



## Resection of calcaneonavicular bar with interposition of extensor digitorum brevis. A questionnaire review

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**The purpose of this study was to review the clinical outcome of teenagers who had a resection of a symptomatic calcaneonavicular bar with interposition of the extensor digitorum brevis muscle. After a mean follow-up of almost 5 years, 22 patients were assessed symptomatically and functionally by means of a questionnaire. More than 95% were satisfied with the operation.**

**Keywords:** calcaneonavicular coalition; resection; teenagers; functional and clinical outcome.

### INTRODUCTION

Calcaneonavicular coalition is a congenital fusion between the calcaneus and navicular bone. This is one of the two commonest forms of tarsal coalition (talocalcaneal bar is the other). Not all cases are symptomatic, but those that do present with symptoms usually do so during the beginning of the second decade of life when the coalition ossifies. The child develops chronic mechanical pain of the hindfoot and a pes planus with or without peroneal muscle spasm. Functional limitations in sports or repeated distortions are typical (21). Tarsal bars are present bilaterally in 50% (3,13) (Fig. 1).

In our study, only the symptomatic coalitions were operated. We investigated whether this type of operation provided improvement in function and/or symptoms of the foot. We used the technique of resection with interposition of the extensor

digitorum brevis muscle (EDB), which is the most published and generally accepted technique.

### MATERIALS AND METHODS

#### Patient selection

During the period from August 2000 to April 2009, 29 patients underwent excision of a calcaneonavicular bar with interposition of the extensor digitorum brevis muscle in the defect thus created. They were operated in St-Augustinus Hospital in Antwerp or in St-Jozef Hospital in Malle by the same surgeon. All 29 patients were in their teenage years when operated. Seven patients were lost for follow-up; this study was therefore based on 22 patients.

The mean age of the children at operation was 13 years and 3 months, with a minimum of 9 years and a maximum of 15.5 years. There were 13 girls (59%) and 9 boys (41%).

The patients were evaluated in a retrospective manner. A questionnaire to evaluate their function and symptoms

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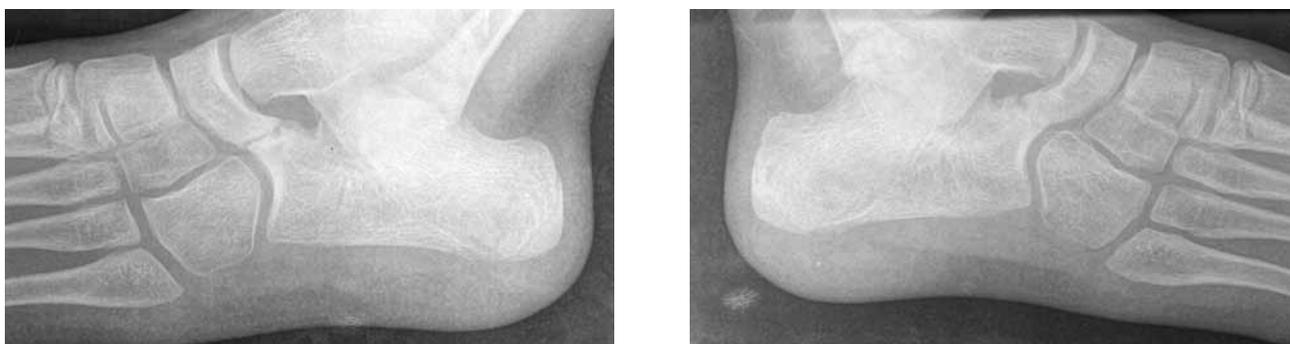
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*Fig. 1.* — Bilateral calcaneonavicular coalition

was sent to all patients. There was no clinical or radiographic evaluation included in the study.

### **Surgical technique**

A lateral approach with a modified Ollier incision was used. This is a linear incision perpendicular to an intersecting line between the lateral malleolus and the base of the fifth metatarsal. The insertion of the extensor digitorum brevis was dissected free and released proximally. The sinus tarsi was debrided to expose the calcaneonavicular bar. An osteotome was inserted into the calcaneal and navicular portions of the bar. The synostosis was excised with a generous portion of the calcaneal and navicular components. Adequate excision of the bar was performed and a sufficient gap ( $\pm 1$  cm) was left after removal of the bar in order to prevent recurrence (Fig. 2). The extensor digitorum brevis muscle was subsequently interposed using a button pull-through technique.

The wound was closed and the foot was immobilised in a below-knee cast in neutral position for four weeks. Weight-bearing was allowed after one week.

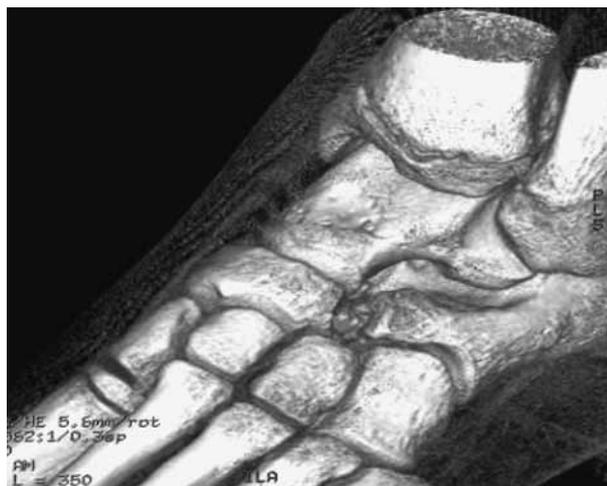
Mobilisation of the foot was started after removal of the cast. Physiotherapy was prescribed.

### **Follow-up evaluation**

We used a retrospective questionnaire to evaluate the outcome of the operation. Foot and ankle function and clinical symptoms were outlined.

A Dutch version of the Foot and Ankle Outcome Score (8,17,18) was sent to all patients. This list comprises six subgroups of questions to evaluate certain symptoms, stiffness, pain, function in daily living, function in sports and recreational activities and quality of life. Each item consists of a few questions. To evaluate any symptoms

we asked for swelling, clicking or catching of the foot or ankle. Stiffness was defined as a sensation of restriction or slowness in the ease when moving the joint in the morning or later in the day. We asked specifically how often they experienced pain, whether it was related to any specific movement and whether or not pain was sustained during the night. To assess the function in daily living we inquired about walking on stairs, rising from sitting, walking and shopping, putting on and taking off socks and stockings and light and heavy domestic duties. To evaluate sports activities we asked for pain or symptoms with running, jumping, twisting and kneeling. Finally we were interested in their quality of life. We checked if the patients had modified their life style to avoid certain activities and asked them how often they were aware of their foot problem. They were asked to fill in the questionnaire and send it back.



*Fig. 2.* — CT scan after coalition resection

## RESULTS

The questionnaire was sent to 29 patients. Twenty-two patients answered and returned the list (5 of them were contacted by telephone). These 22 patients were included in the study.

The mean follow-up time was 4 years and 9 months (range : 7 to 111 months). As seen in Table I, 95.5% of all patients subjectively rated the operation positively (very satisfied or satisfied).

Only one patient had a mean score below 4 or less than satisfied. In her outcome score we noticed a general dissatisfaction. When we checked her file we found that this patient kept complaining of pain postoperatively. A CT-scan to exclude a recurrence was done. We never found a reason or origin to explain the complaints.

Three other patients only complained of cosmetic discomfort (scar).

## DISCUSSION

This study was intended to evaluate the treatment and technique we use for a symptomatic calcaneonavicular bar and to compare this to other procedures and check the pros and cons.

Non-operative treatment in symptomatic calcaneonavicular bar is mostly unsuccessful. Patients treated conservatively with shoe inserts and casts continued to have symptoms in 42 and 88% respectively according to Blockey and Braddock (2,4). Vincent prefers to start with conservative treatment for symptomatic calcaneonavicular coalition with immobilization in a weight-bearing cast for 2 to 4 weeks, followed by fitting a UCBL (University of California Biomechanics Laboratory) orthotics. If both were ineffective, he considered surgery (21).

We almost invariably proposed resection when confronted with a painful bar. Besides solving the problem of pain, we believe this also restores mobility and as such reduces the risk of later adjacent degenerative problems. Most of the patients already had conservative treatment with cast immobilisation after ankle sprain at the time we first examined them.

The younger the patient, the better, because of the increased potential of return to full joint

mobility (21). Gonzalez and Kumar noticed the best results in patients who were less than 16 years old at the time of operation (9). On the other hand, Saxena and Erickson could not support a better outcome in patients younger than 18 years of age in calcaneonavicular coalition resection (19). According to Inglis *et al*, beaking of the talus seen preoperatively is more important than age to predict the outcome of calcaneonavicular bar resection (10). Scott and Tuten have treated adults successfully with resection of the coalition and EDB interposition with no degenerative changes or recurrence in more than 50 months follow-up (20). Jerosch *et al* reviewed different types of treatment of calcaneonavicular coalition (triple arthrodesis, resection with or without fat or muscle interposition) and concluded that the worst results were found in patients with pre-existing degenerative changes (11).

Treatment does not depend on the type of coalition. Cartilaginous or osseous coalitions when painful were always completely resected (19,21).

We used the technique of resection with interposition of the extensor digitorum brevis muscle because it is the most written about and generally accepted technique with a low incidence of recurrence (5,6,9,14,15). Some studies claim a recurrence with reossification with the EDB interposition technique (16). Mubarak *et al* did a cadaveric study in which they measured the tunnel created by the resection. They compared it with the length of the EDB and concluded that there was inadequate filling of the resection gap. Only an average of 64% was filled (16). Therefore they suggested using a fat interposition taken from the guteal cleft or the abdomen. As we stated earlier, it is important to create a defect of at least 1 cm in length (21). The EDB is sutured either to the plantar fascia or with a plantar surface button (21). We used a button-pull-through mechanism to the medial side of the foot. In our study we had no revisions or clinical painful recurrence.

An endoscopic procedure to resect the calcaneonavicular synostosis has also been described (1,12). This would give a better visualisation of the whole resection area and avoid a plantar residual bone bar. The other important advantage is the possibility to assess and treat associated pathologies such as

Table I. — Foot and Ankle Outcome Score 1 = Very dissatisfied 2 = Somewhat dissatisfied 3 = Neutral  
4 = Satisfied 5 = Very satisfied

Patient	Age (years)	Symptoms	Stiffness	Pain	Function daily living	Function sports & recrea	Quality of Life	MEAN
1	11.83	4.5	3.5	5	5	4.8	3.8	4.433
2	12.08	4.5	5	5	5	5	4.5	4.833
3	13.00	4.5	5	5	5	5	5	4.916
4	12.75	4.5	5	4.5	5	3.8	3.8	4.433
5	13.08	5	5	5	5	5	5	5.000
6	12.58	4	4	5	4.5	4.5	4.5	4.416
7	12.83	2	3	3.5	3.5	1	1	2.333
8	10.00	5	5	5	5	5	5	5.000
9	10.17	4.5	4.5	5	5	4.5	4	4.583
10	11.00	5	5	5	5	5	5	5.000
11	12.42	4	4.8	4.8	5	5	4.8	4.733
12	10.67	4.5	5	5	5	5	4.5	4.833
13	11.50	4	4	4.8	5	4	4	4.300
14	15.50	4.5	3.5	4.8	4.8	5	3.5	4.350
15	11.75	5	5	5	5	5	5	5.000
16	13.75	5	4.8	5	5	4.8	4.5	4.850
17	9.42	4.5	5	5	5	5	5	4.916
18	11.50	5	5	5	5	5	5	5.000
19	13.00	5	2.8	5	5	4.5	3	4.216
20	11.08	5	5	4.8	5	5	5	5.967
21	9.00	4.5	5	5	5	4	5	4.750
22	11.75	5	4.8	5	5	5	5	4.967
MEAN	11.85	4.522	4.532	4.873	4.900	4.586	4.359	

degenerative changes on the lateral side of the talar head in the same procedure (1). Without mentioning the risk of damaging the superficial peroneus nerve we do not see the benefit of this procedure, since we had no recurrence with our technique and no degenerative changes in our young population.

According to Mubarak *et al* there is a concern with regard to skin cosmetics from a bony prominence on the lateral aspect of the foot with the EDB interposition technique (16). In our study there was no report of such, although we did not specifically question on the subject. The only cosmetic problem mentioned was the scar (3 cases). We are convinced that there is no need to make a secondary incision to harvest a fat graft.

Overall, the present study yielded findings similar to those of the other studies reviewed. All but one patient were satisfied, had less pain and better function postoperatively. We therefore recommend this technique in all symptomatic teenage patients.

In further studies, applying standardized objective rating scales and measuring methods would be helpful.

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