

# THE SINUS TARSI SPACER IN THE OPERATIVE TREATMENT OF FLEXIBLE FLAT FEET

F. VERHEYDEN \*, E. VANLOMMEL \*, J. VAN DER BAUWHEDE \*, G. FABRY \*, G. MOLENAERS \*

The results of operative treatment of 45 flexible flat feet (29 patients) using the sinus tarsi spacer are reported. Although radiological improvement in both the talar declination and the ground-navicular distance was found, our patients suffered from pain and functional impairment for an average period of 5 months. An unacceptably high rate of spacer dislocation was noted. Furthermore, the literature indicates spontaneous improvement as the natural history of flexible flat feet. We therefore no longer advise the sinus tarsi spacer as a routine treatment for flexible flat feet.

**Keywords :** flat foot ; surgery ; arthroereisis.

**Mots Clés :** pied plat ; chirurgie ; arthrorise.

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## INTRODUCTION

Flexible flat foot can be defined as a foot that on weightbearing pronates abnormally and displays exaggerated mobility of the tarsal and subtalar joints, adopting the characteristic flat-footed appearance, while when not bearing weight, it assumes a "normal" posture (6).

It is one of the most frequent deformities of the musculoskeletal system in children. Ideas about the spontaneous evolution remain controversial. Several authors report good spontaneous evolution in flexible flat feet (9, 11, 12, 17, 18), while others think that early correction is necessary to prevent late painful secondary changes (1, 3, 6, 14, 16). Treatment therefore also remains controversial : should we treat children with flexible flat feet in order to prevent late degenerative changes

or should we wait and treat the late degenerative changes if they are painful ?

In flexible flat feet both the passive supporting structures (calcaneus and talus and the stretched ligamentous structures) and the active supporting structures (tibialis posterior and peroneus longus muscles) are deficient. The talus can rotate medially, flex plantarly and shift anteriorly with respect to the calcaneus. This leads to secondary bony changes and stretching of the ligaments in the hindfoot. Several types of procedures have been proposed to obtain reduction of the talus with respect to the calcaneus : soft tissue procedures, arthrodesis, calcaneal osteotomies, extra-articular arthrodesis, arthroereisis and combined procedures.

Relatively few publications have specifically addressed the subject of arthroereisis. Long-term follow-up data on this subject are not available.

The aim of this study is to evaluate whether the sinus tarsi spacer developed by Giannini *et al.* (3) is able to restore normal foot morphology while preserving good function in patients with severe flexible flatfoot. The sinus tarsi spacer was designed to re-establish the normal relationship between calcaneus and talus, and to maintain this reduction long enough for secondary remodelling of the bones and ligaments in the hindfoot to take place, while in the mean time subtalar motion is preserved (3).

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\* Department of Orthopedic Surgery, University Hospital K.U. Leuven, Weligerveld 1, 3212 Pellenberg, Belgium.

Correspondance and reprints : G. Fabry.

## PATIENTS AND METHODS

Between November 1988 and August 1994 we treated 29 patients (45 feet) with a sinus tarsi spacer for "symptomatic" flexible flat foot in otherwise healthy children. Cerebral palsy patients and patients with tarsal coalitions treated with the sinus tarsi spacer were excluded.

We reviewed all 45 feet. The mean age at the time of surgery was 9.8 years (range 6.2 to 15.6 years). There were 18 girls and 11 boys. The mean follow-up was 34 months, ranging from 7 to 72 months.

The evaluation was based on a standard questionnaire (5), a review of all pre- and postoperative medical records, an evaluation of patient's satisfaction, and a clinical and radiological examination.

Radiographic measurements on immature feet often are inaccurate owing to enormous inter- and intra-observer variability. In our hands the ground-navicular (GN) distance and the talar declination (TD) (1) (on standing x rays) were the two most reproducible measurements. For this reason, in the final protocol, only preoperative and postoperative data on these two measurements were used to document improvement. These measurements were not used for patient selection.

All radiographs were examined by one of the authors (V. L. E.) to exclude interobserver variability. Preoperative findings revealed that 20 patients exhibited moderate or severe foot pain during walking or running, and that in 9 patients the operation was performed for cosmetic reasons. Nonoperative treatment (insoles and activity modification) for a minimum of one year had failed in all 29 patients.

### Operative technique

An oblique 2- to 3-cm incision is made over the sinus tarsi following the natural skin creases. The peroneal tendons and the lateral branch of the superficial peroneal nerve are protected. The incision is deepened to the level of the capsule of the sinus tarsi using sharp and blunt dissection. The capsule is incised vertically and reflected distally. The fatty tissue from within the sinus tarsi is removed, and the deep interosseous talocalcaneal ligament is cut. Subsequent reamers of increasing caliber (+ 2 mm) are introduced until stable correction of the deformity is obtained. The sinus tarsi spacer is then introduced (fig. 1). The screw is then applied in order to expand the fins of the spacer until the talocalcaneal alignment is restored. In those cases where a prominent navicular is present or where the

pull of the tibialis anterior is judged inadequate, a Kidner procedure is associated (14 out of 45 feet). After the operation a back slab is applied for 2 weeks followed by 3 weeks of walking cast.

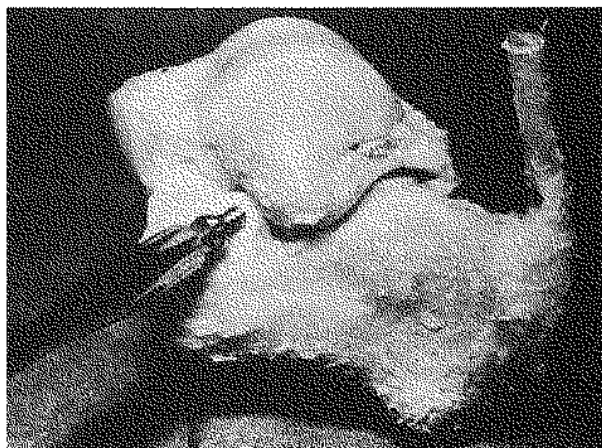


Fig. 1. — Anatomic specimen demonstrating insertion of the sinus tarsi spacer.

## RESULTS

Radiological parameters demonstrated statistically significant changes ( $p < 0.001$ ) in both ground-navicular (GN) distance and talar declination (TD). The mean GN distance was 16.3 mm preoperatively and 23.7 mm at the time of follow-up, with an average increase of 7.4 mm (fig. 2). The mean TD was  $30^\circ$  preoperatively and  $24.2^\circ$  at the time of follow-up, with an average reduction of  $5.8^\circ$  (fig. 3). No statistically significant corre-

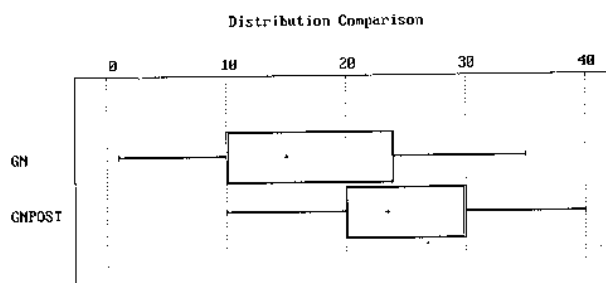
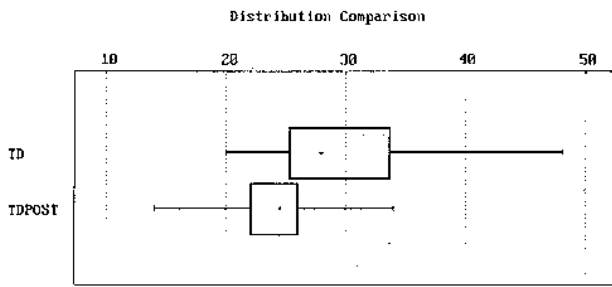
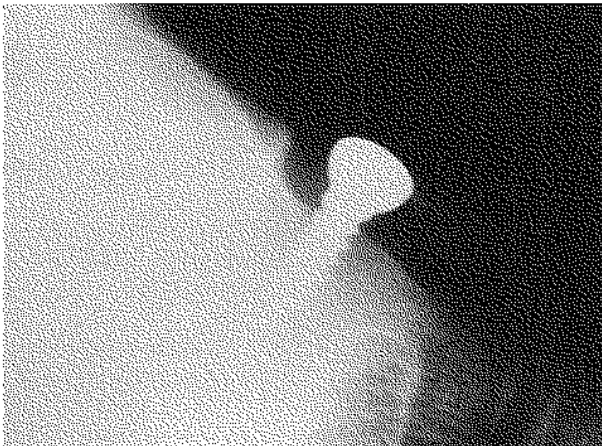


Fig. 2. — The mean GN distance was 16.3 mm preoperatively and 23.7 mm at the time of follow-up, with an average increase of 7.4 mm.



**Fig. 3.** — The mean TD was 30° preoperatively and 24.2° at the time of follow-up, with an average reduction of 5.8°.



**Fig. 4.** — AP view demonstrating lateral subluxation of the sinus tarsi spacer.

lation (linear regression  $P > 0.1$ ) between improvement in GN or TD and patient satisfaction could be found. Postoperative pain on walking and limitation of activities of daily life in children, was noted for a mean of 5 months, ranging from 2 weeks to 17 months. Eighteen patients (62%) at follow-up had no functional limitation whatsoever, 11 patients (38%) however still experienced some pain impeding them from walking long distances or running. Five of these 11 patients stated they had improved, 4 felt their functional ability had remained the same, and 2 felt they were even worse after the operation. In 10 out of 45 feet (22%) a luxation or subluxation of the spacer was noted (fig. 4). A significant correlation between persisting pain and spacer dislocation was found (Fischer 0.004, Yates 0.007), and pain only improved after removing the spacer in all dislocated

cases. Twenty-seven patients (93%) continued wearing insoles after the operation, whereas only 2 (7%) were able to stop wearing their insoles. Subjective complaints of chronic instability were rare with only one patient reporting recurrent distortion while walking on uneven surfaces. Twenty-three patients (79%) were subjectively satisfied with the result of the operation; 6 (21%), however, were completely dissatisfied with the result and would never advise it for other patients.

## DISCUSSION

In our patients we noticed an improvement in both mean GN distance (7.4 mm) and mean TD (5.8°), which is comparable to the previously reported improvements in talar declination after arthroereisis (1, 8). Two important questions remain. First, is the improvement that is obtained better than the improvement that would have been the natural history of the flat foot if not treated surgically (17, 12)? Second, is the achieved improvement in talocalcaneal alignment sufficient to obtain the secondary bony and ligamentous remodelling in the hindfoot, which is the primary goal of treatment? Only when such bony changes occur, can the long-term outcome of the treated flexible flat feet be altered. This question however can only be answered after long-term follow-up. The price paid by our patients to achieve improvement in talocalcaneal alignment was pain and functional limitation for an average period of 5 months. Furthermore, 93% of our patients still needed their insoles after surgery.

The most important complication in our series was spacer (sub)luxation (22%). Such spacer (sub)luxation almost invariably led to pain that improved only after removal of the spacer, suggesting that in some patients persisting pain can be attributed to spacer (sub)luxation. Unacceptable high rates of spacer dislocation have been reported earlier (4, 13). Other authors however reported no such alarming rate of spacer expulsion (3). As proposed by previous authors, selecting the correct implant size and complete sectioning of the deep interosseous talocalcaneal ligament is of

major importance in preventing this complication (1, 2, 4, 7, 13). No adverse effects on subtalar stability caused by resecting the deep interosseus talocalcaneal ligament during the primary procedure were clinically detectable at the time of implant removal. In our hands the sinus tarsi spacer is not an innocent device capable of turning severe flat feet into normal feet with minimal morbidity, contrary to what is stated by other authors (4, 6, 10, 15, 16). Because of the potential hazards of the spacer, the prolonged postoperative discomfort, the fact that there is no correlation between radiographic and clinical improvement, and the controversies that remain concerning the spontaneous improvement of the flat foot to be expected, we believe that it should not be routinely used in flexible flat feet, certainly not to prevent symptoms in the future. Perhaps an indication remains in those rare cases of flexible flat foot that cause severe pain and functional disability and that do not respond to prolonged conservative treatment. A prospective long-term follow-up study, comparing the sinus tarsi spacer to conservative treatment in an identical group of patients and with adequate follow-up, is necessary. Until such information is available the usefulness of the sinus tarsi spacer is highly questionable.

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#### SAMENVATTING

*F. VERHEYDEN, E. VAN LOMMEL, J. VAN DER BAUWHEDE, G. MOLENAERS en G. FABRY. Sinus tarsi spacer in de behandeling voor flexiebele platvoet.*

De resultaten van de sinus tarsi spacer als operatieve behandeling voor flexiebele platvoeten in 45 voeten (29 patiënten) worden gerapporteerd. Een radiogra-

fische verbetering zowel in de talaire declinatie als in de grond-naviculare afstand werd gevonden. Pijn en functionele belemmering persisteerden echter postoperatief gedurende gemiddeld 5 maanden. Verder was er een niet aanvaardbaar hoge frequentie van spacer dislocatie (22%). Bovendien vermeldt de literatuur, dat ook in de spontane evolutie van de flexibele platvoeten, een verbetering in de radiografisch gemeten waarden kan worden vastgesteld. Daarom menen wij dat de sinus tarsi spacer geen plaats heeft in de routine behandeling van flexibele platvoeten.

plats souples (29 patients) sont présentés. Une amélioration de l'angle entre l'astragale et le sol ainsi que de la distance sol-scaphoïde tarsien fut constatée. Tous les patients ont cependant présenté des douleurs et une limitation fonctionnelle durant en moyenne 5 mois. Une luxation du spacer fut constatée dans 22% des cas. De plus, plusieurs rapports montrent que l'évolution spontanée d'un pied plat souple se fait dans le sens d'une amélioration. Pour ces raisons nous ne recommandons plus le spacer comme traitement de routine pour le pied plat souple.

### RÉSUMÉ

*F. VERHEYDEN, E. VAN LOMMEL, J. VAN DER BAUWHEDE, G. MOLENAERS et G. FABRY. Le spacer du sinus tarsien dans le traitement chirurgical du pied plat souple.*

Les résultats d'un traitement chirurgical par implantation d'un spacer dans le sinus tarsien sur 45 pieds