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Humeral Bone Loss in Revision Total Shoulder Arthroplasty: the Proximal Humeral Arthroplasty Revision Osseous inSufficiency (PHAROS) Classification System

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When performing revision shoulder arthroplasty, it is common to encounter humeral bone loss. Anticipating humeral defects prior to performing revision shoulder arthroplasty allows the revising surgeon to plan for fixation and stability of the revision humeral prosthesis. Until this publication, there was no known validated classification system for humeral bone loss in revision shoulder arthroplasty. Creation and utilization of a classification system for humeral arthroplasty revision could assist the surgeon in diagnosing, treating and with a final prognosis. The PHAROS system was devised to help surgeons classify humeral defects and to build a strategy for revision humeral arthroplasty where considerations like the need for allograft, an appropriate revision stem length, potential need for proximal humeral replacement in addition to likelihood of intraoperative humeral related complications such as greater tuberosity fractures.

This retrospective, multi-part study, included high-volume, experienced surgeons to review radiographic and clinical histories of patients with revision shoulder arthroplasty from November 2006 to January 2018.

Key takeaways

- Radiographic images and clinical histories were necessary for evaluation. Pre-revision images included AP, Grashey, and lateral-view radiographs in addition to patient's clinical history.

- Upon review, revised patients were excluded for the following criteria: no humeral component revision, no new humeral placement, no previous humeral component and where a platform system was utilized but not revised.

- A total of 106 patients with 108 shoulders for revision were included in the cohort.

- Three types of bone loss were classified: Type 1, Type 2 and Type 3.

- Type 1 bone loss includes epiphyseal bone loss with epiphysis including calcar, tuberosities and the articular surface. Type 2 bone loss includes metaphyseal bone loss with the metadiaphysis above the insertion of the deltoid and Type 3 includes diaphyseal bone loss below the deltoid insertion point.

- The PHAROS classification also includes evaluation of cortical walls, condition of the calcar and compromise of the Greater Tuberosity.

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Key takeaways (continued)

- In Type 1 and Type 2 bone loss, use of greater tuberosity fixation for intraoperative fractures was commonly utilized. In Type 2 and Type 3 bone loss, structural humeral bone grafting was commonly utilized and in Type 3, where diaphyseal bone loss was greatest, the most treatment was proximal humeral replacement or total humeral replacement.

- In conclusion, the PHAROS classification system was shown to be helpful in planning operative treatments, but this study does not include data on clinical outcomes, revision rates or rates of humeral loosening.