Comparison of Early and Late Failed Total Shoulder Arthroplasty

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Introduction: Risk factors associated with failure of total shoulder arthroplasty have not been well described. The etiology of early failures, in particular, can be difficult to diagnose and the mangement of these patients can be challenging. The purpose of the present study was to compare the demographic data, radiographs, and damage mapping of retrieved glenoid polyethylene components of early and late failures after total shoulder arthroplasty, and to determine any risk factors associated with the two cohorts.

Materials and Methods: From 1979 to 2005, 69 consecutive patients with a mean age of 60.8 ± 11.7 years underwent revision TSA at a single institution at a mean of 4.0 ± 4.4 years after their index surgery. The patients were retrospectively assigned to two cohorts based on time of failure: Early, less than 2 years (N = 35); and Late, greater than 2 years (N = 34).

Clinical information was obtained from medical records including patient demographics, medical comorbidities, shoulder history, clinical assessment (pain, range of motion), intra-operative findings, implant information, and post-operative complications. The most recent plain radiographs (AP and axillary) prior to removal of the glenoid were examined and scored according to previously described classification systems for glenoid loosening.1,2,3 The extent of radiolucency was measured with digital calipers. The polyethylene bearing surfaces of the components were examined microscopically for evidence of burnishing, abrasion, scratching, pitting, delamination, focal wear, surface deformation, embedded 3rd body debris, and fracture. The surface was divided into anterior, posterior, superior, and inferior quadrants and given a subjective damage score of 0-3 for each damage mode in each quadrant using an established grading system.4 Statistical analysis was performed between groups using Student’s T-Test for continuous variables and Chi-Square Test for categorical variables. P value of less than 0.05 was considered significant.

Results: The age at initial surgery was 64.7 ± 9.5 years for the patients in the Early group and 57.1 ± 12.8 years for the patients in the Late group (P = 0.006). The mean length of implantation was 11.73 ± 8.72 months for the Early group and 87.46 ± 51.4 months for the Late group (P = 0.0001). The proportion of osteoarthritis cases was 97.1% (34 of 35) for the Early group and 61.8% (21 of 34) for the Late group (P = 0.0001), and the remainder of the cases in each group were performed on patients with rheumatoid arthritis. Four glenoid components (11%) in the Early group had metal backing, while none of the glenoids in the Late group did (P = 0.021). No significant differences existed between the two groups with respect to gender, hand dominance, tobacco history, range of motion, infection, rotator cuff tears, instability, glenoid component conformity, glenoid fixation, or glenoid version.

The Late group had greater radiolucency measurements in all six zones compared to the Early group, but only Zones 2 and 5 demonstrated a significant difference (Table 1). No difference was observed between radiolucency, loosening, and lucency classification systems.

The retrieved glenoids from the Late group demonstrated increased scores for pitting, abrasion, wear through, and delamination compared to the Early group (Table 2).

Discussion: There appears to be a bimodal distribution in failed primary TSA. The Early failures occur within the first year after primary TSA and in older patients with a mean age of 65 years. The overwhelming majority of cases with Early failure occur in patients with osteoarthritis, and the Late failures had a greater proportion of rheumatoid arthritis patients than the Early failures. The Late failures have greater radiolucency prior to revision surgery and also have greater polyethylene wear in terms of pitting, abrasion, wear through, and delamination.


Table 1. Radiolucency Measurements of Glenoid Component on Antero-Posterior View

<table>
<thead>
<tr>
<th>Group</th>
<th>Zone 1 (mm)</th>
<th>Zone 2 (mm)</th>
<th>Zone 3 (mm)</th>
<th>Zone 4 (mm)</th>
<th>Zone 5 (mm)</th>
<th>Zone 6 (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early</td>
<td>1.42 ± 0.9</td>
<td>1.10 ± 0.7</td>
<td>1.24 ± 0.7</td>
<td>1.77 ± 1.6</td>
<td>1.70 ± 0.5</td>
<td>1.04 ± 0.4</td>
</tr>
<tr>
<td>Late</td>
<td>2.10 ± 1.5</td>
<td>2.39 ± 1.8</td>
<td>1.53 ± 0.4</td>
<td>2.70 ± 0.8</td>
<td>2.00 ± 0.3</td>
<td>1.26 ± 1.7</td>
</tr>
</tbody>
</table>

Table 2. Damage Mapping

[Table 2 is not included in the text but would be included in the document.]