 44 (63%) were salvaged. Both strategies (fixing apparently dead testis or second look operation), may help in increasing testicular salvage rate.

The vast majority of responding surgeons performed contralateral fixation to the other testis upon initial exploration, with the exception of some general surgeons who fixed the contralateral testis on an elective base at a later time. This approach involving fixation of the contralateral testis is the universally accepted method of practice.<sup>17</sup> However, in the past, Arnbjörnsson et al,<sup>18</sup> disagreed with exploration and fixation of the contralateral testis. Four general surgeons and one urologist did not report fixation of the contralateral testis if the explored, affected testis was viable. In a

survey concerning the practice in United Kingdom and Ireland, 4% (4/97) of surgeons reported that they do not fix the contralateral side.<sup>19</sup>

In cases of negative exploration (namely, in cases with diagnoses other than TT), there was variations between surgeons even within the same specialty. There is no consensus regarding fixation of the explored testis and, to a lesser extent, the contralateral testis. This heterogeneity was also reported by Naumann et al,<sup>9</sup> 73 patients who underwent exploration, 52 were negative, 29 of them underwent fixation of the explored side and 7 underwent contralateral orchidopexy.

Numerous methods have been used by surgeons to fix the testes and prevent re-torsion, including: 1) dartos pouch; 2) eversion of tunica vaginalis; 3) suture fixation using 1-, 2-, or 3-point fixation; 4) 4-point axial fixation; or 5) modifications of the above mentioned techniques.<sup>20-23</sup> There is still controversy concerning the most appropriate fixation technique. In a survey conducted by Bolln et al,<sup>19</sup> on operative practices while managing TT, 88% of PS used suture fixation either alone or in combination with other techniques, such as eversion of the tunica vaginalis or creation of a dartos pouch, and only 15% used a sutureless method for testicle fixation. In a review article by Sells et al,<sup>24</sup> recurrence of torsion after fixation was found to be more common in cases where absorbable sutures were used compared to cases in which non-absorbable sutures were used. Some authors recommend the use of non-absorbable sutures for fixation.<sup>12,25-27</sup> In Kingdom of Saudi Arabia, the most common practice is to use absorbable sutures, consisting of 3/0 or 4/0, and 2 or 3 points for fixation. Nevertheless, the adverse effects of suturing through the testicular parenchyma are still questioned. Coughlin et al,<sup>28</sup> reported that the use of suture in orchidopexy was strongly associated with infertility. The right endocrine marker to assess testicular function should be the level of inhibin B and that a national consensus should state that the level of inhibin B should be measured out postoperatively.

Recommendations from the European Society for Paediatric Urology (ESPU) in this subject state the “use of Doppler ultrasound without delaying the surgical exploration”. Moreover, the most recent ESPU guidelines show that there is controversy on whether to carry out detorsion and preserve the ipsilateral testis, or to perform an orchiectomy in order to preserve function and fertility of the contralateral testis if symptoms duration is over 24 hours. Regarding the type of fixation and suture material, there is no clear recommendation.<sup>29</sup>

**Study limitations.** The number of respondents who completed the questionnaire is small, despite a great

effort was exerted to include all consultants PU and PS (who deals with TT) working in Kingdom of Saudi Arabia. Hence the results of this study should not be generalized to all PS or PU working inside or outside of Kingdom of Saudi Arabia. Furthermore, the results of this cross-sectional design should be interpreted cautiously within the limitations of the survey study design, which is susceptible to bias due to a low response rate and misclassifications due to recall bias. The low response rate was addressed by measuring the 95% CI, which gives insight into the probability of the total participant population.

In conclusion, this study demonstrated that there is a variation in the practice of TT management among PS and PU in KSA. We need to establish national guidelines concerning the approach to such cases in order to ensure the best patient care. Moreover, these guidelines will help trainees who first face this emergency to handle these cases in the most efficacious manner. Other points that warrant attention during training are the variations in practice between surgeons within the same specialty when facing diagnosis other than TT during scrotal exploration, in order to provide optimal patient care.

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