Heliyon 10 (2024) e33775

Contents lists available at ScienceDirect

Heliyon

journal homepage: www.cell.com/heliyon

Case report

# Segmental testicular infarction in adolescent:experience of new treatment and testicular function monitoring

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A B S T R A C T

Segmental testicular infarction is a relatively rare acute or subacute condition that is often overlooked in the differential diagnosis of testicular pain. Ultrasound is highly sensitive in detecting testicular damage. Combining testicular tumour markers with MRI can effectively identify tumours and infarctions. Conservative treatment programs for adolescents suggest that testicular function should be monitored. We report the case of a 12-year-old boy with testicular infarction who was treated with antibiotics, dexamethasone, and vitamin C. We monitored reproductive hormones, inhibin B, anti-Müllerian hormone, and testicular volume to assess the patient's testicular function. LH increased 3.02 fold on day 14 and 3.8 fold on day 42; T increased 6.92 times on day 14 and 7.95 fold on day 42; inhibin B increased 2.72 fold on day 14 and 4.06 fold on day 42; the left testicular volume increased 1.14 fold on day 42; the right testicular volume decreased by 8 %; and the infarct area decreased by 71 %. This case study demonstrated the effectiveness of conservative treatment with antibiotics, dexamethasone, and vitamin C for segmental testicular infarction. Close monitoring of testicular function is essential for optimal management of this rare condition in adolescent patients.

## 1. Introduction

Segmental testicular infarction (STI) is a rare urological condition that is often challenging to diagnose clinically. The aetiology and pathophysiology of STI remain unclear, with the majority of cases being idiopathic and predominantly affecting adult males aged 20–40 years [1]. The current treatment for STIs primarily involves conservative approaches, with surgical exploration considered if testicular or scrotal pain persists. Conservative treatment poses risks such as worsening testicular infarction, inducing testicular atrophy, reducing hormone levels, and increasing the likelihood of contralateral testicular torsion, potentially impacting future fertility [2]. In the existing literature, postoperative follow-up assessments of testicular function in STI cases is limited. Herein, we presented the case of a 12-year-old boy with an STI who underwent conservative treatment, and his testicular function was monitored post-treatment. Written informed consent was obtained from the patient and his family for the publication of this case.

## 2. Case description

The patient is a 12-year-old male who presented to the emergency department with right scrotal pain lasting for 3 days. On physical examination, there was no redness or swelling in the right inguinal region and no palpable masses or enlargement in the right scrotum, but tenderness was noted upon palpation. Genital development was consistent with Tanner stage G2PH2. There was no history of

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https://doi.org/10.1016/j.heliyon.2024.e33775
Received 24 February 2024; Received in revised form 26 June 2024; Accepted 26 June 2024
Available online 27 June 2024

surgery or family medical conditions. Ultrasonography revealed the right testicle size as 35 × 17 × 21 mm with intact tunica albuginea, enhanced echogenicity, and an uneven echo pattern in the upper segment measuring approximately 23 × 16 × 19 mm, with unclear borders and no blood flow signals on CDFI. Emergency scrotal exploration revealed a purplish-black colour in the upper segment of the right testicle. There was no torsion of the spermatic cord or vas deferens. A longitudinal incision in the tunica albuginea revealed a red blood flow, consistent with Arda grade II. The diagnosis was segmental ischaemic infarction of the upper segment of the right testicle. After informing the patient's family about the condition, a decision was made to perform an orchiopexy. A portion of the testicular tissue was subsequently removed for pathological examination, showing the presence of various spermatogenic cells, visible spermatids, and a few sperm. Postoperatively, the patient received intravenous dexamethasone (10 mg daily for 3 days, ceftriaxone 1.5 mg and vitamin C 0.1 mg intravenously daily). On day 5 post-surgery, no testicular tenderness was noted, and the surgical incision exhibited satisfactory healing. The patient was discharged and prescribed oral vitamin C (0.1 g) daily for 1 month. The preoperative and postoperative anti-sperm antibody test results at 2 weeks and 6 weeks, respectively, were negative. Scrotal ultrasound examinations were performed on postoperative days 2, at 2 weeks, and at 6 weeks (Fig. 1). On days 4(Fig. 2 A&B) and 130 (Fig. 2C&D)post-surgery, scrotal MRI was performed. To evaluate testicular function, assessments of testicular volume, hormonal levels, Inhibin B (INH B), and anti-Müllerian hormone (AMH) were conducted at 0, 2, and 6 weeks postoperatively (Table 1).

## 3. Discussion

STI is characterised by ischaemia and necrosis of the local testicular tissue caused by the occlusion of small intratesticular arteries. The extent of infarction depends on the distribution of arteries and the location and degree of thrombus formation. The aetiology of STIs is diverse, with approximately 70 % of them being idiopathic. Epididymo-orchitis is the most common cause of this condition [3]. The testicles are primarily supplied by the testicular artery, which originates from the aorta and branches into the anterior and posterior divisions, giving rise to the centripedal arteries. The posterior division of the testicular artery communicates with the differential artery through the anastomosis. However, the region of the testicle fed by the anterior division has a limited collateral blood supply, rendering it more vulnerable to infarction [2]. This explains why there is a predilection for the upper hemisphere of the testicle. Differential diagnosis is essential for distinguishing STI from conditions such as testicular torsion, testicular tumours, and testicular tuberculosis. While ultrasound is sensitive for detecting testicular injuries, Valentino et al. reported that contrast-enhanced ultrasound has diagnostic sensitivity and specificity of up to 96 % and 100 %, respectively, for testicular emergencies, allowing for more accurate differentiation of various testicular emergencies [4]. Moreover, a combination of testicular tumour markers and MRI can effectively distinguish between tumours and infarction.

The current primary approach to STI treatment is conservative and involves antibiotics (3–5 days) administration, vasodilation, and anticoagulation. Surgical exploration should be considered if the testicular or scrotal pain persists despite conservative treatment. Although conservative treatment preserves testicular function to a certain extent, it may overlook the optimal surgical window or delay treatment, potentially leading to complete testicular infarction or malignant transformation.

STIs are a form of ischaemia-reperfusion injury and a significant cause of impaired testicular spermatogenic and hormonal secretion

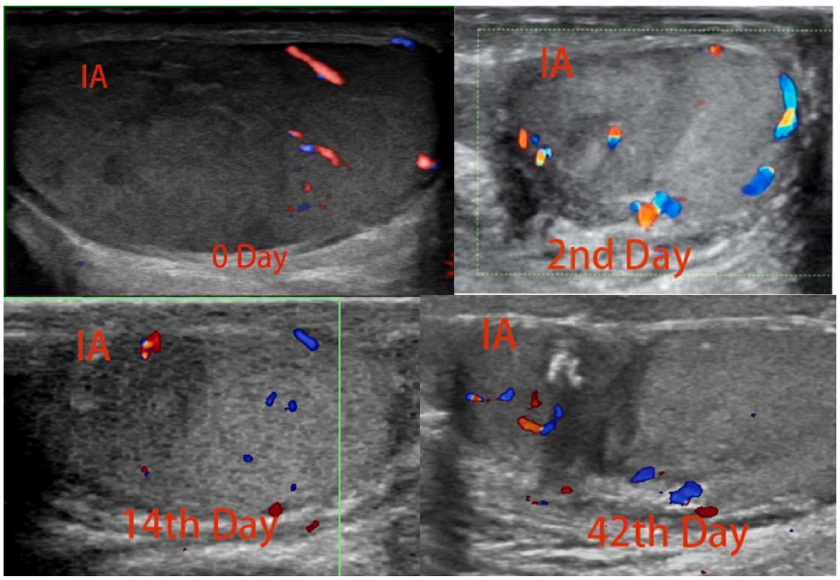


**Fig. 1.** Changes in blood supply to the testicular infarct area during different periods observed under colour Doppler ultrasound. On day 0, CDFI in the infarct area shows an intact tunica of the right testicle with enhanced and heterogeneous echogenicity, and no blood flow signal was observed. By day 2, dot-like blood flow signals were visible, along with peripheral blood flow signals. CDFI on days 14 and 42 shows lower echogenicity with visible blood flow signals.

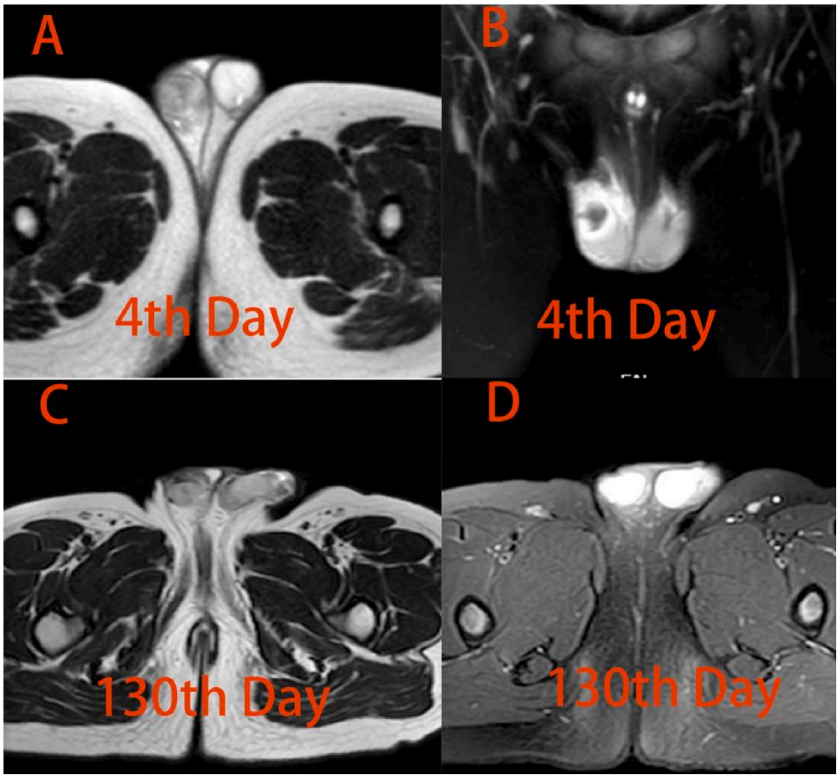


**Fig. 2.** A (T2WI SPIR): A circular isointense signal is observed in the right testicle, with patchy hyperintense signals visible internally. The lateral scrotum exhibits a hyperintense signal consistent with oedema. **B(T1WI)**: Demonstrates a ring-enhancing lesion at the upper part of the right testicle with non-enhancing areas inside, while the lower part shows normal testicular enhancement, similar to the left side. **C, D (T2WI):**The upper part of the right testicle appears absent and manifests as a cystic mixed signal, which shows ring enhancement post-enhancement. The lower part of the testicle exhibits a normal signal with dimensions of approximately 15 × 25 × 21 mm, and the signal post-enhancement is similar to that on the left side.

**Table 1**
Changes in Hormonal,INH B,AMH,TV and IV during different periods.

| Time(day) | 0 | 2 | 14 | 42 |
|---|---|---|---|---|
| HLH(mIU/ml) | 0.9 | | 2.72 | 3.42 |
| TESTO(ng/dl) | 16.51 | | 114.18 | 131.27 |
| INH B(pg/ml) | 36.6 | | 99.4 | 148.6 |
| AMH(ng/ml) | 14.72 | | 12.83 | 13.36 |
| LTV(ml) | 6.54 | 6.52 | 6.54 | 7.44 |
| RLV(ml) | 6.54 | 6.33 | 6.14 | 6.04 |
| IV(ml) | 3.66 | 3.17 | 1.22 | 1.06 |

HLH:Serum luteinizing hormone; INH B: Serum inhibin B; AMH:Anti-Müllerian hormone; LTV: left testicular volume; RTV: right testicular volume. IV:infarction volume; T:Testo.
Testicular volume (ml) = π/6*(length* width* height).

functions. It stimulates a cascade of inflammatory signals in endothelial cells of the testicle, leading to increased levels of reactive oxygen species, lipid peroxidation, and myeloperoxidase. Ultimately, it induces apoptosis in germ cells through two well-known pathways, the Bax and Fas-FasL pathway [5–7]. Considering the mechanism of testicular ischaemia-reperfusion injury, we employed a treatment regimen combining antibiotics with dexamethasone and vitamin C in patients with STI. Dexamethasone is a synthetic glucocorticoid that reduces neutrophil adhesion and extravasation, alleviates lipid peroxidation reactions, and protects antioxidant enzyme activity [8]. Vitamin C improves tissue superoxide dismutase activity, reduces malondialdehyde production, and inhibits tissue cytokine production This helps in enhancing the tissue structure of torsioned testicles and reducing cellular apoptosis in testicular tissue [9]. The combination of dexamethasone and vitamin C in the treatment of STI has not been reported in the literature, and postoperative follow-up does not typically involve monitoring testicular function. Considering that the patient's genital development was in the G2PH2 stage, we deemed it necessary to monitor testicular function. Karaoglan et al.'s [10] study suggests that AMH testing could serve as a reliable and practical biomarker for evaluating testicular function in adolescents with hypogonadism. INH B is a

good indicator of the degree of supporting cell differentiation, and its concentration is related to spermatogenic function [11]. We assessed post-treatment testicular function by monitoring the reproductive hormones, INH B, AMH, and testicular volume. The results showed that HLH increased 3.02 fold on day 14 and 3.8 fold on day 42; T increased 6.92 times on day 14 and 7.95 fold on day 42; INH B increased 2.72 fold on day 14 and 4.06 fold on day 42; left testicular volume increased 1.14 fold on day 42, but the right testicular volume decreased by 8 %; and the infarct area decreased by 71 %. T and INH B were significantly increased, and IV was significantly reduced, indicating that the germ cells in the area of STI were rapidly repaired after antibiotic, dexamethasone, and vitamin C treatment and that hormone secretion function returned to normal levels. The right testicular volume decreased by 8 %, indicating no apparent atrophy of the testicles. These results suggest a good recovery of testicular function post-treatment. However, despite the limited number of cases and short follow-up period, we will continue to collect similar cases and monitor testicular function.

## 4. Conclusion

Antibiotics combined with dexamethasone and vitamin C are effective in treating STI during adolescence,and strict conservative treatment and close monitoring of testicular function are recommended.

## Conflict of interest disclosures

The authors have no potential conflicts of interest to disclose.

## Informed consent

Informed consent was obtained from the patients and their guardians for the publication of the article.

## Funding

This work was supported by the Ningbo medical key supporting discipline (2022-F25).

## Data availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

## CRediT authorship contribution statement

**Yan Li:** Writing – review & editing, Writing – original draft. **Qiang Chen:** Methodology, Data curation. **Jinliang Chen:** Data curation. **Shaoyu Lin:** Data curation. **Hongji Zhong:** Writing – review & editing, Methodology.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Acknowledgments

The authors gratefully acknowledge the contributions of the doctors and nurses in our hospital.

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