The extent to which intrinsic motility and capacity for continuous growth enable pathogenic organisms to establish themselves in the walls rather than in the cavity or on the surfaces of a wound, no doubt varies with different organisms and in different tissues. The fact, however, that phagocytes are constantly transporting organisms from the cavity or the surface to the tissues which form the walls of a wound means that any adverse influence acting on these loaded cells on their return journey calculated to interfere with their power of retaining and digesting these ingested organisms is a source of danger. It is possibly in this way that antiseptic solutions act prejudicially when used too continuously or in a too concentrated form.

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REFERENCE.

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Notes on Military Orthopaedics.

III. THE SOLDIER'S FOOT AND THE TREATMENT OF COMMON DEFORMITIES OF THE FOOT.

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(Continued from page 753.)

PART III.

HAMMER-TOE.

HAMMER-TOE is a deformity which usually affects the second toe, though it is common to find slighter degrees of the condition in other toes. It consists of flexion of the proximal interphalangeal joint and dorsiflexion of the metatarso-phalangeal joint (Fig. 1). The prominent knuckle of the proximal interphalangeal joint chafes on the upper of the boot, while the tip of the toe is pressed on the sole. Painful corns naturally develop at these points of pressure, making the man unfit to march.

FIG. 1.—Hammer-toe.

The causes are numerous: sometimes the deformity runs in families, but the commonest cause is the crowding of the toes in ill-fitting, badly designed boots. Hence it is common to find hammer-toe associated with hallux valgus.

Treatment.

In the adult operative procedure is indicated if we are to produce a quick and lasting recovery. Neither amputation of the toe nor an attempt at pseudo-arthritis of the proximal interphalangeal should ever be undertaken. Amputation should not be done, because the absence of the second toe increases the tendency to the production of hallux valgus, and often leads to a second disability more serious than the original hammer-toe (Fig. 2).

FIG. 2.—The disability produced by amputation of second toe.

Some surgeons, when operating to correct the deformity, leave the articular cartilage on one side of the joint in order to obtain a new joint. My experience is that this is followed by recurrence so frequently that the operation should be condemned as uncertain.

Operation.

The operation found most uniformly satisfactory is a wedge-shaped excision removing the articular cartilage on

both sides of the joint, so as definitely to ankylose the joint in extension. An oval piece of skin, including the corn, is excised over the prominent knuckle. A wedge, base upwards, including the joint, is then excised, of sufficient size to allow the toe to be straightened (Fig. 3). The flexor tendon is divided by tenotomy. The skin incision is then

FIG. 3.—Wedge excision of joint for hammer-toe.

stitched so as to leave a transverse linear scar. The toe is fixed down to the toe-splint shown in Fig. 4, and the patient walks about, still wearing the splint inside his boots, for some weeks, to make sure that solid ankylosis occurs without any return of the deformity.

FIG. 4.—Splint for hammer-toe.

DISPLACEMENT OF THE LITTLE TOE.

A displacement of the little toe, similar in nature to hallux valgus, frequently occurs, usually as the result of wearing boots which are too tight and too pointed. Occasionally the condition is congenital. The toe is displaced inwards either over the dorsal or under the palmar aspect of the fourth toe. In either position it is subjected to undue pressure in any ordinary boot, and therefore becomes painful.

Treatment.

This condition is very troublesome, and when it occurs in a soldier an operation is essential. The treatment which may be applied successfully in children has no place here, as the structures have become so contracted, especially the skin, that tenotomies, excisions, or simple splintings are wholly inefficient. Amputation of the toe is simple and effective in most cases, especially if no callosities have formed under the metatarsal head. In amputating it is advisable to make an ample flap to obviate the result of subsequent contractures and to secure a lax fleshy covering for the bone. If a callosity has formed, no pressure should be allowed upon that area until by rest and treatment it has become soft and normal. If the head of the bone is arthritic and the condition is complicated by exostoses or irregularities, these should be pared away. Only in very exceptional circumstances should the head of the metatarsal be removed, for, as pointed out in a previous article, this forms one of the points of support in the foot on which a soldier's marching powers depend.

METATARSALGIA.

Metatarsalgia is a peculiarly painful disability of the foot associated with flattening of the transverse arch. The characteristic pain is usually felt in the fourth metatarso-phalangeal joint, frequently in the third, and less often in the second. The pain is variously described as a sharp stab, a burning pain, or as if the patient was "stepping on a red-hot pea." The pain may come on suddenly as the patient is walking in the street, and cripple him, so that he has to hobble into a shop and get his boot off. The device adopted by most patients to obtain relief is to grasp the metatarsals in the hands and squeeze them so as to restore the transverse arch. In more chronic cases the affected toe becomes glazed and shows signs of trophic disturbance, while in some cases there is complaint of severe pain shooting up the leg.

Morton in his original description attributed the pain to pinching of the digital nerves between the metatarsal heads. The fact that relief is obtained by squeezing the metatarsal heads casts doubt on the truth of this. I described the condition fully in 1897, and stated that,

as the result of the study of dissections and frozen sections, I had come to the conclusion that descent of the transverse arch and consequent pressure on the nerves in the sole was the real cause of the pain.

Diagnosis is easily made by the characteristic tenderness elicited by pressing the offending joint between the finger and the thumb. In addition, obvious flattening of the transverse arch is usually present, and the fatty pad under the heads of the metatarsals is absorbed by the pressure of the descended arch, so that the "ball of the foot" feels unnaturally thin, and there are corns in the sole under the unusual points of pressure. The condition is therefore to be regarded as directly connected with overstrain of the foot, and is consequently associated with flat-foot.

Treatment.

Immediate relief can nearly always be given by removing the pressure of the body weight off the heads of the metatarsal bones by a bar behind them (Fig. 5).

FIG. 5.—Treatment of metatarsalgia. Bar on sole of boot behind the heads of the metatarsal bones.

The effect of this is to carry the body weight on the necks of the metatarsals. The heel of the boot should also be raised one third of an inch on the inner side, as for ordinary flat-foot. A band of strapping round the bases of the metatarsals to prevent spreading also helps. These measures, combined with exercise of all the small muscles of the foot to restore the arch, and massage to relieve the pain and improve nutrition, will suffice to cure all early cases in the space of a few weeks.

The patient should then be warned against wearing narrow boots, which impede the free play of the fore part of the foot, and conduce to atrophy of the muscles of the foot from disuse.

In cases which have lasted for some time these measures do not suffice for a cure, though they give some relief.

Operation.

More drastic measures are required for the soldier's foot. Removal of the head of the offending metatarsal through a small dorsal incision completely relieves the condition in ninety per cent. of cases, even when the crippling effects have lasted a long time, and the patient is suffering so much that he asks for amputation of the foot. In the remaining cases it gives enough relief for the patient to be made comfortable with a bar across the sole of the boot.

After-Treatment.

The bar on the sole of the boot and crooked heel, already described, should be employed as an essential part of the after-treatment. The patient may then walk during the whole period of convalescence without injuring the site of operation, and so exciting new inflammatory changes.

PAINFUL CONDITIONS ABOUT THE HEEL.

The painful conditions about the heel most commonly met with may generally be traced to one of three causes:

1. Injuries or strain about the insertion of the tendo Achillis.
2. Spurs of bone and adventitious bursae under the os calcis.
3. Osteitis and periostitis from direct injury of the os calcis.

Injuries and strains about the insertion of the tendo Achillis are marked by pain about the back of the heel which is aggravated by walking and relieved by rest, but the pain recurs again if the patient is tempted to take exercise. The condition may be divided into three types:

1. *Tenosynovitis*, in which there is swelling due to effusion within the tendon sheath. This swelling extends some distance up the tendon, and is both palpable and visible.

The treatment is counter irritation, firm bandaging and rest. When the acute stage is passed the patient may be allowed to walk limited distances with the heel of the boot raised $\frac{1}{4}$ in., so as to relax the tendon and diminish the strain. If the condition tends to

become chronic, the actual cautery may be used with great benefit, especially in the form of the heated needle.

2. *Bursitis* of the bursa under the insertion of the tendon into the os calcis. This is diagnosed by localizing the tenderness at the site of the bursa and by detecting a small area of fluctuation.

Treatment.—Relax the tendon by raising the heel $\frac{1}{4}$ in. Apply a band of strapping round the leg above the malleoli to act like the wristlet worn by workmen who have strained a tendon at the wrist. The patient should be instructed to walk a little every day, but should not be allowed to do an indefinite amount of walking; this is one of the difficulties connected with letting soldiers out from hospital on pass.

3. *Periostitis* at the site of insertion of the tendon, due to strain of the insertion.

The diagnosis is made by localizing the tenderness on pressure a little lower down than in the case of bursitis, and by the absence of deep fluctuation in the bursa beneath the tendon. The treatment by rest is the same as for the preceding condition.

Both these last-mentioned conditions may be present simultaneously and become chronic. The best treatment then is first to puncture the bursa or the inflamed area of periosteum several times with a hot needle. The process is exactly that known to the farrier as "pin-firing." The effect of this is to excite an active vascularization of the part, after which repair takes place more rapidly if the rest treatment is carried out.

Further, cauterizing a patient's heel deters him from wearing a boot and going out for too long walks, and gives the deep lesion an opportunity to recover while the surface blister is healing.

Irregular fibrous masses are sometimes noted in the Achilles tendon. These are usually the result of partial ruptures, and if large and persistently painful they should be removed.

SPURS OF BONE UNDER THE OS CALCIS.

Spurs of bone running forward into the plantar fascia or short muscles of the sole are frequently seen in skiagrams (Fig. 6). They often cause no symptoms. On the other hand, if the patient accidentally jumps on to a stone and bruises the periosteum over one of these spurs, it may become enlarged, or an adventitious bursa may develop under it. After this, the patient feels pain every time he puts his heel on the ground, and in the course of a long march.

FIG. 6.—Spur of bone under os calcis.

Treatment.

Make an incision along the side of the foot and gouge away the spur and tissue round it to make sure of clearing out the bursa and any chronically inflamed periosteum. The incision should, of course, not be made in the sole, as a scar in these regions is often itself the cause of trouble.

Osteitis and Periostitis.

Osteitis and periostitis of the os calcis often arise from bruising of the bone by a jump or fall from a height, or by injury due to gunshot. There may be no gross fracture, only some crumpling of the lamellae, which may be seen in a good skiagram. When a fracture occurs, the disability is often due to bony irregularities on the under surface of the bone.

Treatment is often unsatisfactory, and if the bony masses are felt in the sole under the heel they should be freely removed. Palliative measures are of no use in the case of a soldier; and one may state as a general proposition that a soldier with a badly-fractured astragalus or os calcis will not again be fit for service.

THE City Council of Boston has issued an ordinance establishing zones of silence in the neighbourhood of hospitals with fifty or more beds. Foot passengers, drivers of vehicles and street cars, and operators of motors are warned not to make any unnecessary noise within these zones.