

Table E-1. Nonunions and delayed unions of the distal humerus.*

Case	Age/Sex	Nonunion		Infection	Previous Treatment(s)	Pre-operative Nerve Condition	Nonunion Duration (Months)	Approach	Soft Tissue and/or		Pre-operative ROM	Post-operative ROM	Time to union (Months)	FU (Months)
		(Type)	Class						Joint Release	Release				
1	28M	Gap	T ^a	—	K-Wires, Rush Pins, Cast	—	2	O.O.	Y	50-110°	35-130°	24	198	
2	59F	AT	SC	—	Cast, Sling, EBI	—	12	Tr. Spl.	Y	40-110°	20-125°	6	6	
3	44M	AT	IC	—	ORIF	—	4	O.O.	Y	75-80°	20-95°	4	10	
4	47F	AT	MC	—	ORIF (X2)	—	13	Tr. Spl.	N	30-135°	15-130°	3	52	
5	55M	AT	SC ^a	Y	ORIF, I&D, Ex Fix	Ulnar neuropathy	5	O.O.	Y	N/A	20-75°	4	4	
6	41F	HT	LC	—	ORIF (X2)	—	88	Tr. Spl.	Y	45-105°	20-110°	4	4	
7	48M	AT	SC ^a	—	ORIF	Ulnar neuropathy	6	Tr. Spl.	Y	N/A	30-125°	4	8	
8	50F	HT	TC	—	ORIF, Brace	Ulnar neuropathy	9	O.O.	Y	25-100°	5-150°	8	108	
9	61F	Sy	T	—	K-Wires, Cast	—	8	O.O.	Y	35-118°	20-100°	7	28	
10	51F	AT	MC	—	ORIF	Ulnar neuropathy	5	O.O.	N	20-100°	15-135°	6.5	48	
11	18F	HT	IC	—	Traction, Cast	—	4	Tr. Spl.	Y	30-90°	35-110°	4.5	40	
12	36M	HT	SC ^a	Y	ORIF	—	3	Tr. Spl.	Y	30-100°	15-100°	6	6	
13	60F	AT	SC	Y	ORIF, I&D, HR	—	13	Tr. Spl.	Y	30-90°	35-120°	11	61	
14	50M	AT	SC ^a	—	ORIF	Ulnar neuropathy	4	O.O.	N	20-90°	10-130°	3	24	
15	38M	HT	SC	—	ORIF (X2), Cast	—	10	O.O.	Y	45-80°	35-110°	13	18	
16	35M	Sy	SC	—	Traction, Brace	—	11	Tr. Spl.	Y	20-125°	5-145°	5	5	
17	32M	AT	T	—	Tx Pin, Cast	—	11	Tr. Spl.	Y	95-105°	75-100°	3	3	
18	16F	AT	T	—	ORIF, ulnar trans	—	5	O.O.	Y	55-110°	20-145°	5	13	
19	31F	AT	T ^a	—	Traction, Cast	—	14	O.O.	Y	90-100°	55-105°	2	5	
20	33F	AT	MC	—	ORIF	Ulnar neuropathy	6	O.O.	Y	80-90°	80-90°	7	15	
21	64F	Sy	SC	—	Cast, Sling	—	7	Tr. Spl.	Y	10-130°	0-140°	4	28	
22	75M	AT	T	—	Traction, Cast	—	5	O.O.	Y	55-115°	35-100°	Not applicable	68	
23	52M	AT	SC	—	ORIF (X2)	Ulnar neuropathy	19	O.O.	Y	20-90°	0-115°	5.5	5	
24	88M	AT	T	—	None	—	7	O.O.	Y	40-120°	25-110°	2	3	
25	57M	HT	SC	—	Traction, Cast	Ulnar neuropathy	7	O.O.	Y	35-110°	30-130°	5	5	
26	26M	AT	SC	—	ORIF, Cast	—	10	O.O.	Y	50-80°	30-100°	6	6	
27	34M	Sy	T	—	ORIF, Cast	—	18	O.O.	N	15-120°	30-110°	2	8	
28	75M	AT	SC	—	Cast	—	3	O.O.	Y	50-90°	25-125°	7	8	
29	42M	HT	SC	—	ORIF (X2)	—	8	O.O.	Y	40-90°	20-105°	4	4	
30	27M	AT	SC	—	ORIF	Radial neuropathy	11	Tr. Spl.	Y	20-130°	0-140°	4	49	
31	68F	HT	MC	—	ORIF	—	2	Tr. Spl.	N	60-135°	45-130°	7	7	
32	52F	AT	TC	—	ORIF	Ulnar neuropathy	13	Tr. Spl.	N	10-100°	5-120°	6	14	
33	56M	HT	SC	—	ORIF/EBI	—	21	Tr. Spl.	Y	30-105°	25-120°	3	9	
34	47M	Sy	TC	Y	ORIF (X9)	—	118	Tr. Spl.	Y	10-100°	20-115°	3	3	
35	22M	HT	SC ^a	Y	Traction, Cast	—	33	O.O.	Y	45-90°	40-110°	7	68	
36	21M	AT	TC	—	Traction, Cast	—	3	Tr. Spl.	Y	10-90°	10-135°	5	7	
37	35F	Sy	SC	—	ORIF	—	13	Tr. Spl.	Y	15-135°	0-140°	9	39	
38	76F	HT	SC	—	ORIF (X2), HR	Ulnar neuropathy	21	Tr. Spl.	Y	30-110°	20-130°	3	41	
39	54F	AT	T	—	K-Wires, Cast	Ulnar neuropathy	9	O.O.	Y	25-105°	5-105°	5	55	
40	33M	AT	IC ^a	—	ORIF	—	13	O.O.	Y	20-120°	30-95°	7	7	
41	34M	HT	IC	—	ORIF, Brace	—	8	O.O.	Y	20-110°	15-115°	4.5	27	
42	63F	HT	TC	—	ORIF, Cast	—	81	O.O.	Y	35-130°	30-135°	7	192	
43	48F	Sy	SC	—	ORIF, Sling	—	12	O.O.	N	20-125°	20-135°	4	4	
44	54F	AT	TC	—	Traction, Brace, ORIF	Ulnar neuropathy	13	Tr. Spl.	Y	35-90°	40-110°	12	12	
45	53F	HT	SC	—	ORIF, HR	—	192	O.O.	N	N/A	45-100°	4	36	
46	40M	AT	SC	—	ORIF	Radial neuropathy	7	Tr. Spl.	N	30-110°	10-130°	7	27	
47	70F	HT	SC	Y	ORIF, I&D, Ex Fix	—	9	Tr. Spl.	N	N/A	10-100°	2.5	60	
48	49M	AT	LC/Cap ^a	—	ORIF (X2)	—	14	O.O.	Y	50-100°	65-105°	4	67	
49	31M	AT	SC	—	ORIF (X2)	Ulnar neuropathy	12	Tr. Spl.	Y	20-125°	10-135°	7	7	
50	42M	AT	SC	—	Cast, Brace	—	5	Tr. Spl.	Y	30-95°	10-125°	5	197	
51	79F	HT	SC	—	ORIF	Ulnar neuropathy	12	O.O.	Y	20-125°	5-120°	Not applicable	15	
52	67F	AT	SC	—	ORIF, Cast	Ulnar neuropathy	21	O.O.	Y	75-115°	30-140°	6	6	

*ROM = range of motion, ^a = open fracture, AT = atrophic, HT = hypertrophic, Sy = synovial pseudarthrosis, TC = transcondylar, SC = supracondylar, IC = intercondylar, MC = medial column, LC = lateral column, T = T-type, Cap = capitellar, ORIF = open reduction and internal fixation, HR = hardware removal, Ex Fix = external fixation, I&D = irrigation and débridement, EBI = EBI bone-healing system, ulnar trans = ulnar nerve transposition, O.O. = olecranon osteotomy, Tr. Spl. = triceps splitting, N/A = not available.

Table E-2. Complications of nonunions and delayed unions of the distal humerus

Case	Complications	Repeat/Revision Surgery*	Comments†
1	Delayed incorporation fibular graft	HR	Incorporated at 2 years
3	Ulnar neuropathy	HR, HO removal	Ulnar neuropathy resolving
4	Ulnar neuropathy	External neurolysis	Ulnar neuropathy resolving
5	Deep infection	Irrigation & débridement	Resolved
7	Compartment syndrome, ulnar/radial neuropathy	Compartment release	Resolved
11	Stiffness	HR, arthrolysis, arthrotomy	Improved motion
14	Stiffness	MUA, ORIF, HR	Improved motion
20	Deep infection	HR, débridement, MUA	Residual stiffness
22	Persistent nonunion	none	Severe Parkinson Disease
23	Radial neuropathy	none	N/A
28	Ulnar neuropathy	none	N/A
35	Ulnar neuropathy	HR	N/A
38	Superficial infection	none	Resolved with antibiotics
39	Moderate instability	none	Residual instability
46	Ulnar neuropathy	none	Ulnar neuropathy resolving
47	Superficial infection	none	Resolved with antibiotics

*HR = hardware removal, HO = heterotopic ossification, MUA = manipulation under anesthesia, and ORIF = open reduction and internal fixation. †N/A = not available.