Shoulder Arthroplasty Without a Rotator Cuff

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Patients with glenohumeral arthritis and absent or irreparable lesions of the rotator cuff represent a therapeutic challenge for orthopedic surgeons. In the June issue of Orthopedics, Dr Gilles Walch discussed the Delta reverse design shoulder prosthesis as a method of managing this problem.

Although the Delta prosthesis is currently successful in Europe, it is not yet available in the United States. One technique for managing this problem in North America as well as Europe is a new system that uses the standard Global Advantage humeral component with the special Cuff Tear Arthroplasty head.

In this issue of Orthopedics, codeveloper and inventor of the Global™ Total Shoulder Prosthesis System, Dr Charles A. Rockwood, Jr discusses treatment options, which are currently available in the United States, for patients with glenohumeral arthritis and irreparable rotator cuff defects.

What options exist for patients with glenohumeral arthritis and large rotator cuff tears?

Conservative treatment consisting of rehabilitation, anti-inflammatory modification, and intra-articular steroidal injections. Other possible solutions include shoulder arthrodesis, a hemiarthroplasty with resection of the bone prominence of the greater tuberosity,1,2 or the special Cuff Tear Arthroplasty (CTA) head on the Global Advantage humeral component (DePuy, Warsaw, Ind).3

Unfortunately, the Delta prosthesis is not yet approved for use in the United States. Once approved, it will be a new procedure for surgeons in the United States. It is technically difficult to perform and it has limitations. Orthopedic surgeons in the United States will be required to attend specific courses on the indications for its use and learn how to perform the operation from selected international shoulder surgeons.

What is the primary purpose of surgically treating patients with arthritis and absence of the rotator cuff?

Eliminate pain and restore function to patients for everyday living activities.

How is the CTA Head used?

The CTA humeral head articulates on the Global Advantage Humeral Component, which allows an anatomical articulation of the head into the glenoid as well as up and under the acromial process of the shoulder.

The CTA was introduced in 2000 and several thousand have been used to date. It does not mimic the normal biomechanics of the shoulder, but rather the adaptive biomechanics of patients with massive cuff tear arthropathy.

Patients develop a glenohumeral-acromial joint. The goal of the CTA hemiarthroplasty is to provide a low coefficient surface throughout a full range of motion and distribution of joint reaction forces over a large surface area, thereby optimizing a fixed fulcrum kinematics.

What problems are associated with conventional unconstrained arthroplasty in these patients?

I agree with Dr Walch that glenoid resurfacing is not possible because without a rotator cuff, the head will migrate superiorly, which will cause an improper seating of the humeral head on the glenoid prosthesis and will cause it to loosen. However, with the CTA, hemiarthroplasty allows smooth, anatomical articulation between the humeral head, glenoid fossa, and acromion.

With the CTA hemiarthroplasty prosthesis, the patient’s pain is relieved, functional overhead elevation can be achieved, and patients continue to improve, probably because the improved pain relief allows for easier rehabilitation of the shoulder girdle muscles.

A standard humeral head on a humeral prosthesis provides some relief but it tends to migrate superiorly up and under the acromion and limits shoulder motion. During abduction with a standard hemiarthroplasty, the
greater tuberosity in a standard hemiarthroplasty butt into the acromial process and is painful. 2

What is your view of the reverse design prosthesis as opposed to the CTA humeral head for this problem?
I agree with Dr. Walch that the reverse shoulder prosthesis has a specific place in managing this problem, but I believe the CTA head is more practical for most or many of these cases.

The CTA system is more closely

What problems existed in reverse shoulder prostheses that were developed in the past?
Essentially all reverse shoulder prostheses developed in the past have failed because of glenoid fixation. The humeral component is stable but prolonged use or a fall seems to disengage the humeral component from the glenoid and ultimately, the prosthesis fails. However, to date, loosening of the Delta prosthesis has not been a problem.

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anatomical than the reverse shoulder prosthesis, is easy to use because most shoulder surgeons are accustomed to treating this problem with hemiarthroplasty, and the risk of loosening or component failure is minimal.

The reverse design is an elegant solution when patients have dysfunctional shoulders, ie, for patients aged ≥70 years with degenerative arthritis or massive defects in the rotator cuff causing severe pain and terrible shoulder elevation and function; for patients who have had failed previous procedures; and for patients who have had “anterior superior escape” dislocation of the shoulder following failed rotator cuff procedures, acromioplasty, and resection of the coracocapitligament arch.

The CTA head can be used to treat most patients with arthritis and no cuff. Whereas the reverse shoulder prosthesis should be limited to elderly patients who have severe dysfunctional shoulders.

Furthermore, activity level in patients with a CTA hemiarthroplasty is not limited. Many older patients with cuff tear arthropathy want to remain physically active.

Have you experienced any problems with reverse design prostheses?
No. This particular reverse prosthesis (DePuy) designed by Professor Grammont has not been available for use in North America. I agree with Dr. Walch that there have been and there are problems that he reported. 4

• Have you experienced problems with the CTA head?
To date, use of the CTA head has been associated with minimal complications. The primary purpose of using a prosthesis to treat this problem is 1) to eliminate the pain, which has been accomplished using the CTA head, and 2) the restoration of some function, which has been achieved successfully. Some patients with the CTA head have experienced full overhead elevation.

Are shoulder arthroplasty and tendon transfer indications in the management of these patients?
The most common tendon transfer performed in patients with arthritis and no rotator cuff is the transfer of the upper half of the pectoralis major tendon to an area lateral to the bicipital groove to replace the deficient subscapularis tendon, which serves as the functional front door of the shoulder. The L’Episcope transfer of the latissimus dorsi helps as an external rotator.

For a conventional shoulder to work, what part of the rotator cuff needs to be intact?
In using the CTA head, stable structures anteriorly and posteriorly are needed to balance the force-couples to keep the head centered in the glenoid fossa. Posteriorly, the teres minor and particularly the infraspinatus must be present, and anteriorly, the subscapularis or the transferred pectoralis major tendon must be present.

What are your final thoughts for treating patients with arthritis of the glenohumeral joint?
The management of patients with arthritis of the glenohumeral joint and absence of the rotator cuff is a significant problem due to pain and inability to use the shoulder for activities of daily living. I believe the CTA head offers a simple solution in most instances.

The reverse shoulder prosthesis can be used for this problem, but it is a more difficult procedure to perform and I am concerned about the longevity of the prosthesis.
Without question, some patients with severe arthritis, cuff problems, loss of stabilizing structures about the shoulder, and loss of functional humerus, can best be managed with the reverse shoulder prosthesis.

REFERENCES