Displaced Proximal Humerus Fractures in Older Patients: Shoulder Surgeons Versus Traumatologists

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abstract

Proximal humerus fractures are relatively common, with treatment dependent on fracture-specific, patient-specific, and surgeon-specific factors. This study sought to identify preferences among shoulder specialists and orthopedic traumatologists in the treatment of proximal humerus fractures. An anonymous Internet survey of fellowship-trained shoulder surgeons and traumatologists was conducted with radiographs and select computed tomography images of 15 unique displaced proximal humerus fractures. Participants were asked to classify each case according to Neer criteria and choose management from a list of options. Groups were analyzed using chi-square test for independence, paired t test, and Fleiss’ kappa within and between each group. Among shoulder surgeons, there were a total of 19 cases selected for nonoperative management, 204 cases selected for open reduction and internal fixation (ORIF), and 122 cases selected for arthroplasty. Among traumatologists, there were 44 cases selected for nonoperative management, 234 for ORIF, and 67 for arthroplasty. Fleiss’ kappa for intraobserver agreement on treatment choice was 0.26 for shoulder surgeons and 0.18 for traumatologists, and chi-square test for independence was significant between the 2 groups (P < .001). Paired t test of the average treatment proportions was significant for nonoperative management and arthroplasty (P = .003) but not significant for differences in rates of ORIF. These results confirm poor consistency in Neer classification among surgeons and suggest that shoulder surgeons were more likely to consider arthroplasty for treatment and that traumatologists were more likely to use ORIF or to manage patients nonoperatively. These variations in care may translate to differences in outcome and cost. [Orthopedics. 2016; 39(3):e509-e513.]

As the US population ages, fragility fractures are becoming an increasing disease burden and management concern. Proximal humerus fractures represent approximately 5% of all fractures and comprise 10% of fractures among elderly patients, with an estimated 13% annual increase.1-5 Although the majority of proximal humerus fractures are minimally displaced and may be managed nonoperatively, surgical treatment often is considered for displaced 3- and 4-part fractures.6-10 Several operative interventions have been suggested and are routinely used for

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treatment of proximal humerus fractures in elderly patients, including closed reduction and percutaneous pinning, transosseous suture repair, open reduction and internal fixation (ORIF), with locking plates or intramedullary nails with or without bone grafting, hemiarthroplasty, and reverse total shoulder arthroplasty. 7,9,11,12 Previously published series have reported mixed results in the operative treatment of geriatric proximal humerus fractures, 8,13-16 revealing the paucity of studies directly comparing options and inadequate evidence to identify the optimal treatment for most displaced proximal humerus fractures. 9,17,18

In light of the paucity of sound evidence-based guidance for management of 3- and 4-part proximal humerus fractures, treatment algorithms are likely to be driven to some degree by surgeon preference. This variability among practice patterns may have secondary implications with regard to accessibility and cost of treatment of these patients. Previous studies have demonstrated that fellowship training can independently influence the selected surgical treatment of fractures. 19,20

Proximal humerus fractures commonly are treated by both orthopedic traumatologists and orthopedic shoulder surgeons. This study sought to characterize differences in proximal humerus fracture management within and between specialty groups.

**MATERIALS AND METHODS**

**Survey**

An electronic study questionnaire was developed as the survey instrument. Fifteen cases of displaced proximal humerus fractures were selected from the case records of a large multispecialty orthopedic practice. Radiographs and up to 3 computed tomography (CT) slices were presented with each case. Each set of images was preceded by the following short clinical vignette:

“The patient is a 70-year-old woman with medication-controlled hypertension and hyperlipidemia, who had a mechanical fall and sustained the following fracture to her dominant extremity. She is retired, but lives independently and enjoys light recreational activity, including gardening and golf.”

Images were followed by a series of multiple-choice questions in which participants were asked to classify each case based on Neer criteria and then select their management choice from the following options: nonoperative, ORIF (locking plate), ORIF (locking plate) with bone grafting (allograft or autograft), intramedullary device, intramedullary device with bone grafting (allograft or autograft), reverse total shoulder replacement, and hemiarthroplasty. Survey participants also were asked about their specialty and practice experience.

**Management Choices**

Among the shoulder surgeons, there were a total of 19 instances in which a case was indicated for nonoperative management, 204 selected for ORIF, and 122 selected for arthroplasty (21 hemiarthroplasty and 101 reverse total shoulder arthroplasty). Among traumatologists, there were 44 instances when a case was selected for nonoperative management, 234 for ORIF, and 67 for arthroplasty (54 hemiarthroplasty and 13 reverse total shoulder arthroplasty) (Figure). Chi-square test for independence was significant between the 2 subspecialties for their management selection (P<.001), both when hemiarthroplasty and reverse arthroplasty were considered independently and together.
By case, Fleiss’ kappa (κ) for intraobserver agreement on treatment choice was 0.318 for shoulder surgeons, 0.23 for traumatologists, and 0.28 for all surgeons when both arthroplasty options were considered in a single category. When hemiarthroplasty and reverse total shoulder arthroplasty were considered independently, Fleiss’ kappa was lower at 0.263 for shoulder surgeons, 0.189 for traumatologists, and 0.18 for all surgeons. Paired t test between the groups of the average treatment proportion for each case was significant for differences in nonoperative management (P < .003) and arthroplasty both when hemiarthroplasty and reverse shoulder arthroplasty were considered independently (P < .036 and P < .0008, respectively) and together (P < .003) but not significant for differences in rates of ORIF. Fleiss’ kappa for intraobserver agreement on Neer classification was 0.325 for shoulder surgeons, 0.247 for traumatologists, and 0.25 for all surgeons.

**DISCUSSION**

This study demonstrates a difference in the management of proximal humerus fractures based on the background and practice of the surgeon. Orthopedic injuries often are treated by surgeons with differing backgrounds, which can lead to unacknowledged variations in practice; subspecialty training has been shown to produce differences in the management of other fractures. In particular, conditions that lack clear evidence-based treatment guidelines often are managed in ways that are substantially influenced by surgeon preference. Multiple treatment options exist for displaced proximal humerus fractures, with limited literature-based support for any particular treatment. Therefore, multiple treatment options exist for displaced proximal humerus fractures, with limited literature-based support for any particular treatment.

The observed differences in management may be partially explained by variability in the classification of these fractures by Neer criteria. This represents at least some degree of disparity with regard to diagnosis by imaging. Prior studies have highlighted the poor to fair reliability of classification of proximal humerus fractures across specialties, subspecialties, level of training, experience, and even by the same surgeon over time.

The authors found moderate interobserver agreement between surgeons, with no significant difference between the shoulder surgeons and reverse total shoulder arthroplasty were considered independently (P < .003) but not significant for differences in rates of ORIF. Fleiss’ kappa for intraobserver agreement on Neer classification was 0.325 for shoulder surgeons, 0.247 for traumatologists, and 0.25 for all surgeons.

The role of surgeon experience and training in treatment decisions has been investigated previously. In 2010, Petit et al surveyed 3 shoulder surgeons and 5 traumatologists from a single institution. Participants were presented with the same proximal humerus fracture radiographs. The authors found moderate interobserver agreement between surgeons, with no significant difference between the 2 specialty groups.

Participants chose management options from 6 possibilities, with hemiarthroplasty as the only arthroplasty option included. Interestingly, the study did not include reverse arthroplasty as an option, which was likely due to the timing of the publication. With reverse arthroplasty increasingly used for displaced proximal humerus fractures, the addition of this treatment option may account for some of the greater variability identified in the current study.

More recently, Jawa et al surveyed 2 shoulder surgeons and 2 traumatologists with pre-, peri-, and postoperative radiographs of treated proximal humerus fractures to evaluate agreement of the surveyed surgeons with actual treatment choice using interclass correlation coefficients. The examiners assigned scores for agreement with treatment decisions and for ratings of reduction/arthroplasty placement, fixation method, and radiographic outcomes. They found that the correlation of agreement with the presented treatment choice was different between the shoulder surgeons and traumatologists, as well as within the groups. Surgeons agreed poorly with treatment decisions and fixation methods but agreed moderately on acceptable reductions/arthroplasty placement and final radiographic outcomes. The actual preferences of the survey participants for treatment were not analyzed.

Given identical imaging and clinical scenarios between groups, shoulder surgeons in the current study were more likely to consider arthroplasty for treat-
ment of displaced proximal humerus fracture, and traumatologists were more likely to use ORIF or to manage the same patients nonoperatively. When hemiarthroplasty and reverse total shoulder arthroplasty were considered as distinct treatment options, these differences between the subspecialty groups became even more pronounced, suggesting that the advent and increasing use of reverse shoulder arthroplasty in the shoulder surgery community has increased the variability in treatment preference between the subspecialties. These differences were durable across practice scenarios and experience. Although compiled and per case differences between shoulder surgeons and traumatologists were significant, within group correlations were weak. This suggests that although treatment behavior between shoulder surgeons and traumatologists is different, practice inconsistency within subspecialties also exists.

Limitations

There are several limitations of this study. First, although multiple surgeons from various practice environments were surveyed, the respondents may not be fully generalizable to all practice environments. Second, decision making was based on images provided; although this was consistent between respondents, some cases had radiographs only, and other cases had both radiographs and CT image. Third, a single clinical vignette was used across all cases, which improves consistency of comparisons but may fail to fully capture differences in treatment that emerge from different patient scenarios.

Conclusion

Multiple variables influence treatment approaches to displaced proximal humerus fractures. Surgeon training and background, as well as differences in practice settings, are contributing factors. The resulting variation in care can subsequently translate to differences in outcomes and costs. Further evaluation of these differences will be necessary in health services planning situations where surgeon background plays a role in treatment.

References

