Debridement arthroplasty for osteoarthrosis of the elbow

50 patients followed mean 5 years

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ABSTRACT — The characteristics and surgical outcome of debridement arthroplasty were investigated in athletes and manual laborers with osteoarthrosis of the elbow. There were 26 elbows in athletes, and 24 elbows in laborers. The mean age was 32 years in athletes and 50 years in laborers. The osteoarthrosis was mainly mild in athletes, but moderate or severe in laborers. Debridement arthroplasty, consisting of resection, osteophytes and removal of loose bodies, was performed in all cases. The medial approach was most frequently employed. Surgery relieved pain and improved range of motion at an average follow-up of 59.5 months. Evaluation of the long-term outcomes at more than 5 years showed recurrence of mild osteoarthrosis with minimal symptoms. Debridement arthroplasty is an effective treatment in athletes and manual laborers with osteoarthrosis of the elbow.

The elbow joint is frequently affected by osteoarthrosis in athletes and laborers, who use their upper extremities extensively. Pain and limitation of the range of motion (ROM) caused by elbow osteoarthrosis (London 1981, Wadworth 1982, An and Morrey 1993) are major concerns for this population. Many patients hesitate to undergo surgical intervention (Knight and Van Zandt 1952, McGinty 1982, Tajima 1985, O'Driscoll and Morrey 1992). Consequently, conservative management is frequently employed. The best treatment for symptomatic elbow osteoarthrosis has yet to be determined. Since it is frequently associated with cubital tunnel syndrome, numbness, sensory disturbances, and induced grip strength may worsen the elbow dysfunction. Many types of operations for elbow osteoarthrosis have been performed, including arthroplasty, with resection of the articular surface (Knight and Van Zandt 1952, Unander-Scharin and Karlholm 1965), interposition arthroplasty using fascia or an artificial membrane (Tajima 1985), the Outerbridge-Kashiwagi method (Kashiwagi 1985, Minami and Ishii 1985), open debridement arthroplasty (Tsuge et al. 1987), arthroscopic debridement (McGinty 1982, O'Driscoll and Morrey 1992) with spur resection and removal of loose bodies (Milgram 1977), and total elbow replacement.

The most likely cause of pain and limitation of elbow motion is impingement between bony spurs, due to the coronoid process, radial head, and olecranon, and bony ridges in the olecranon, coronoid, and radial fossae. Open debridement arthroplasty has therefore been used in operations for elbow osteoarthrosis by the author for 18 years. In this study, patient characteristics and outcomes of open debridement arthroplasty for osteoarthrosis of the elbow were prospectively studied to clarify indications, and issues regarding surgical treatment in athletes and manual laborers.

Patients and methods

Between 1979 and 1997, I treated 51 elbows in 51 patients by open debridement arthroplasty. Only 1 had no history of overuse of the upper arm and was excluded from this report. 26 patients had arthrosis of the elbow presumed to be secondary to

sports. The patients were active or had participated in sports in the recent past. 24 patients had arthrosis that was considered to be the result of manual labor. The indications for surgery were pain, limitation of motion, or cubital tunnel syndrome with radiographic evidence of spur formation and bony ridges, or loose bodies in the joint.

There were 49 men. The right elbow was involved in 39 patients and the left elbow in the rest. The mean age was 41 (18–72) years (32 in the athletes and 50 in the laborers).

Elbow pain was classified as: grade 0, no pain; grade 1, slight pain including a sense of looseness, heaviness, or tightness without limitation in daily activities, sports or labor; grade 2, moderate pain; and grade 3, severe pain.

All patients had grade 2 or 3 elbow pain during or after sports and manual labor (Table 1). Severe pain occurred on terminal flexion or extension in all cases. This reduced performance and caused anxiety during sports and manual labor.

Motion was limited, with a mean extension deficit of 17 ± 12 (60–0)°. The mean elbow flexion was 112 ± 15 (80–140)°. Motion was more severely limited in laborers than in athletes (Table 2). 27 patients had symptoms of ulnar nerve compression including numbness or easy fatigue of the ulnar side of the forearm, hand, and ring and little fingers.

Anteroposterior and lateral radiographs and tomograms on initial examination revealed osteophytes of various sizes on the coronoid process, radial head, olecranon tip, coronoid fossa, radial fossa, and olecranon fossa, as well as loose bodies. The radiographic degree of arthrosis (Kellgren and Lawrence 1957) was divided into 4 grades: none, mild, including patients with only loose bodies (19 patients), moderate (16 patients) and severe (15 patients). Athletes mainly had mild osteoarthrosis, while most laborers had moderate or severe osteoarthrosis (Table 2). Loose bodies were present in 32 elbows, often large in athletes.

The mean follow-up period was 60 (24–145) months. To evaluate the postoperative recurrence of osteoarthrosis, the intermediate and long-term results were studied in the 20 patients in whom at least 5 years had lapsed since surgery.

Surgery

The joint was exposed using a medial approach (method 1), a simple lateral approach (Harty and Joyce 1964) (method 2a), a lateral approach with a medial incision for ulnar neurolysis (method 2b), or a bilateral approach (method 3). Osteophytes were resected and excessive bony build-up was shaved to near-normal anatomic levels using a burr drill. Loose bodies were removed.

In the medial approach, after freeing the ulnar nerve, the proximal half of the insertion of the pronator teres muscle was detached, without detaching the flexor muscles at the medial epicondyle. The anterior portion of the elbow joint was entered, preserving the anterior bundle of the medial collateral ligament. Next, the olecranon fossa was exposed under the triceps muscle, separating the posterior oblique fibers of the medial collateral ligament. This approach allowed adequate resection of the anterior and posterior osteophytes on the medial side of the elbow joint, providing access to the coronoid process, coronoid fossa, olecranon, and olecranon fossa. Surgery was done solely with this medial approach in most cases. However, lateral pathology involving the radial head and radial fossa could not be sufficiently treated using this approach in patients with severe arthrosis. In such cases, a lateral approach was also used.

In the lateral approach, between the anconeus and extensor carpi ulnaris muscles, the annular ligament was incised in longitudinal direction. With this approach, osteophytes on the coronoid process and coronoid fossa, olecranon, and olecranon fossa could also be treated. In the patients with cubital tunnel syndrome in whom a lateral approach was used, a medial skin incision was made for ulnar nerve neurolysis. In the patients with severe degenerative changes, in whom a bilateral approach was required, a posterior longitudinal incision that curved around the olecranon was made.

The lateral approach was used during the first part of the study. The medial approach was the procedure of choice during the latter part of the study. Methods 1 (n 17), 2a (n 10), 2b (n 12), and 3 (n 9) were used. The Outerbridge-Kashiwagi method (Kashiwagi 1985) and a posterolateral approach (Tsuge et al. 1987) were used in one pa-

Table 1. Data of 50 patients with elbow arthrosis. Cases 1–26 are athletes, 27–50 are laborers

Case	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	28	25	120	2	mild	yes	1	105	5	20	125	5	0	1	0	1
2	24	20	95	3	mild	yes	1	63	15	5	120	35	1	1	1	0
3	30	0	110	2	mild		1	55	0	0	135	25	0	0	0	0
4	59	10	125	2	moderate	yes	1	54	13	-3	123	-2	0	0	1	1
5	22	10	125	3	moderate	yes	1	42	0	10	127	2	1	1	1	0
6	50	12	135	3	moderate		1	34	4	8	140	5	0	0	0	0
7	18	25	110	2	mild	yes	1	33	5	20	125	15	0	0	0	0
8	23	0	140	3	mild		1	31	5	-5	135	–5	1	0	0	0
9	55	5	95	3	severe	yes	1	29	-4	9	120	35	0	0	0	0
10	30	10	110	2	mild	yes	2a	100	5	5	130	20	0	0	0	0
11	19	12	130	3	mild	yes	2a	64	0	12	145	15	0	1	0	0
12	21	25	90	3	mild	yes	2a	42	10	15	110	20	0	1	0	0
13	22	0	120	3	mild	yes	2a	28	-10	10	134	14	1	0	1	0
14	22	20	130	3	mild	yes	2a	26	0	20	135	5	0	0	0	0
15	42	10	120	3	moderate	yes	2b	84	5	5	114	-6	2	2	2	1
16	41	30	120	2	moderate	tyes	2b	74	20	10	145	25	0	0	0	1
17	36	15	100	2	moderate		2b	62	10	5	120	20	0	0	0	0
18	20	20	120	2	mild	yes	2b	61	5	15	130	10	0	0	0	1
19	22	20	100	2	severe		2b	47	25	-5	105	5	0	0	0	0
20	38	20	90	2	mild		3	51	5	15	125	35	0	0	0	0
21	30	12	100	2	mild	yes	3	39	8	4	124	24	1	1	1	2
22	27	20	120	2	mild		3	34	5	15	130	10	0	1	0	0
23	41	30	80	2	severe	yes	3	32	8	22	120	40	0	0	0	0
24	50	25	112	3	severe	yes	3	30	7	18	118	6	1	1	1	1
25	41	8	110	2	mild		3	29	0	8	120	10	0	0	0	0
26	19	20	125	2	mild	yes	O-K	51	5	15	125	0	1	0	0	0
27	41	5	125	2	moderate		1	127	0	5	135	10	1	1	1	0
28	46	10	135	2	mild	yes	1	60	15	-5	126	-9	1	1	0	0
29	50	15	110	2	moderate		1	43	10	5	115	5	1	0	0	2
30	54	30	110	3	severe	yes	1	32	13	17	134	24	1	0	0	1
31	40	25	100	3	severe	yes	1	28	15	10	130	30	0	0	0	0
32	71	0	115	2	mild	yes	1	27	0	0	130	15	0	0	0	0
33	58	20	116	3	moderate	yes	1	27	14	6	130	14	0	1	1	0
34	44	5	123	2	moderate	yes	1	26	0	5	133	10	0	0	0	0
35	54	20	110	3	severe	yes	2a	115	20	0	135	25	0	0	0	0
36	56	30	100	3	severe	yes	2a	102	10	20	140	40	0	0	0	0
37	48	10	130	3	severe		2a	69	12	-2	132	2	0	0	0	0
38	51	18	108	2	mild		2a	48	13	5	128	20	0	0	0	0
39	54	10	130	2	moderate	yes	2a	25	0	10	130	0	0	0	0	1
40	53	25	115	3	severe		2b	145	22	3	125	10	0	0	0	2
41	52	20	105	2	severe		2b	124	12	8	127	22	2	1	1	0
42	59	55	85	3	severe	yes	2b	116	25	30	125	40	0	0	0	2
43	38	10	80	3	moderate	yes	2b	106	10	0	115	35	0	0	0	0
44	49	20	100	3	severe	yes	2b	98	20	0	118	18	1	0	2	2
45	53	10	100	2	moderate		2b	59	14	-4	125	25	1	1	0	1
46	52	10	90	3	severe	yes	2b	38	0	10	130	40	0	0	0	0
47	35	0	85	2	moderate		3	103	7	-7	125	40	1	2	1	0
48	35	0	100	2	moderate		3	91	5	-5	123	23	1	2	1	0
49	40	25	110	2	moderate		3	44	40	-15	125	15	1	1	1	0
50	72	60	100	3	severe	yes	Tsuge	24	43	17	130	30	1	1	0	0
Aver.	41	17	110					60	9	7	127	17				
SD		12	15						10	9	8	13				

A Age
B Preop. extension deficit, degree
C Preop. flexion, degree
D Pain: 0 none, 1 slight, 2 moderate, 3 severe.
E Grade of OA
F Free body
G Approach
  1 medial
  2a lateral
  2b lateral+medial neurolysis
  3 bilateral
  O-K Outerbridge-Kashiwagi
  Tsuge postero-lateral
H Follow-up, month
I Postop. extension deficit, degree
J Gain in extension, degree
K Postop. flexion, degree
L Gain in flexion, degree
M Postop. pain
N Terminal pain in extension
O Terminal pain in flexion
P Numbness

Table 2. Results of debridement arthroplasty in athletes and laborers

	Athletes (n 26)		Laborers (n 24)	
	Preop.	Postop.	Preop.	Postop.
Pain, n				
none	0	18	0	13
slight	0	7	0	10
moderate	15	1	12	1
severe	11	0	12	0
terminal flexion/extension	26	11	24	10
Motion, degree				
mean extension deficit	16	6	18	13
SD	9	7	15	11
range	(0–30)	(-10– 25)	(0–60)	(0–43)
mean flexion	112	126	108	128
SD	15	10	14	6
range	(80–140)	(105–145)	(80–135)	(115–140)
Osteoarthrosis, n				
mild	16	7/8	3	8/12
moderate	6	1/8	10	4/12
severe	4	0	11	0
Loose bodies, n	18	0	14	0
Ulnar nerve symptoms , n	12	7	15	7

tient each.

A plaster splint was used for postoperative immobilization. Active and continuous passive motions were started at 5 days. A dynamic splint was applied 2 weeks after surgery. Light work was permitted at approximately 6 weeks. Return to sports and manual labor were possible at 10–12 weeks.

Results

The postoperative pain was grade 0 in 31 elbows, grade 1 in 17 elbows, and grade 2 in 2 elbows. There was no difference in the degree of pain relief between athletes and laborers. Postoperative pain associated with terminal flexion or extension of the elbow was present in 21 elbows, but much less severe than that prior to surgery. Postoperative terminal flexion or extension pain did not hinder participation in sports or labor in any patient.

Motion improved. The mean extension deficit was 9 (–10 to 43)° and the mean elbow flexion was 127 (105–145)°; a mean 24° improvement (7° in extension and 17° in flexion). There was no difference in the improvement of motion between the groups (Table 2). Postoperative symptoms of ulnar nerve compression were mild (n 9) or moderate (n 5). The patients with moderate numbness had a prolonged preoperative history of symptoms of ulnar nerve compression.

All 48 patients with grade 0 or 1 pain returned fully to their original sport (n 25) or manual labor (n 23). None had limitations in the activities of daily living. Both patients with grade 2 pain returned to their original sport (n 1) or manual labor (n 1) with some limitations. They had slight difficulties with the activities of daily living. Many of the judo wrestlers were top class. 3 were able to achieve first and second class levels at national and global competitions after surgery.

The intermediate and long-term outcomes were studied in 20 patients observed for more than 5 years (8 in the athletes and 12 in the laborers). The mean follow-up period was 93 (60 –145) months. These patients had grade 0 (n 12), grade 1 (n 6), or grade 2 (n 2) pain at the last follow-up. The mean improvement of motion was 25 (–14 to 70)°.

Recurrence of osteophytes was studied radiographically. 15 of 20 patients had mild arthrosis with limited formation of osteophytes. 5 of 20 patients had moderate arthrosis. The 5 patients with moderate recurrent arthrosis had grade 0 (n 1), grade 1 (n 2), or grade 2 (n 2) pain. The recurrence

Figure 1. 24-year-old college judo wrestler (case 2).

Preoperative small osteophytes at the coronoid process and coronoid fossa with a large loose body.

A near-normal elbow joint 5 years after surgery.

Figure 2. 59-year-old construction worker (case 42).

Preoperative severe spur formation at the coronoid process, olecranon tip and their fossae with a loose body.

Slight osteophyte recurrence is seen at the tip of the coronoid process and the olecranon 10 years after surgery.

of spurs was less severe than the preoperative arthrosis in all cases.

Discussion

Pain and limitation of motion due to arthrosis of the elbow are a major concern for athletes and manual laborers. For example, judo wrestlers and baseball players may not be able to use their arms adequately due to severe pain associated with hyperextension of the elbow by an opponent, or with maximum extension of the elbow in the follow-through phase of throwing. Elbow pain in manual laborers may significantly affect job performance. Osteoarthrosis occurred more frequently in younger athletes (mean age 32 years), and older laborers (mean age 50 years).

At the intraoperative examination, in 3, the humeroulnar joint surface was generally well pre-

served. In contrast, the humeroradial joint surface was damaged to varying degrees. However, the articular cartilage was close to normal or slightly damaged in many of the athletes; radiographic evidence of mild or moderate arthrosis was present in 22/26 of the athletes. Osteophytes were most frequently found on the tip of the coronoid process and coronoid fossa in these patients. 21/24 of the laborers had moderate or severe arthrosis (Table 2).

Loose bodies (Milgram 1977) were commoner and larger in athletes than in laborers. In the athletes, this may have been caused by the acute forceful flexion and extension motions and rotatory forces associated with sports, which result in the formation of osteophytes. Repeated infliction of intense forces may have led to osteochondral fractures of the osteophytes, resulting in relatively large loose bodies. In contrast, the osteoarthrosis in group II was presumed to be associated with aging changes (Goodfellow and Bullough 1967, Meachim 1969) and excessive stress applied to the elbow over a long period of time developing into arthrosis involving the entire joint.

The elbow pain was most intense with maximum flexion and extension and may have been caused by spurs, bony ridges, and loose bodies in the anterior (coronoid process and coronoid fossa, and radial head and radial fossa) and posterior (olecranon and olecranon fossa) joint spaces. Therefore, I hypothesized resections of osteophytes and removal of loose bodies, without treating the degenerated articular cartilage should be effective.

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