Technique of Forearm Osteotomy for Pediatric Problems

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Correction of a rigid forearm deformity in children is often desired in congenital radioulnar synostosis, brachial plexus palsy, cerebral palsy, or posttraumatic torsional deformity. Osteotomies at the diaphyseal level present difficulties with maintenance of reduction, whether or not internal or pin fixation is used. The stabilizing and healing potential of the periosteum in these cases can be used to advantage in the correction of these deformities. *(J Hand Surg 2012;37A:2400–2403. Copyright © 2012 by the American Society for Surgery of the Hand. All rights reserved.)*

Key words Forearm osteotomy, pediatric forearm deformity, radioulnar synostosis.

Correction of diaphyseal rotational or angulatory deformity in a child's forearm can present some difficulties with maintenance of reduction. In a 2-bone system with a fixed deformity, complete osteotomy and rotational correction usually leads to a loss of bony contact of the cut radius or ulna, or both. Forced torsion will constrict the soft tissues and strain the distal radioulnar joint.

Options to hold correction include closed reduction and casting, non-rigid pin fixation, and rigid internal fixation with plates and screws. Each has advantages and disadvantages. Pinning of diaphyseal bone is difficult. Plates require contouring and wide exposure, and plating can be time consuming.

The most serious complication of forearm osteotomy and repositioning, particularly in cases of radioulnar synostoses, is compartment syndrome. The ideal method of maintaining the desired position after osteotomy must be flexible enough to "dial back" the correction should vascular compromise occur. As a general guideline, correction greater than 90° should be done in stages, with final adjustment at the time of first cast change in 10 to 14 days.

The technique presented here takes advantage of the robust periosteum in a child and creates an opportunity for closed reduction and casting. The creation of a periosteal tube that is refilled with morselized bone has been a useful technique that has avoided excessive torsion on the soft tissues and loss of bony contact during closed treatment.

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SURGICAL ANATOMY

Normal or abnormal anatomy can be encountered in the child's forearm, depending on the etiology of the deformity. The surgeon should be familiar with the diagnosis and anticipate anomalous anatomy in the congenital conditions.

INDICATIONS

The most common indications for this technique are congenital radioulnar synostoses in an unacceptable position, torsional deformity due to spasticity, fixed rotational deformity due to other neurologic conditions such as lower brachial plexus palsy, and bowing with or without rotation due to abnormal growth of one or both bones in the forearm such as in osteochondromatosis or focal fibrocartilaginous dysplasia.

CONTRAINDICATIONS

The contraindications to this technique are related to the condition of the periosteum. These include older age of the patient, prior infection or prior surgical intervention

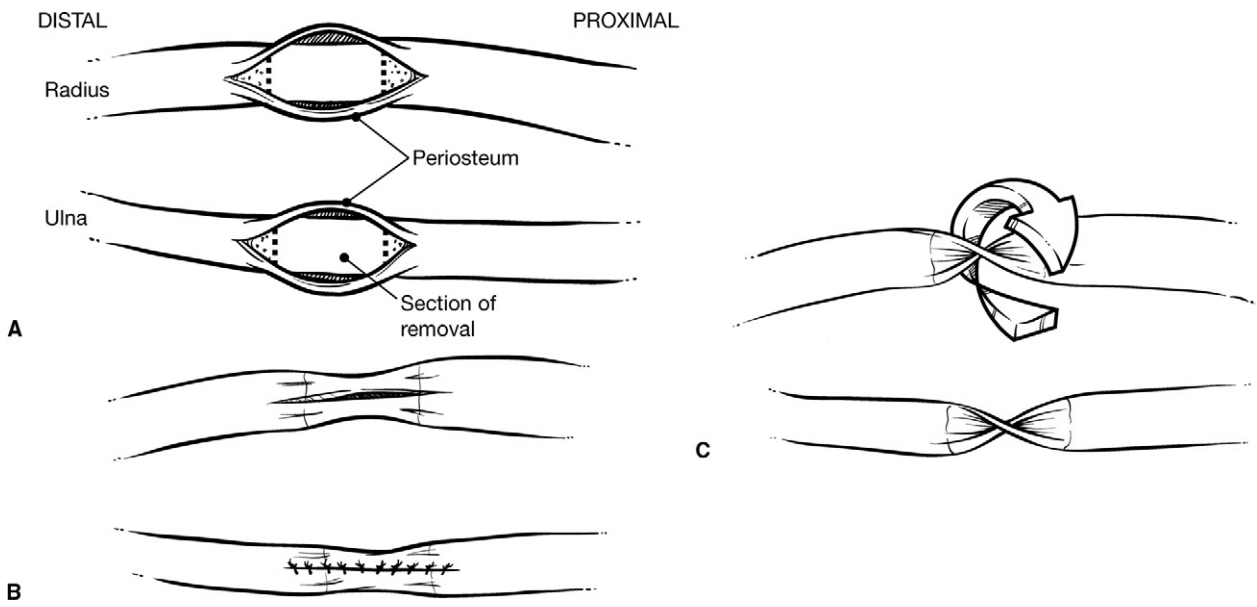

FIGURE 1: Illustration showing twisting off of the periosteal tube if left empty.

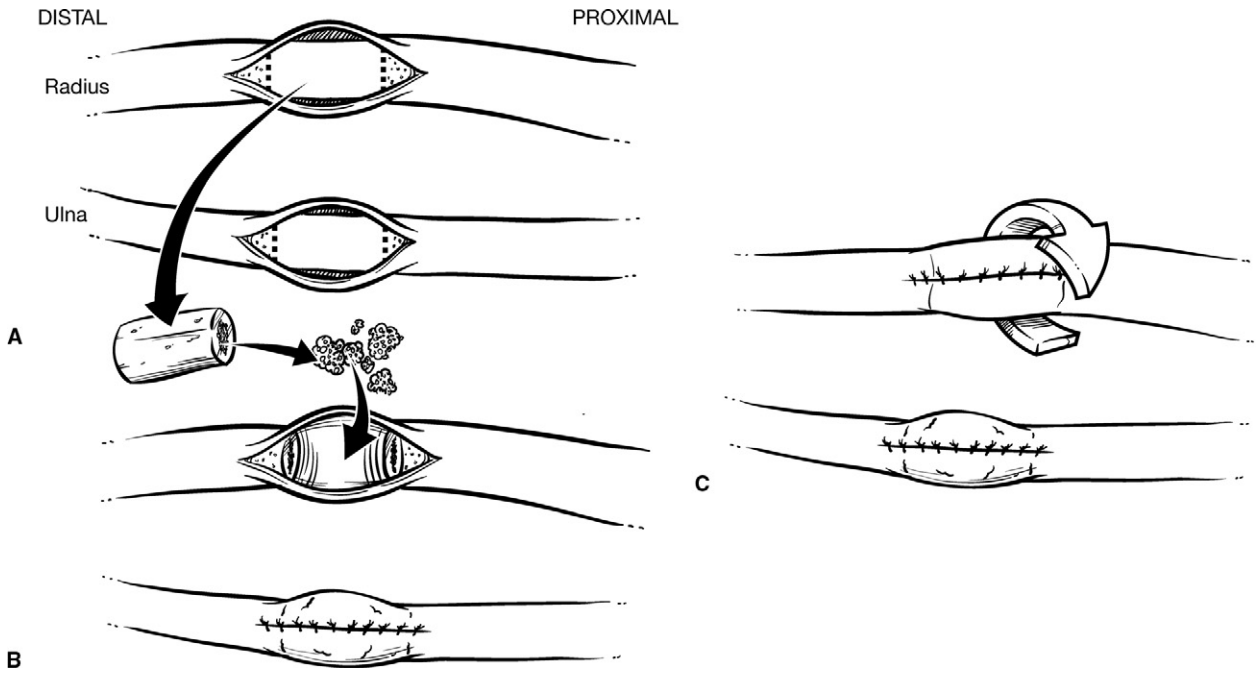

FIGURE 2: Surgical technique of making a periosteal tube and filling it with morselized bone to create a flexible segment.

and loss of the periosteal tube, and a non-diaphyseal location of the deformity that would make correction amenable to other methods of fixation.

TECHNIQUE

In the case of a proximal radioulnar synostosis of the forearm, the child is given a general anesthetic and positioned supine with the limb on a hand table. Under tourniquet control, a direct approach is made to the ulna at the mid-distal third and to the radius at a point distal to the insertion of the pronator teres tendon. The planned level of osteotomy should be slightly different in the radius than in the ulna. The skin incision should be long enough to expose 3 cm of the bone and thus depends on the body mass of the child. Flexor compartment fasciotomies are made through these incisions.

The periosteum is opened longitudinally and carefully elevated from the bone to preserve a periosteal tube. A 2-cm segment of bone is then removed from each bone, morsellized, and put back into the periosteal tube, which is