

TREATMENT OF CHRONIC HAEMATOGENOUS OSTEOMYELITIS OF THE OS CALCIS

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Twenty-five patients suffering from chronic haematogenous osteomyelitis of the os calcis were studied. The disease often presents in a sub-acute or chronic form, and the pathological process is well established in the majority of the cases by the time treatment is begun. For this reason, conservative treatment was found to be ineffective. Similarly, limited surgical procedures, such as curettage, sequestrectomy or partial excision, were also inadequate because of the wide-spread nature of the infection. Complete excision of the os calcis and stitching of the Achilles tendon to the plantar fascia was followed by a high rate of success, provided the other tarsal bones were not involved in the infective process. The infection was cured and reasonably normal function was obtained in 14 out of 19 patients (73.7 per cent). A "new heel" is often formed after the operation by the laying down of plaques of calcification within the toughened scar tissue of the heel pad.

Key words: osteomyelitis; os calcis

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Chronic haematogenous osteomyelitis of the os calcis is often difficult to treat (Martini et al. 1974). Conservative treatment, partial excision of the os calcis and calcenectomy have been tried by different authors with varying and often conflicting results, with amputation not infrequently being the outcome (Mackay & Manes 1958).

The aim of this study was to analyse and compare the effect of the different types of treatment mentioned above.

PATIENTS

This series consisted of 25 patients, 17 males (68.0 per cent) and 8 females (32.0 per cent). Their ages ranged from 6 to 32 years with an average of 17.9. Radiographically, the whole of the os calcis was involved in 11 patients (44.0 per cent), whereas in six (24.0 per cent) the affection was only partial (less than one third

of the os calcis). The greater part of the os calcis (more than one third of the bone but not its entire bulk) was involved in eight patients (32.0 per cent). Other foci of osteomyelitis were encountered in eight patients, and in six of them other tarsal bones were involved.

The duration of the disease before the commencement of treatment varied from 1 week to 11 years.

METHODS OF TREATMENT

All the patients were treated conservatively for periods varying from 5-32 weeks. This involved antibiotic therapy, supportive treatment and immobilisation when necessary. Patients not responding favourably to the above regime were treated surgically.

Thirteen patients with only partial, and rarely extensive, involvement of the os calcis underwent conservative surgery: curettage in eight, excision of the affected segment in seven and sequestrectomy in three. Five of these patients had more than one surgical procedure each.

In 19 patients the os calcis was excised com-

Table 1. The various lines of treatment applied and their results, related to the age at the time of treatment, the extent of involvement of the os calcis and the duration of the disease prior to treatment.

Number	Age (years)	Extent	Other tarsal bones affected	Conservative treatment				Conservative surgery			Excision of the os calcis		
				Sinuses	Duration (months)	Follow-up (months)	Result	Duration (months)	Follow-up (months)	Result	Duration (months)	Follow-up (months)	Result
1	13.5	E	—	3	3	16	poor	19	11	poor	30	110	good
2	19	W	yes	1	11	22	poor				33	107	good
3	6.5	P	—	—	1/4	108	good						
4	7	E	—	2	4	17	poor	21	105	good			
5	17	E	—	1	5	32	poor	37	11	poor	48	105	good
6	27	W	—	1	61	8	poor	69	10	poor	79	92	good
7	23	W	—	3	14	6	poor	20	12	poor	32	87	poor
8	31	W	—	1	110	5	poor	115	9	poor	124	81	fair
9	9	P	—	—	1/3	88	good						
10	17	E	—	2	13	14	poor	27	7	poor	34	80	good
11	8	W	—	—	1	9	poor	10	9	fair	19	80	good
12	24.5	E	yes	—	39	7	poor	46	10	poor	56	77	poor
13	25	W	yes	1	30	9	poor	39	11	poor	50	73	good
14	8.5	P	—	—	1/4	71	fair						
15	21	W	yes	—	11	13	poor	24	5	poor	29	69	poor
16	16.5	P	—	1	5	7	poor	12	11	poor	23	65	good
17	11	P	—	—	1	9	poor	10	61	good			
18	6	P	—	—	1/2	58	good						
19	18	W	yes	1	17	13	poor				30	49	good
20	32	E	—	2	132	15	poor				147	34	fair
21	29	E	—	1	96	11	poor				107	29	good
22	20	W	yes	—	19	12	poor				31	24	poor
23	14	E	—	2	10	13	poor				23	19	good
24	13	W	—	—	14	11	poor				25	11	good
25	31	E	—	—	120	17	poor				137	8	poor

Abbreviations for extent of infective process: P = partial involvement, E = extensive involvement, W = total involvement, of the os calcis.

pletely together with the infected soft tissues and sinuses. Eleven of these patients (57.9 per cent) had previously undergone some type of conservative surgery. The split heel incision (Gaenslen 1931) was used in all the cases, and the tendo Achilles was stitched to the plantar aponeurosis. The resulting cavity was packed with sterile gauze soaked in acriflavine. Half of the pack was removed after 48 hours, and the remaining part 72 hours after the operation. Post-operative immobilisation in a below-knee plaster-of-Paris cast was maintained for 4-6 weeks with the ankle in about 10° equinus.

Surgical treatment was supplemented by suitable antibiotic therapy for 2-3 weeks.

Follow-up

The follow-up period was calculated from the time the particular line of treatment was applied until the final check-up if treatment was successful, or in the event of treatment failure, until another line of treatment was instituted (Table 1). This period varied from 5-108 months after conservative treatment, 5-105 months after conservative surgery and 8-110 months after calcectomy.

RESULTS

In assessing the results, each important factor was given a number out of 100, viz:

A) Healing of sinuses	25
B) Functional performance	35
a) Movements of the ankle and subtalar joints, both active and passive	7
b) Ability to stand on tiptoe	7
c) Ability to stand on the heel	7
d) Capacity for walking and standing	7
e) Gait, whether the patient is limping or not	7
C) The opinion of the patient	30
a) Pain	15
b) Shape of the heel	5
c) Functional capacity at work	10
D) Footwear	10
Total	100

Results were assessed as follows: Good if the patient scored 75 or more, fair if he scored 50-75 and poor if he scored less than 50.

Results obtained are shown in Table 1. In patients who received proper management early in the disease process, conservative treatment yielded good results especially in younger patients. However, it can be seen from Table 2 that the best results were obtained after total excision of the os calcis.

Table 2. Comparison of the results of the different lines of treatment applied.

Result	Conservative treatment (25)	Conservative surgery (13)	Excision of the os calcis (19)
Good	3 (12.0 %)	2 (15.4 %)	12 (63.2 %)
Fair	1 (4.0 %)	1 (7.7 %)	2 (10.5 %)
Poor	21 (84.0 %)	10 (76.9 %)	5 (26.3 %)

DISCUSSION

Antibiotics may effect a cure of haematogenous osteomyelitis only if the proper therapy is started very early in the disease process (Harsha 1964). The four patients (16.0 per cent) who responded favourably to this regime had had the disease for only a short time prior to treatment. Osteomyelitis of the os calcis, however, often presents subacutely (Antoniu & Conner 1974, Eid & Deif 1977), thus delaying diagnosis and treatment. By then the value of antibiotics alone is doubtful because of the resulting ischaemia and sclerosis (Buchman 1956, Trueta 1953). The os calcis, in addition, seems to be more vulnerable to blood deprivation than other bones. It derives its blood supply from the peroneal and posterior tibial vessels via two nutrient branches (Last 1966). Its plantar surface is related to poorly vascularised fibrofatty tissue, its medial and lateral surfaces are subcutaneous and its superior surface is articular. Additional blood supply analogous to the periosteal blood vessels in other bones would be very small if any. This may explain the frequency with which total and extensive involvement of the os calcis was encountered. In 4 out of 19 patients (12.1 per cent) who underwent calcanectomy, the os calcis was found loose in a pool of pus (Figure 1) without blood supply. Obviously antibiotics alone could not be expected to be of help in such circumstances.

Conservative surgery in the form of curettage, sequestrectomy and partial excision of the os calcis has been recommended by some authors. The aim was eradication of the infection and the preservation of more or less normal anatomy. Results, however were disappointing as only two patients had good results (15.4 per cent). In a third patient, the result was rated fair, but he consented to a calcanectomy because of a persistent sinus.



Figure 1. The os calcis found completely loose in a pool of pus with no periosteal attachment.

This made a failure rate of 84.6 per cent. *Curettage* was tried in eight patients without improvement. As a line of treatment of chronic bone infection, this has been condemned by many authors (Mercer & Duthie 1964). It fails to eradicate all pockets of infection, exposes new bone to infection and leaves behind a rigid-walled uncollapsible cavity, which becomes readily infected. *Sequestrectomy* was tried in three patients, two of them having previously had curettage. A fair result was obtained in one patient, who underwent calcenectomy later because of a persistent sinus. *Partial excision* of the os calcis was performed in 7 patients; three of them had had curettage. Only two patients (28.6 per cent) achieved a good result. The line of excision was arbitrarily based on preoperative radiographic appearances, which did not coincide with the actual extent of the infection in the majority of the cases. In many instances the line of resection had to be advanced more than once when the cut surface showed definite evidence of infection. In addition, the whole or most of the os calcis was involved in the majority of the cases (76.0 per cent of the series). Consequently, the amount of

healthy bone was negligible in most of the patients.

Total excision of the os calcis, together with all infected soft tissues and sinuses, on the other hand, was followed by a high rate of success. Results were good in 63.2 per cent, fair in 10.5 per cent and poor in 26.3 per cent. The procedure complies with the essential principle of treatment of chronic bone infection, i.e. the removal *en masse* of all infected tissues. It is justified by the indolent nature of the lesion and its accompanying ischaemia, the total or extensive involvement of the os calcis in the majority of the cases, the ill-defined nature of the lesion and the poor results obtained after less radical measures. The surgical approach used in this series was the midline posterior one described by Gaenslen (1931). It was found more convenient than the "lateral" approach advocated by Wiltse

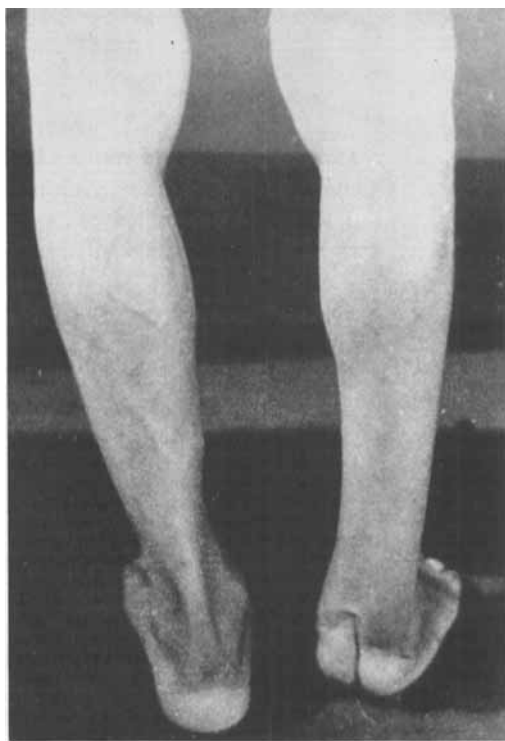


Figure 2. The deeply seated plantar scar after Gaenslen's approach.



Figure 3. Spotty calcification after calcenectomy.

et al. (1959) or the modified posterior approach recommended by Martini et al. (1974). Gaenslen's approach yields a deeply seated scar so that the plantar tissues form two thick cushions well adapted to weight-bearing (Figure 2), without appreciable pain. In addition, it allows access to the other tarsal bones when this is necessary.

Following successful calcenectomy, there often occurs spotty calcification in the heel pad. This varies in extent and may amount to only small scattered plaques (Figure 3). These calcified plaques, together with the thickened and toughened scar tissue form a firm pad under the talus, thus providing a "new heel" (Figure 4). Compared with the normal side the "new heel" was shorter and broader, but the difference was slight. The height of the heel was reduced on the average by 8 mm, while its

breadth was increased by 6 mm. Only four patients (21.1 per cent) required a heel raise of 1.5–2 cm. Passive ankle movements showed increased dorsiflexion of an average of 6.5° compared with the healthy side. This may be due to lengthening of the tendo Achilles. This resulted in slight weakness of tiptoeing, which, however, did not materially affect the gait of these patients. Only three patients complained of easy fatiguability after walking. Eversion and inversion after calcenectomy were practically the same as on the normal side. Conversely, all movements were restricted following partial excision of the os calcis, possibly due to muscle spasm consequent upon persistent infection. The shape of the heel and the ability to wear normal shoes were improved after calcenectomy. In three female patients the operative scar was repaired for cosmetic reasons. This minor surgical procedure gave a greatly improved result (Figure 5).



Figure 4. A well-formed "new heel".



Figure 5. Improved shape of the heel after plastic repair of the scar.

Because of the lack of involucrum formation in the majority of the cases (Gaenslen 1931), delaying of the operation is not recommended. Perseverance with conservative treatment will not prevent further bone destruction. It is, therefore, justifiable to excise the os calcis once chronic infection is established.

There were five cases of total excision (26.3 per cent) with subsequent poor results. All had persistent sinuses, pain and difficulty in wearing shoes. Four of these patients had associated osteomyelitis of other tarsal bones. The latter were not removed and thus maintained the infection. Amputation has been considered the best treatment for this situation if not controlled by conservative means

(Martini et al. 1974). In the fifth case failure was caused by the leaving behind of a small part of the anterior end of the os calcis, which was sufficient to maintain the infection.

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