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Pseudoaneurysm following Percutaneous Achilles Tenotomy for Congenital Talipes Equinovarus

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Abstract

Pseudoanerysm following percutaneous tendoachilles tenotomy is a rare condition found in children with Congenital Talipes Equinovarus (CTEV). In this case report, we describe a case of this and explore the various issues in relation to percutaneous achilles tendon tenotomy. CTEV or clubfoot is a common idiopathic deformity of the foot that generally presents in neonates. Treatment starts with non-operative management, most commonly with the Ponseti casting method. This can then be supplemented surgically with tendoachilles lengthening or anterior tibial transfer to correct any residual deformity.

Categories: Pediatrics, Orthopedics, Trauma
Keywords: pseudoaneurysm, achilles tendon tenotomy, congenital talipes equinovarus, ponseti, idiopathic clubfoot

Introduction

Congenital talipes equinovarus (CTEV) or clubfoot is one of the most common congenital abnormalities. However its aetiology remains poorly understood. CTEV deformity consists of four main components: the equinus, hindfoot varus, forefoot adductus and cavus. The aim of treatment is to provide a long-term correction to these deformities allowing the patient to achieve a fully functional and pain-free foot with good mobility [1,2].

The Ponseti method was first developed by Dr Ignacio V. Ponseti in 1950 and is now the first line treatment of choice for CTEV. This method uses manipulation and application of a well-moulded long plaster cast to correct cavus, adduction and varus deformities [3]. In the majority of cases, percutaneous tendoachilles tenotomy is then required to correct the remaining equinus deformity. It has been shown to reduce the need for extensive surgical intervention compared with other treatment methods [4]. However as with all procedures, it is not without its risks and complications. We present a case of bilateral pseudoaneuryms following Ponseti casting and percutaneous Achilles tenotomy that was successfully treated with surgical excision.

Case Presentation

An 11-day old baby born at caesarean section at 37 weeks was first seen in the paediatric orthopaedic clinic in December 2014 with bilateral talipes equinovarus, Pirani score of six bilaterally. There is no family history of clubfoot. At birth, pelvic radiograph was performed as the paediatric team struggled to abduct his right hip during postnatal check which demonstrated a dislocated right hip. Figures *1* and 2 below show the patient's talipes and pelvic radiograph at birth.

FIGURE 1: Talipes equinovarus at birth

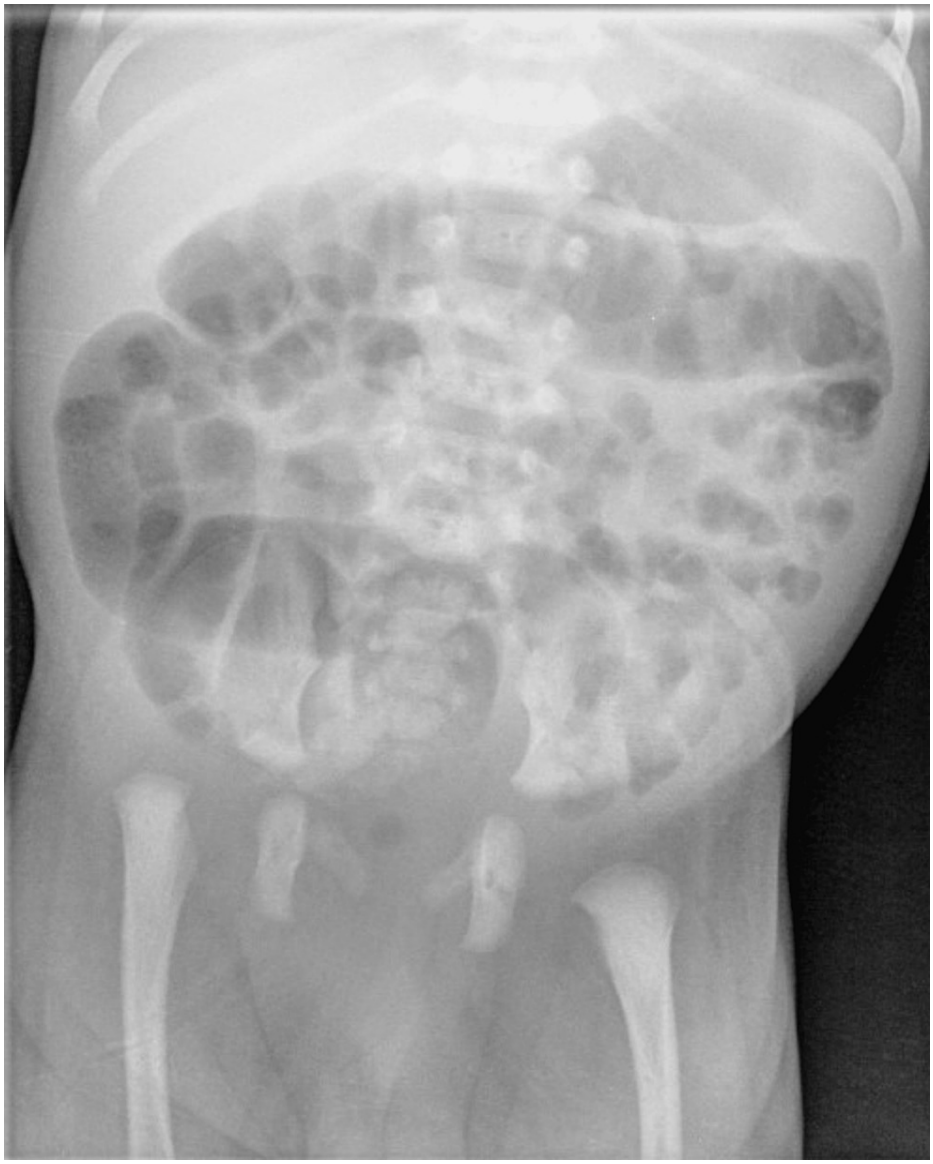

FIGURE 2: Pelvic radiograph at birth

An ultrasound scan confirmed this, as seen in Figure *3*.

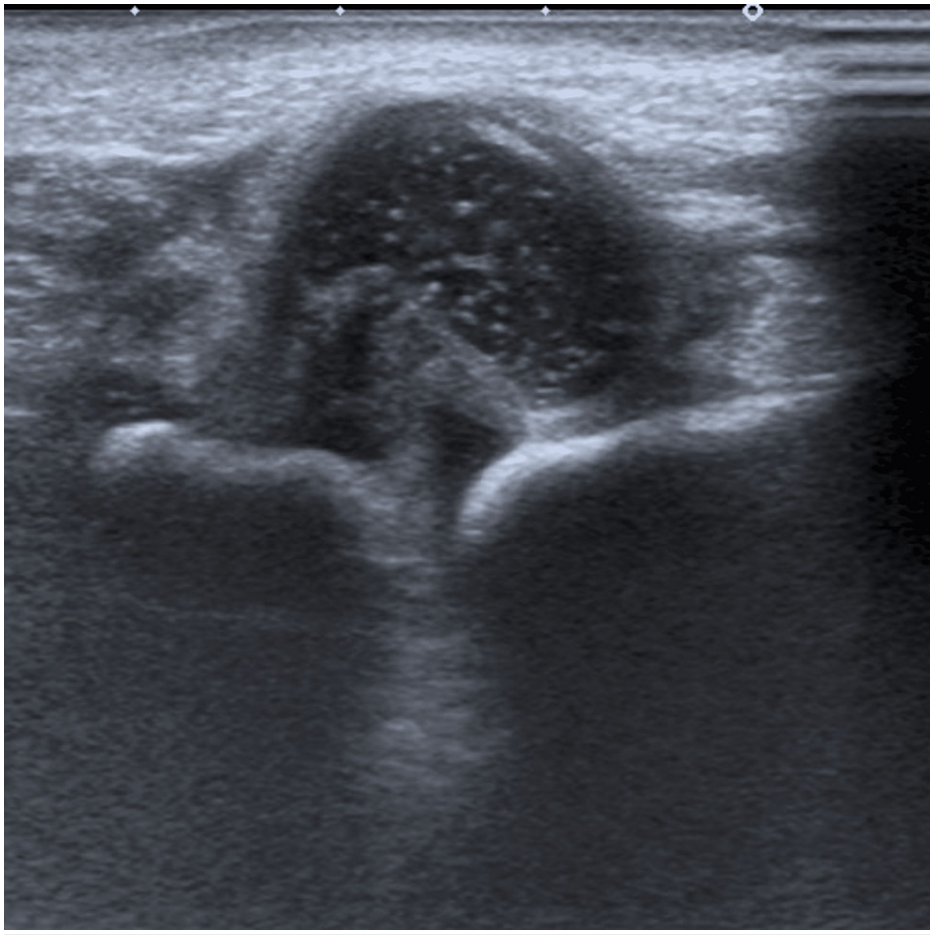

FIGURE 3: Ultrasound right hip at birth

On examination he had a very stiff hip raising a possibility of teratologic dislocation. He was treated with the Ponseti manipulative method for 12 weeks. Unfortunately his feet remained stiff, shown in Figure *4*, so he had bilateral tenotomies and hip arthrogram (Figure *5*) at the same time to reduce his dislocated hip at three months.

FIGURE 4: Pre-tenotomy, age 14 weeks

FIGURE 5: Hip arthrogram

Immediately post surgery he developed swelling in his toes and hence plaster had to be changed. He continued in his plaster and was reviewed weekly by the Ponseti physiotherapist making good progress.

At week two post-tenotomies, it was noted that there was swelling in the posterior aspect of both heels that were bluish (Figure 6). An ultrasound scan of bilateral achilles tendons confirmed bilateral posterior haematomas with pseudoaneurysm arising from distal peroneal arteries bilaterally (Figure 7). He was kept

out of cast for a week before resuming below knee plaster cast bilaterally with pressure focusing on the pseudoaneurysms. However at week four it was noted his left foot was swollen and almost black posteriorly above the tenotomy site. A further ultrasound scan was performed then which confirmed patent dorsalis pedis artery.

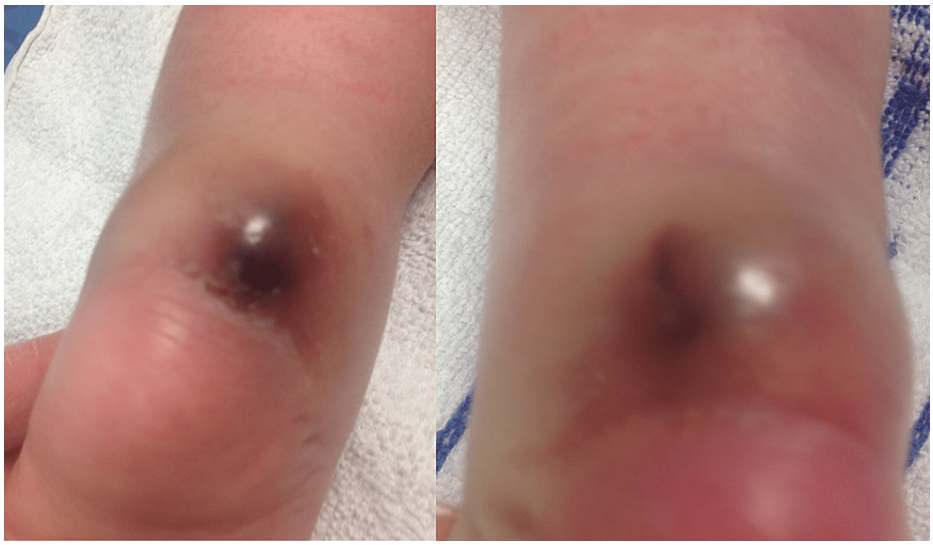

FIGURE 6: 2 weeks post-tenotomy

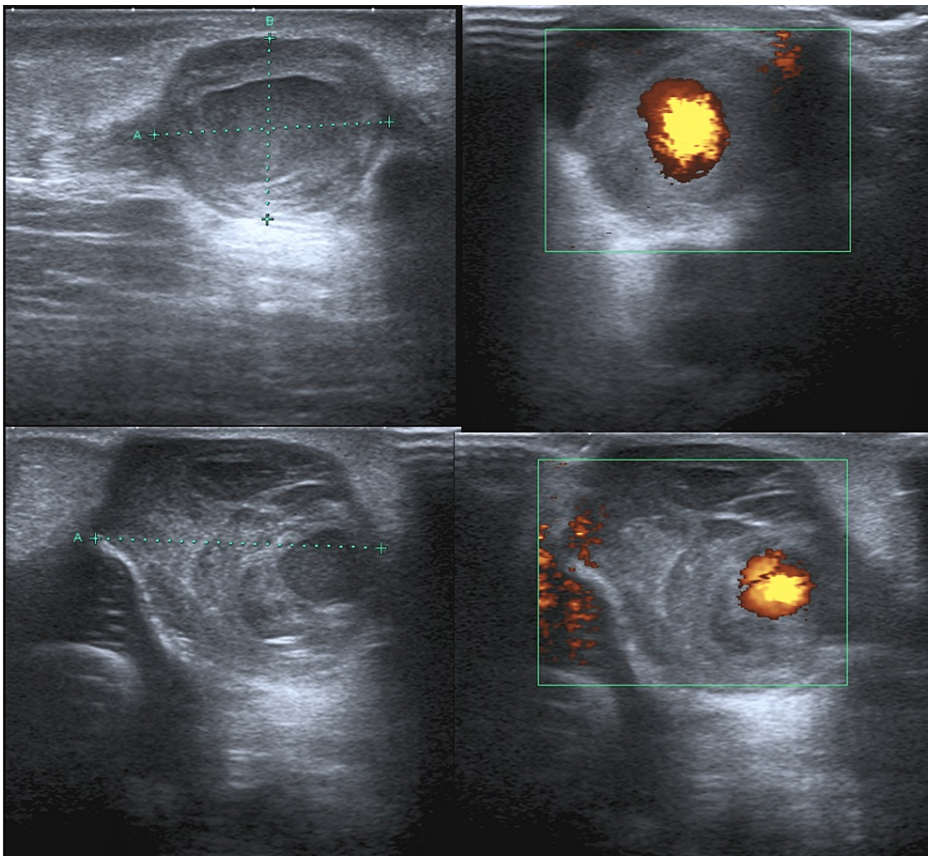

FIGURE 7: Ultrasound scan of bilateral pseudoaneurysms

Due to ongoing discolouration at week six (Figure *8*), bilateral pseudoaneurysms were explored where the peroneal arteries were found to be thrombosed with no active bleeding so pseudoaneurysms were excised, haematoma evacuated and Achilles tendons lengthened (Figure *9*).

FIGURE 8: Bluish discolouration at week 6 post-tenotomy

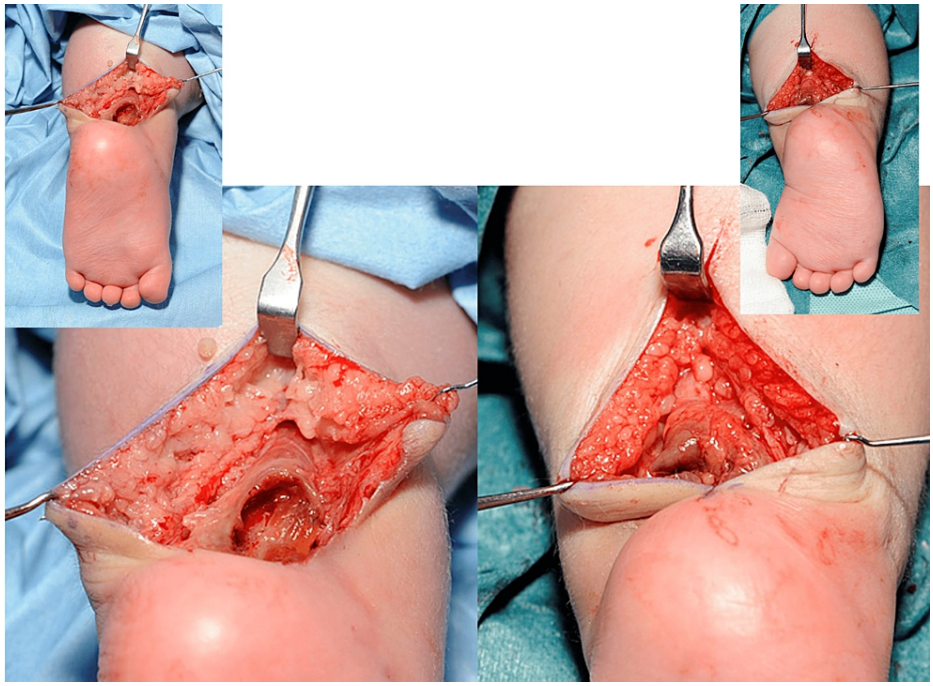

FIGURE 9: Pseudoaneurysm excision and haematoma evacuation

Two weeks post exploration, although his left foot was stiffer he was achieving 5° dorsiflexion and 20° abduction in both feet in above knee plaster casts. At week three post-exploration, his right foot achieved 15-20° dorsiflexion and 20-30° abduction while the left foot achieved a plantigrade position with 20° abduction. His plaster casts were changed to boots and Denis Browne bar.

Discussion

It is imperative to understand the anatomy involved when performing percutaneous tendoachilles tenotomy. Anterolateral to the Achilles tendon lies the peroneal artery, sural nerve and lesser saphenous vein. Anteromedially lies the posterior tibial neurovascular bundle [5]. Vascular anomalies in clubfoot is

widely recognised and has been proposed as an aetiology for congenital idiopathic club foot. The absence of anterior tibial artery [6,7] and posterior tibial artery [8-10] in children with severe club foot deformity have been reported.

However there is very limited literature describing complications relating to it. Dobbs et al retrospectively reviewed 219 idiopathic CTEV of 134 infants of which 200 CTEVs required percutaneous tendoachilles tenotomy. They reported four serious bleeding complications; three from presumed injury to the peroneal arteries and one from injury to the lesser saphenous vein [2]. In 2007, Changulani et al reported a case of laceration to the posterior tibial artery and complete transection of tibial nerve following a percutaneous tendoachilles tenotomy that was treated with ligation of the vessel and primary repair of the nerve [11].

The first case of pseudoaneurysm after Ponseti percutaneous Achilles tenotomy was reported in 2008 by Burghardt et al [12]. They described a swelling that was noted behind the left Achilles tendon after three weeks of casting post tenotomy. This led to technical difficulty in bracing with straight last shoe and Denis Browne bar. A month later pseudoaneurysm was diagnosed with ultrasonogram and colour Doppler ultrasonography and the patient continued with four weeks of casting. The pseudoaneurysm had completely resolved after the four weeks negating the need for invasive intervention. In our case, surgical exploration was performed after three weeks of pressure moulding due to ongoing discolouration of the foot above tenotomy site. Clinically this indicated a lack of resolution of both pseudoaneurysms, hence they were excised, and the patient recovered well with good progress of his CTEV treatment.

Another interesting complication reported following Ponseti percutaneous Achilles tenotomy was by Lewis et al in 2013 [13]. An eight-week-old boy presented with active bleeding from a ruptured pseudoaneurysm of the posterior tibial artery leading to haemorrhagic shock four weeks after tenotomy. He required cardiopulmonary resuscitation, intubation and was also given antiseizure medication for possible seizure activities. After stabilisation, the posterior tibial artery was explored and ligated proximal and distal to the pseudoaneurysm. Fortunately he made good recovery systemically and neurologically and both feet achieved satisfactory correction.

Rademan 2021 reported a case study of a patient who suffered a pseudoaneurysm post TA tenotomy [14]. In that case, following ultrasound reporting the differential of a pseudoaneurysm, decision was made to treat the swelling non-operatively initially. Unfortunately the pseudoaneurysm ruptured on cast change at third follow-up post ultrasound, and the patient underwent emergency exploration and successful ligation of the bleeding peroneal artery. The author summarised that the survival of the patient and successful ligation of the ruptured vessel was highly likely because it occurred whilst the patient was in the outpatient department in hospital, where immediate resuscitation was available. The patient in our case was treated similarly with initial non-operative management and observation, and operative intervention when the swelling did not subside. Intra-operatively we found thrombosed pseudoaneurysms with no active bleeding, however this could have been a very different picture.

Pseudoaneurysm is a common vascular abnormality resulting from disruption in arterial wall continuity leading to a perfused sac contained by media, adventitia or soft tissue surrounding an injured vessel which communicates with the arterial system. This can be secondary to an infection, trauma, or iatrogenic from surgical procedures [15]. In orthopaedics, pseudoaneurysms have been reported following trauma such as ankle sprain [16] and ankle fracture [17]; and following elective surgery such as ankle arthroscopy [18], release of plantar fascia, open clubfoot release [19], percutaneous multiple-cut tendon lengthening [20], and insertion of arterial cannula [21].

Treatment options for pseudoaneurysms following cardiac catheterisation have been well reported. More recently, instead of surgery the paradigm of treatment is shifting more towards less invasive methods such as ultrasound-guided compression repair (USGC), ultrasound-guided thrombin injection, FemStop compression devices, coil insertion, fibrin adhesives, and balloon occlusion [22]. While the success rate of USGC have been reported to be 75% - 98%, it takes an average of 33 minutes to sustain thrombosis and can be a painful experience for the patient. Cho et al described a case of external iliac artery pseudoaneurysm in a six month old patient after a follow-up cardiac catheterisation with angiography post-surgical correction for pulmonary atresia with ventricular septal defect and major aortopulmonary collaterals successfully treated with percutaneous ultrasound-guided thrombin injection [23]. Ultrasound-guided thrombin injection has been reported to be more effective than USGC in adults [24]. However as pseudoaneurysm is rare in infants and children, there has been limited information in their treatment.

Conclusions

Based on our experience, surgical treatment for pseudoaneurysm following Ponseti percutaneous Achilles tenotomy has been demonstrated to be a safe and effective treatment option. However as the paradigm of treatment for pseudoaneurysm shifts towards more minimally invasive treatment options, further large scale studies need to be carried out to demonstrate their safety in infants and children.

Additional Information

Disclosures

Human subjects: Consent was obtained or waived by all participants in this study. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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