Acta orthop. scand. *48*, 121–128, 1977

POST-TRAUMATIC SINUS TARSI SYNDROME

An Anatomical and Radiological Study

J. M. MEYER & R. LAGIER

Department of Surgery (Orthopaedic Clinic) and Department of Pathology (Osteoarticular Unit), University of Geneva, Switzerland.

Four cases of sinus tarsi syndrome are presented. They were studied by means of arthrography of the posterior subtalar joint and histological examination of sinus tarsi soft tissue. The obliteration of synovial recesses on posterior subtalar joint arthrography can be explained by synovial hyperplasia and by cicatricial remodelling of ligament tissue.

Key words: subtalar joint arthrography; tarsal sinus syndrome: diagnosis

Accepted 29.xi.76

The X-ray pictures of patients with sinus tarsi syndrome do not show skeletal changes (Debrunner 1963, Hauser 1962, Navarre 1966). Meyer & Taillard (1974) have previously described arthrographic changes in the posterior subtalar joint in nine patients suffering from post-traumatic pain in the midtarsal joints. These changes were considered significant since they were not observed in 90 clinically normal subjects. Two of the patients had pain over the lateral part of the sinus tarsi, thus presenting a clinical picture similar to that described by O'Connor in 1956 as "sinus tarsi syndrome". Therefore a clinical and radiological entity of post-traumatic sinus tarsi syndrome was proposed by Meyer & Taillard (1974) on the basis of this association between foot pain (not necessarily confined to the sinus tarsi) and a characteristic arthrographic appearance of the posterior subtalar joint, viz. absence of synovial recesses in front of the interosseous ligament.

The present article describes four cases of this syndrome which were studied anatomically and radiologically.

Normal Anatomy and Radiological Appearance of the Sinus Tarsi

Anatomy. The cohesion of the talus and the calcaneus is ensured by several ligaments, primarily the interosseous talocalcaneal ligament. The latter is attached to the sulcus tali and the sulcus calcanei, which form the roof and floor of the sinus tarsi. The ligament is thinner and more fibrous on the medial side and thicker on the lateral side, where its bundles intermingle with fatty tissue (Figure 1). This transversal sheet in the sinus tarsi thus separates the two diarthrodial joints which are found between the talus and the calcaneus. The anterior joint forms part of the talocalcaneo-navicular joint, and the posterior one is the actual talocalcaneal or subtalar joint.

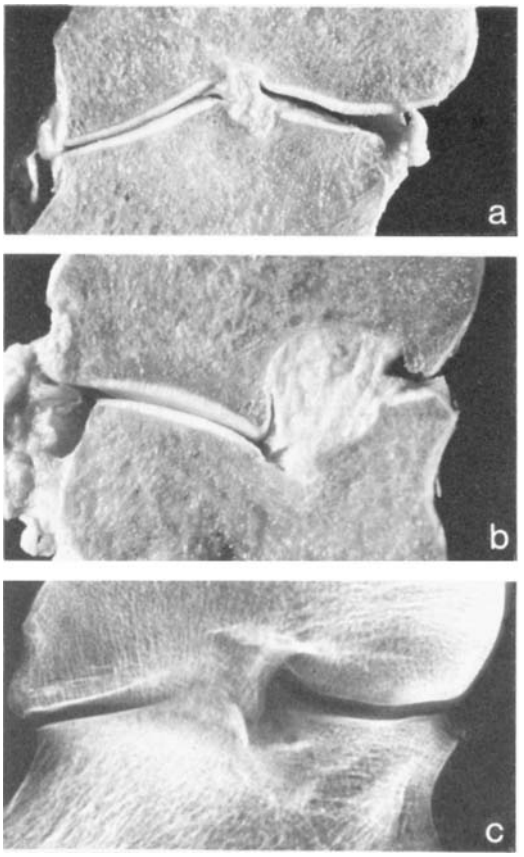

Figure 1. Normal subtalar joint with interosseous ligament (52-year-old man with no joint disease). Anterior region is on the right.

a) Macroscopic appearance of a medial sagittal surface.

b) Macroscopic appearance of a lateral sagittal surface.

c) X-ray of a central sagittal section (1 cm thick).

Hence, both sides of the interosseous talocalcaneal ligament are lined with synovial membrane. This was observed histologically on sagittal sections of two anatomical specimens taken from subjects with no osteoarticular pathology. On the posterior side, the synovium formed small superior and inferior recesses and occasional papillary folds due to simple hyperplasia of the lining cells (Figure 2). On the anterior side, fairly similar small recesses were observed on certain sections. The synovial membrane lined the remainder of the articular cavity of the posterior subtalar joint, particularly at the level of the well-developed posterior, lateral, and medial recesses.

Radiological appearance. The soft tissues of the sinus tarsi can be evaluated radiologically only by means of an arthrographic mould. However, arthrography of the talocalcaneo-navicular joint involves technical problems and does not readily permit a study of the sinus tarsi. Arthrography of the posterior subtalar joint was therefore performed as proposed by Meyer (Meyer 1973, Meyer & Taillard 1974), the best view being obtained with an image intensifier. The contrast medium injected into the postero-lateral part of the joint cavity formed a thin layer between the calcaneal and talar cartilage surfaces and filled the medial and lateral recesses. It then peretrated into the posterior joint cavity, which, on oblique view arthrography, resulted in an opacification of half the surface of the sinus tarsi (Figure 3). By filling small synovial recesses or folds on the posterior side of the interosseous talocalcaneal ligament, the contrast medium produced indented images that were clearly visible on transversal arthrographic post-mortem sections (Meyer 1973) as well as on lateral view arthrography (Figure 3). Communication with the talocalcaneo-navicular joint was rare.

CASE REPORTS

The clinical details of the four cases studied are given in Table 1. All cases showed the two subtalar arthrographic changes (Figure 4) formerly considered to be characteristic of pathological alteration of the soft tissues of the sinus tarsi (Meyer & Taillard 1974), viz. absence of filling of the sinus tarsi and of several small recesses in the lining of the interosseous ligament.

After the failure of medical treatment, surgery was performed (Table 1), leading to favourable results in all four cases. During operation the

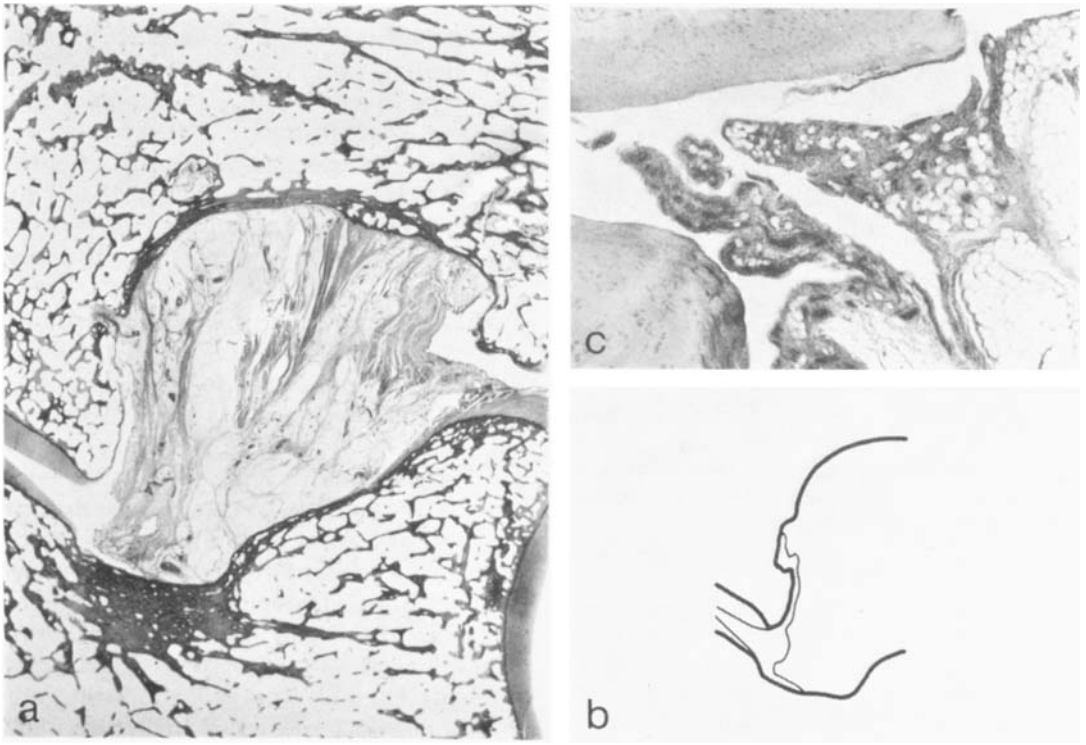

Figure 2. Histology of a normal sinus tarsi (same case as Figure 1).

a) Topographical histology (lateral sagittal section—Haematoxylin-eosin × 2.7). Bundles of interosseous ligament separated by adipose tissue. Synovial membrane layer on the anterior and posterior surfaces of the ligament, with synovial recesses on the latter.

b) Diagram of the posterior part. Thick line, bony contour; thin line, cartilaginous and synovial surfaces.

c) Hyperplastic synovial fringe on the posterior surface of the interosseous ligament (sagittal section, more medial than in (a)—Haematoxylin-eosin × 22). On the right, adipose tissue of the ligament. On the left, cartilaginous talar and calcaneal surfaces.

sinus tarsi was found to contain scar tissue in case 1 and the lateral talocalcaneal ligament was thickened in case 2.

The material studied histologically consisted in all cases of soft tissue from the sinus tarsi taken by lateral surgical approach, comprising the interosseous ligament, the fibrous capsule with bundles of lateral talocalcaneal ligament, the synovial membrane, and adjacent connective and adipose tissue. In addition, the biopsy material of case 3 included talar and calcaneal osteocartilaginous surfaces.

Case 4 showed slight signs of cicatricial remodelling in the very small fragment of ligament studied. The changes seen in the other three cases were decidedly abnormal and were particularly marked in case 1.

The synovial membrane exhibited papillary hyperplasia (Figure 5) characterized by an abundance of cells in some places and fibrous changes in others, a lack of fibrin deposits, absence of polymorphonuclear or lymphoplasmocytic infiltration except for a few small clusters of lymphocytes (Figure 6 a), haemosiderin deposits indicative of old haemorrhages (clear deposits in case 1, faint ones in case 3, and none at all in case 2), and thickening of the adjacent blood vessels. In case 1 some remnants of pre-existing ligaments were embedded in hyperplastic synovial membrane (Figure 6 b).

Cicatricial remodelling in the ligament was discrete in case 2 (small interstitial fibroblastic and vascular sites) and marked in case 1 (pre-existing bundles embedded in newly formed scar tissue—Figure 7).

In case 3 the cartilage surfaces showed a mar-

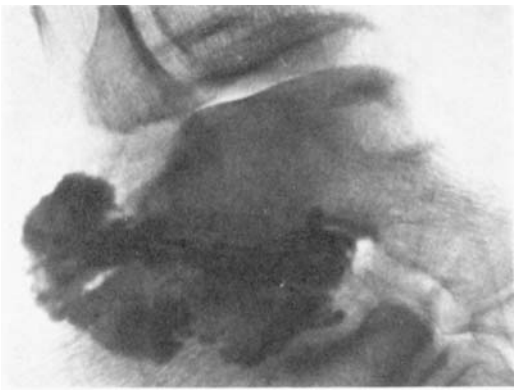

Figure 3. Normal arthrography of a posterior subtalar joint (30-year-old man with no joint disease). Oblique lateral view. Opacification of half the surface of the sinus tarsi with moulding of small synovial recesses.

ginal osteophyte indicating a minor equivalent of osteoarthritic remodelling; the underlying bone showed evidence of discrete non-specific remodelling.

DISCUSSION

Studies of the normal histological appearance of the sinus tarsi make it clear why arthrography is valuable in the diagnosis of soft tissue changes (Figure 2). They enable one to appreciate why remodelling with synovial hyperplasia has to be marked before it can obliterate the radiological images of synovial recesses or fringes. As a result of such studies it can further be understood why such obliteration might also be caused by joint effusion, particularly haemorrhage.

Microscopical observations strongly suggest that trauma can cause remodelling of this kind in the soft tissues of the sinus tarsi. In the cases presented here the changes were quantitatively rather marked and qualitatively similar to those usually seen in post-traumatic conditions (as opposed to the changes seen in infections or rheumatoid illness). Of the analogous histological examinations mentioned in the literature, "inflammatory" changes were observed in some of them (Blasnik cited by Komprda 1966) but not in others (O'Connor cited in Brown 1960 and Komprda 1966). In the light of our experience, this discrepancy might be due to differences in the quantity and orientation of the material examined. In our opinion, arthrography is not diag-

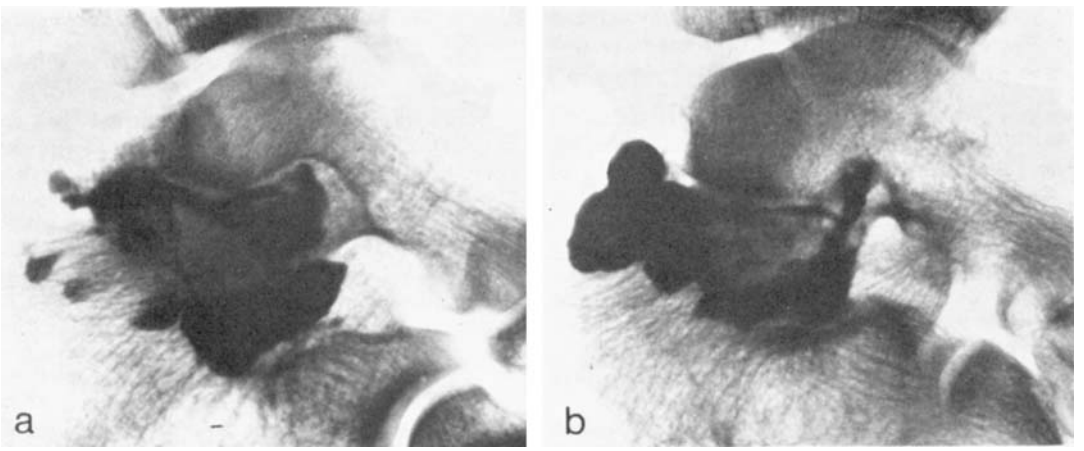

Figure 4. Arthrography of the posterior subtalar joint with pathological changes in the sinus tarsi —oblique lateral view. (a) Case 1. (b) Case 2. Partial obliteration of the posterior subtalar joint. Contrast medium is forced to the back. Small synovial recesses are not visible. The lateral and posterior synovial recesses are different in appearance in both cases.

Table 1. Clinical details of the four cases studied.

	Case 1	Case 2	Case 3	Case 4
Sex	male	male	male	male
Age (at biopsy)	25 years	24 years	30 years	47 years
Nature of injury	sprain (left foot) tear of calcaneo-fibular ligament	sprain (right foot)	fracture of fibula and malleolus—fissure of calcaneus (left foot)	fracture of os trigonum tear of talo-calcaneal ligament
Interval between injury and arthrography	?	2 years 5 months	1 year 10 months	1 year 6 months
Interval between injury and surgery	?	3 years	1 year 11 months	2 years
Intervening symptoms	pain	pain (particularly upon palpation of sinus tarsi)	pain	pain (particularly upon palpation of sinus tarsi)
Nature of operation	plasty of calcaneo-fibular ligament sinus tarsi curettage	subtalar arthrodesis sinus tarsi curettage	subtalar arthrodesis sinus tarsi curettage	sinus tarsi curettage
Biopsy	sinus tarsi contents fibrous capsule with ligament synovial membrane	sinus tarsi contents fibrous capsule with ligament synovial membrane	sinus tarsi contents fibrous capsule with ligament synovial membrane + bone and cartilage	sinus tarsi contents fibrous capsule with ligament synovial membrane
Biopsy number	T. 3883/74	T. 11432/74	T. 10372/73	T. 2601/74

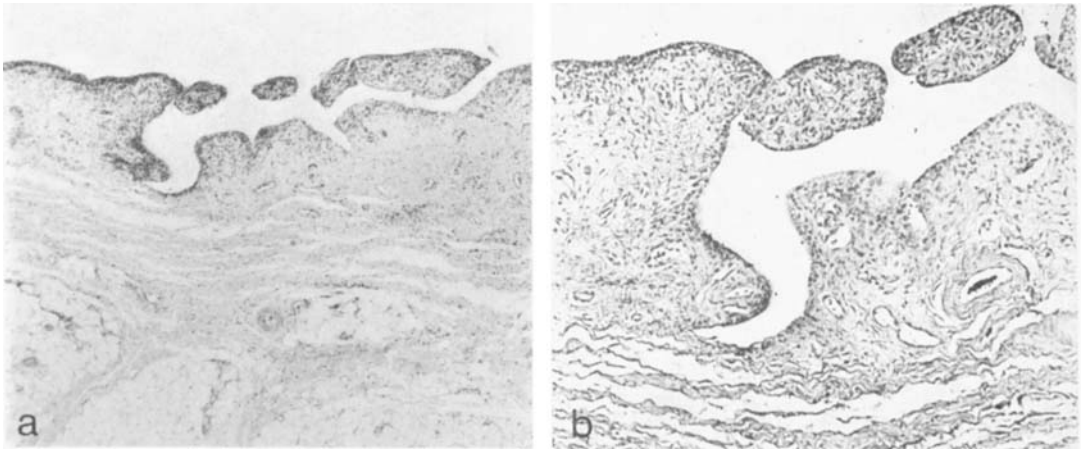

Figure 5. Case 1. Synovial hyperplasia without inflammatory cells.
a) Overall topographical view, with underlying adipose tissue. (Haematoxylin-eosin × 22).
b) Detail (Haematoxylin-eosin × 55).

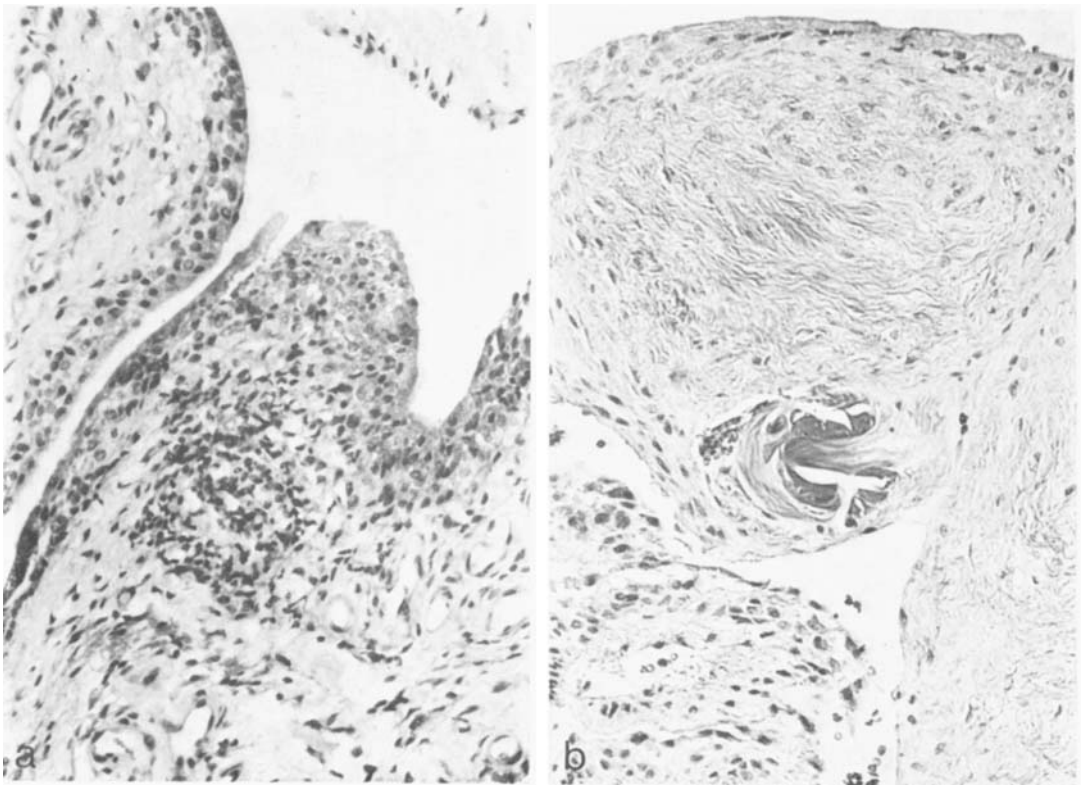

Figure 6. Case 1. a) Synovial fringe. Hyperplasia of the lining cells with a small cluster of lymphocytes. (Haematoxylin-eosin × 180).
b) Synovial fringe. Lower left: fibroblastic hyperplasia. Above right: fibrous scar tissue, which includes some remnants of ligament; this reflects the destruction of pre-existing tissue. (Van Gieson × 180).

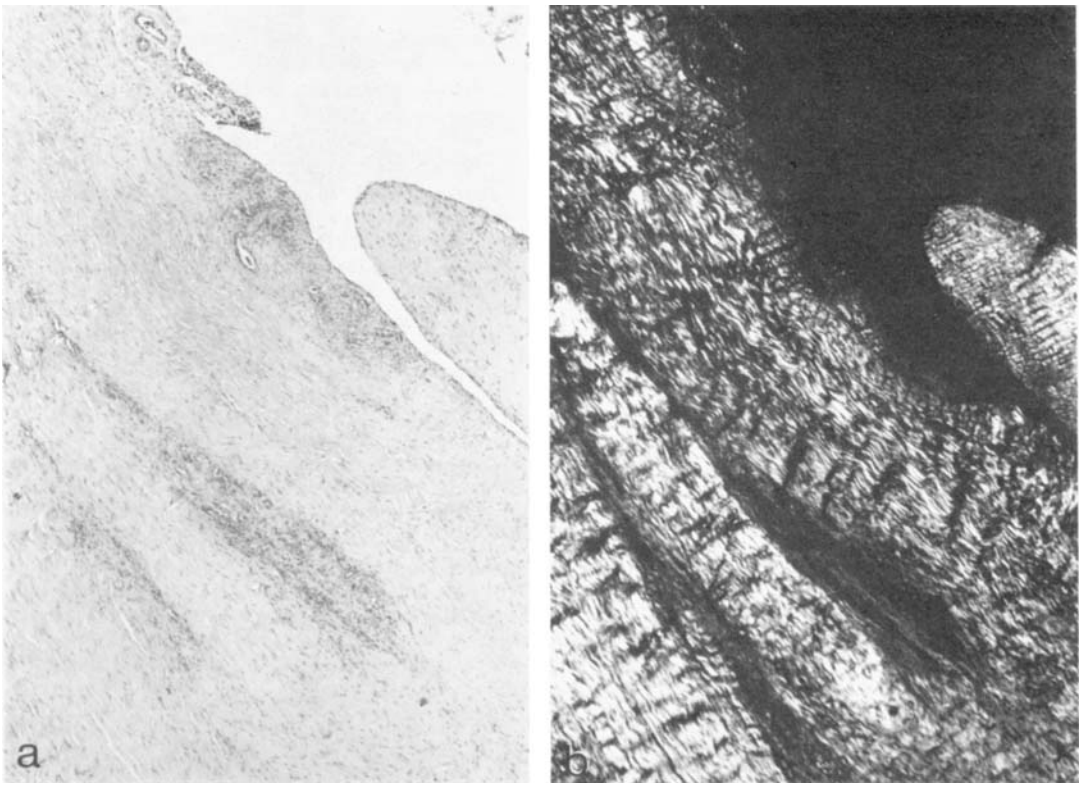

Figure 7. Case 1. Ligament bundles connected to fibrous tissue resulting from cicatricial remodelling.

a) Normal light.

b) Polarized light, showing differences in structure between pre-existing ligament bundles (lower left) and fibrous scar tissue (upper right)—(Haematoxylin-eosin × 22).

nostically useful immediately after trauma because it is only later on that synovial hyperplasia develops; moreover, misleading appearances can be produced by joint effusion. The rather discrete bone and cartilage changes observed in case 4 are not visible on X-rays but may be considered as early osteoarthritic changes similar to those sometimes seen in the subtalar joint (Brown 1960, Debrunner 1963, Komprda 1966).

These pathological soft tissue changes in the sinus tarsi seem to be secondary mainly to rupture of the calcaneofibular ligament. This was observed clinically in nine cases in a previous study (Meyer & Taillard 1974). In our present case 1, the rupture was observed at operation and was unassociated with any bone changes. Simple plasty of the ligament resulted in the disappearance of symptoms, which were still absent after 6 months. This is consistent with Castaing's view on the role of the calcaneofibular ligament in subtalar stability (Castaing 1970).

An anatomical and radiological picture of the post-traumatic sinus tarsi syndrome is thus recognizable. However, it cannot be superimposed on a characteristic clinical picture. For example, in case 1, which was radiologically and histologically typical, there was rather diffuse pain in the mediotarsal region and no elective pain over the sinus tarsi. Conversely, a post-traumatic syndrome featuring just such pain has been observed

in the absence of arthrographic changes (Meyer & Taillard 1974).

ACKNOWLEDGEMENT

The authors express their thanks to Dr. F. Indermühle (Porrentruy Hospital) for having kindly provided them with the clinical and radiological data for case 4.

REFERENCES

Brown, J. E. (1960) The sinus tarsi syndrome. *Clin. Orthop.* **18**, 231–233.

Castaing, J. (1970) Les entorses de la cheville. S.O.F.C.O.T. Orthopédie et Traumatologie. Conférence d'Enseignement 1968, 23–41.

Debrunner, H. U. (1963) Das Sinus Tarsi Syndrom. *Schweiz. med. Wschr.* **93**, 1660–1664.

Hauser, E. D. W. (1962) The sinus tarsi syndrome. *Podologie*, 11–14.

Komprda, J. (1966) Le syndrome du sinus du tarse. In: *Ann. Podologie.* Vol. I, pp. 11–17. Masson et Cie, Paris.

Navarre, M. (1966) A propos du syndrome du sinus du tarse. *Acta orthop. belg.* **32**, 743–754.

Meyer, J. M. (1973) L'arthrographie de l'articulation sous-astragalienne postérieure et de l'articulation de Chopart. *Thèse méd. Genève*, No. 3318.

Meyer, J. M. & Taillard, W. (1974) L'arthrographie de l'articulation sous-astragalienne dans les syndromes douloureux post-traumatiques du tarse postérieur. *Rev. Chir. Orthop.* **60**, 321–330.

Correspondence to: Dr. J.-M. Meyer, Clinique d'orthopedie, Hôpital Cantonal, 1200 Genève, Switzerland.