CHAPTER 21

Use Of Absorbable Fixation In The Austin Bunionectomy:

A Preliminary Study

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HISTORICAL

During the last decade, metallic osteosynthesis devices such as screws, plates, and nails have made modern operative fracture care possible. However, metallic implants are associated with two disadvantages. Rigid fixation devices may cause atrophy of bone, especially in cortical regions. In addition, when placed in a location where the subcutaneous tissue is sparse, the implants may require subsequent removal. In an effort to avoid these problems, researchers have attempted to devise implants which are made of absorbable (biodegradable) materials.

Absorbable implants should be strong enough to guarantee stable fixation during the time of fracture healing, and then gradually degrade. These materials should also be well tolerated without any carcinogenic, teratogenic, toxic, inflammatory, or allergic side effects. Absorbable synthetic polyesters of glycolic acid, lactic acid, and para-dioxanone have been used as raw materials for sutures. These materials, having been thoroughly investigated for their clinical use, and possessing encouraging mechanical properties, are ideal for absorbable implants in orthopedic surgery.

Absorbable synthetic sutures have been clinically used for twenty years. However, despite intensive research, the development of an ideal absorbable implant suitable for reliable fixation of cancellous bone tissue has been difficult. Studies show that certain fractures of cancellous bone can be successfully treated using absorbable pins. The Austin osteotomy appears to be an elective surgical procedure that is suited for this type of implant.

Polydioxanone degrades in vitro and in vivo by hydrolysis. The degradation products of PDS are excreted in the urine and feces and exhaled as carbon dioxide. In rats, degradation is completed within 180 days with a minimum of foreign body reaction being observed. The mild foreign body reaction seen histologically has been considered by several authors to be a normal biological response in the degradation of absorbable implants.

Pins made of polydioxanone possess a relatively low initial shear strength value of 92 mPA, which is reduced to about 50% within five weeks. Greve and Holste, in 1985, afforded successful fixation of osteochondral fragments of the distal femur using polydioxanone pins in rabbits. Ewers and Foster, in 1985, used polydioxanone plates and screws for fixation of experimental costal fractures in dogs. They found good osseus healing that was comparable to that obtained with metallic plates in the same animals. Claes et al. in 1986 used pins made of polydioxanone in the refixation of osteotomized osteochondral fractures in twelve sheep by inserting three small pins, 1 mm in diameter, through each fragment. They noticed no displacement of the fragments.

ABSORBABLE FIXATION OF THE AUSTIN BUNIONECTOMY

Orthosorb® pin fixation for the Austin osteotomy has been previously described. Orthosorb® pins are available in a straight as well as tapered configuration. The mechanism of degradation and the absorption time is the same for both types of pins. The preliminary results of this institution demonstrate that the Orthosorb® pins provide stable fixation of the Austin osteotomy when used for the correction of a mild hallux abducto valgus deformity.

The author has studied the use of 2 point Orthosorb® pin fixation.To enhance the stability of the Austin osteotomy, the Orthosorb® pin is driven across the osteotomy site and through the dorsal and plantar wings. The pins are directed from dorsal to plantar in a parallel fashion. The osteotomy is thereby secured by the pins against sagittal or transverse plane displacement.

TECHNIQUE FOR TAPERED PIN

(Johnson & Johnson Orthopedics, 1991)

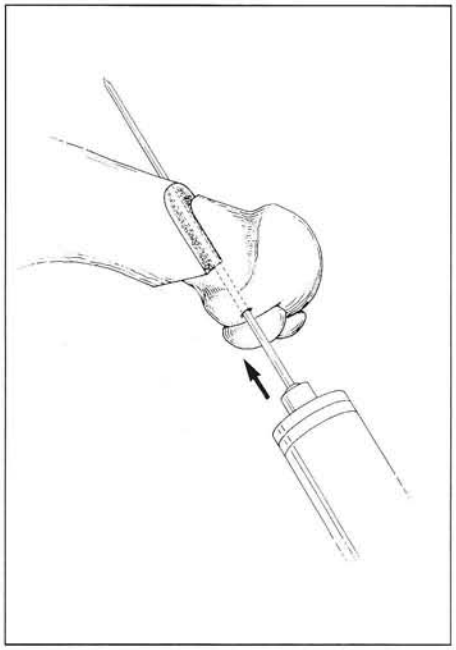

Figure 1A. Drill the stainless steel part of the pin through the bone with a power drill, exposing 15 mm of the pin on the opposite side.

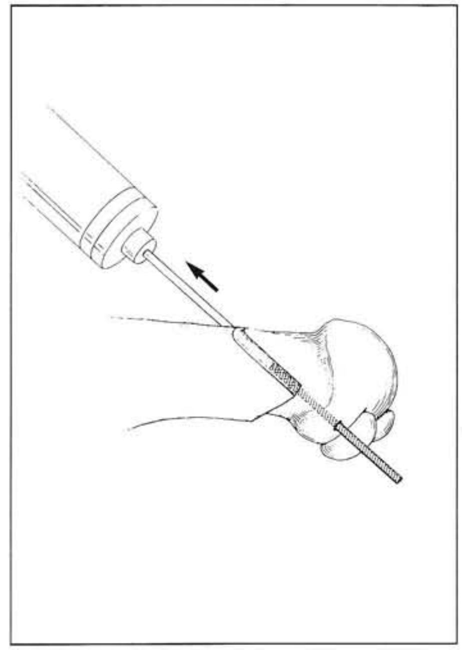

Figure 1B. Reattach the pin driver to the steel portion of the pin that has been passed through the bone and advance the wire until the tapered absorbable portion is across the bone.

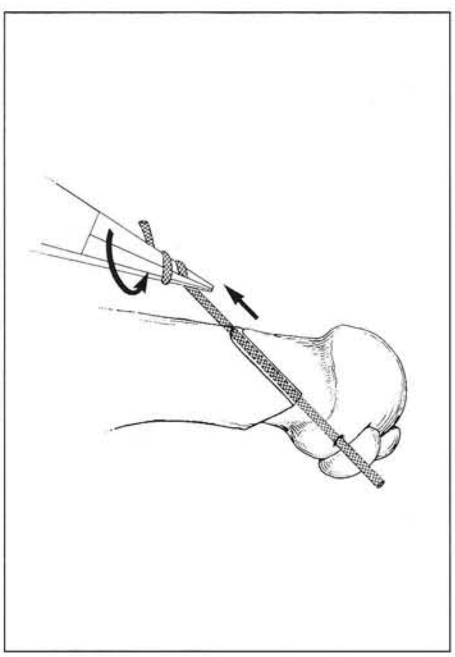

Figure 2. Cut off the steel portion. Grasp the absorbable portion of the pin with a needle-nose clamp and wrap the pin around it, pulling and wrapping slowly and steadily until the non-tapered portion is wedged securely into the bone.

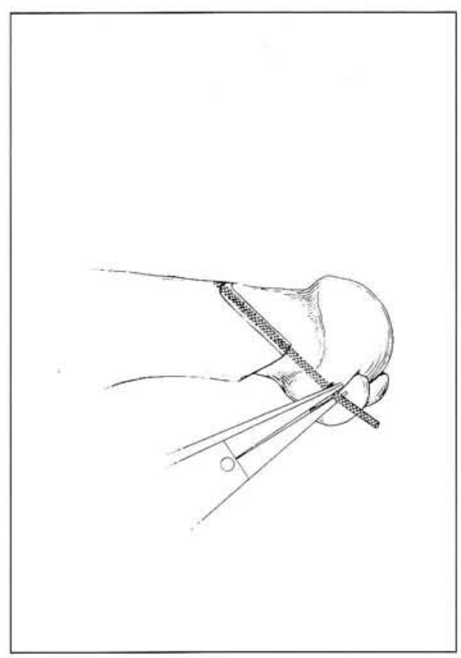

Figure 3. Trim both ends of the tapered pins flush to bone with a double action bone cutter.

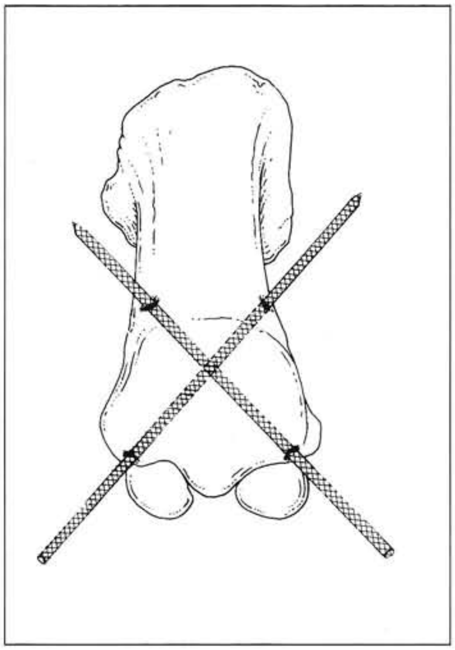

Figure 4. Two pins are driven transarticularly to stabilize the osteotomy, the first pin is driven distal-plantar-lateral to proximal-dorsal-medial while the second pin is driven distal-plantar-medial to proximal-dorsal-lateral.

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