The Pritchard Mark II elbow prosthesis in rheumatoid arthritis

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Twenty-five consecutive rheumatoid elbows treated with the Pritchard Mark II elbow prosthesis were prospectively followed for 3 (2–5) years. There were marked pain relief and increased motion after the operation. Two elbows were revised, one because of deep infection and the other because of loosening. There were no neuropathies or fractures. The major long-term complication was radiographic loosening (6/24), which mainly occurred in elbows with only moderate rheumatoid destructions.

The results of hinged total elbow prosthesis are poor, with a high rate of loosening (Souter 1973, Garrett et al. 1977, Morrey et al. 1981b). The Pritchard Mark II elbow prosthesis provides some rotation and medial/lateral laxity in the hinge, and several studies suggest that this improvement of the Pritchard-Walker design has reduced the incidence of loosening (Inglis and Pellicci 1980, Pritchard 1981, Rosenfeld and Anzel 1982).

We report a prospective series of 26 consecutive Pritchard Mark II elbow arthroplasties for rheumatoid arthritis.

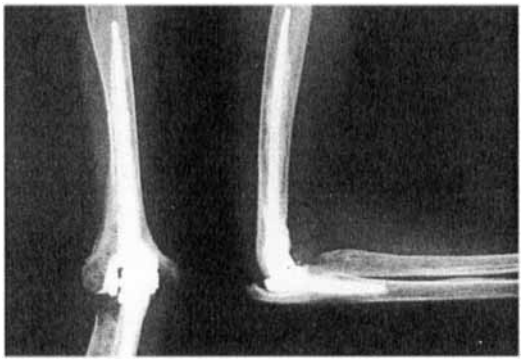

Figure 1. The Pritchard Mark II prosthesis in Case 4, 6 months after arthroplasty.

Patients and methods

Between 1983 and early 1986, a total of 22 patients with rheumatoid arthritis were operated on with the Pritchard Mark II elbow prosthesis (Figure 1). One patient died of another cause before 2 years of follow-up, leaving 21 patients – mean age 56 (36–78) years – with 25 elbow arthroplasties followed prospectively for 2 to 5 years (mean 38 months). All the patients had had rheumatoid arthritis for at least 9 years, and all except 2 had had previous arthroplasties or arthrodesis of other joints. Five elbows had had a previous synovectomy, in 3 cases combined with excision of the radial head. Fourteen elbows were classified (Inglis 1985) as III A and 11 elbows as III B (Figure 2).

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All the operations were performed by the same surgeon, and all the patients received a prophylactic antibiotic regimen. A V-shaped splitting of the triceps tendon was performed through a straight posterior approach. The radial head was excised just distal to the neck. The ulnar nerve was identified and freed in its course through the cubital tunnel. The intramedullary canal of the humerus was identified prior to the minimal resection of intercondylar bone. The medullary canal was prepared with rasps. Very little bone was resected from the ulna, and the medullary canal was widened with a rasp. No plugs were applied, and the bone cement was introduced digitally before the prosthesis was inserted. Before closure of the wound, the elbow was tested for collision of the radial neck with the capitellum, and if necessary further resected. At closure the annular ligament was reinserted if possible to stabilize the radius. There was no intention to reinsert the collateral ligaments. The ulnar nerve was always left in situ.

Figure 2. Classification of rheumatoid arthritis of the elbow (Inglis 1985)

Postoperatively, the patients started supervised active exercises as soon as the suction drain was removed.

The patients were recommended to follow a set of general restrictions for the rest of their lives, notably to minimize anteroposterior and rotatory forces across the elbow – i.e., to refrain from using a crutch, from assisting when rising from a seated position, and from carrying heavy articles.

The elbows were scored preoperatively and yearly after the operation according to Inglis and Pellicci (1980) and followed up radiographically for loosening. Case 14 suffered a supracondylar humeral fracture while she was waiting for the arthroplasty (which then was performed 3 weeks after fracture), and therefore the preoperative score is missing. Migration of the prosthesis and/or radiolucencies of 1 mm or more in more than 50 percent of the bone-cement interface were defined as loosening.

Results

A primary low-grade infection developed in Case 1. Because of pain and increasing radiolucencies around the humeral component, the arthroplasty was revised after 2.5 years with a good result. There were three minor wound hematomas (Cases 10, 11, 25) that did not require further surgery or very long hospitalization. Cases 19 and 24 had protracted wound healing; Case 19 was the only one in whom a primarily nearly stiff supination-pronation motion remained unimproved. There were no postoperative neuropathies, triceps ruptures, or fractures.

Pain relief was the major benefit of the elbow arthroplasty (Table 1). A paired *t*-test showed increased motion ($P < 0.05$) in all four directions; and upon comparing the elbow motion 1 year after the operation with the motion found at the last control, we found unchanged flexion, extension, and pronation, but the supination decreased on an average of 6° ($P < 0.05$) usually between the first and the second postoperative year. The average overall score was 40 (15–49) before the operation and 82 (58–99) at follow-up.

Table 1. Relief of pain after elbow arthroplasty for rheumatoid arthritis

	Functional pain		Pain at rest	
	Before[a]	After	Before[a]	After
None	0	18	0	21
Mild	0	5	5	4
Moderate	0	2	15	0
Severe	24	0	4	0

[a] Case 14 was not assessed before the operation.

Radiographic loosening was found in six elbows, of which four showed minor migration, and one of them underwent revision arthroplasty with a good result 21 months postoperatively because of additional moderate pain. All the radiolucencies were in the humerus, and the majority of them in the distal part; no radiolucencies were found in the ulna. Five of the six radiographic loosenings were found in III A elbows. In three arthroplasties, loosening of the hinge (Figure 3) was seen, in 1 case associated with loosening. A Mann-Whitney *U*-test showed no difference between age, follow-up time, overall preoperative score, or score improvement between the III A and III B groups.

Discussion

Several types of prostheses may provide satisfactory pain relief (Ewald et al. 1980, Inglis and Pellicci 1980, Morrey et al. 1981b, Pritchard 1981, Davis et al. 1982,

Type of prosthesis		A	B	C	D	E	F	G	H	I	J
Semiconstrained											
Pritchard I & II	Inglis and Pellicci 1980	35	19	43	1	2	4	3	2	0	8
Pritchard Mark II	Pritchard 1981	92	55	21	3	?	2	0	?	0	?
GSB III	Gschwend et al. 1988	71	51	49	2	?	3	2	2	7*	?
Pritchard Mark II	Present study 1989	25	25	38	1	1	6	0	0	0	2
Surface prosthesis											
Wadsworth	Rydholm et al. 1984	19	19	30	1	1	10	1	3	0	2
Roper-Duke	Roper et al. 1986	51	44	61	6	9	?	?	5	3	18
Other nonconstrained											
Ewald	Ewald et al. 1980	69	69	42	3	1	3	3	11	5	8
Ewald	Davis et al. 1982	30	28	40	2	0	0	?	3	4	4
Ewald	Rosenberg and Turner 1984	28	28	35	2	1	1	1	3	4	4
Liverpool	Soni and Cavendish 1984	80	57	42	5	9	?	0	19	3	24
Capitello condylar	Trancik et al. 1987	35	34	67	3	1	3	2	9	3	4

A Total no. of elbow arthroplasties.
B No. of elbow arthroplasties due to RA.
C Mean follow-up in months.
D No. of deep infections.
E No. of revisions because of loosening.
F No. with radiographic loosening.
I No. with dislocation (*uncouplings of the device).
J No. of reoperations.

Figure 3. Loosening of the hinged axis in Case 13, 39 months after arthroplasty.

Johnson et al. 1984, Rosenberg and Turner 1984, Roper et al. 1986, Sourmelis et al. 1986, Rancik et al. 1987).The range of motion also improves and is sufficient for most daily activities (Morrey et al. 1981a).

The type and frequency of complications after different types of prostheses vary (Table 2). Loosening of the prosthesis is usually the major long-term problem, although the definition of loosening varies in different studies (Ewald et al. 1980, Rosenberg and Turner 1984, Soni and Cavendish 1984). Six of our 25 elbows had radiographic loosening, but only one required revision because of pain. One explanation for the high rate of radiographic loosenings in the present study is the insufficient cementing technique (Søballe and Christensen 1988). Nonconstrained prostheses appear to have less risk of loosening at the price of increased risk of dislocation (Table 2). Further, postoperative neuropathies seem to be more frequent after nonconstrained prostheses, which could be due to the necessary spacing of the joint in order to achieve stability of the elbow.

It is apparent that a loose prosthesis should be revised before large resorption of bone occurs, and we recommend annual radiographic control. Failed nonconstrained prostheses have been said to be easier to revise (Roper et al. 1986, Rydholm et al. 1984); our two revisions did well.

The number of deep infections is not related to the type of prosthesis (Table 2) or to the surgical approach.

Table 3. Data from 21 patients with 25 elbow arthroplasties

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	52	F	A	34	120	70	0	0	130	30	30	20	27	58	4	3	3	2	-	1	bc	34
2	63	F	A	27	120	40	30	90	130	30	40	90	45	80	4	1	3	1	-	-	a	-
3	38	F	A	31	90	10	30	20	140	25	80	80	38	88	4	1	2	1	-	-	a	-
4	63	F	B	36	130	30	20	30	140	10	80	90	36	99	4	1	4	1	-	-	d	-
5	66	F	A	47	110	45	30	30	130	20	80	80	36	88	4	2	3	1	-	-	c	-
6	55	F	A	31	110	60	15	20	120	70	50	40	44	58	4	2	3	2	-	-	bc	-
7	55	F	A	28	100	60	0	15	120	80	20	30	33	60	4	2	3	2	-	-	a	-
8	78	F	A	24	100	45	45	90	140	25	90	70	46	92	4	1	2	1	-	-	a	-
9	63	F	B	28	110	40	40	60	135	40	45	60	43	77	4	1	3	1	-	-	a	-
10	64	F	B	28	120	40	30	60	135	40	40	60	44	76	4	1	3	1	-	2	a	-
11	41	F	A	54	80	75	10	30	130	30	80	70	44	89	4	1	2	1	1	2	a	-
12	36	F	A	51	80	20	45	70	135	15	80	80	44	98	4	1	2	1	-	-	bc	-
13	66	F	A	39	100	35	45	10	140	30	90	90	36	92	4	1	4	1	-	-	d	-
14	41	F	A	45	-	-	-	-	120	20	40	80	-	82	-	1	-	1	-	-	a	-
15	67	F	B	53	130	30	40	30	135	25	90	90	46	86	4	1	3	1	-	-	a	-
16	55	F	B	59	90	80	0	10	120	20	30	60	15	72	4	1	4	1	-	-	a	
17	59	F	B	37	120	25	25	15	140	20	60	80	49	89	4	2	3	1	-	-	a	-
18	59	F	B	30	130	30	30	30	135	20	60	60	49	89	4	2	3	1	1	-	bcd	-
19	36	F	A	26	100	50	5	5	130	50	0	0	31	86	4	1	3	1	-	3	a	-
20	50	F	B	48	50	30	0	0	130	20	90	90	39	90	4	1	3	1	-	-	a	-
21	51	F	B	44	120	30	0	0	130	0	90	90	48	92	4	1	2	1	-	-	a	-
22	67	F	A	28	120	20	30	30	130	15	30	45	44	85	4	1	3	1	-	-	c	-
23	68	F	A	21	130	30	60	30	130	30	80	80	39	59	4	3	4	2	2	-	bc	21
24	58	F	B	42	120	45	25	20	115	20	80	60	42	83	4	1	3	1	2	3	a	-
25	61	M	B	28	90	10	70	80	120	20	90	60	42	88	4	1	3	1	2	2	a	-
Mean	56			37	107	40	26	32	130	28	62	65	40	82								

A Case number (| bilateral arthroplasties).
B Age.
C Sex.
D Preoperative grade: A = III A, B = III B (Inglis 1985).
E Follow-up in months.
F Flexion in degrees before arthroplasty.
G Flexion contracture before operation.
H Supination before operation.
I Pronation before operation.
J Flexion at last follow-up.
K Flexion contracture at last follow-up.
L Supination at at last follow-up.
M Pronation at last follow-up.
N Overall score before operation (Inglis and Pellicci 1980).
O Overall score at last follow-up.
P Functional pain before operation.
Q Functional pain at last follow-up.
R Pain at rest before operation.
S Pain at rest at last follow-up.
T Previous operation: 1 synovectomy, 2 synovectomy and radial head excision.
U Primary complication: 1 deep infection, 2 wound hematoma, 3 protracted wound healing.
V Radiograph at last follow-up: a normal, b migration of humeral comp., c radiolucencies around the humeral comp., d loose hinge.
W Revision in months after primary arthroplasty (the motion, pain, and score at last follow-up were measured before revision).

The number of humeral fractures after elbow prosthesis do not differ either, except after the Pritchard-Walker prosthesis, where the fracture incidence seemed to be unduly high (Inglis and Pellicci 1980, Pritchard 1981).

The Pritchard Mark II elbow prosthesis is a good alternative in the treatment of the severely destroyed rheumatoid elbow. We do not believe that all patients comply with the recommended restrictions, but our patients perceived they had be careful, and this could have been the reason why our revision rate remained satisfyingly low.

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