Extravaginal testicular torsion in neonates - review of clinical symptoms with ultrasound and intraoperative photo documentation.

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Learning objectives

- to illustrate spectrum of clinical and radiological findings in extravaginal testicular torsion (ETT) in neonates.

- to revise embryological development of the ETT.

- to present usefulness of ultrasound (US) examination, including elastography, in correlation with clinical and intraoperative findings with photo documentation.

Background

Testicular torsion is taken into consideration in differential diagnosis of acute scrotum. It should be confirmed or ruled out at first diagnostic step. It may concern children, including prenatal age, and adults as well.

Ultrasonography with colour Doppler is a first choice diagnostic method [1].

Extravaginal testicular torsion (ETT), also called prenatal or perinatal testicular torsion, occurs prenatally and is present at birth OR appears within the first month of life [2]. It is connected to the high mobility of the tunica vaginalis inside the scrotum due to the poor fixation to the scrotal wall [6]. Fixation occurs in the first weeks after birth.

Intravaginal torsion appears in older children and adults. It has a different etiology than ETT - tunica vaginalis is already fixed to the scrotal wall and the spermatic cord undergoes torsion within the tunica vaginalis (Fig. 1).

Irreversible damage of spermatogenesis occurs after 4-6 hours of ischemia, and damage of Leydig cells responsible for testosterone production - after 12 hours of ischemia [3].

Most cases of ETT appear prenatally, and testicles are unsalvageable [4]. Clinical examination of scrotum, performed by pediatrician at birth, can reveal hardened testicle [5] or scrotal mass. Differential diagnosis of a palpable scrotal mass in the newborn should include ETT, as well as tumors of the testicle, inguinal hernia with or without incarceration, hydrocele and hematocoele [1,6].

Postnatal testicular torsion is an acute state and needs immediate surgery. However, acute torsion in older children and adults has a different clinical presentation than in
newborn. First of all, older patient will highlight the pain in scrotum, while the newborn will manifest not characteristic general signs and symptoms, like pain or irritability. Local signs, as swelling, redness and tenderness of scrotum will also appear.

Immediate surgery is a standard procedure in acute perinatal testicular torsion. There are however still wide discussions concerning management of the "old" prenatal testicular torsions - varying from immediate orchiectomy to conservative treatment resulting in testicle atrophy [3,7-12]. The argument for immediate orchiectomy is a possibility of contralateral healthy testicle damage through antisperm antibody production [13]. On the other hand, data from literature suggest that some tissue after torsion can survive, even if perfusion does not resume - this concerns especially the Leydig cells.

Orchiectomy of the necrotic testicle is a standard procedure in our Hospital.

The knowledge about this disease is essential to manage the patient appropriately.

**Images for this section:**

![Images](image-url)

**Fig. 1:** Anatomical background of testicular torsion: comparison of normal structures of scrotum, intravaginal spermatic cord torsion and extravaginal testicular torsion with tunica...
Findings and procedure details

We present clinical findings and pictorial review of testicular torsion in neonates in US, including elastography, in correlation with intraoperative findings with photo documentation.

In the period 2008-2013 there were 11 cases of perinatal testicular torsion in our Hospital. The clinical signs were present at birth in 8 cases, while in 3 cases they appear within the first month of life. In the first group, the most common signs in clinical examination were: hardened testicle and discoloration of the scrotum (Fig. 2), while in the second group - signs of acute scrotum, i.e. scrotal swelling, redness and tenderness. Testicular torsion occurred on the right side in 6 patients and on the left side in 3 patients. One patient had torsion of both testicles (Fig. 7-8). Primary diagnosis was assessed according to clinical examination performed by a surgeon. In all cases US was performed (Fig. 3-4, Fig. 9-11), which revealed: thickening of the tunica vaginalis (6), heterogenous testicle with hypoechoic areas of necrosis (6), testicular enlargement (6), reduction or absence of blood flow in Doppler ultrasonography (5), hydrocele (3), contralateral hydrocele (4). Normal testicular echogenicity was present in 4 cases, including 2 cases of postnatal and 2 prenatal torsions. In 1 case the testicle was small with increased echogenicity, what suggests testicular atrophy.

Surgical management included: ipsilateral orchiectomy and contralateral orchiopexy (4), ipsilateral orchiectomy without orchiopexy of the contralateral testicle (5) and bilateral orchiectomy of both necrotic testicles (2). Surgery was performed immediately after diagnosis. During surgery there was only 1 case of a certain diagnosis of extravaginal testicular torsion. In all other cases this macroscopic diagnosis was very difficult due to thickening and necrotic changes within testicle, spermatic cord and their layers.

Preoperative ultrasonographic findings of suspected testicular torsion were correlated with findings at surgery at 7 cases.

Images for this section:
Fig. 2: 1-day old newborn with suspected prenatal testicular torsion. Clinical examination revealed swelling and redness of the right hemi-scrotum (Fig. 2). US revealed enlarged and heterogenous right testicle (Fig. 3) without blood flow in Doppler US (Fig. 4). Intraoperative findings included hemorrhagic and necrotic right testicle (Fig. 5, Fig. 6).
Fig. 3: 1-day old newborn with suspected prenatal testicular torsion. Clinical examination revealed swelling and redness of the right hemi-scrotum (Fig. 2). US revealed enlarged and heterogenous right testicle (Fig. 3) without blood flow in Doppler US (Fig. 4). Intraoperative findings included hemorrhagic and necrotic right testicle (Fig. 5, Fig. 6).
Fig. 4: 1-day old newborn with suspected prenatal testicular torsion. Clinical examination revealed swelling and redness of the right hemi-scrotum (Fig. 2). US revealed enlarged and heterogenous right testicle (Fig. 3) without blood flow in Doppler US (Fig. 4). Intraoperative findings included hemorrhagic and necrotic right testicle (Fig. 5, Fig. 6).
Fig. 5: 1-day old newborn with suspected prenatal testicular torsion. Clinical examination revealed swelling and redness of the right hemi-scrotum (Fig. 2). US revealed enlarged and heterogenous right testicle (Fig. 3) without blood flow in Doppler US (Fig. 4). Intraoperative findings included hemorrhagic and necrotic right testicle (Fig. 5, Fig. 6).
Fig. 6: 1-day old newborn with suspected prenatal testicular torsion. Clinical examination revealed swelling and redness of the right hemi-scrotum (Fig. 2). US revealed enlarged and heterogenous right testicle (Fig. 3) without blood flow in Doppler US (Fig. 4). Intraoperative findings included hemorrhagic and necrotic right testicle (Fig. 5, Fig. 6).
Fig. 7: Newborn in the second day of life with signs of acute scrotum and suspected right testicle torsion. US revealed enlarged right testicle with normal echogenicity of both testicles. Intraoperative findings included torsion of both testicles, with hemorrhagic and necrotic right testicle (Fig. 7) and necrotic left testicle (Fig. 8).
Fig. 8: Newborn in the second day of life with signs of acute scrotum and suspected right testicle torsion. US revealed enlarged right testicle with normal echogenicity of both testicles. Intraoperative findings included torsion of both testicles, with hemorrhagic and necrotic right testicle (Fig. 7) and necrotic left testicle (Fig. 8).
Fig. 9: 1-day old newborn with suspected prenatal testicular torsion. US revealed enlarged and heterogenous right testicle (Fig. 9) without blood flow in Doppler US (Fig. 10), and contralateral hydrocele. Elastography revealed abnormal structure of the right testicle, related to necrotic changes - stiffer peripheral part with soft tissue central part (hard tissues are displayed in blue, soft tissues - in red) (Fig. 11). Intraoperative findings included necrosis of the right testicle (Fig. 12). Elastography images correlated with clinical examination and intraoperative findings.
Fig. 10: 1-day old newborn with suspected prenatal testicular torsion. US revealed enlarged and heterogenous right testicle (Fig. 9) without blood flow in Doppler US (Fig. 10), and contralateral hydrocele. Elastography revealed abnormal structure of the right testicle, related to necrotic changes - stiffer peripheral part with soft tissue central part (hard tissues are displayed in blue, soft tissues - in red) (Fig. 11). Intraoperative findings included necrosis of the right testicle (Fig. 12). Elastography images correlated with clinical examination and intraoperative findings.
Fig. 11: 1-day old newborn with suspected prenatal testicular torsion. US revealed enlarged and heterogenous right testicle (Fig. 9) without blood flow in Doppler US (Fig. 10), and contralateral hydrocele. Elastography revealed abnormal structure of the right testicle, related to necrotic changes - stiffer peripheral part with soft tissue central part (hard tissues are displayed in blue, soft tissues - in red) (Fig. 11). Intraoperative findings included necrosis of the right testicle (Fig. 12). Elastography images correlated with clinical examination and intraoperative findings.
Fig. 12: 1-day old newborn with suspected prenatal testicular torsion. US revealed enlarged and heterogenous right testicle (Fig. 9) without blood flow in Doppler US (Fig. 10), and contralateral hydrocele. Elastography revealed abnormal structure of the right testicle, related to necrotic changes - stiffer peripheral part with soft tissue central part (hard tissues are displayed in blue, soft tissues - in red) (Fig. 11). Intraoperative findings included necrosis of the right testicle (Fig. 12). Elastography images correlated with clinical examination and intraoperative findings.
Conclusion

Testicular torsion may concern children in perinatal period.

Diagnostic imaging procedures should confirm or rule out the testicular torsion, however there are still many diagnostic pitfalls.

Ultrasound elastography may be a very useful tool for visualisation of a very common sign - hardening of the torsed testicle.

Patient management is still a subject of discussions.

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References


