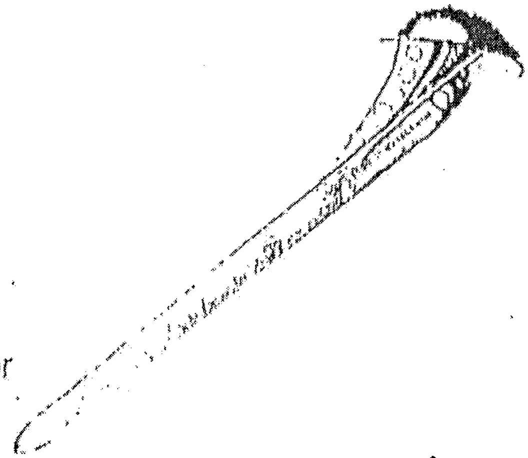

The Neer Total Shoulder Arthroplasty Surgical Technique

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Once the decision has been made that a total shoulder arthroplasty is indicated, measurement of the glenoid and humeral bone stock is essential. The Brothers Glenoidal Component requires that there be less than 5 mm erosion of the glenoid bone stock. This most often occurs on the posterior rim and can best be visualized on the axillary view. The humerus may be severely osteoporotic or its medullary canal may be very narrow. Significant osteoporosis will preclude the use of a press fit and the great majority of patients will probably require methacrylate fixation of both components. Although absence of adequate head and neck bone is seldom a problem, this deficiency will require consideration of a bone graft. The humeral stem size can be estimated by measuring the humeral medullary canal at the isthmus. This surgery is optimally performed by the surgeon and two assistants. One assistant stands distal to the surgeon and controls the arm position. The second assistant is across the table and can easily control retractors (Figure 1). It is our experience that self-retaining retractors can be avoided. So much wound motion is required during this procedure, it seems that self-retainers would add significant soft tissue trauma.

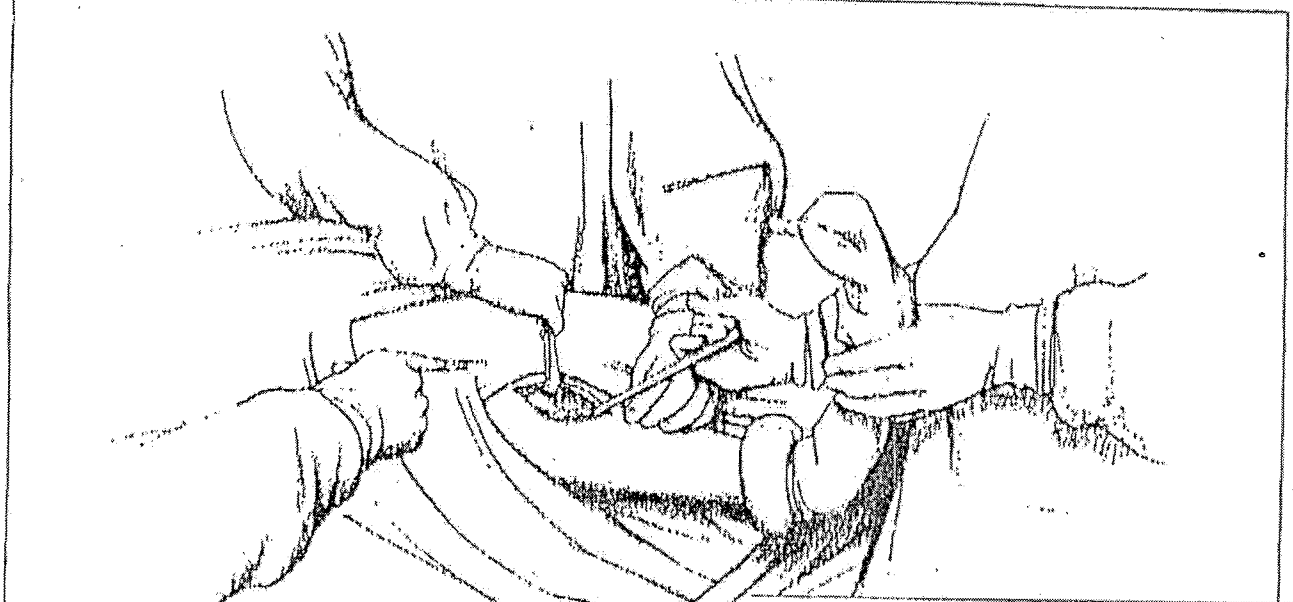
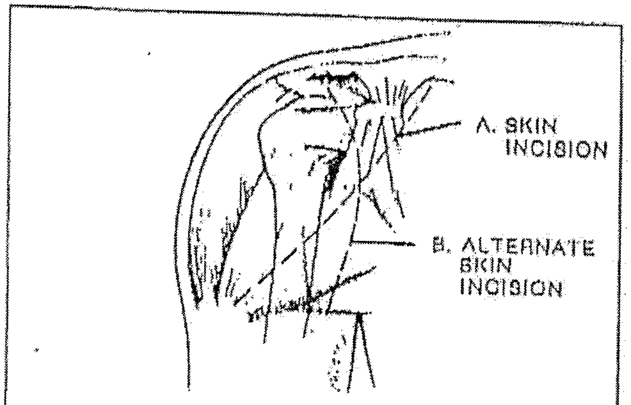


Figure 1 POSITION OF ASSISTA

INCISION

The skin incision may follow a line from the clavicle just cephalad to the coricoid onto the arm paralleling the delto-pectoral groove (Figure 2A). This may be extended at either end to improve exposure. This incision allows for a deltoid splitting approach without detaching the deltoid from its clavicular origin.



Figures 2A & 2B

An alternative incision would begin more laterally behind the acromio clavicular joint and extend just lateral to the coricoid and then distally onto the arm just lateral to the axillary groove (Figure 2B). This approach also allows for a deltoid splitting incision and gives a somewhat better exposure for rotator cuff repair.

Once the deltoid fascia is opened, the muscle fibers can be identified. Usually the cephalic vein can be spared by reflecting it caudad and medically with a few fibers of the pectoralis muscle. There is no apparent problem with its sacrifice but it is a significant anatomic structure which might best be saved. Once the subscapularis is identified, the transverse branches of the basilic vein should be noted and protected from laceration or tearing (Figure 3). The subscapularis is detached from the lesser tuberosity leaving a tendinous rim for later reattachment. Two large stay sutures are used in the tendinous stump for gentle retraction. This tendon is often adherent to the capsule and digital or blunt instrument freeing of adhesions will at this point in the procedure provide a looser joint to work with and demonstrate the integrity of the rotator cuff. If the cuff is intact, the capsule should be entered just lateral to the glenoid rim. Often in severe disease, the capsule and subscapularis cannot be separated and are taken down as a unit from the lesser tuberosity. An attempt should be made to find this tissue plane to improve the potential for a good range of motion, and to increase post-operative joint stability by their separate repair.

The four-in-one operation as described by Neviaser

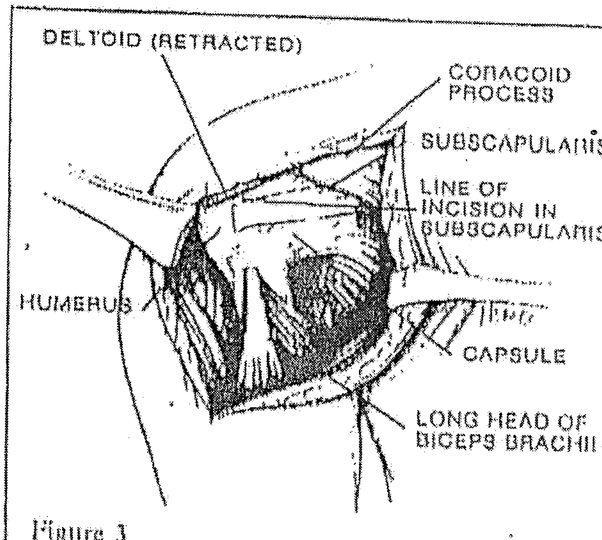


Figure 3

should be a part of every total shoulder arthroplasty unless there is a specific contraindication. Transection of the coracoacromial ligament and anterior acromioplasty will decrease the incidence of impingement. Biceps tenodesis and acromioclavicular joint resection eliminate those two sources of pain and the acromioclavicular joint resection is thought to improve flexion as well. Synovectomy, joint debridement and meticulous control of bleeders is completed before glenohumeral bony surgery.

A posterior capsular release may be necessary to facilitate closure or to improve motion but should not be routinely carried out because of the capsular contribution to joint stability.

Acromioclavicular joint ligamentous repair at the site of resection will help protect against cephalad migration of the humerus. Acromionectomy is contraindicated because of its adverse effect on mechanical function of the deltoid.

The sequence of the implantation begins with minimal humeral head resection at a thirty-five degree retroversion angle. This angle is judged by grasping the elbow epicondyles and placing the arm in the desired degree of external rotation. The prosthesis is used as a guide for determining the angle of the cut (Figures 4A & 4B). The cut may be made with a power saw or a sharp osteotome and is made perpendicular to the patient's coronal plane. Careful evaluation of the patient's position on the operating table prior to draping will be very helpful in making the determination of this cut. Once the humeral cut is made, the prosthesis seating can be checked if the component is to be seated in methyl methacrylate. The mid-portion of the rotator cuff can be elevated from the greater tuberosity a few millimeters without risking detachment. This will allow deep seating onto the humerus without soft tissue impingement.

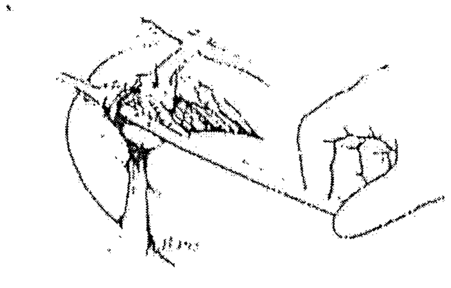


Figure 4A

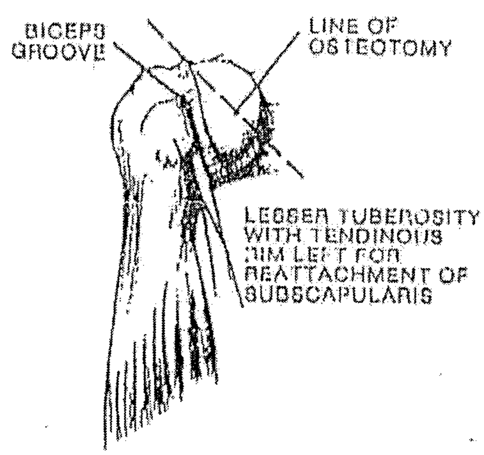


Figure 4B

Once the humeral head excision is complete, glenoid visualization is improved. Visability is often good but not excellent and patience on the part of the surgeon seems to be preferred over additional soft tissue release to improve exposure.

Osteophyte excision is not a part of the surgical procedure in patients with rheumatoid arthritis unless they are the rare case of pre-existing osteoarthritis. Bony stock is of special importance on the glenoid side for good component fixation and backing. As little cortical bone as possible should be removed.

The size of the glenoid can now be measured with a ruler to make an estimate as to any need for trimming the prosthesis. In very small patients both the inferior and superior polyethylene may require trimming. Superior glenoid surface should be preserved as much as possible to provide optimal joint stability.

The glenoid neck may be palpated and the center of the neck estimated. Using a high speed burr a central hole is made and increased to five millimeter diameter (Figure 5A). A curette can then be utilized to perform the major portion of the cancellous bone removal. Care should be taken to avoid perforation of the thin glenoid neck bone. Once the dimensions are known, the central hole should be increased to ten millimeter diameter to just accommodate the prosthesis. Multiple circumferential two millimeter burr holes should be made to enhance cement fixation. Usually, trimming of the deepest portion of the glenoid component is necessary because there is inadequate glenoid depth. This can be performed with a knife. As much glenoid stem should be preserved as possible. The goal is to have removed loose neck cancellous bone and to seat the polyethylene as close to the subchondral glenoid face as possible. A trial reduction of the glenoid only is performed if the humeral component is to be inserted by a press fit. If both components are to be seated in methacrylate, a trial reduction of both components is completed prior to final bony preparation (Figure 5B).

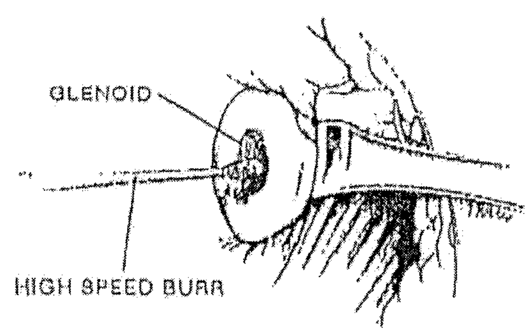


Figure 5A

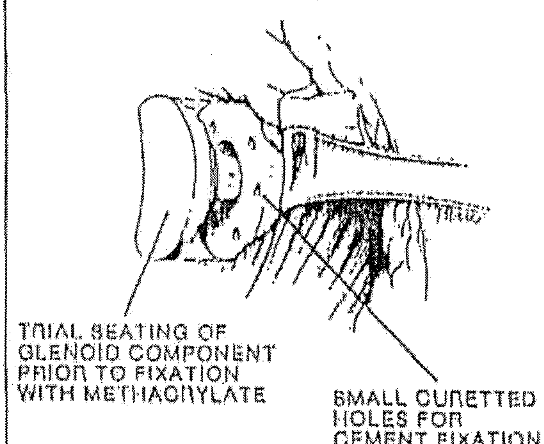


Figure 5B

The humeral and glenoid bone are prepared with vigorous intermittent lavage. The bone should be dried and freed of blood clot prior to insertion of methyl methacrylate. The cement is inserted in a liquid state with a syringe and pressure is applied with the syringe or finger packing. A distal bone plug, cement plug or polyethylene plug will improve medullary pressurization during seating and will prevent the extension of cement beyond the desirable two centimeters beyond the prosthesis tip.

The humeral component should have as large a stem as the shaft will accommodate. If there is any concern about the security of a press fit, the component should be seated in methyl methacrylate (Figure 6).

Wound closure and the post-operative management are influenced by the use of methyl methacrylate and the severity of disease.

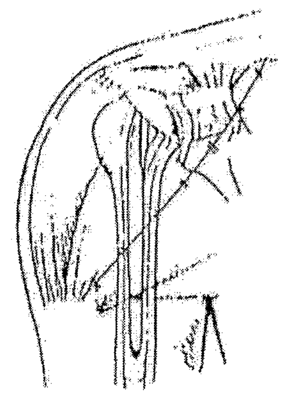


Figure 6

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