

**THE BIPOLAR SHOULDER PROSTHESIS  
LONGER TERM RESULTS (5-10 YEARS)  
IN THE MANAGEMENT OF PRIMARY  
GLENOHUMERAL OSTEOARTHRITIS**

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## Abstract

This is a prospective study in which we evaluate the 5-10 year results of BiPolar shoulder arthroplasty in 64 patients (71 shoulders) with primary glenohumeral osteoarthritis. Fifty two patients (56 shoulders) were followed for greater than 60 months (average 79 months), and no patients were lost to follow up. The average age of the patient at operation was 72.5 years.

The UCLA score increased from 10.8 preoperatively to 25.7 postoperatively. The final Constant score in this elderly subset of patients averaged 65% (unadjusted). Eighty seven percent of patients were satisfied with their final result.

Excellent pain relief was achieved with a VAS of 2.5 (0=no pain, 15=excruciating pain). Active anterior forward flexion improved from 45° to 104°. Seventy five percent of patients reveal persisting head-shell motion at an average of 7 years. There were two reoperations because of humeral stem loosening; both stems should have been cemented at the initial arthroplasty.

It is demonstrated that BiPolar shoulder arthroplasty is durable over time, with clinical results equivalent to that in the literature when compared with hemiarthroplasty and total shoulder replacement.

## **Introduction**

There is sufficient evidence in the literature to demonstrate good midterm results of both total shoulder replacement and hemiarthroplasty in the treatment of primary glenohumeral osteoarthritis.<sup>23-31</sup> There are protagonists for both treatment options, and analysis of the literature with all the ensuing variables makes it difficult to make a definitive case for either one or the other. A further option expands the concept of the hemiarthroplasty to attend to some of its theoretical disadvantages related to the impact on the glenoid<sup>38</sup>, and this is the BiPolar concept, which has been described as an alternative in shoulder arthroplasty, providing pain relief and function, with a low complication rate.<sup>3-5</sup> BiPolar shoulder arthroplasty was first developed by Swanson et al, in 1975 for complex cases. The Bi-Angular BiPolar shoulder system (Biomet, Warsaw, Indiana) was developed in 1990 and has been employed by us since April 1991 for painful conditions of the shoulder, including primary glenohumeral osteoarthritis.

## **Materials and Methods**

Sixty four patients with end-stage glenohumeral osteoarthritis underwent BiPolar shoulder arthroplasty between April 1991 and March 1997. Seven sequential, bilateral arthroplasties were performed resulting in a total of 71 procedures. At review 9 patients (11 shoulders) were deceased; three patients (4 shoulders) were unassessable due to severe Alzheimer's disease; fifty two patients (56 shoulders) were available for clinical assessment using the Constant and UCLA scores and radiological examination. No patients were lost to follow up in this study. The average age at surgery was 72.5 years and 77.3 at latest follow up. The average follow up was 79 months (range 60-108 months).

## **Results**

The preoperative UCLA score was 10.8 (maximum UCLA score is 35). Preoperative pain and function scores measured 2.5 and 2.2 respectively (out of 10). The average preoperative active forward flexion score was 45°. The average preoperative strength score was 4 (out of 5) which indicated good strength preservation despite high pain scores. Postoperatively the UCLA scores improved significantly to an average total of 25.7, pain and function increased to 7.9 and 6.7 respectively. Active forward flexion improved to an average of 104°, external rotation to 47° and lateral elevation to 87°. Constant scores were performed in 57 patients and measured 65% (maximum Constant score is 100). Eighty seven percent of the patients were satisfied with the procedure.

Excellent pain relief was achieved as shown with the results of the Visual Analogue Scale (VAS):2.5. Scale is from 0 (no pain) to 15 (excruciating pain).

There were two documented complications in this group of patients: 1) a type B1 periprosthetic fracture not requiring revision surgery, 2) A complex late postoperative course in a patient with probable metabolic bone disease, who had a supracondylar elbow fracture and an unreported periprosthetic fracture.<sup>41</sup> Radiographic examination showed one case of humeral component loosening. Lucent lines >1mm were considered reactive lines. Seven cases showed evidence of superior migration (maximum 10mm), 2 cases of stress shielding 3+, and 10 cases of inferior glenoid osteophytes possibly indicating glenoid erosion. Seventy five percent of patients revealed persisting head-shell motion at an average follow up of 7 years. Two reoperations: the first for recurrent posterior dislocation because a loose humeral component had spun, revised at 12 months post index procedure, the second because of humeral component loosening revised at 25 months post index procedure.

### **Conclusions**

This report documents a minimum 5 year follow up (average follow up: 7years) of patients with primary glenohumeral osteoarthritis treated with BiPolar humeral arthroplasty. There is a paucity of longer follow up studies in the literature addressing the issues in humeral arthroplasty, and there are still many issues that require resolution. The results of total shoulder arthroplasty have been excellent. Between 1982 and 1993, there were 33 studies documenting approximately 90% pain relief.<sup>23-29</sup> There are, however, some concerns regarding glenoid replacement, and these relate to a multiplicity

of factors including: 1) Technical demands of glenoid implantation, 2) Increased operating time and blood loss, 3) Introduction of polyethylene wear to shoulder arthroplasty, 4) High incidence of radiolucent lines. This has in general not correlated with clinical failure of the glenoid, but has fueled the debate regarding the relative value of hemi- versus total arthroplasty, when one considers the long-term consequences of glenoid radiolucent lines.<sup>25,27,29,30,31</sup> It is also recognized that the results of hemiarthroplasty may deteriorate over time<sup>32,33</sup>, but the literature is difficult to interpret, with lack of consistency in comparison groups. It is in this setting that the BiPolar requires discussion and the issue addressed as to whether the BiPolar is superior to hemiarthroplasty due to its differential effect on the glenoid. Is glenoid erosion an issue? And, is glenoid pain sequelae? If this is so, does the fact that the glenoid is not replaced make it a superior option to total shoulder replacement and hemiarthroplasty? It is not possible to answer these questions at this time, however, the results of the BiPolar are encouraging as they compare favorably with the literature, with excellent relief of pain and patient satisfaction, a probability of survival at 10 years of 96%, accompanied by a low complication and reoperation rate, with a comparatively straightforward operative approach.

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