THE PAINFUL HEEL

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In orthopaedic surgery there are several conditions which, though not serious diseases, are not welcomed by the orthopaedic surgeon on account of their intractable nature. Though confident instructions are often given for the treatment of these conditions in textbooks, in practice the results of orthodox treatment are frequently disappointing both to the surgeon and to the patient, and it is therefore a matter of some relief when a method of treatment which appears to give consistently good results is discovered.

In my experience painful heel, of the type where the pain is located in the region of the postero-medial attachment of the plantar fascia to the os calcis, comes into this category, and, despite the use of various types of heel "sorbo" pads to take the weight off this area, the elevation of the heel of the shoe, or even erosion of the tender area surgically, the results are usually disappointing. The fact that a surgical attack upon a calcaneal spur had proved successful was considered important enough for a case to be shown at a London orthopaedic club (*J. Bone Jt Surg.*, 1954).

It is almost universally agreed, however, that the condition is one of chronic strain of the posterior end of the central part of the plantar fascia, initiated or aggravated by toxic conditions on some occasions, and sometimes associated with the presence of a calcaneal spur on the x-ray film. It is also now widely appreciated that the presence of such a spur is probably only the sign of there being, or having been, a chronic strain in this area, and that such spurs frequently exist without any symptoms either past or present. In the days when this spur was regarded as the cause of the pain, the logical method of treatment was to remove the pressure of the patient's body weight from this spiky area. Methods of treating the condition by heel pads are relics of that approach to the condition, but once it is appreciated

that in fact the strain which causes pain in this area is a longitudinal one working in the line of the plantar fascia, then obviously some other method of minimizing this strain is required.

Consideration of the anatomy of the plantar fascia (Fig. 1) shows that the main and apparently offending portion of the fascia is attached just medial to the vertical axis of the peritarsal joint (Shephard, 1951). It seems logical, therefore, that the strain can be relieved by some form of insole which tilts the heel and relaxes this portion of the fascia.

For the past two years I have been using an insole (Fig. 2) originally designed, I believe, by Mr. A. O. Parker, of Cardiff, and designated by him a convex wedge. Whilst at first sight it would appear that this appliance presses on the plantar fascia and would increase the tension in the tender area, in practice the result of this treat-

ment has been so consistently good that I would sooner abandon the theory of its effectiveness than the method of treatment.

In the past two years I have seen 17 cases of painful heel varying in duration from two to twenty-four months. All of these have been relieved by the use of this insole, and in all but three cases relief has been such that by the time the insole has worn out they have not required a further insole. It has therefore become my practice to supply this insole, see the patients again in six weeks' time for confirmation of the results of therapy, to ask them to wear the

FIG. 2.—View of the insole from the medial aspect.

insole until it wears out, and only to see me again if they are not cured in this time. All the patients have been willing to do this, as within seven days of having the insole they have found that relief is being obtained, and they feel confident that the condition is slowly but steadily being alleviated. In three cases where more than one insole has been supplied (in fact, up to date they have applied for only one replacement each) it has been to people who had the condition for a considerable time before receiving treatment and who are heavy walkers.

This insole was supplied to me by Messrs. R. Taylor and Son, 50, Bath Road, Walsall.

REFERENCES

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PHARMACOLOGICAL STUDIES ON
LEAD E.D.T.A.

BY

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A recent communication by Sapeika (1955) on use of "the water-soluble chelated compound lead ethylenediamine tetra-acetic acid" (Pb E.D.T.A.) as a contrast medium describes the intravenous administration of the disodium complex (PbNa₂ E.D.T.A.) to four human subjects. We wish here to record some animal experiments carried out at these laboratories in 1953, when we were investigating the potentialities of this substance for radiography, as well as some subsequent studies. Polarographic analyses showed that the samples of PbNa₂ E.D.T.A. used in our experiments contained less than 0.01% of ionized lead.

In aqueous solution, this chelated compound is decomposed by sulphides and forms a black precipitate; we were not surprised to find that the faeces of animals dosed with PbNa₂ E.D.T.A. turned black, as Sapeika recorded of his patients' stools, but we are not clear why he found it necessary to invoke enzymatic decomposition to account for the observation.

Toxicology and Excretion Rates

The acute intravenous LD₅₀ of PbNa₂ E.D.T.A. was determined in two different strains of mice (A2G and GFF)

FIG. 1.—Plantar fascia after Gray. The insertion of the central part posteriorly on the medial side of the os calcis is to be noted. A, medial part; B, central part; C, lateral part.

and gave values of 3.5 to 4.5 g./kg. The corresponding figure for diodone, still widely used as a contrast medium, was approximately 6 g./kg.

Excretion studies were carried out on adult female albino rats (WAG strain) and on rabbits. Six groups of three rats were given single doses of PbNa_2 E.D.T.A. by the oral, subcutaneous, or intraperitoneal route, two dose levels (100 and 500 mg./kg.) being used for each route. The faeces and urine from each group were collected separately each day for four days and then analysed for total lead polarographically.

On the first day after oral doses of 100 and 500 mg./kg., 2% and 3% respectively of the administered lead appeared in the urine, and thereafter this was free from lead. At the dose of 100 mg./kg. the remaining lead was excreted in the faeces during the first two days, but at the dose of 500 mg./kg. the total faecal recovery was only 88% over four days. After subcutaneous administration of 100 and 500 mg./kg. the urinary recoveries over four days were 79% and 82% respectively, the faecal recoveries being 6% and 12%. Although most of the urinary lead was recovered in the first day's voidings, there was still some present four days after the 500 mg./kg. dose. The four-day urinary recoveries after intraperitoneal injections at 100 and 500 mg./kg. were 70% and 50% respectively, the faecal values being 5% and 25%.

Fourteen days after treatment all the rats were killed; the organs of one rat from each group were examined histologically. There was evidence of slight renal damage (cloudy swelling of mid-zone and juxtamedullary tubules) with 500 mg./kg. This group had shown the highest urinary recovery and was still voiding lead on the fourth day. Apart from this finding, nothing abnormal was observed in any of the other rats. The liver, kidneys, gastro-intestinal tract, spleen, femur, and blood from a second rat in each group were assayed for lead. None was detected in these tissues in any of the rats killed fourteen days after dosing. All rats lost weight during the experimental period.

A further group of three young female rats were given single intravenous injections (100 mg./kg.) of PbNa_2 E.D.T.A. The excreta were collected for three days, when the animals were killed and their carcasses assayed for lead. The urinary and faecal recoveries were 85% and 8% respectively, 7% being found in the cadavers. The animals were still excreting small amounts of lead by both routes on the third day.

The excretion studies in rabbits were conducted as follows. Two adult rabbits in each of three groups were given single intravenous injections of PbNa_2 E.D.T.A. at levels of 100, 500, and 1,000 mg./kg. One rabbit on the highest dose died 24 hours later and the second after seven days. The remaining animals were killed one week after being injected. Except from the first rabbit, which of the total dose voided 71% and excreted 2% in the faeces before dying, the urinary and faecal excretions were measured for two days after administration. In this period the rabbit that died after seven days voided 87% and excreted 3%. The average urinary and faecal recoveries were 80% and 4% and 73% and 5%, for the animals dosed at 500 and 100 mg./kg. respectively. Histological examinations were made on the two rabbits that died and on one rabbit from each of the two other groups. There was evidence of hepatic and renal damage in the rabbits that died. The lungs and livers, and especially the kidneys, of the remaining two rabbits had clearly been affected by the drug, the degree of damage being related to dosage. Two further rabbits were given intravenous doses at 1,000 mg./kg. The first developed severe convulsions and screaming fits, and died two days later. After three days the second rabbit developed paralysis of the hind legs and was destroyed.

The urine from rabbits injected intravenously with PbNa_2 E.D.T.A. at levels of 100 mg./kg. or more gave positive reactions with benzidine. At 100 mg./kg. a positive reaction was obtained with the third day's voidings only, but at higher levels the test became positive within

16 hours of administration. There was no evidence of haematuria in rats given 1,000 and mice given 2,000 mg./kg. intravenously. It is interesting that Sapeika reports intravascular haemolysis in his fourth patient.

At this point it may be pertinent to mention the results of an *in vitro* experiment carried out by Mr. C. R. B. Joyce (private communication) at the London Hospital. PbNa_2 E.D.T.A. and PbCl_2 were compared for their effects on the mobility of K^+ ions in human erythrocytes suspended in physiological saline. The results showed that PbNa_2 E.D.T.A. was considerably less active than PbCl_2 in this respect, but that its effect was appreciable and increased with time.

Summary

Our results may be summarized thus. PbNa_2 E.D.T.A. did not appear to be unduly toxic to mice and rats and did not cause haematuria in them. Although most of the lead was eliminated via the kidney after intravenous administration, a small percentage appeared in the gut. Also, some of the drug appeared in the urine after oral dosing. Although lead could not be detected in the liver, kidney, alimentary tract, spleen, femur, or blood of rats dosed fourteen days earlier, it is obvious from the excretion rates that the time required for complete elimination from the body is considerably longer than it is for diodone. The effects of PbNa_2 E.D.T.A. on rabbits were disturbing. Doses of 1,000 mg./kg. were fatal, and at lower doses the drug produced haematuria and caused severe hepatic and renal damage.

The results of our earlier experiments, here recorded, led us to conclude that we should not be justified in submitting the substance studied to clinical trial, and the confirmation of its toxicity provided by the later investigations caused us to lose interest in it as a possible contrast medium.

REFERENCE

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Medical Memoranda

Tuberculosis of Pubis Presenting as a Cold Abscess of the Thigh

The pubic bone is an uncommon site of tuberculous osteitis: it is not mentioned by Girdlestone and Somerville (1952). Small series of cases have been described in recent literature (Clavel, 1951, three cases; Mallo, 1947, one case; Fical, 1949, two cases). Cold abscess formation from tuberculous osteitis of the pubis seems peculiarly rare. The following case presented as a cold abscess tracking down the thigh from the pubis.

CASE REPORT

A married woman aged 23 was admitted to hospital in August, 1953, complaining of a lump in the inner aspect of the upper part of the right thigh which had slowly increased in size over the previous two months. It was painless, and had not interfered with movement. Her general health had been good and there was no loss of weight or cough. She had one child, aged 2, and no abnormal obstetric history.

Examination showed a fusiform tumour in the adductor region of the right thigh deep to the superficial adductor muscles. Its long axis measured 6 in. (15 cm.), and its upper pole was attached to the pubis. It had a uniformly firm consistency, the surface was smooth, and the edge was ill defined. It was not tender nor did it fluctuate or pulsate. The pubic bone was not tender. The patient's general condition was excellent.