patients rated their final overall results as good or excellent. Improvement of active forward flexion (127° to 139°), abduction (115° to 135°) and internal rotation did not reach statistical significance ($P > .05$). Although statistically significant, compared active internal and external rotation did not deteriorate substantially (from 8 to 6 Constant score points; $P = .015$ and from 50° to 37°; $P = .004$) from the thirty-two months to the final follow-up. At final follow-up, a rupture of the PMT was sonographically identified in 2 patients (12%). One patient (5%) underwent reverse total shoulder arthroplasty and two patients (12%) showed radiographic evidence of cuff tear arthropathy (Hamada stages 4 or 5), both with the sonographically identified rupture of the PMT.

Conclusion: Pectoralis major transfer for an irreparable subscapularis tear leads to significant subjective and objective improvement over 20 years of follow-up. It is associated with a low rate of salvage reverse total shoulder arthroplasty. If the transfer fails, cuff tear arthropathy may develop.

Paper #26 MID-TERM CLINICAL AND STRUCTURAL EVALUATION OF PLATELET-RICH PLASMA IN ROTATOR CUFF REPAIRâA PROSPECTIVE RANDOMIZED STUDY

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Background: Platelet-rich plasma (PRP) has been studied with the objective of reducing retear rate and improving functional outcome after rotator cuff repair. Only one study to date reported its mid-term effect.

Hypothesis: PRP promotes better functional and structural results in arthroscopic rotator cuff repair.

Study Design: Randomized controlled trial; Level of evidence, 1.

Methods: All patients underwent arthroscopic single-row repair of small to medium supraspinatus tear. At the end of the surgical procedure, liquid PRP prepared by apheresis with autologous thrombin was applied in the tendon-to-bone interface in the PRP group. The outcomes were assessed by the University of California at Los Angeles (UCLA) and Constant scores and visual analog scale (VAS) for pain at 6, 12, 24 and 60 months after surgery, and Magnetic resonance imaging (MRI) at 12 and 60 months. The significance level was 5%.

Results: Of 54 patients initially randomized, we analyzed the clinical outcomes in 51 (25 control, 26 PRP) and the structural outcomes in 44 (22 each group). At the 60-month follow-up, the UCLA scores were 32.5 ± 3.8 and 32.1 ± 4.6 in the control and PRP groups, respectively ($P = .992$). The mean Constant scores were 82.0 ± 9.5 in the control group and 82.1 ± 11.0 in the PRP group ($P = .699$). The VAS scores were 1.4 ± 1.8 and 1.5 ± 2.1 in the control and PRP groups, respectively ($P = .910$). None of the clinical assessments at 6, 12 and 24 months in either group produced statistically significant differences, and both groups showed significant improvements throughout the follow-up time in the three evaluations ($P < .001$). The control group exhibited 1 full-thickness retear (Sugaya type IV) and 11 partial retears (Sugaya type III), while the PRP group had 7 partial retears (Sugaya type III). The overall number of retears did not differ between groups ($P = .203$).

Conclusion: PRP obtained by apheresis and applied in liquid consistency with the addition of thrombin at the end of single-row repair of supraspinatus tears did not promote better clinical or structural results at 60-month follow-up.

Paper #27 LOCKING-PLATE FIXATION OF PROXIMAL HUMERUS FRACTURES IN PATIENTS OVER 60 CONTINUES TO BE ASSOCIATED WITH A HIGH COMPLICATION RATE

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Background

Locking plate technology has increased fixation (ORIF) of proximal humerus fractures dramatically. However, reported rates of success and complications have varied widely. A number of technical pearls have been recommended to lower the complication rate of this technique. These include valgus reduction of the fracture, metaphyseal shortening for enhanced fracture stability, augmentation of the fixation with sutures though the rotator cuff and plate, and the selective addition of fibular strut allograft augmentation. In addition, delayed postoperative rehabilitation have been associated with success in some case series. Finally, shorter proximal locking screws, to avoid iatrogenic or delayed screw penetration into the joint, have become more frequent. There have been few large, single center studies on the modern application of this technology.

Methods

Between 2005 and 2015, 173 consecutive proximal humerus fractures in patients over the age of 60 were treated at our institution with internal fixation using locked plating. Shoulders with less than 2 years of follow-up were excluded from the study unless they had undergone reoperation or radiographic failure. This left 131 shoulders available for final analysis (76% of eligible). The average age was 73 (60-95) years, and 84% were females. Fractures were classified according to Neer's criteria as 2-part fractures (61-47%), 3-part fractures (59-45%), and 4-part fractures (11-8%). Failure was defined as reoperation or radiographic evidence of hardware failure, severe arthritis, and intraarticular screw penetration. The average follow-up was 6.1 years.

Results

Failures, complications and reoperation rate

There was an overall failure rate of 34%. This correlated with fracture type, with a failure rate of 26% in 2-part fractures (16 failures), 39% in 3-parts (23 failures), and 45% in 4-parts (11 failures)[Table 1]. Failure rate was also correlated with age, with a 26% failure rate for patients in their 60s, 40% failure rate for patients in their 70s, and 48% failure rate for patients in their 80s [Table 2]. None of the six patients in their 90s failed. There was no difference between the failure rate with and without fibular allograft (33% vs 34%).

The main complications that led to failure were AVN with severe head collapse (±screw penetration) in 23 patients (52% of failures), intraarticular screw penetration in 6 patients (14% of failures), hardware failure in 5 patients (11%), severe posttraumatic arthritis in 4 patients (9%), severe cuff failure in 3 patients (7%), nonunion in 2 patients (5%) and severe malunion in 1 patient (2%). When all surgical complications were included, there was an overall complication rate of 44%. The majority of complications that didn't lead to revision or failure were mild, asymptomatic AVN (6 cases), and mild, asymptomatic arthritis (3 cases). There was also one case of tuberosity escape, one asymptomatic loose screw, one case of

Table 1

	Failure rate (%)	Reoperation rate (%)
2 part	26%	7%
3 part	39%	14%
4 part	45%	18%

Table 2 Failure by age

Failure by age	Failures	Total Patients (n)	Percentage
60-64	7	26	27%
65-69	8	31	26%
70-74	7	23	30%
75-79	10	20	50%
80-84	6	13	46%
85-89	6	12	50%
90+	0	6	0%
	44	131	34%

frozen shoulder requiring injection, and 1 case of asymptomatic rotator cuff failure.

Most patients with radiographic or clinical failure did not undergo reoperation. The overall reoperation rate was 11% (14 patients). This correlated with fracture type, with 7% of 2-part fractures (4 shoulders), 14% of 3-parts (8 shoulders), and 18% of 4-parts (2 shoulders) requiring reoperation. Revision operations were reverse total shoulder arthroplasty (rTSA) in 8 patients, hardware removal in 5 patients, and revision ORIF in 1 patient.

Clinical outcomes

Overall patient reported outcomes were satisfactory in patients without failure. VAS for pain averaged 0 at rest and 1 with activity. The average SANE score of this cohort was 92. At final follow up, for patients with failure (including those who had required revision operation), the VAS (rest) was 1, VAS (activity) was 2, and average SANE score was 77.

Discussion and Conclusions

Internal fixation of proximal humerus fractures with locking plates in patients over the age of 60 resulted in a 44% complication rate, including a 34% failure rate defined as reoperation or radiographic failure. Higher complication and failure rates were observed in older patients and more complex fractures. However, the reoperation rate was relatively low (11%), which may be partly due to unwillingness to offer revision surgery to older patients with failed fixation if clinically well tolerated. Improvements in fracture fixation techniques, implants and instruments are required to improve the surgical management of proximal humerus fractures.

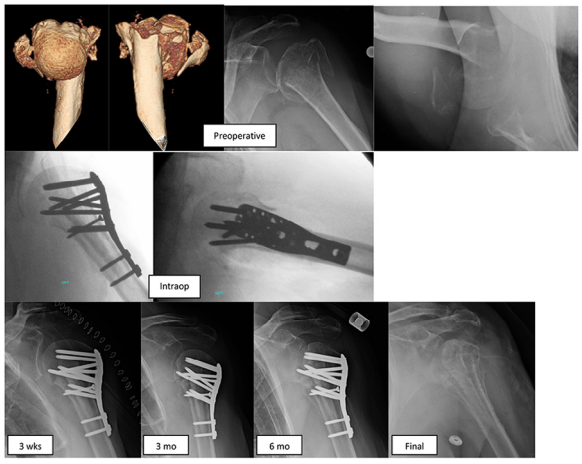

Figure 1 Illustrative Case—3 part fracture in 78 YO female. Progressive, symptomatic avascular necrosis postoperatively. Given activity demands, she elected to have isolated hardware removal without reconstruction.

Paper #28 CEMENTLESS REVERSE TSA FOR PROXIMAL HUMERAL FRACTURE: RESULTS OF A MODERN TECHNIQUE

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Introduction: Reverse total shoulder arthroplasty (RTSA) has been successfully used for the treatment of proximal humeral fractures (PHFx). Traditional surgical technique has utilized cemented fixation of the humeral stem to restore anatomic humeral height and version. The use of cement has been associated with both intraoperative cardiopulmonary issues as well as postoperative difficulty if revision is required. To this end, we report here the results of cementless RTSA for the treatment of acute and chronic PHFx.

Methods: Fifty-five consecutive patients underwent hybrid cementless RTSA for proximal humeral fracture. There were 30 acute fractures (Neer 3- and 4 part fractures) and 25 chronic fractures (Boileau Types 2, 3, and 4). Mean age was 67 years (range 35-91 years). Mean clinical and radiographic followup was 28 months (range 12-60 months).

Results: At final review, mean range of motion was as follows: active anterior elevation 152.6°(range 80-170°), active external rotation 52.7°(range 0-80°), and active internal rotation 65.7°(range 0-80°). ASES score improved from 8.82 to 90.6, Simple Shoulder Test improved from 4.91 to 91.58, and Visual Analog Score improved from 6.67 to 0.39.

Overall, 47 of 55 (85%) of greater tuberosities demonstrated osseous healing (28/30 = 93% acute PHFx, and 19/25 = 76% chronic PHFx).

Overall, 6/55 (10.9%) of major complications occurred postoperatively (including 5 periprosthetic fractures and 1 wound infection requiring implant removal).

Conclusion: Cementless RTSA for PHFx utilizing a modern reproducible surgical technique demonstrates successful clinical and radiographic outcomes compared with traditional techniques.

Paper #29 OUTCOMES USING SUPERIOR AND POSTERIOR-SUPERIOR AUGMENTED BASEPLATES IN REVERSE TOTAL SHOULDER ARTHROPLASTY FOR GLENOID WEAR: SHORT TERM FOLLOW UP COMPARED TO MATCH CONTROL

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Objective: Augmented base plates are used to address asymmetric glenoid wear while avoiding excessive eccentric reaming in reverse shoulder arthroplasty (RSA). The purpose of this study is to evaluate the short-term outcomes of superior and posterior-superior augmented baseplates used in patients undergoing reverse shoulder arthroplasty in patients with superior or posterior-superior glenoid wear.

Methods: A multi-institutional database was used to retrospectively analyze patients that underwent RSA with superior or posterior-superior augmented glenoid baseplates (RSA-A) for superior glenoid wear between 2009-2015. A total of 58 patients with minimum 2-year follow up were included and matched with a control group of 58 patients (RSA-C) that underwent RSA with a standard glenoid baseplate. The primary outcome measure was failure of the glenoid baseplate requiring revision shoulder arthroplasty. Secondary outcomes included range of motion, pain scores, SST and ASES scores.

Results: The average follow up in both groups was 33.19 (±12.3) months. The average age was 72.16 (±8.5) years. There was one revision in the RSA-C group due to glenosphere loosening likely secondary to infection. Radiographic glenoid loosening was