

Paediatric Modified Chopart's Amputation for Synovial Sarcoma of the Foot

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Abstract

The Chopart's amputation fell into disrepute due to the development of progressive deformity of the stump, painful callosities and skin breakdown, and poor prosthetic fitting. Since then, several authors have described modifications in the prosthetic fitting as well as the operative techniques of the Chopart's amputation, which have resulted in better outcomes. However, there is a paucity of literature on these modified techniques in children. The purpose of this study was to describe the outcome in a ten year old child with synovial sarcoma of the foot, who underwent a modified Chopart's procedure to retain muscle balance around the hindfoot, and to assess if this procedure was consistent with good function.

Key Words: amputation; synovial sarcoma; Chopart

Introduction

Disarticulation through the midtarsal joints was first performed by Francois Chopart in the late 18th century. This procedure was used for the treatment of diabetic gangrene, frost bite, unsalvageable injuries and tumours of the foot [1]. However, it soon fell into disrepute due to the development of progressive equinovarus deformity of the stump, painful callosities and skin breakdown on the anterior aspect of the calcaneum, and poor prosthetic fitting [2].

Subsequently, other authors described modifications in the prosthetic fitting as well as operative techniques of the Chopart's amputation, which resulted in better outcomes [3,4,6]. These modifications to the original procedures included suturing dorsal tendons to the talus and tenotomy of the tendoachilles to avoid equinovarus deformities. There is a paucity of literature on these modified techniques in children. In general, Syme's amputation is favored over midtarsal amputation because of the uncertainty in the outcome of Chopart's procedure [2]. In many cultures, and in warm climates, the patients prefer to be unshod at home and for them, the foot amputation techniques which preserve the length of the limb, the ability to walk on uneven ground by virtue of preserved subtalar joint motion and push off

function have a distinct appeal. The purpose of this study was to describe the outcome in a ten year old child with synovial sarcoma of the foot, who underwent a modified Chopart's procedure to retain muscle balance around the hindfoot, and to assess if this procedure was consistent with good function. The patient and her family were informed that data regarding the case would be submitted for publication.

Case Report

A ten year old girl presented with the complaints of pain and swelling over the sole of the left foot of three months duration. Examination revealed a tender, ill-defined, mobile swelling deep to the sole of the midfoot. The overlying skin was normal and not fixed to the swelling. There was no local lymph node enlargement. MRI (GE Signa Profile EXCITE 0.2T) showed a 25 mm x 18 mm well defined, homogenous, T1 isointense, T2 hyperintense lesion in the sole of the foot underlying the shafts of the 2nd and 3rd metatarsals and displacing the FHL and FDL tendons plantar wards (Fig. 1). This was reported as a plantar neuroma. A needle biopsy done as an outpatient procedure showed only skeletal muscle and fibroadipose tissue. The differential diagnoses at this stage were deep plantar fibromatosis or plantar neurofibroma.

In view of the absence of any evidence of malignancy, the child underwent an excisional biopsy and the lesion was removed with clear margins.

The histology of the

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Table 1: Lieberman et al Classification of Outcome following Chopart's Amputation

Excellent	No callus formation or ulceration, and able to wear the prosthesis without discomfort
Good	An episode of stump breakdown or callus formation with subsequent healing. Able to wear the prosthesis with occasional minimal discomfort
Fair	Multiple episodes of stump breakdown or callus formation. Mild to moderate discomfort in the prosthesis, and pain in the foot
Poor	Failure of amputation or severe pain in the foot

naviculocuneiform joint distal to the site of the scar on the sole of the foot. The transverse plantar incision was made proximal to the scar. Dorsal and plantar flaps were formed. The dorsalis pedis and the plantar branch of the posterior tibial artery were identified, ligated and cut. All tendons over the dorsal, medial and peroneal aspects were incised. The disarticulation was carried out through the calcaneocuboid and naviculocuneiform

swelling showed spindle shaped cells arranged in sheets and fascicular pattern. These cells displayed mild pleomorphism and mitotic activity, had round to elongated, hyperchromatic nuclei, few having small indistinct nucleoli. The tumor cells had scant eosinophilic cytoplasm. Areas of hemorrhage and focal necrosis were seen in the stroma. There were dilated vascular channels around the tumour cells with

joints preserving the navicular with the attached tibialis posterior. The tibialis anterior, extensor hallucis longus and extensor digitorum longus tendons were sutured onto the upper surface of talus while the peronei were sutured to the lateral aspect of the calcaneum inferior to the trochlear process. Tenotomy of the tendoachilles was done to balance its pull with that of the dorsiflexors. The modifications in this

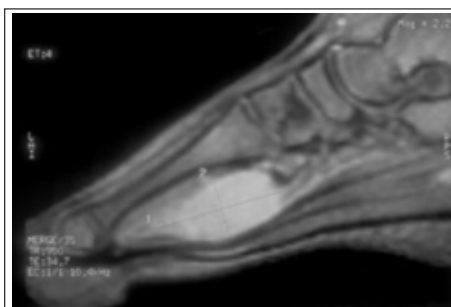


Figure 1: T2 weighted sagittal Magnetic Resonance Image showing a 25 x 18 mm well defined, homogeneous, hyperintense lesion underlying the shaft of the second metatarsal.

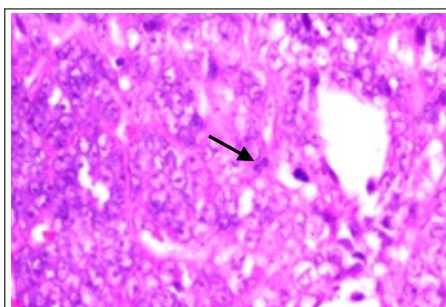


Figure 2a: Photomicrographs showing spindle shaped tumour cells with hyperchromatic nuclei, mild pleomorphism and mitotic activity (arrow) (IHC: 400x)

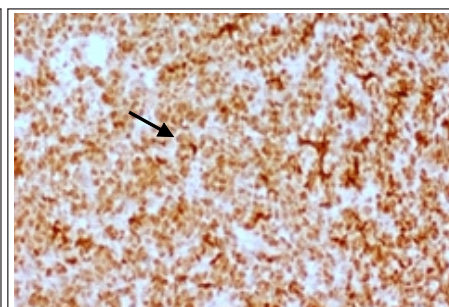


Figure 2b: Immunohistochemistry for TLE1 shows diffuse strong nuclear positivity (arrow) (IHC: 100x)

hemangiopericytoma like pattern. These findings were consistent with malignant spindle cell tumour suggestive of synovial cell sarcoma. Immunohistochemistry was done to rule out a vascular tumour in view of the vessels surrounding the tumour cells. It was positive for CD56 and TLE1, and negative for CAM5.2, CD34 and CD31 (Fig. 2 a and b). A midtarsal (modified Chopart's) amputation was performed with the described modifications. The procedure was done under general anaesthesia with tourniquet control. A transverse dorsal incision was made at the level of the

procedure included retaining the navicular with the attached tibialis posterior, and the reattachment of the tendons in the appropriate positions, especially the tibialis anterior, the extensor tendons and the peronei. To prevent an equinus positioning of talus in the short stump, the neutral position of the foot was maintained by temporary fixation using a thick transcalcaneal K wire inserted into the tibia. The wound was closed in layers over drains. Stump dressing and a plaster slab were applied.

Histopathological examination of the amputated specimen



Figure 3: Photographs of a rear entry orthosis with partial foot filler

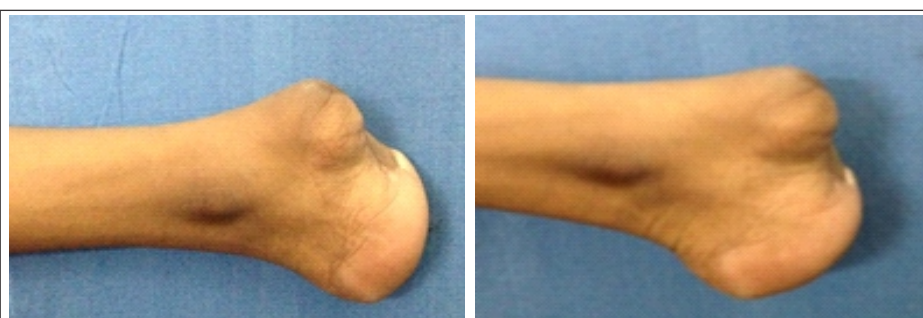


Figure 4: Photograph of the disarticulation stump in a) plantarflexion and b) dorsiflexion



Figure 5: Postoperative radiographs of the disarticulation stump



Figure 6: – Photographs showing the patient weight bearing on the disarticulation stump and in the prosthesis

showed no residual tumour. The child was allowed non weight bearing ambulation with crutches. Two weeks after the surgery, she was started on chemotherapy. Four cycles of Doxorubicin/Ifosfamide were administered. The amputation stump healed uneventfully. Two months later, she was fitted with partial foot prosthesis (a rear entry orthosis with forefoot filler) (Fig. 3) and she was allowed to ambulate bearing full weight on the stump. The K wire was subsequently removed at seven months following completion of chemotherapy. The result at final follow up was graded according to the classification described by Lieberman et al in 1993 based on skin condition, prosthesis comfort and pain (Table 1) [4].

She has been followed up for a period of two years and six months and continued to be disease free on regular follow ups. She had no pain, callus formation or skin breakdown. The prosthesis was worn without any discomfort. She was able to do all activities of daily living. She cycled to school every day. On examination, the stump was healthy, with no callosities or evidence of skin breakdown. Active dorsiflexion of 25 degrees and plantarflexion of 20 degrees was possible (Fig. 4). Subtalar movements were preserved. Her gait with and without the prosthesis was antalgic, unaided and stable. The calf was atrophied. The result was graded as excellent as per the Lieberman et al classification of outcome.

Discussion

Most soft tissue tumours involving the foot are benign [6]. However, among the malignant lesions, synovial sarcomas are one of the commonest. They occur in the age group between ten and forty years, with a slight female preponderance. The commonest site is the dorsum of the foot. Metastasis can occur, most often to the lungs, followed by lymph nodes and bone marrow [7]. These tumours are treated by wide excision, either by amputation or with limb salvage [7,8]. However, owing to the anatomy of the foot (limited soft tissue and the proximity of the lesions to the anatomical

structures) there is a greater possibility of residual disease and therefore, a higher rate of amputations as compared to synovial sarcomas elsewhere on the body. The level of the amputation depends on the location of the lesion and can be either a foot amputation (Chopart's or Syme's), or a below knee amputation [7]. Surgery is followed by adjuvant chemotherapy and/or radiotherapy. The rarity of sarcomas in the foot and their slow growing nature make them prone to delayed diagnoses as well as unplanned excisions [8,9]. In this particular case, the clinical presentation, the radiographic appearance and the absence of malignant changes in the initial biopsy report culminated in an excisional biopsy which then necessitated an amputation.

The original Chopart's amputation was described as a disarticulation through the midtarsal joints without any muscle balancing. The unopposed gastrocnemius caused an equinus deformity of the hindfoot stump resulting in painful callus formation and skin breakdown over the anterior portion of the stump. This led to reamputation at a higher level in many cases. Proper prosthesis fitting was also compromised. These setbacks led to a gradual abandonment of the procedure.

In 1955, McDonald described one case of Chopart's amputation which had a good outcome following modification of the prosthesis, and in that, he suggested the importance of attaching all the dorsiflexor muscles to the talus to counter the action of the gastrocnemius [5]. Christie et al reported on six patients who underwent the procedure. Out of these, all three patients who were available for review were pleased with the outcome. The authors stressed that careful relocation of the extensor tendons could prevent deformity of the hindfoot and that the stump acts as a platform for weight bearing [1].

Subsequently, other authors have also reported good results with modifications of the procedure. Zaricynyj described the prevention of the equinus deformity by tibiotalar arthrodesis [10]. Letts et al described a modified Chopart's amputation

in children, consisting of contouring of the talus and calcaneus, transferring of the anterior and posterior tibialis tendons, EHL and EDL to the neck of the talus and sustentaculum tali, anterior advancement of the plantar flap and lengthening of the Tendo Achilles. They followed up eight feet in six children over an average of 3.5 years without any complication [3].

In our case, the retained navicular increased the length of the stump and made it unnecessary to transfer the tibialis posterior to the talus to counteract the action of the peronei.

Conclusions

The Chopart's amputation is a technically easy procedure to perform. The advantages of this procedure over the Syme's are that the hindfoot height and heel proprioception are retained. The ankle and subtalar movements are preserved and result in a near-natural gait, as well as the ability to walk on uneven surfaces. The broad, functional stump allows for full weight bearing and the patient may ambulate inside the house without a prosthesis. The prosthesis prescribed in this case was a rear entry ankle foot orthosis with forefoot filler, which was lightweight and cosmetically acceptable. Given these advantages, it is a useful option for treating malignant tumours and unsalvageable trauma involving the forefoot. Conversely, sarcomas with margins encroaching on the mid foot are a contraindication to this modified

Chopart's amputation. The potential drawbacks of this procedure as compared to the Syme's amputation are wound breakdown, a higher incidence of phantom pain [11] and the need for custom made prostheses to accommodate the stump. This case report demonstrates that the benefits of the Chopart's amputation are retained even when it is carried out during the years of growth.

Clinical Message

The modified Chopart's amputation is a useful procedure for paediatric orthopaedic surgeons faced with unsalvageable foot injuries or foot tumours in children. It is easy to perform, allows excellent prosthetic fitting, and at the same time, gives freedom to the child to ambulate inside the house without the prosthesis.

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