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Arthrographic examination of the pseudocapsule of the hip after posterior dislocation of total hip arthroplasty

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Abstract We examined the pseudocapsule in ten patients with posterior dislocation after total hip arthroplasty (THA) using arthrography to investigate the relationship between dislocation and the state of the pseudocapsule. The pattern of contrast medium pooling demonstrated on tangential views was evaluated. In five patients with early dislocation arthrography showed leakage indicating lack of pseudocapsule whereas there was no leakage in five patients with late dislocation. Repeat arthrography revealed healing of the pseudocapsule could progress by 6–8 weeks after dislocation. These findings suggest that the difference in the pseudocapsule between those who dislocate early and late may explain different clinical outcomes in the two groups.

Résumé Nous avons examiné par arthrographie dix cas de luxation postérieure après prothèse totale de la hanche. A la première arthrographie, l'ensemble de cinq cas avec une luxation ancienne ont montré un tracé de déperdition indiquant l'absence de pseudocapsule à la différence de cinq cas avec une luxation récente. Ceci permet de suggérer que les luxations anciennes se sont produites avant le développement d'une pseudocapsule, mais que les luxations récentes se sont produites après cela. Une seconde arthrographie a révélé que la cicatrisation d'une pseudocapsule pourrait considérablement progresser sur une période de 6–8 semaines après luxation tardive. Ces faits pourraient expliquer la différence d'évolution entre les luxations précoces et les luxations tardives.

Introduction

The dislocation after THA is a significant complication. Many factors may be associated with dislocation [2, 4, 6, 9, 10]. Some authors [2, 3] have suggested that a poor pseudocapsule may be a causative factor. Morrey [6] and Coventry [2] showed an enlarged pseudocapsule in patients with late dislocation and suggested that increased hip flexion causing stretching of the pseudocapsule may lead to late dislocation. Some methods have been reported for the treatment of dislocation by promoting the formation of a pseudocapsule. A hip spica or brace may be effective in cases of early dislocation. Pellicci et al. [8] reported that soft tissue repair could decrease the dislocation rate by eliminating the posterior dead space.

Patients and methods

We reviewed the arthrograms of ten patients with early posterior dislocation after THR treated in 1996 and 1997. The mean interval between dislocation and follow-up was 26 months (range, 13–41 months). There were six women and four men with a mean age of 69.5 years (range, 48–88 years). The indication for THA was secondary osteoarthritis in five (avascular necrosis of the femoral head in two and fracture of the femoral neck in three). The original operation was a primary THA in seven patients and a revision procedure in three. For primary THA the Centralign system (Zimmer, Warsaw, Ind., USA) was used in four cases; the Omnifit system (Osteonics, Allendale, N.J., USA) in two and the Physio Hip System (Kyocera, Kyoto, Japan) in one. For revision THA, the Solution system (Depuy, Warsaw, Ind., USA) was used in two cases and a Physio Hip socket and Solution stem were used in one. The posterior approach was used in nine patients and the transtrochanteric approach in one (case 7). In all cases the socket position was within Lewinnek's safe zone [5]. Neither retroversion of the femoral component nor radiological loosening was seen at the time of dislocation. The mean interval between operation and initial dislocation was 27.4 weeks (range, 2–439 weeks). There were five cases of early dislocation (<3 months) and five cases of late dislocation (>3 months).

After confirmation of the diagnosis by plain radiography, manual reduction was attempted without anaesthesia. If this was unsuccessful, a closed reduction was performed with a lumbar block. No patient required an open reduction. Following reduction, all patients were treated with rest or a hip spica for about 3 weeks or abduction splinting for several months.

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Arthrography was performed using the lateral approach under local anaesthesia, with Iotran (Shering, Osaka, Japan) as contrast medium. Further dislocation occurred in five patients and revision surgery was required in three.

Results

Arthrographic findings

We divided the pattern of contrast medium pooling demonstrated on tangential view into four categories: (1) a tight pattern with only a thin rim of contrast around the implant; (2) a ripped pattern with a small pool of contrast at the posterior aspect of the socket; (3) an enlarged pattern with a large pool of contrast extending posteriorly to the neck of the femoral component; and (4) a leakage pattern with widespread leakage and no pooling (Figs. 1–4).

Details of the patients are shown in Table 1. The mean interval between THA and dislocation was 6.4 weeks (range, 1–10 weeks) in those with early dislocation and 206 weeks (range, 37–439 weeks) in those with late dislocation. Arthrography was performed twice in seven patients and once in three. Further dislocation occurred in five cases. Four patients (cases 1, 3, 6, 10) had a further dislocation before the first arthrographic examination and one patient (case 9) after the second arthrographic examination. Revision surgery was required after the first arthrography in cases 3 and 6 and after the second arthrography in case 9.

At the first arthrography all patients with an early dislocation (cases 1–5) showed a leakage pattern, whereas patients with late dislocation (cases 6–10) had no leakage pattern; a ripped pattern was seen in four cases and an enlarged pattern in one.

At the second arthrography two of the three patients with an early dislocation (cases 4, 5) had changed from a leakage to a tight pattern, while one (case 1) still showed a leakage pattern. In the four patients with a late dislocation and repeat arthrography (cases 7–10) the ripped pattern changed to a tight pattern.

Operative findings

We performed further surgery in three cases (cases 3, 6, 10). In case 3 implant was used directly after splitting the tensor fascia lata and a lack of pseudocapsule was confirmed consistent with the preoperative arthrographic findings. There was impingement between the anterior aspect of the greater trochanter and the antero-superior region of the acetabulum, and a partial resection of the greater trochanter was performed. In case 6, the posterior pseudocapsule was thin and ballooned from the posterior aspect of the socket to the posterior area of the neck in the region of the trochanteric bursa as was shown on preoperative arthrograms. There was impingement between the neck and soft tissues anteriorly and prominent soft tissue was removed, the liner was changed and a longer neck inserted with plication of the pseudocapsule. In case 9, with five dislocations after the second arthrography, an enlarged pseudocapsule was found although a tight pattern was demonstrated arthrographically. There was marked wear of the liner posteriorly. The cup was revised. No further dislocation has occurred in these cases.

Discussion

Dislocation is one of the major complications of THA. There is a difference in the cause and outcome between early and late dislocation [1, 7]. Some authors have reported that dislocation usually occurs in the early postoperative period (<3 months) and closed reduction is usually adequate treatment. In the present study the pseudocapsule seemed immature (leakage pattern) at 10 weeks postoperatively. However, even if a single dislocation occurred during this period the pseudocapsule could become mature (a tight pattern) by 16–18 weeks as demonstrated by arthrography. In those patients with late dislocation the pseudocapsule was mature with no leakage, and dislocation stripped the pseudocapsule from the posterior aspect of the socket whilst maintaining a mature

Table 1 Patient details

Case no.	Interval between THA and initial dislocation (weeks)	Interval between index dislocation and first arthrography (days)	Interval between first and second arthrography (weeks)	No. of dislocations			Finding at first arthrography	Finding at second arthrography
				Before first arthrography	Interarthrographic period	After second arthrography		
1	1 (early)	6	64	2 (9) ^b	0	0	Leakage	Leakage
2 ^a	5 (early)	3	–	1	0	0	Leakage	–
3	7 (early)	4	–	3 (9) ^b	0	0	Leakage	^c
4	8 (early)	5	10	1	0	0	Leakage	Tight
5	10 (early)	5	6	1	0	0	Leakage	Tight
6 ^a	37 (late)	9	–	7 (9) ^b	0	0	Enlarged	^c
7	138 (late)	2	7	1	0	0	Ripped	Tight
8 ^a	167 (late)	5	8	1	0	0	Ripped	Tight
9	250 (late)	3	8	1	0	5 (3) ^b	Ripped	Tight ^d
10	439 (late)	1	8	3 (39) ^b	0	0	Ripped	Tight

^aRevision THA

^bThe mean interdislocation period (weeks)

^cOperated after first arthrography

^dDislocated repeatedly after second arthrography and then operated

Fig. 1 Arthrographic classification of posterior pseudocapsule

Fig. 2A,B Radiographs in case 1. **A** First arthrography was performed 6 days after the second dislocation, showing leakage pattern. **B** Second arthrography was performed 64 weeks after the second dislocation, showing consistent leakage pattern

Fig. 3 Radiograph in case 6. First arthrography was performed 9 days after the seventh dislocation, showing enlarged pattern

Fig. 4A,B Radiographs in case 8. **A** First arthrography was performed 5 days after the dislocation, showing ripped pattern. **B** Second arthrography was performed 8 weeks after the dislocation, showing tight pattern

appearance (ripped pattern). This damage to the pseudocapsule could recover 6–8 weeks after late dislocation.

In this series further dislocation occurred in two patients with early dislocation and three with late dislocation. We were unable to observe pseudocapsule formation after further dislocation in case 3 as revision surgery was performed soon after the first arthrography. The remaining four patients (cases 1, 6, 9) showed differences of the pseudocapsule (prolonged immaturity in case 1, redundancy in cases 6, 9). The diagnosis in case 1 was rheumatoid disease which may have been responsible for prolonged poor pseudocapsule formation. Arthrography in case 10 with repeated late dislocation did not show redundancy;

and the interdislocation period could have been long enough for the damaged pseudocapsule to repair as occurs within 7–8 weeks after late dislocation. Enlargement of the pseudocapsule, as has also been described by Coventry [2], may thus occur after recurrent late dislocation; and we suggest that the ripped pattern might be seen after the initial late dislocation in these patients.

The difference in outcome between the early and late dislocation may partly be explained by the differences in the maturity of the pseudocapsule. That dislocation is more commonly seen early than late after THA may partly be due to poor formation of a pseudocapsule. In addition to the correct alignment of components, appropriate soft tissue reconstruction performed at the time of THA might reduce the incidence of early dislocation as has been reported by Pellicci et al. [8]. We recommend conservative treatment for early dislocation and recognise that factors other than pseudocapsule formation are required for stability. Impingement by osteophytes, polyethylene wear as well as an enlarged pseudocapsule are factors which contribute to late dislocation and simple reefing of the pseudocapsule may not be sufficient for the management of these cases.

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