上腕骨近位端骨折の手術成績：順行性髄内釘とロッキングプレートの比較

Table 1 **Demographic characteristics of the study population**

	Two-part fractures (n=42)			Three and four-part fractures (n=66)		
	Antegrade intramedullary nails	Locking plates	P value	Antegrade intramedullary nails	Locking plates	P value
Number of patients（men/women）	23 (5/18)	19 (3/16)	0.93	31 (6/25)	35 (12/23)	0.28
Average age (years, range)	67 (35–91)	66 (21–87)	0.62	70 (46-85)	61 (20–83)	< 0.01
Age, <65 years	10 (44%）	6 (32%）		6 (18%）	23 (64%）	
Age, 65–74 years	7 (30%）	4 (21%）		16 (52%）	6 (21%）	
Age, ≥75 years	6 (26%）	9 (47%）		9 (33%）	6 (15%）	
Follow-up (months, range)	18 (12–78)	19 (12–48)	0.24	24 (12–64)	23 (12–114)	0.53

*: P < 0.05

Table 2 **Active range of motion in forward flexion and external rotation, opetation time and intraoperative bleeding in the N and P groups disaggregated by the type of fracture**

	Two-part fractures			Three and four-part fractures		
	Antegrade intramedullary nails, Mean ± SD	Locking plates, Mean ± SD	P value	Antegrade intramedullary nails, Mean ± SD	Locking plates, Mean ± SD	P value
Forward flexion (°)	127 ± 26.82	114 ± 29.06	0.16	117 ± 25.11	116 ± 36.67	0.69
External rotation (°)	39 ± 17.06	27 ± 11.93	＜0.02	35 ± 22.70	31 ± 16.49	0.36
Operation time (minutes)	146 ±77.68	148 ±27.17	0.54	176 ±79.45	143 ±32.22	0.08
Blood loss (ml)	172 ±200.56	203 ±83.52	0.42	198 ±158.27	249 ±154.52	0.36

*: P < 0.05

The external rotation of two-part fractures in the antegrade intramedullary nails group was significantly better than that of those in the locking plates group

Table 3 **Active range of motion in forward flexion and external rotation post operation in the N and P groups disaggregated by the type of fracture and various age subgroups**

		Two-part fractures			Three and four-part fractures		
		Antegrade intramedullary nails, Mean ± SD	Locking plates, Mean ± SD	P Value	Antegrade intramedullary nails, Mean ± SD	Locking plates, Mean ± SD	P Value
Forward flexion in patients aged: (°)	<65 years	144 ±19.85	128 ±30.91	0.34	119 ±19.02	123 ±34.00	0.72
	65–74 years	120 ±14.14	119 ±15.16	0.91	127 ±23.57	115 ±30.41	0.46
	≥75 years	108 ±30.79	103 27.99	0.81	100 ±22.11	83 ±36.70	0.39
External rotation in patients aged: (°)	<65 years	42 ±18.48	31 ±10.57	0.21	39 ±17.42	36 ±16.70	0.75
	65–74 years	38 ±9.95	25 ±11.18	0.15	42 ±18.71	15 ±10.00	＜0.001
	≥75 years	38 ±19.09	24 ±9.13	0.21	20 ±24.94	24 ±7.31	0.67

For patients aged 65–74 years, the external rotation of three- or four-part fractures in the antegrade intramedullary nails group was significantly better than that of those in the locking plates group. *: $P < 0.05$

Table 4 **Postoperative complications**

	Antegrade intramedullary nails			Locking plates		
	Two-part fractures (N=23)	Three-part fractures (N=21)	Four-part fractures (N=10)	Two-part fractures (N=19)	Three-part fractures (N=27)	Four-part fractures (N=8)
Non-union	0	0	0	0	1 (4%)	0
Avascular necrosis	1 (4%)	2 (10%)	6 (60%)	0	1 (4%)	4 (50%)
Varus deformity	1 (4%)	1 (5%)	0	4 (21%)	2 (7%)	1 (13%)
Screw back-out	1 (4%)	1 (5%)	0	0	0	1 (13%)
Re-displacement	0	0	1 (10%)	0	0	1 (13%)

One patient with a three-part fracture in the locking plates developed nonunion. Avascular necrosis was more likely to occur in patients with four-part fractures. Varus deformity frequently occurred in patients with two-part fractures in the locking plates group.

Table 5 **Advantages and disadvantages of the antegrade intramedullary nails and locking plates**

	Antegrade intramedullary nail	Locking plate
Advantages	▪less invasion ▪rigid fixation	▪more anatomical reduction
Disadvantages	▪rotator cuff incision ▪cartilage damage of humeral head	▪more invasion ▪more operation time and blood loss ▪mechanical impingement