REVISION OF THE CHARNLEY LOW-FRICTION ARTHROPLASTY FOR RECURRENT OR IRREDUCIBLE DISLOCATION

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Twenty-one cases of the Charnley low-friction arthroplasty were revised because of recurrent or irreducible dislocation. Three main reasons for this revision, usually in combination, were identified: loss of the abductor mechanism due to trochanteric detachment; shortening of the limb due to high placement of the socket or low section of the femoral neck; and malorientation of the components.

Sixteen patients had no further problems after revision. One patient had a single dislocation, four had more than one dislocation although they managed to cope with them and did not require a further revision.

Reports of complications of total hip replacements and their management have increased proportionately with the number of the operations performed. Revision for dislocation after the Charnley low-friction arthroplasty has not received detailed attention. Dislocations after this operation were reviewed by Etienne, Cupic and Charnley (1978). The complication was also discussed by others (Bonnin 1972; Luck, Brannon and Luck 1972; Patterson and Brown 1972; Coventry *et al.* 1974; Pellicci, Salvati and Robinson 1979). The purpose of this paper is to examine the results of revision operations for recurrent or irreducible dislocation in 21 patients with low-friction arthroplasties where the routine transtrochanteric approach had been used.

CLINICAL MATERIAL

In this unit 14 672 low-friction arthroplasties have been performed between November 1962 and June 1979. Dislocation after operation occurred in 92 patients, an overall incidence of 0.63 per cent. This figure includes the occasional dislocation immediately after operation in patients whose dislocations were reduced under the same general anaesthetic and who did not require further intervention. Sixteen patients dislocated on more than one occasion and required revision operations; the incidence of revision was 0.11 per cent of the total number of arthroplasties performed. The records of one of these 16 patients were not detailed enough to be included in this study. It should be noted that this figure represents the total incidence since 1962 and does not take into account considerable refinements in technique which have evolved over the years such as transverse reaming of the acetabulum, the anatomical placement of the socket with respect to the obturator foramen, the use of a socket with a long posterior-wall and the improved method of trochanteric reattachment (Boardman, Bocco and Charnley 1978). Six patients, who each fulfilled the criteria outlined above and who were referred to the hip centre for revision operations, have been added to this group.

The group comprised two men and 19 women aged between 42 and 78 years (average 63.2 years). Twelve had had the low-friction arthroplasty for primary osteoarthritis, five for rheumatoid arthritis, two had had a fracture of the femoral neck and two others had secondary osteoarthritis, one due to Paget's disease and one to congential dysplasia. Five patients had previously had intertrochanteric osteotomy and in another with a fracture of the femoral neck an uncemented Moore's prosthesis had been inserted.

For the patients operated on by this unit the stability of the new joint was recorded at the time of insertion, before reattachment of the greater trochanter. The hip was put through the full range of movements and longitudinal traction was applied to the limb to assess the amount of distraction between the head of the femoral component and the socket. Stability was found in all but one patient in whom a distraction of some two centimetres was possible.

In one of the patients referred from another unit, the low-friction arthroplasty dislocated immediately after operation and the patient was never mobilised; two others dislocated in the first month. In the remaining 18 the first dislocation had occurred between two months and four and a half years after operation. Eighteen patients had had manipulation and closed reduction of the initial dislocation followed by a period of rest in bed with an abduction pillow for up to three weeks. In three patients the manipulation had failed and exploration and revision had to be performed.

RESULTS

Sixteen of our 21 patients obtained stable hips after operation. Details of the patients are presented in Table I. All the measurements were made on standardised radiographs (Charnley 1979a). The socket was considered to be high when the distance between the "tear drop" (obturator foramen) and socket was five millimetres or more. The socket was placed in the

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Table I. Details of the group of patients under review

Case	Sex	Age (years)	Diagnosis	Tear drop to socket distance (mm)		Socket open laterally (degrees)	Length of femoral neck stump (mm)	Shenton's line			Trochanteric		Comments and findings (at revision)	Operative details (at revision)	Follow-up (months)	Result	Definitive reason for dislocation
				Superior	Lateral			Restored	Short	Long	Union	Detachment					
1	F	60	RA	0	10	49	30	X				X	Telescoping (++). Cup anteverted 10 degrees. Stem retroverted 10 degrees. Trochanteric non-union	Deepening of socket. Reorientation of stem and socket. Reattachment of trochanter	30	Satisfactory	Malorientation of stem, superficial socket, loss of abductor mechanism
2	F	63	OA	9	6	48	15	X				X	Trochanteric non-union	Change of stem to facilitate trochanteric reattachment	24	Dislocation. Trochanteric non-union	Loss of abductor mechanism
3	F	72	OA	2	10	48	15	X				X	Telescoping (+). Trochanteric non-union	Trochanteric reattachment	7	Satisfactory	Loss of abductor mechanism
4	F	64	OA	9	5	44	15	X				X	Trochanteric non-union	Trochanteric reattachment	11	Satisfactory	Loss of abductor mechanism
5	F	78	OA	5	5	42	5		X		X		High socket. Short femoral neck	Resiting of socket	1	Satisfactory Lost to follow-up	Shortening due to high socket and short femoral neck
6	F	72	Fracture of femoral neck. Moore's prosthesis	20	16	40	10		X		X		Telescoping (++). High superficial socket	Plication of tensor fasciae latae only	36	Recurrent dislocation	Shortening due to high socket and short femoral neck
7	M	76	OA	10	5	42	20	X			X		Irreducible dislocation in a spastic patient after trauma	Open reduction	14	Satisfactory	Spasticity, trauma, high socket
8	F	64	OA, ITO	5	10	47	0		X			X	Trochanteric non-union. High socket	Trochanteric reattachment, adductor tenotomy	30	Satisfactory	Loss of abductor mechanism, high socket. Loss of femoral neck
9	F	61	RA, ITO	0	0	45	15			X		X	Trochanteric non-union. Slightly overlengthened	Trochanteric reattachment	30	Satisfactory	Loss of abductor mechanism
10	F	65	OA	5	3	50	20	X			X		Telescoping (++). Very lax capsule. Cup open laterally	Capsular plication	69	Satisfactory	Cup open laterally. Ligamentous laxity
11	F	54	RA	4	5	45	15		X		X		Telescoping (++). Very lax capsule. Short limb	Capsular plication	42	Satisfactory	Short limb. Ligamentous laxity
12	F	72	OA	0	0	52	15	X				X	Trochanteric non-union. Cup open laterally. Severe trauma	Trochanteric reattachment	12	Satisfactory	Loss of abductor mechanism. Trauma
13	F	64	OA, ITO	3	0	40	0		X			X	No femoral neck, short limb. Telescoping (++). Abductor cut off the greater trochanter	Long neck prosthesis. Abductors attached to fascia lata	36	Unsatisfactory. Recurrent dislocation	Loss of abductor mechanism. Loss of femoral neck
14	M	75	Paget's disease	0	0	40	20	X			X		Slight telescoping	Full revision. Long neck prosthesis	10	Satisfactory	Not apparent. ?shortening
15	F	71	OA, ITO	0	10	40	15	X			X		Slight telescoping	Long neck femoral prosthesis	5	One dislocation. No further problems	No obvious cause found
16	F	66	OA	25	20	49	15		X		X		Telescoping (++). High superficial socket, retroverted 40 degrees. Short limb	Resiting and reorientation of socket	96	Satisfactory	Malorientation and malposition of socket, short limb
17	F	52	RA	7	15	45	15		X		X		Telescoping (++). Superficial cup	Deeper positioning of socket	30	Satisfactory	Superficial socket. Limb shortening.
18	F	51	Fracture of femoral neck	10	10	45	20			X		X	Telescoping. Trochanteric non-union	Change of both components. Long neck stem. Trochanteric reattachment	24	Unsatisfactory. Dislocation Trochanteric non-union	Trochanteric non-union. Long lever due to fused ipsilateral knee
19	F	57	Congenital dysplasia	20	0	50	0		X		X		Telescoping (++). Gross shortening. No femoral neck	Long neck stem	42	Satisfactory	Gross shortening, due to high socket. Loss of femoral neck
20	F	43	OA, ITO	15	15	50	15		X			X	Trochanteric non-union. Cup loose and vertical, stem loose and retroverted	Full revision with resiting of components	41	Satisfactory	Loss of abductor mechanism. Malorientation and loosening of components
21	F	58	RA	4	10	45	15		X			X	Irreducible dislocation, Trochanteric non-union. Cup loose. Stem loose and retroverted 10 degrees	Resiting of both components. Trochanter excised. Abductor reattached into fascia lata	12	Satisfactory	Loss of abductor mechanism. Loosening of components

ITO—intertrochanteric osteotomy OA—osteoarthritis RA—rheumatoid arthritis

anatomical position in five patients and within the acceptable limits in a further four. It was high in the remaining 12 patients, an average of 11.7 millimetres (with a range of 5 to 25 millimetres). In four cases superficial placement of the socket was considered to be present. These sockets were not fully covered by the superior rim of the acetabulum and the lateral distance between the tear drop and the socket was more than 10 millimetres. The socket was considered to be excessively open in a lateral position when the angle between the face of the socket and the line joining the inferior pubic rami measured 50 degrees or more. There were four of these sockets.

The length of the stump of the femoral neck was measured on the earliest radiograph taken after operation from the cut surface of the femoral neck to the base of the lesser trochanter. In three patients no femoral neck was present and in two others it was considered short (5 and 10 millimetres). In the remaining patients it was considered adequate. Shenton's line was restored after the low-friction arthroplasty in nine patients but was broken in 12; in two patients the limb was over-long and in 10 it was short. Trochanteric detachment with proximal migration was present in 10 patients. In one patient (Case 13) the abductors were separated from the greater trochanter by the compression spring used for its reattachment; trochanteric non-union was also present. Malorientation of components is not possible to estimate accurately using radiography but it was found to be excessive in four patients at the time of revision.

Fig. 1

Fig. 2

Figure 1—Radiograph to show dislocation as a result of shortening. The femoral neck is short and the socket is high. Figure 2—Radiograph to show dislocation as a result of trochanteric detachment. The femoral neck is of normal length with the socket positioned anatomically.

DISCUSSION

Three main causes of dislocation requiring revision operations have been identified: loss of the abductor mechanism, shortening of the limb (Fig. 1), and malorientation of the components. Detachment of the trochanter and thus the loss of the stabilising action of the abductor mechanism, alone or in combination with other factors, was the commonest cause of dislocation (Fig. 2). Attention to detail at every stage of the procedure is advocated (Charnley 1979b). Preparation of the acetabulum and placement of the socket in the anatomical position is greatly facilitated by identifying the margin of the obturator foramen at the inferior aspect of the acetabulum, especially in difficult cases and revisions. A retractor designed for the purpose was placed into the superior margin of the obturator foramen, to ensure the anatomical placement of the socket and also to improve the exposure of the acetabulum (Fig. 3). The level of the section of the femoral neck is a matter of experience; although variation has been reduced by the design of the neck length jig (Charnley 1979c). In the final assessment of the results stability must take priority over leg length.

Reattachment of the greater trochanter need not be a problem if this method of exposure is used routinely and the principles for its reattachment are followed carefully. At revision the trochanteric bed and the trochanter must be carefully prepared and a method of fixation which has an element of compression is advisable. Telescoping and capsular laxity, recorded in two patients, is unlikely to be a primary lesion but is probably secondary to the capsular stretching by the repeated dislocation. It could possibly be considered primary in the patients with rheumatoid arthritis who were receiving steroids. To avoid dislocation of the low-friction arthroplasty attention must be paid to the details of preparation of the acetabulum, section of the femoral neck, and placement of the components. With secure reattachment of the greater trochanter mobilisation of the patient need not be curtailed.

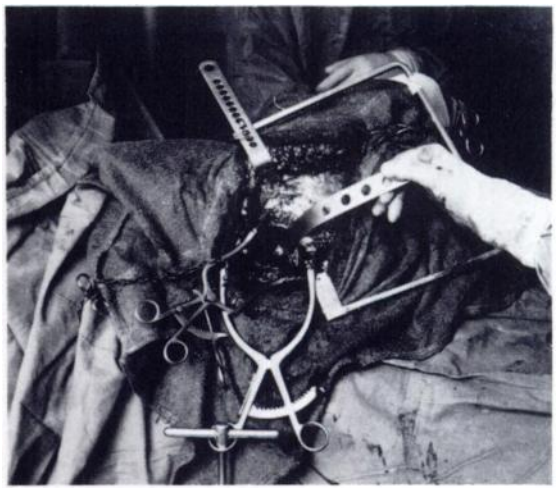

Fig. 3

The use of the retractor at the time of operation.

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