Outcomes for Type C Proximal Humerus Fractures in the Geriatric Population: Comparison of Nonoperative Treatment, Locked Plate Fixation, and Reverse Shoulder Arthroplasty

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Purpose: This study compares patient-reported outcomes (PROs) and range of motion (ROM) between patients managed nonoperatively, with open reduction and internal fixation (ORIF), and with reverse shoulder arthroplasty (RSA).

Methods: This was a retrospective cohort study of patients >55 years old treated with nonoperative management, ORIF, or RSA for AO/OTA Type 11C proximal humerus fractures from 2015 to 2018. Visual analog scale (VAS) pain scores, Patient-Reported Outcomes Measurement Information System (PROMIS) scores, ROM values, and complication and reoperation rates were compared using analysis of variance for continuous variables and $\chi 2$ analysis for categorical variables.

Results: A total of 94 patients were included: 46 nonoperative, 24 ORIF, and 24 RSA. No significant differences in patient characteristics were identified ($P>0.05$). All results are reported in Table 1. At 2-week follow-up ORIF and RSA showed lower VAS scores, and better ROM and PROMIS scores ($P<0.05$) compared to nonoperative treatment. At 6-week follow-up, ORIF and RSA had lower VAS scores, and better ROM and PROMIS scores ($P<0.05$) compared to nonoperative treatment. At 3-month follow-up ORIF and RSA showed decreased VAS scores, and better ROM and PROMIS scores ($P<0.05$) compared to nonoperative treatment. At 6-month follow-up ORIF and RSA showed similar VAS scores ($P>0.05$), but better ROM and PROMIS scores ($P<0.05$) compared to nonoperative treatment. The RSA group had a significantly lower reoperation rate ($P<0.05$).

Table 1. Outcomes Type C Fractures*

	Nonoperative (N=46)	ORIF (N=24)	RSA (N=24)	†p-value
Complications (n)ǂ	**80.4% (37)**	**54.2% (13)**	**0.0% (0)**	**<0.001**
Varus Malunion	54.4% (25)	37.5% (9)	--	0.181
Nonunion	4.4% (2)	4.2% (1)	--	--
HS Translation	2.2% (1)	4.2% (1)	--	--
AVN	4.4% (2)	12.5% (3)	--	--
Reoperation (n)§	**4.4% (2)**	**33.3% (8)**	**0.0% (0)**	**<0.001**
Range of Motion (Mean ± SD, °)				
Active Forward Flexion				
2-week follow up	0 ± 0	0 ± 0	0 ± 0	--
6-week follow up	**16.4 ± 28.1**	**32.6 ± 31.8**	**57.1 ± 50.8**	**<0.001**
3-month follow up	**56.4 ± 47.0**	**80.6 ± 41.1**	**125.1 ± 20.4**	**<0.001**
6-month follow up	**93.6 ± 29.9**	**104.0 ± 28.2**	**133.0 ± 22.5**	**<0.001**
Passive Forward Flexion				
2-week follow up	**0 ± 0**	**11.7 ± 28.6**	**46.5 ± 47.7**	**<0.001**
6-week follow up	**48.4 ± 40.8**	**59.9 ± 41.5**	**114.1 ± 31.5**	**<0.001**
3-month follow up	**68.7 ± 53.4**	**100.4 ± 46.5**	**137.5 ± 21.2**	**<0.001**
6-month follow up	**117.1 ± 22.4**	**125.4 ± 14.8**	**147.9 ± 15.1**	**<0.001**
External Rotation				
2-week follow up	**0 ± 0**	**0.5 ± 1.5**	**3.3 ± 6.1**	**<0.001**
6-week follow up	**12.3 ± 14.7**	**14.7 ± 14.5**	**23.4 ± 13.8**	**0.005**
3-month follow up	**22.3 ± 23.4**	**29.1 ± 21.8**	**37.3 ± 21.3**	**0.013**
6-month follow up	36.6 ± 20.0	35.9 ± 20.7	44.1 ± 19.4	0.233
Patient Reported Outcomes (Mean ± SD)				
VAS Pain Score				
2-week follow up	**6.2 ± 3.3**	**2.6 ± 2.4**	**2.7 ± 2.6**	**<0.001**
6-week follow up	**3.7 ± 3.0**	**2.1 ± 2.4**	**1.1 ± 1.7**	**<0.001**
3-month follow up	**2.4 ± 2.6**	**1.8 ± 2.1**	**1.1 ± 2.0**	**0.047**
6-month follow up	1.8 ± 2.4	1.5 ± 2.3	0.8 ± 1.6	0.085
PROMIS Depression				
2-week follow up	58.3 ± 8.9	54.0 ± 9.6	55.8 ± 7.0	0.285
6-week follow up	53.1 ± 9.4	52.7 ± 8.1	52.8 ± 7.3	0.882
3-month follow up	51.5 ± 8.7	48.8 ± 8.5	49.3 ± 10.2	0.409
6-month follow up	52.5 ± 11.2	47.2 ± 11.3	46.8 ± 10.6	0.117
PROMIS Pain Interference				
2-week follow up	**69.9 ± 6.3**	**64.5 ± 7.2**	**63.8 ± 6.9**	**0.003**
6-week follow up	**61.5 ± 5.9**	**58.1 ± 5.3**	**57.4 ± 5.7**	**0.012**
3-month follow up	**60.0 ± 6.2**	**55.8 ± 6.7**	**50.0 ± 7.3**	**<0.001**
6-month follow up	**58.9 ± 9.6**	**53.5 ± 8.0**	**53.3 ± 6.0**	**0.042**
PROMIS Physical Function				
2-week follow up	28.1 ± 6.7	31.0 ± 5.9	28.3 ± 4.8	0.763
6-week follow up	**30.6 ± 4.7**	**35.8 ± 5.3**	**33.8 ± 4.4**	**0.016**
3-month follow up	35.4 ± 8.5	40.4 ± 5.7	39.0 ± 4.3	0.076
6-month follow up	**36.7 ± 8.9**	**44.3 ± 5.6**	**42.2 ± 5.2**	**0.021**

SD = Standard deviation; ORIF = Open reduction internal fixation; RSA = Reverse shoulder arthroplasty; HS = Head-shaft; AVN = Avascular necrosis; VAS = Visual analog scale; PROMIS = Patient reported outcomes measurement information system
***Boldface** indicates statistical significance.
†p-values calculated using analysis of variance and chi square analysis for continuous and categorical variables, respectively
ǂ Additional complications: Nonoperative – valgus malunion (9); ORIF – screw cutout (2), hardware failure (2), adhesive capsulitis (1), symptomatic hardware (1)
§ Reoperations: Nonoperative – conversion to arthroplasty (2); ORIF – conversion to arthroplasty (3), revision fixation (2), removal of hardware (2), lysis of adhesions (1)

Conclusion: The management of geriatric AO/OTA type 11C proximal humerus fractures with RSA or ORIF led to early decreased pain, and improved physical function and ROM compared to nonoperative management.