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Original Article

Clinical evaluation of testicular torsion presenting with acute abdominal pain in young males



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Received 25 February 2017; received in revised form 22 April 2017; accepted 8 February 2018

Available online 26 May 2018

KEYWORDS

Acute abdominal pain;
Testicular torsion;
Young males;
Initial symptom;
Retrospective analysis

Abstract Objective: To evaluate the features of testicular torsion presenting with acute abdominal pain and to raise awareness of testicular torsion with specific symptoms.

Methods: From October 2005 to June 2016, nine patients with testicular torsion who presented with isolated acute abdominal pain rather than scrotal pain as their primary symptom were retrospectively reviewed. Data, including the age of patients, season at admission, initial medical history, external genital examination, emergency ultrasound findings, operative findings, duration of abdominal pain, complications, and follow-up results, were collected.

Results: The average age of patients was 14 years (range 10–17 years). Seven patients whose genitals were not initially examined externally were misdiagnosed as having ordinary abdominal diseases. Surgical exploration revealed that all the involved testes necrotized, and orchidectomy was performed. In the other two patients, scrotal and testicular abnormalities were detected immediately on admission, and emergency surgical exploration determined that the involved testis remained vital, so orchiopexy was performed. The mean duration from symptom onset to diagnosis was 4 h (3–5 h) in the orchiopexy group and 37 h (18–72 h) in the orchidectomy group. Six patients were psychologically affected during postoperative follow-up. Neither recurrence of testicular torsion nor testicular atrophy was recorded.

Conclusion: Acute abdominal pain can be the initial and sole symptom of testicular torsion in young males. Physicians should pay close attention to the specific clinical presentation of testicular torsion.

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Peer review under responsibility of Second Military Medical University.

<https://doi.org/10.1016/j.ajur.2018.05.009>

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1. Introduction

Testes, as the key sexual and reproductive organs, losing one or both may affect a young male's viability and future fertility. Torsion of the testis, commonly denoted by twisting of the spermatic cord, is a urological emergency usually occurring in young males [1]. The annual incidence of spermatic cord torsion is 4.5 per 100 000 males aged 1–25 years. It can occur at any age but usually occurs in younger males, with a bimodal incidence in the pediatric population, specifically during the first year of life and between the ages of 13 and 16 years [2]. Most patients with testicular torsion present with acute scrotal or testicular pain. However, in some instances acute abdominal pain can be the initial and only symptom, and if the condition remains unrecognized by the patient or his physician the twisted testicle can become non-viable. This study was conducted to determine the features of testicular torsion that elicit acute abdominal pain in young males.

2. Patients and methods

From October 2005 to June 2016, all cases of testicular torsion presented at the Department of Urology Surgery of Heze Municipal Hospital were retrospectively reviewed. This study was approved by Heze Municipal Hospital Ethics Committee (201512). Patients who presented with acute abdominal pain but without scrotal pain were selected for further study, and data including the age of patients, season at admission, initial medical history, external genital examination, emergency ultrasound findings, operative findings, duration of the abdominal pain (from symptom onset to operation), complications, and follow-up results were collected. Either orchiopexy or orchidectomy was performed according to the testicular blood flow. Following detorsion, a ruddy and flexible testicle where bright bleeding was detected proved that the testicle remained vital, in which case orchiopexy was performed. If the testicle was dark in color and no bright bleeding was detected after fomenting the testicle with warm salt water for 20 min, orchidectomy was performed. All the patients had signed on informed consent documents.

3. Results

Of the 76 cases of testicular torsion, only nine (12%) presented with acute abdominal pain (Table 1). In the nine cases of extraction the average age was 14 years (range 10–17 years), with five cases admitted during the late autumn and four during the early spring. Six cases presented with left lower abdominal pain and three with right lower abdominal pain; in all cases the pain was ipsilateral to the twisted testicle and abruptly occurred during sleep. Five patients presented with nausea and vomiting, one with fever, and three without any other symptoms. Seven cases were misdiagnosed as ordinary abdominal diseases by non-urologists (five cases by emergency physicians, one by a gastrointestinal surgeon, and one by a digestive physician). The seven patients were first assessed by abdominal physical examination and imaging as well as blood analysis at

the emergency department or outpatient clinic, and without genital examination, which eventually led to the delay in diagnosis. Two patients who were treated promptly by urologists after genital examination presented no differently from the other seven patients, but were more fortunate in that they were first assessed by a urologist on duty at the emergency department.

In the seven misdiagnosed patients, the genitals were not examined until the pain worsened and moved to the scrotum. In all these affected testes, no blood flow signals were detected by color Doppler ultrasound performed later. In the other two cases, the external genitals were examined by a urologist immediately on admission, whereby scrotal and testicular abnormalities were discovered timely; in these two patients a small amount of blood flow was detected by emergency color Doppler ultrasound. All nine patients underwent surgical exploration. In the seven misdiagnosed patients, later surgical exploration revealed that all involved testes had necrotized because the ischemia time was too long (more than 6 h) (Fig. 1), and orchidectomy was performed. The excised testes were further examined pathologically and were confirmed to exhibit testicular necrosis. In the other two patients, emergency surgical exploration established that the involved testis remained vital after detorsion (Fig. 2), and orchiopexy was performed. Among the nine patients the degree of torsion varied between 270° and 720° (median 420°), with clockwise torsion in four cases and counter-clockwise torsion in the remaining five. In the two patients whose testes were successfully salvaged the mean duration of testicular torsion was 4 h (range 3–5 h), compared with 37 h (range 18–72 h) in the seven misdiagnosed patients. No serious postoperative complications occurred.

Each patient was followed up at 1, 3, and 6 months post-operatively. Six patients were psychologically affected; specifically, they or their parents worried about potential influences on the growth of the body, sexual function, and fertility. Then we explained that one testicle did not affect sexual function, fertility, growth, and so forth, these psychological effects gradually waned. No recurrence of testicular torsion or incidence of testicular atrophy was recorded.

4. Discussion

Hemiscrotal or testicular pain has historically been the most common presenting symptom of testicular torsion. In our study, however, testicular torsion presenting with abdominal pain but without scrotal pain was noteworthy because its presentation resembled some abdominal diseases such as appendicitis, gastroenteritis, or peritonitis, but could be differentiated from abdominal diseases by examination of the external genitals and color Doppler ultrasound. However, these patients are often first evaluated by non-urologists who know little about the specific symptoms of testicular torsion, so their external genitals are rarely examined, often leading to a delayed diagnosis. In our study, seven of the nine patients who presented with abdominal pain without scrotal pain were misdiagnosed, leading to a delay in surgical treatment.

Several researchers have focused on the atypical clinical presentation of testicular torsion in adolescents and boys.

Table 1 Characteristics, operative findings, and outcomes observed in patients presenting initially with abdominal pain ($n = 9$).

Case No.	Age (year)	Side	Season	Initially presenting symptoms	Genital examination	Misdiagnosed	Duration time of testicular torsion (h)	Degree of testicular torsion (°)	Outcome
1	13	Left	Late autumn	Left lower abdominal pain	No	Yes (emergency physician)	40	720 (clockwise)	Orchidectomy
2	14	Left	Early spring	Left lower abdominal pain	No	Yes (emergency physician)	18	360 (counterclockwise)	Orchidectomy
3	10	Right	Early spring	Right lower abdominal pain	No	Yes (emergency physician)	24	360 (clockwise)	Orchidectomy
4	14	Left	Late autumn	Left lower abdominal pain	No	Yes (gastrointestinal surgeon)	20	360 (clockwise)	Orchidectomy
5	16	Left	Early spring	Left lower abdominal pain	No	Yes (emergency physician)	40	270 (counterclockwise)	Orchidectomy
6	12	Right	Late autumn	Right lower abdominal pain	Yes (urologist)	No	3	720 (counterclockwise)	Salvaged
7	17	Left	Late autumn	Left lower abdominal pain	No	Yes (emergency physician)	45	360 (counterclockwise)	Orchidectomy
8	14	Right	Early spring	Right lower abdominal pain	Yes (urologist)	No	5	360 (clockwise)	Salvaged
9	15	Left	Late autumn	Left lower abdominal pain	No	Yes (digestive physicians)	72	270 (counterclockwise)	Orchidectomy

**Figure 1** This testis necrotized because the ischemia time was too long (more than 6 h).**Figure 2** This testis remained vital after detorsion.

Anderson and Williamson [3] reported that 134 of 597 patients presented with abdominal pain, which often preceded and sometimes exceeded scrotal pain, whereas 29 of the same 597 patients presented only with abdominal pain. Mellick [4] reported the case of a 6-year-old boy who presented with isolated abdominal pain, while Pogorelić et al. [5] reported that 17 of 84 patients with testicular torsion presented with abdominal pain, and seven of 100 patients with testicular torsion complained of abdominal pain in a study by Mäkelä et al. [6]. Gaither and Copp [7] found that 16 patients presented with only abdominal pain upon a review of state appellate cases about testicular torsion malpractice litigation from 1985 to 2015. In our study, the patients who presented with isolated abdominal pain accounted for 12% of the total population.

The diagnosis of testicular torsion can preliminarily be made by physical examination. An external examination of the genitals can often reveal swelling or erythema of the scrotum and testicle, testicular tenderness, or a horizontal testicle, and the cremasteric reflex may be absent. Santos and Kohl [8] recommended that a mandatory genital examination should be conducted in the clinical assessment of boys with abdominal pain.

Color Doppler ultrasound is routinely used to detect the testicular blood flow, as it is a convenient and non-invasive way to demonstrate the central arterial blood supply and venous drainage of the testis. Mellick [4] believed that color Doppler was a consistently reliable tool for confirming the diagnosis of testicular torsion.

Although the etiology of abdominal pain in young males with testicular torsion is still not well known, we speculate that it possibly involves the following: (i) The scrotum is innervated by L1 in the anterior part and S2 and S3 in its posterior part. Besides this the testicle is innervated by spinal segments T10 and T11, and testicular pain can spread to the adjacent spinal cord segment of the commonly innervated abdominal organs [5]; (ii) Innervation is rich in the normal testis, but some congenital disorders possibly exist in those patients with testicular torsion who present with abdominal pain; (iii) The twisted spermatic cord pulls and stimulates the peritoneum, which triggers abdominal pain; (iv) The tensed cremaster muscle pulls and stimulates the peritoneum.

Torsion may lead to serious testicular ischemia. When testicular torsion occurs, venous return is first obstructed, after which edema begins to appear in the testicle and epididymis. If the obstruction is not removed in timely fashion the swelling continues to increase, which can lead to blood supply disorder of the testicular arteries. Fabiani et al. [9] believed that the elapsed time between the onset of symptoms and explorative surgery represented the only prognostic factor for testicular viability. Testicular viability is negatively correlated with the ischemia time. It is commonly believed that testicular torsion addressed in a time period shorter than 6 h is the best timeframe for successful survival [4]. If treated within 6 h from the onset of torsion symptoms, 90%–100% of testis can be rescued; if treated within 6–12 h, 20%–50% of testicles can be saved. However, if treated within 12–24 h only up to 10% of testicles can be rescued [4–6,10]. In this study, the ischemia time was between 18 and 72 h (mean 37 h) in the seven excised testes, whereas in the two salvaged testes the

mean ischemia time was 4 h. Comparing the times of ischemia in our study with those of the aforementioned published reports, our results are consistent with the previous literature findings.

Even if testicular torsion is treated in the early stage, operative detorsion and orchiopexy cannot completely ensure normal testicular function. Lian et al. [11] reported that half of the patients with testicular torsion who underwent salvage surgery developed testicular atrophy. Some experts believed that atrophied testis could lead to a more serious injury to the contralateral testis [12,13]. However, Lorenzini et al. [14] observed that testicular torsion did not cause long-term effects on the spermatogenesis of the contralateral testis in pubertal rats. For male adolescents and young boys, we consider it essential to conserve as much testis as possible at the time of operation unless the twisted testicle has died. In the short term, if the affected testicle is found to have seriously atrophied it can be excised by reoperation.

Previous articles on the incidence of testicular torsion in relation to the seasons of the year have shown a positive correlation between lower air temperature and testicular torsion [15]. However Karakan et al. [16] proposed that the prevalence of testicular torsion did not change with the seasons but directly positive correlated to the air temperature, especially below 15 °C. In the present study we also noticed that testicular torsion often occurred during the late autumn and early spring, potentially in relation to the temperature difference in addition to the low air temperature.

A limitation of this study is its possible information bias. Some adolescents are undergoing a period of sexual shyness when abdominal pain accompanied by scrotal pain occurs at the onset of testicular torsion; thus, they may only complain of abdominal pain to their parents or primary care physicians.

5. Conclusion

In some cases of testicular torsion in young males, lower abdominal pain can be the initial and the only presenting symptom. Clinicians should pay very close attention to the specific clinical presentation to ensure the correct diagnosis in a timely manner.

Conflicts of interest

The authors declare no conflict of interest.

Author contributions

Study design: Fujun Wang, Zengnan Mo.

Data acquisition: Fujun Wang.

Data analysis: Fujun Wang.

Drafting of manuscript: Fujun Wang.

Critical revision of the manuscript: Zengnan Mo.

Acknowledgment

We thank Hugh McGonigle, from Liwen Bianji, Edanz Group China (www.liwenbianji.cn/ac), for editing the English text

of a draft of this manuscript. The study was partially supported by the Medical Records Room, Heze Municipal Hospital, Shandong Province, China.

References

- [1] Józsa T, Klárik Z, Kiss F, Tóth E, Mester A, Hargitai Z, et al. Morphological and microcirculatory evaluation of the rat testis after detorsion with or without a capsular release with a tunica vaginalis flap. *Asian J Androl* 2016;18:462–6.
- [2] Pogorelić Z, Mustapić K, Jukić M, Todorčić J, Mrklić I, Meštrović J, et al. Management of acute scrotum in children: a 25-year single center experience on 558 pediatric patients. *Can J Urol* 2016;23:8594–601.
- [3] Anderson JB, Williamson RCN. Testicular torsion in Bristol: a 25-year review. *Br J Surg* 1988;75:988–92.
- [4] Mellick LB. Torsion of the testicle: it is time to stop tossing the dice. *Pediatr Emerg Care* 2012;28:80–6.
- [5] Pogorelić Z, Mrklić I, Jurić I. Do not forget to include testicular torsion in differential diagnosis of lower acute abdominal pain in young males. *J Pediatr Urol* 2013;9:1161–5.
- [6] Mäkelä E, Lahdes-Vasama T, Rajakorpi H, Wikström SA. 19-year review of paediatric patients with acute scrotum. *Scand J Surg* 2007;96:62–96.
- [7] Gaither TW, Copp HL. State appellant cases for testicular torsion: case review from 1985 to 2015. *J Pediatr Urol* 2016;12:291.e1–5. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5073043/>.
- [8] Santos M, Kohl M. Testicular torsion masked by painful abdomen. *Dtsch Arztebl Int* 2013;110:41.
- [9] Fabiani A, Calabrese M, Filosa A, Fioretti F, Maurelli V, Scandola M, et al. Explorative surgery of for acute scrotal pain: the importance of patient age, side affected, time to surgery and surgeon. *Arch Ital Urol Androl* 2016;88:189–94.
- [10] Saxena AK, Castellani C, Rutenstock EM, Höllwarth ME. Testicular torsion: a 15-year single-center clinical and histological analysis. *Acta Pediatr* 2012;101:e282–6. <https://doi.org/10.1111/j.1651-2227.2012.02644.x>.
- [11] Lian BS, Ong CC, Chiang LW, Rai R, Nah SA. Factors predicting testicular atrophy after testicular salvage following torsion. *Eur J Pediatr Surg* 2016;26:17–21.
- [12] Yıldız H, Durmus AS, Simşek H, Yaman M. Protective effect of sildenafil citrate on contralateral testis injury after unilateral testicular torsion/detorsion. *Clinics (Sao Paulo)* 2011;66:137–42.
- [13] Schanaider A, Aiex CA, Errico G. Immunological effects of acute testicular torsion on the contralateral testis in rats. *Eur J Pediatr Surg* 2011;21:370–4.
- [14] Lorenzini F, Tambara R, Gomes RPX, Martino-Andrade AJ, Erdmann TR, Matias JEF. Long-term effects of the testicular torsion on the spermatogenesis of the contralateral testis and the preventive value of the twisted testis orchidectomy. *Acta Cir Bras* 2012;27:388–95.
- [15] Grushevsky A, Allegra JR, Eskin B, McCarthy C. The seasonality of testicular torsion. *Pediatr Emerg Care* 2011;27:1146–7.
- [16] Karakan T, Bagcioglu M, Özcan S, Telli O, Turgut H, Özkan M, et al. Seasonal preponderance in testicular torsion: is it a myth? *Arch Esp Urol* 2015;68:750–4.