

Neonatal Testicular Torsion

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Abstract

Rotation of the testis around the axis of the spermatic cord results in tissue ischaemia and testicular torsion (TT). TT in the newborn infant in the 1st month of life is referred to as neonatal TT (NTT) or perinatal TT and occurs in 6.1/100,000 live births. The true incidence could be higher as some of these occur prenatally and can be asymptomatic. TT can be extravaginal, intravaginal and mesorchial and NTT is usually extravaginal. Physical examination can be adequate for the diagnosis, and utility of ultrasound (US) is mainly to exclude other conditions. If the timing of the torsion is prenatal, the testicle may not be salvageable. But, in certain situations, these could be asymptomatic bilateral TT. When the timing of torsion is not simultaneous (asynchronous torsion) early contralateral orchiopexy done at the time of exploration would prevent the occurrence of asynchronous torsion. Non-operative maneuvers to detorse in NTT are not successful and not recommended. This review focuses on the diagnostic approach and management.

Keywords: Extravaginal, orchiectomy, orchiopexy, perinatal, testicular torsion

INTRODUCTION

When the testis rotates around the spermatic cord attachments and disrupts the blood flow this results in ischaemia and testicular torsion (TT).^[1] When ischaemia is prolonged, generally within a 4–8 h, it can lead to irreversible injury.^[1,2] In boys <18 years, the incidence of TT is estimated at 3.8/100,000/year with peaks in the neonatal and adolescent age groups.^[1,3] TT identified prenatally (in utero) or within the 1st month of life is referred to as neonatal TT (NTT) or perinatal TT (PTT) regardless of when the event occurred—prenatally, during delivery or postpartum.^[2,4–6] NTT has an incidence of 6.1/100,000 live births.^[2,4,5]

TT occurs when the spermatic cord structures twist away from the midline in the direction of the cremasteric muscle fibres.^[5–8] Depending on the degree of torsion, the venous drainage is impeded initially and then the arterial blood flow resulting in ischaemia, and necrosis of the testis, leading to loss of function. If bilateral, it results in infertility and hypoandrogenism.^[2,5–8]

Based on the rotation of the spermatic cord, either within the tunica vaginalis (TV) or along with the TV, there are different forms of torsion. The intravaginal torsion occurs when rotation of the testis and spermatic cord occurs within the TV,

especially if its attachment to the testicle is high, allowing for the spermatic cord to rotate within it.^[1,3] When the rotation of the spermatic cord is external to the TV and involves the entire TV, along with the testis and epididymis, this can lead to extravaginal torsion.^[1,3,6–9] The factors for the occurrence of an extravaginal torsion are the lack of a firm fixation of the dartos to the scrotum and an abnormally long attachment of the TV to the testis.^[3,7–9] If the twisting of the tissue occurs anteriorly, between the epididymis and parietal TV, it results in mesorchial torsion.^[10] A hyperactive cremasteric reflex, cryptorchidism and epididymal abnormalities are predisposing factors.^[6,8]

The most common type of NTT is the extravaginal type (85%–90%) and often occurs during the testicular descent from the abdominal cavity into the scrotum.^[1,7] Most of this occurs (60%–75%) prenatally or during delivery.^[7,8] The intravaginal type is seen in 90% of TT in later infancy and childhood.^[7,8]

Predisposing factors for PTT include breech presentation, large for gestational age, prolonged labour and a difficult delivery.^[6]

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Familial incidence is seen in about 10% of cases of TT.^[1] In the bell clapper deformity, TT is often bilateral.^[1] The severity of TT is dependent on both degree of rotation and duration of torsion. With increased rotation of the spermatic cord, there is a more rapid onset of ischaemia and a higher risk for atrophy.^[1]

NTT can be asymptomatic but should be suspected if a firm, non-tender, discoloured scrotal or groin mass is seen. It can also be difficult to palpate the testicle separate from the scrotal skin as inflamed testicular mass is adherent to the skin.^[2,3] The causes of a scrotal swelling in the neonate include birth trauma, breech delivery, epididymo-orchitis, scrotal haemorrhage and hydrocele.^[7,8] The differential diagnosis also includes torsion of epididymis or the appendix of the testis, tumours, inguinal hernia and cellulitis.^[7,8] NTT when occurring postnatally appears with more classic inflammatory signs of torsion such as swelling, erythema or discoloration and tenderness. The absence of the cremasteric reflex is not a reliable sign in this age group.^[2] If there is asymptomatic involvement of the contralateral testis, at presentation, it is termed synchronous and if it occurs later in life, it is called asynchronous bilateral TT.^[8]

If there is an uncertainty in clinical diagnosis, ultrasound (US) imaging using a high frequency linear transducer and colour doppler can confirm the diagnosis and helps assess the contralateral testicle, for synchronous bilateral involvement.^[1-4,8,9,11-13] US has a sensitivity of 89.9% and a specificity of 98.8%, with a false-positive rate of 1%.^[2,6] Other techniques such as real-time shear wave elastography, trans-scrotal near-infrared spectroscopy (NIRS), 3-D multiparametric contrast enhanced US and using heterogeneity index may also be helpful.^[1,2,9,12-19] NIRS, which measures the tissue oxygen saturation, may be a useful bedside examination tool.^[1,19] Apart from absent blood flow, other US signs include heterogeneity of the parenchyma, calcifications, “snail sign” or “whirlpool sign,” representing an abrupt change in the course of the spermatic cord with a spiral twist, but this may not be reliable in neonates.^[2-4,20] US should be used when the diagnosis is equivocal as diagnostic studies will delay scrotal exploration.

If a clinical diagnosis of NTT is made, then early surgical exploration is needed. If the time from torsion to detorsion is <4–8 h, then testicular salvage rates are higher.^[2-4,8] Inguinal, hemiscrotal and midline scrotal raphe incisions have been used. After dissection of the dartos layers, incision and eversion of the TV allow for the inspection of the testicle and epididymis. The affected testicle is detorsed, noting the direction and degree of torsion and placed on warm, moist sponges.^[2-4] The contralateral testicle is explored and if viable, an orchiopexy, by fixing the testis excluding the TV to the scrotum.^[2-4] Depending on the viability of the affected side, either an orchiopexy or if non-viable an orchiectomy is performed as it could be a nidus for later infection, or be a source of malignancy or lead to production of testicular antibodies.^[2-4]

The timing of exploration can be controversial as in infancy, testicular salvage after surgery is as low as 6% in neonates and 17% in infants.^[7,8] Even after immediate surgery in

bilateral synchronous NTT, bilateral testicular atrophy could not be prevented.^[21-23] The proponents for delayed elective exploration cite the low salvage rates, the rarity of asynchronous torsion and the increased anaesthetic risk in this age group.^[2-4,8,23,24] However, due to the risk of bilateral asynchronous torsion and the devastating consequences of bilateral anorchia, many believe in urgent exploration as the overall salvage rate improved from <10% to 22% when the operation was specified as an emergency.^[25-30] Roth *et al.* reported that after they adopted a strategy of urgent surgical exploration in cases of prenatal torsion, anorchia was minimized.^[31] The risks of anaesthesia during the neonatal period and the potential for infertility are the main reasons for these different opinions.^[11,31-38] Increasing use of caudal anaesthesia avoids the potential negative effects of general anaesthesia on neurocognitive development and decreases the use of narcotics post-operatively.^[39]

An inguinal incision in neonates for exploration is used by some surgeons due to the rare possibility of finding a tumour, but there is the risk of spermatic cord or vasal injury and the potential for later development of hydrocele or hernia.^[2,4,31,36,38] Placement of the testis in a dartos pouch between the external spermatic fascia of the scrotum and the dartos fascia is thought to be less traumatic.^[2] TWIST score - testicular workup for ischaemia and suspected torsion to assess the risk of torsion has not been validated in NTT.^[40,41] There are other minor surgical differences in practice, as in the method of fixation with or without sutures, use of dissolvable or non-absorbable suture, the number of points of testicular fixation and the placement of testicle within a dartos or extradartos pouch.^[2,3,11] Non-operative manoeuvres such as manual external detorsion is not successful. Intravaginal NTT is extremely rare.^[8,42-44]

After testis is detorsed, the rapid reperfusion could potentially exacerbate the ischaemia-reperfusion injury of the testis.^[1] An excess of reactive oxygen species could cause endothelial dysfunction, inflammation, vascular leakage and eventually further apoptosis. The subsequent oedema and rise in intra-testicular pressure can lead to additional tissue injury and infarction. To mitigate the reperfusion injury and prevent post-operative intra-compartmental pressure that could worsen the vascular compromise, Kutikov devised a TV flap.^[45] This approach also attempts to salvage the testicle when its viability is questionable.^[3,46-48] When the testis of questionable viability is retained, the risk of this procedure could be the rare development of antisperm antibodies.^[2] Prevention of the reperfusion injury using phosphodiesterase inhibitors, angiotensin converting enzyme inhibitors, calcium channel blockers and anti-oxidative agents is being studied.^[1,49]

Bilateral exploration resulted in higher ipsilateral salvage rates as compared to when only the affected testicle is explored.^[50] In their pooled metanalysis data, Monteilh, reported that, most of the patients were unilateral and extravaginal and bilateral torsion was usually asynchronous torsion.^[50] They reported a trend towards earlier exploration and orchiopexy

of the unaffected testicle.^[50] This metanalysis was a review of qualitative and descriptive studies.^[50]

SUMMARY

NTT when presents in the newborn infant can be missed during a routine initial neonatal examination as they could be asymptomatic. The presence of inguino-scrotal bruising, swelling, discolouration or tenderness should alert the physician of this diagnosis. Surgical intervention is not delayed and US confirmation is not usually needed. Synchronous bilateral TT may be identified only during surgical exploration as it may not be apparent on physical examination. In NTT, a contralateral orchiopexy reduces the risk of asynchronous TT developing later.

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