CHAPTER 15

REMOVAL OF INTERNAL FIXATION

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Due to the numerous indications for internal fixation, one must consider the potential removal of these devices at a later time. There are individuals that recommend all metal implants be removed, while others believe implants should be removed only under specific clinical indications. In today's medical-economic atmosphere and concerns about further operative risks, surgeons should not routinely remove all fixation. The indications, timing, and several techniques for the removal of internal fixation devices will be presented.

INDICATIONS

The AO-ASIF group recommends that implant removal be determined on an individual case basis. A recent study by Brown et al. found no significant problems with asymptomatic or clinically insignificant fixation retention. Furthermore, they found routine removal of fixation devices had an associated high postoperative complication rate, specifically an 11% infection rate and a 15% overall complication rate. Although many of the studies regarding implant removal are associated with concomitant fractures, the concepts are also pertinent to implants used in elective or reconstructive surgery.

The AO-ASIF group categorizes potential problems associated with metal implants into three areas: 1. Volume factor, 2. Implant compatibility, and 3. Alterations of bony structure. The volume factor is secondary to placing an implant in a confined space and thereby creating potential irritation and altering the mechanics of surrounding soft tissues. Implant compatibility is the potential for metal corrosion and allergic reactions. Tumors, in both animals and humans, have also been reported to be associated with metal implants. The third category, bony structure alteration, deals with the remodeling of bone secondary to vascular disturbances associated with fixation devices, particularly plates. The concern is protection of a potentially weak bone after fixation is removed.

The literature describes several additional potential complications associated with internal fixation including fatigue fractures of the implant, or bony refracture secondary to the implant. Failure of fixation with a resultant non-union or infection may also occur.

Complications due to the volume factor may include neuropraxia, tendon irritation, and skin prominence. Kirschner wires and Steinmann pins may migrate and may require subsequent removal because of local irritation. Areas particularly prone to local irritation are bony prominences, especially when bulky fixation is used. Several studies have noted a relative higher incidence of irritation around the distal fibula, especially when plates were used. The surgeon should consider the anatomic area involved and the potential for local irritation.

The incompatibility of a fixation device may require later removal, however this is a rare occurrence. A patient's sensitivities to metals should be considered and appropriate metals avoided to prevent potential reactions and removal of the implant. Corrosion of an implant is the highest when there is contact between separate metal pieces, eg. plates and screws, and further increased when friction or movement occurs between the pieces. Therefore, proper technique/application of fixation is mandatory. Many of the implants today are very inert, and a reaction is rare unless a true allergy is present. Nickel sensitivity is the most common, while titanium appears to be the least allergenic. Reactions can vary from cutaneous to systemic manifestations. Malignancies associated with fixation implants have been reported, but are extremely rare.

Other indications for the removal of fixation are infection, failure of the fixation with secondary refracture, non-union, or reconstructive surgery with previous fixation. The removal of fixation under these circumstances, and the timing should be determined on an individual case basis. One of the determining factors is the stability provided by the fixation. In the case of infection, if the motion and stability of the fracture/osteotomy is maintained, temporarily retaining the fixation may be a consideration. Stabilization will increase the healing potential while instability of a fracture or osteotomy

will be a hindrance. When a nonunion or refracture occurs with internal fixation the surgeon may gain stability through the insertion of additional fixation devices, by conservative means, or by leaving the original fixation in place. Application of the treatment principles for delayed/nonunions will ultimately determine fixation removal.

If fixation is to be removed, the timing of removal depends on the type of fixation used, the anatomic area, and additional factors. Ideally, prior to removal, the fixation device has served its ultimate function. The AO-ASIF Group have published average removal times for specific implants and anatomic areas: 1. Metatarsal and hallux, K-wires ~1 to 2 months, screws ~4 to 6 months, plates ~8 to 12 months; 2. Talus and calcaneus, screws ~6 to 8 months, plates ~6 to 12 months; 3. Ankle fractures, screws ~6 to 8 months, plates ~6 to 12 months.

A study by Jacobsen et al. noted that the time for removal of fracture devices averaged 15 months in various SER and PER ankle fractures. The majority of the surgeries in this study were performed due to local irritation over the implant, with a 75% improvement after removal.

TECHNIQUES FOR REMOVAL

Techniques for the removal of fixation will vary depending on the type of device to be removed, however some basic concepts apply regardless. The three basic steps to removal are location, exposure, and extraction. Accurate location of the device must be determined first. If the device is not easily palpated, plain radiographs are used. Two separate views, preferably at right angles, i.e. AP and lateral views, are necessary to accurately determine the location. Having dissected to the approximate area of the fixation, bony overgrowth obscuring direct visualization of the device may be encountered.

At Northlake Regional Medical Center, a K-wire is used at times in an attempt to fenestrate the bone and locate the exact position of the fixation device. Exposure is then done by removing the bony overgrowth with ronguers, osteotomes or rotary burrs. The amount of bone removed depends upon the amount of exposure necessary for the type of device being used. When K-wires are being removed enough bone must be removed for a plier or needle driver to grasp the wire. With screws, the head must be exposed for the screwdriver to be applied. When the head of a screw is stripped further bone removal may be necessary to introduce the extraction device.

In summary, one should have specific clinical indications for the removal of internal fixation devices. When removal is necessary the surgeon must consider the timing for removal, the potential for operative complications, and the technique to remove the fixation device.

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