

USE OF A CANCELLOUS CALCANEAL BONE PLUG IN FOOT SURGERY

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The lateral calcaneus offers easy access to a cancellous bone graft for different indications. The incision is made at the lateral posterior aspect of the calcaneus and avoids the neuro-vascular structures. The lateral calcaneus offers easy access to a cancellous bone plug and more cancellous bone chips. With this technique nonunions in several sites have been treated.

A trephine of appropriate size is introduced into the bone and the plug is harvested. Additional bone might be harvested with a curette. The indications for the plug are versatile. Experiences are reported with nonunions after a Lapidus arthrodesis and Jone's fractures.

Another very useful indication is the lengthening of the lesser toes after a very aggressive shortening for a hammertoe repair. Harvesting a tricortical bone graft from the iliac crest creates a new site of morbidity, which is not necessary in many cases.

TREATMENT OF NONUNIONS

Nonunion After First Metatarsocuneiform Fusion

The symptomatic nonunion is identified by computed tomography scan. The dissection is carried out to the MC joint and the nonunion is again identified clinically or under fluoroscopy. With an appropriate size trephine, the

pseudarthrosis is taken out as a plug after removal of the hardware (Figure 1). The nonunion is sent for histopathological evaluation (Figure 2). The bony defect is then drilled with a small drill. The cancellous bone plug is then taken out from the lateral heel together with some bone chips according to the size of the defect (Figure 3). The canal of the removed screw is again drilled with a larger drill for a larger screw (i.e., a 0.18/0.22 inch headless screw). The position and length are confirmed radiographically (Figure 4).

The bony defect is filled with the plug and with additional bone chips. The fixation is carried out with a screw and a plate (i.e. poly-axial locking plate). The postoperative radiographs show the fixation and the remaining gap of the nonunion, as only the central part is fused (Figure 5).

The postoperative course resembles the course after the original surgery, prior to the nonunion. It is recommended that weightbearing over 20 kg should not be exceeded for 4 weeks, followed by full-weightbearing after that, dependent on the radiographic findings.

The same principle is applied to a nonunion of a Jone's fracture of the fifth metatarsal of a premier league soccer player (Figures 6-9). The athlete was allowed to bear full weight and start with aggressive rehabilitation after 4 weeks.



Figure 1. The nonunion site (arrow) is identified and taken out with a trephine of an appropriate size.

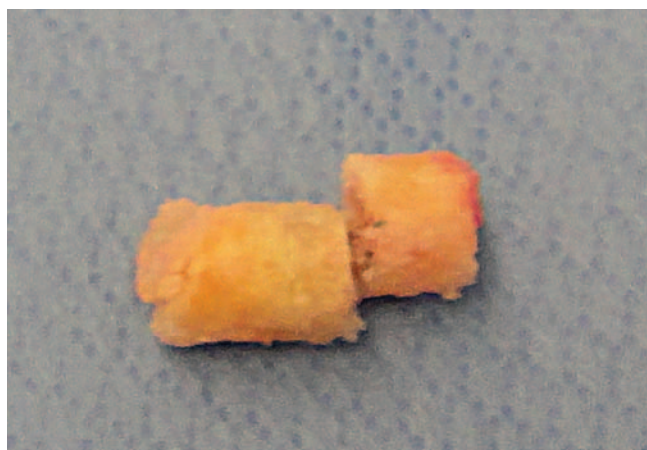


Figure 2. Excised nonunion.

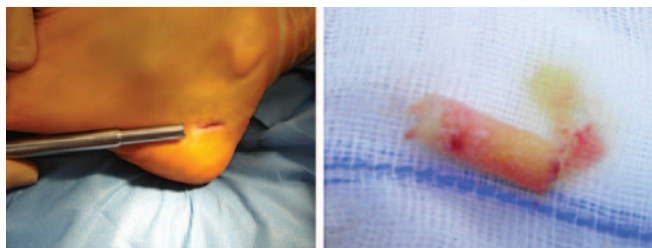


Figure 3. Bone plug is taken out of the posterior lateral heel with a trephine.



Figure 4. Headless screw in place in re-drilled previous screw canal; the defect is filled with the bone plug.



Figure 5. Postoperative radiograph.



Figure 6. Nonunion of Jones's fracture (second revision).

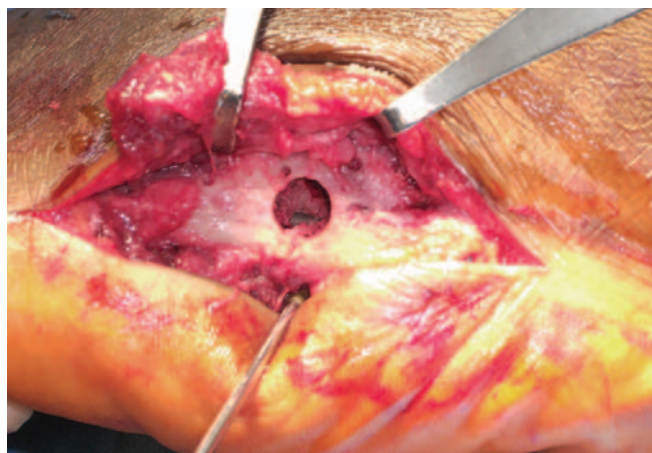


Figure 7. Intraoperative view.



Figure 8. Defect filled with cancellous bone plug from the heel.



Figure 9. Nonunion is healed.



Figure 10. Preoperative radiograph.



Figure 11. Intra-operative view with short second and third toe.

Treatment of Iatrogenic Short Lesser Toes

The recurrent hammertoe deformity is sometimes inaccurately treated with aggressive shortening of the toe. The result is not very favorable cosmetically, and the residual pain will prompt the patient to seek revisional surgery (Figures 10 and 11). A suitable approach is a proximal interphalangeal joint fusion with an interpositional bone graft with a cancellous bone plug taken from the heel.

The skin incision is carried out straight over the dorsal aspect of the toe. The approach may also be carried out as a multiple z-plasty if necessary. The base of the middle phalanx and the distal proximal phalanx are resected until healthy bone appears (Figure 12).

A cancellous bone plug is then harvested from the lateral heel (13). The appropriate-sized plug is then penetrated by a smooth Kirschner wire so that the plug is in the middle of the double trocar pointed pin (Figure 14). Using an inside-out technique, the bone graft is then positioned in the proximal interphalangeal joint (Figures 15-17). The pin is left in place for 4-6 weeks according to the radiographic findings. Full weight-bearing is allowed in a shoe with a heel lift.

DISCUSSION

This technique was applied in 8 cases of nonunion after Lapidus arthrodesis. All fusions healed uneventfully after the revision, provided that the level of vitamin D was normal.

The technique can only be applied, if the complete correction of the first intermetatarsal angle was achieved. With the plug technique, the lateral wall of the first metatarsal is preserved as well as the stability of the previous fusion site. If a tri-cortical bone graft is applied, the area of the first MC joint has to be resected completely, which leaves the surgeon with a very unstable situation.

The technique is easy, fast, and allows for a histopathological proof of the nonunion. The healing rates are excellent. The same results with this technique were also achieved with 3 cases of nonunion of Jones's fractures.

The short lesser toe after revisional hammertoe correction leads to both cosmetically and functionally unsatisfactory results. The interpositional cancellous plug fusion is a fast and reproducible technique to overcome the disadvantages of previous surgeries. The technique was applied in 3 patients with 8 toes. All interpositional fusions consolidated with a satisfactory cosmetic result, a pain-free postoperative result, and normal function of the respective toes.



Figure 12. Distal proximal and proximal middle phalanx are resected.

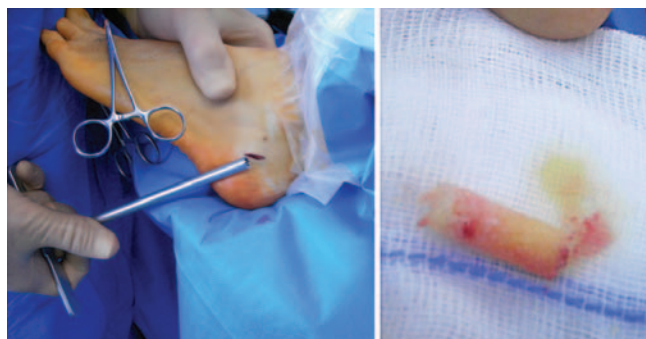


Figure 13. A cancellous bone plug is harvested.



Figure 14. The plug is positioned on a Kirschner wire.



Figure 15. The plug is put in place as an interpositional bonegraft into the proximal interphalangeal joint.



Figure 16. Intraoperative result.



Figure 17. At 6 weeks postoperative, the interposition is healed.