The Humeral Bone Loss (HUMBL) classification identifies patterns of bone loss that are associated with higher rates of reoperation, instability, and humeral loosening in primary and revision shoulder arthroplasty

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Introduction:

Humeral bone loss is commonly encountered in primary and revision shoulder arthroplasty and failure to recognize bone loss preoperatively can lead to complications including humeral loosening or instability. The Humeral Bone Loss (HUMBL) classification categorizes bone loss into 5 major patterns of increasing severity: 1) Intact bone (including prior implants/hardware or abnormal bone quality) 2) isolated greater tuberosity loss or compromise (including acute fracture, nonunion and malunion) 3) segmental bone loss (defined as bone loss distal to the surgical neck) 4) ectatic bone loss (defined as expansion of the cortex compared to an intact proximal or distal segment) and 5) humeral discontinuity (defined as a separation of the humeral shaft from a prior implant or where a new implant would be placed). The purpose of this study was to describe patterns of bone loss in primary and revision shoulder arthroplasty and stratify outcomes based on bone loss pattern.

Methods:

This retrospective review identified shoulders with humeral bone loss undergoing primary or revision shoulder arthroplasty between 2012-2022. There were 415 shoulders included. When patients required multiple revisions, each humeral revision was included as a separate case of humeral bone loss. Patterns of bone loss were identified with preoperative radiographs according to the HUMBL classification. When patients had a combination of bone loss patterns, they were grouped with the most severe pattern present. 107 shoulders (26%) had intact bone, 88 (21%) had isolated greater tuberosity loss, 167 (40%) had segmental bone loss, 32 (8%) had ectatic bone loss and 21 (5%) had humeral discontinuity. Primary outcomes were all-cause reoperation, instability, and humeral loosening between patterns.

Results:

The overall all-cause reoperation rate in the cohort was 14%. Compared to bone intact shoulders (6% reoperation rate), shoulders with segmental (16%, OR 3.1, p=.001) and ectatic (41%, OR 11.5, p<.001) bone loss had significantly higher reoperation rates. The overall rate of post-operative instability was 13%. The rate of instability was significantly higher in shoulders with segmental (14%, OR 3.4, p=.008), ectatic (38%, OR 12.2, p<.001) and humeral discontinuity (24%, OR 5.4, p=.007). The overall rate of humeral loosening was 5%. The humeral loosening rate was higher in shoulders that had segmental (9%, OR 9.7, p=.015), ectatic (9%, OR 11.0, p=.02) or humeral discontinuity (10% or 11.2, p=.03). Shoulders with isolated loss or compromise of the greater tuberosity did not have statistically significant higher rates of reoperation, instability, or humeral loosening compared to bone intact shoulders.

Conclusion:

The Humeral Bone Loss (HUMBL) classification demonstrates that certain patterns of bone loss are associated with increased rates of reoperation, instability, and humeral loosening. The presence of ectatic bone loss, not previously described in shoulder arthroplasty, led to high rates of reoperation, instability, and humeral loosening. Further research is necessary to determine the optimal treatment for each pattern of bone loss.