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Technical tip: Percutaneous bone shaving and ulcer endoscopy to manage abnormal pressure point of the sole

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ABSTRACT

Abnormal plantar pressure can follow post-traumatic foot deformity, Charcot neuroarthropathy and partial foot amputations. Surgery is indicated if the condition does not improve with orthotic treatment. We describe the techniques of percutaneous shaving of the plantar bone prominence and ulcer endoscopy to manage abnormal pressure points under the sole of the foot.

1. Introduction

Abnormal pressure points of the sole of the foot can present with pain, callosity and/or ulceration. It can occur as a result of diabetic Charcot forefoot or midfoot deformity; post-traumatic deformity or exostosis formation; or partial foot amputation. Surgery is indicated if the condition does not improve with orthotic treatment. The goal of surgery is relief of the abnormal pressure points by removal of the plantar bone prominence. This is classically achieved by open procedures either by direct plantar approach or indirect medial or lateral approach. The plantar approach has the advantage of direct access of the bone prominence. It is usually the more favorable approach if an ulcer is present. The ulcer can be excised together with removal of the osseous prominence [1]. We described the technique of percutaneous bone shaving and ulcer endoscopy to manage the abnormal plantar pressure points. The technique is not demanding and detailed pre-operative planning is the key to success. The location of the bony structure corresponding to the abnormal pressure points should be determined by clinical examination, radiographs and pedobarography study. This minimally invasive procedure is indicated in case of symptomatic abnormal pressure points of the sole of the foot due to (1) plantar bone prominence of the forefoot and heel (Fig. 1); (2) abnormal pressure at the plantar distal end of the partial foot amputation stump; (3) residual midfoot plantar bone prominence after reconstruction of the Charcot midfoot deformity. This is favorable to open procedure in patients with multiple flap surgeries, poor local circulation or poor local soft tissue condition. It is contraindicated in case of (1) an extensive area of abnormal pressure due to gross deformity of the foot and ankle, e.g. abnormal pressure over the lateral foot border in case of cavovarus deformity; (2) open reconstructive surgery is indicated for symptomatic joint degeneration or deformity of the foot [2]; (3) bone prominence close to the major nerves or vessels, e.g. at the medial side of the heel and the lateral side of the midfoot; (4) an ulcer is present where the bony prominence can be resected together with the ulcer. However, in case of flask shaped ulcer with a small ulcer opening, direct open approach requires extension of the ulcer opening in order to achieve adequate debridement of the ulcer and the osseous prominence. Ulcer endoscopy can be combined with percutaneous bone shaving in order to achieve adequate soft tissue and bone debridement without the need to extend the plantar wound.

2. Description of technique

The patient is put in a supine position. A tourniquet is usually not needed. Intra-operative fluoroscopy is useful to define the anatomical site of the bony prominence and extent of bone shaving needed (Fig. 2).

A small incision is made at the side of the bone prominence of the sole. In general, a lateral incision is made in laterally located bone prominence and a medial incision is made in medially located bone prominence. The wound should be as close to the prominence as possible. It is preferable to make the incision at the distal

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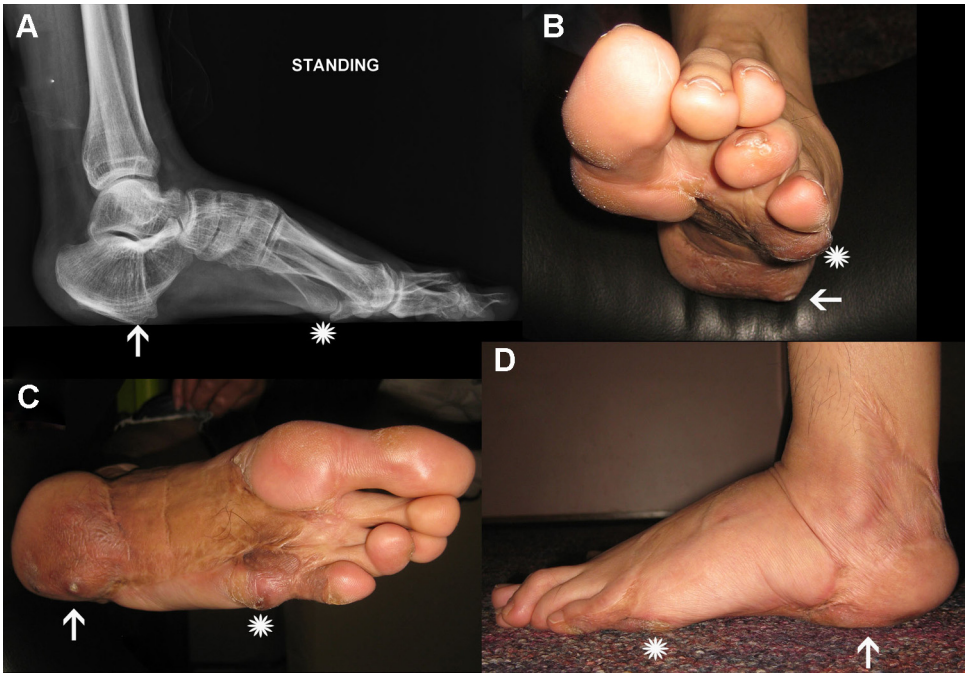

Fig. 1. Preoperative radiograph (A) and clinical photos ((B)–(D)) of Patient number 3. Severe crush injury to the left foot with multiple flap surgeries. Post-traumatic cavus foot with plantarflexed 5th metatarsal. Plantar pressure points with callosities and ulceration at the heel (arrow) and 5th metatarsal heads (star).

border rather than the proximal border of the prominence so that the wound will not jeopardize the length of the foot if revision amputation is needed. Subperiosteal stripping of the soft tissue from the bony prominence is performed by a haemostat and a small periosteal elevator. The bony prominence is resected by a 2 mm Isham straight flute burr (Vilex Inc.) till it is flushed with the surrounding bone surface (Fig. 3). The orientation of the burr is parallel to the bone surface and the bone shaving procedure is similar to the arthroscopic acromioplasty of the shoulder. A flat bone surface can be easily achieved. In case of partial foot amputation, the plantar distal end of the bone should also be rounded off by the burr after removal of the bone prominence in order to avoid pressure point during heel off phase of walking. Postoperatively, the foot is creped and the patient is advised for nonweight-bearing walking to allow the soft tissue to adhere to the raw bone surface.

Ulcer endoscopy is indicated in case of a flask shaped ulcer over the bone prominence. The incision for bone shaving and the ulcer opening are used as the portals of the endoscopy. They are

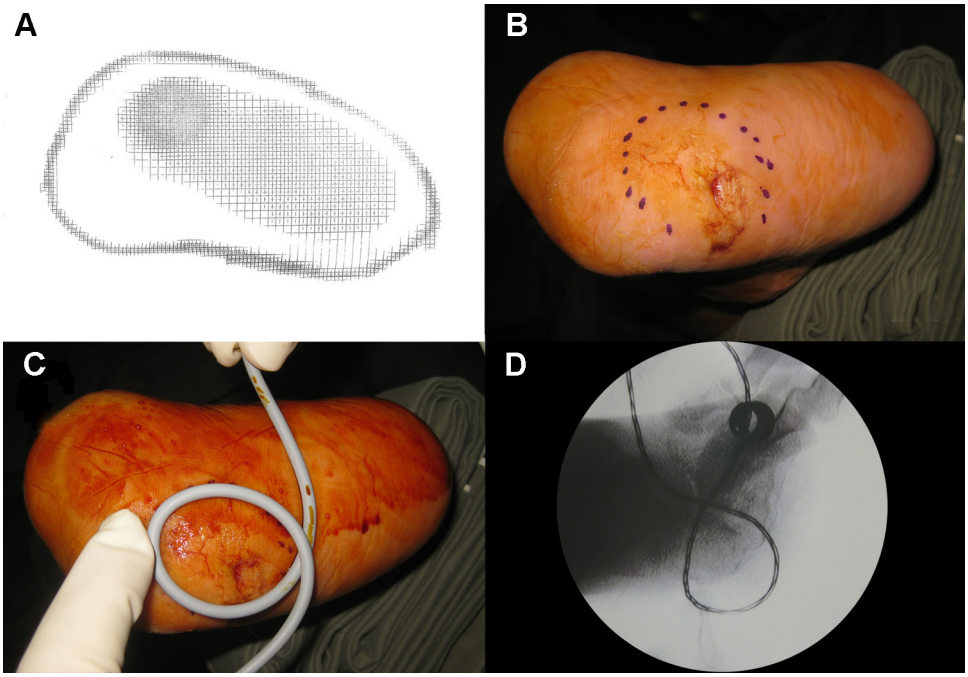

Fig. 2. (A) Preoperative foot print located the extent of abnormal plantar pressure area. (B) Intra-operatively, the extent of abnormal plantar pressure was outlined by palpation. ((C) and (D)) the abnormal pressure area was outlined by the cable of the diathermy and the area of ostectomy was then defined under fluoroscopy.