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ORIGINAL PAPER

Long-term results of hip arthroplasty in ambulatory patients with cerebral palsy

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Abstract Osteoarthritis (OA) secondary to dislocation and dysplasia is a common problem in patients with cerebral palsy. The purpose of this study was to evaluate the results of total hip replacement (THR) in ambulatory patients with cerebral palsy. Eighteen total hip arthroplasties were performed in 16 ambulatory patients with cerebral palsy. The patient's mean age at surgery was 42±8 years (range 32–58 years), and the mean follow-up was 10±6 years (range 2–18 years). Data were obtained by a standardised telephone interview. There was a significant postoperative reduction in pain on the NAS (narrative analogue scale) from 8.4 preoperatively to 1.1 postoperatively (p= 0.002). At follow-up no stem had been revised. Three cups were revised for aseptic loosening at two and six years, and one cup was revised for recurrent dislocation of the hip. One hip was revised for infection 12 years after the index surgery. One hip dislocated (three months postoperatively) and was treated by closed reduction. In ambulatory patients with cerebral palsy and secondary osteoarthritis of the hip THR can provide long-term pain relief and improved function. The rate of long term complications was moderate in this series; however, the dislocation rate was higher than in standard OA cases.

Introduction

In cerebral palsy painful subluxation or dislocation of the hip joint is common and one of the most significant treatment challenges [6, 7, 9, 10, 11]. The extent depends on the status of neuromuscular deficits and early treatment. We frequently find degenerative joint disease causing pain, stiffness, subsequent limitation of walking, sitting ability and limited or impossible provision of basic care by carers [7, 10, 11, 14].

Frequently, subluxed hip joints with artritic deformation of the femoral head and the acetabulum are seen due to secondary osteoarthritis (OA). Resection arthroplasty, Schanz osteotomy, arthrodesis and total hip arthroplasty are treatment options discussed in literature [1, 2, 4, 11–13, 16, 17, 19–21]. Femoral head resection has been proven to be effective in severely dislocated hip joints in completely immobilised patients, whereas this procedure is not a reasonable option in patients with sufficient walking ability and moderate spasticity, because ambulation without walking aids may be severely impaired. However, total hip replacement is controversial in patients with cerebral palsy because of the higher risk of dislocation, early aseptic loosening, ectopic ossification and infection [4, 11, 16].

We report our experience with total hip replacement in 18 paralytic hips in 16 ambulatory patients with cerebral palsy with a follow-up of 10±6 years (range 2–18 years).

Material and methods

Between 1988 and 2004 18 total hip arthroplasties were performed in 16 ambulatory patients with cerebral palsy in our institution. Eight patients had spastic quadriplegic cerebral palsy, three were hemiplegic on the operated side and four were diplegic. In one patient cerebral palsy had not been classified. Ten female and six male patients were treated. Total hip replacement was performed in 12 right and six left hips. Two patients had a bilateral arthroplasty.

The indication for surgery in all patients was a painful osteoarthritis with severely limited functional ability.

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Two patients with two hips were lost and one patient with one hip died six years after the index surgery of an unrelated cause, so we evaluated data of 13 patients with 15 hips. The mean follow-up was 10±6 years (range two to 18 years) in this study. The mean patients age at the time of surgery was 42±8 years (range 32–58).

Operative technique

All total hip replacements were performed under general anaesthesia. In cases of muscular contractures around the hip joint, soft-tissue releases were performed to prevent early dislocation of the hip in six patients (Table 1). These involved tenotomy of the adductor tendons (n=5), lengthening of the adductor tendons (n=1), psoas- and rectus tendon release (n=4) and transposition of the outer rotators (n=1). In all cases the transgluteal lateral Bauer approach with the patient in the supine position was used.

Different combinations of implants were used (Table 1).

After surgery, five patients were treated in an abduction brace and two patients were treated with a hip spica for six weeks. All patients had physiotherapy after operation or treatment in the plaster cast. Direct full weight bearing was allowed if partial weight bearing was not tolerated for their neuromuscular condition.

Radiographical evaluation

Immediately after operation anteriorposterior radiographs of the hip joint were taken and evaluated.

Clinical evaluation

Charts and radiographs of the 13 patients who underwent total hip replacement were reviewed. Clinical follow-up was obtained by a standardised telephone interview. As these patients, with their special mental and physical condition, do not meet the criteria for generally used evaluation tools like Harris-hip score, Merle-D'Aubigne score, SF-36 score, etc., we used a standardised questionnaire that we adapted to the special needs of these impaired patients.

Patients were either interviewed themselves (n=5) or questions were answered by carers (family or nurses) n=8).

Patients or carers were asked about walking ability before and after surgery. They could state walking ability as being (1) unable to walk, (2) able to walk with a walker, (3)

Table 1 Patient demographics, diagnosis, additional procedures and implants

Patient no.	Gender	Age (y)	Side	Classification of spastic	Cup	Stem	Additional procedures
1	Female	36	Right	Tetraplegia	Uncemented press-fit	Uncemented	Tenotomy of the adductor tendons
2	Female	49	Left	Hemiplegia	Uncemented press-fit	Uncemented	
3	Female	57	Right	Hemiplegia	Uncemented threaded	Uncemented	
4	Female	32	Right	Diplegia	Uncemented threaded	Uncemented	Lengthening of the adductor tendons
5	Female	37	Left	Diplegia	Uncemented threaded	Uncemented	
5	Female	37	Right	Diplegia	Uncemented threaded	Uncemented	
6	Female	47	Left	Tetraplegia	Cemented cup	Cemented	
7	Female	51	Right	Tetraplegia	Cemented cup	Cemented	
8	Female	52	Right	Tetraplegia	Uncemented press-fit	Uncemented	Psoas- and rectus tendon release, tenotomy of the adductor tendons
9	Male	37	Right	Hemiplegia	Cemented cup	Cemented	
10	Male	44	Right	Paraplegia	Cemented cup	Cemented	Tenotomy of the adductor tendons, psoas- and rectus tendon release, transposition of the outer rotators
11	Male	38	Right	Tetraplegia	Uncemented press-fit	Uncemented	
11	Male	38	Left	Tetraplegia	Uncemented press-fit	Uncemented	
12	Male	34	Left	Diplegia	Constrained cup	Uncemented	Tenotomy of the adductor tendons
13	Male	36	Right	Tetraplegia	Uncemented press-fit	Uncemented	P5soas- and rectus tendon release, tenotomy of the adductor tendons

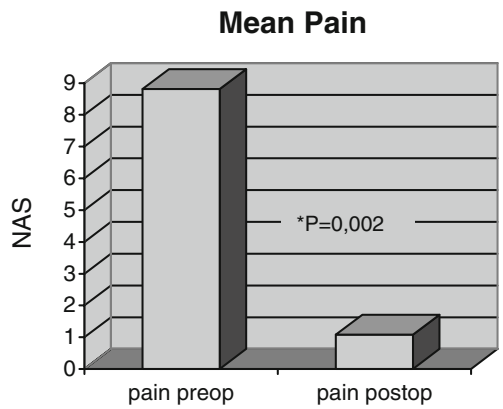

Fig. 1 Mean pain on a narrative analogue scale pre- and postoperatively

able to walk with crutches or (4) free walking ability. They were asked whether perinal care was (1) free or (2) restricted pre- and postoperative. Pain was assessed by narrative analogue scale (NAS) from 0 to 10 pre- and postoperatively. They were asked questions about pain in the contralateral hip, previous operations on the operated hip, postoperative treatment, postoperative complications and possible revision surgeries.

Results

Complications

At follow-up no stem had been revised. Three cups were revised—two hips due to aseptic loosening after two and six years and one because of recurrent dislocation of the hips. One hip was revised for infection 12 years postoperatively. There was one dislocation which was reduced under anaesthesia and was stable thereafter. No periprosthetic fractures occurred peri- or postoperatively.

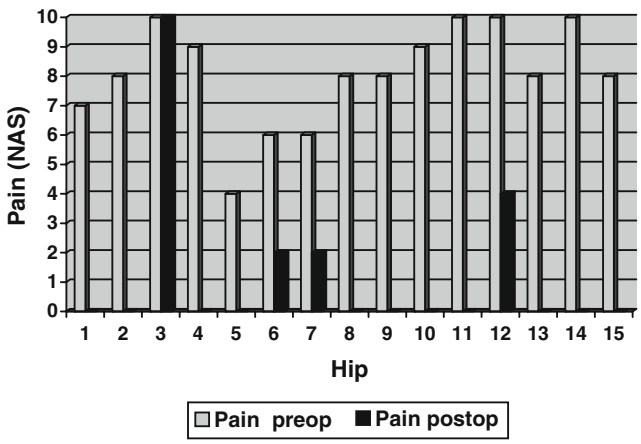

Fig. 2 Pain in the index hip pre- and postoperative

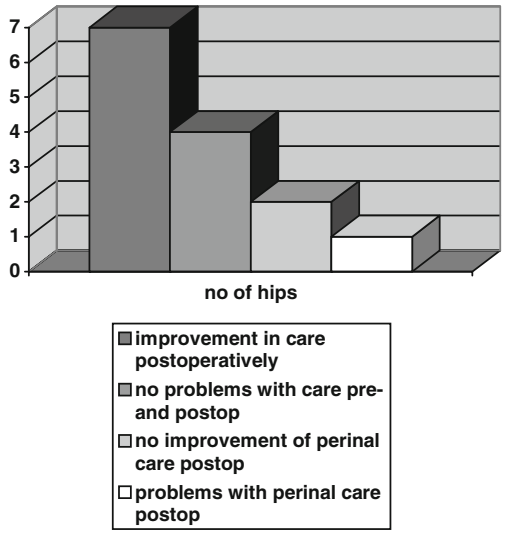

Fig. 3 Improvement in perinal care

Clinical results

Ten patients were pain free at follow-up (NAS scale), one patient reported pain of grade 2 on the narrative analogue scale in both operated hips, one patient had pain grade 4 and one grade 10 on a narrative analogue scale. There was a significant reduction of mean pain from 8.4 on the NAS preoperative to 1.1 on the NAS postoperative (p=0.002) (Figs. 1 and 2).

In nine hips, carers reported problems with hygienic care preoperatively that improved in seven cases. In two cases carers did not see any improvement. One patient without hygienic care problems before operation had problems postoperatively. Four patients did not experience any problems with care before or after total hip replacement (Fig. 3).

In three preoperative nonambulatory patients the walking ability improved. Those patients walked without any walking aids postoperatively. Two patients had an improvement from using walking aids to free walking. Two patients that walked without walking aids needed walking sticks postoperatively (Fig. 4).

Discussion

Painful osteoarthritis of the hip after acquired hip subluxation or dislocation following dysplasia remains a common problem in cerebral palsy [6, 7, 10]. If treatment procedures to prevent osteoarthritis are not effective and the hip has reached the point of painful degeneration, therapy options vary from different forms of resection arthroplasty, redirectional osteotomies, arthrodesis and total hip arthroplasty [1, 2, 4, 11–13, 16, 17, 19, 21].

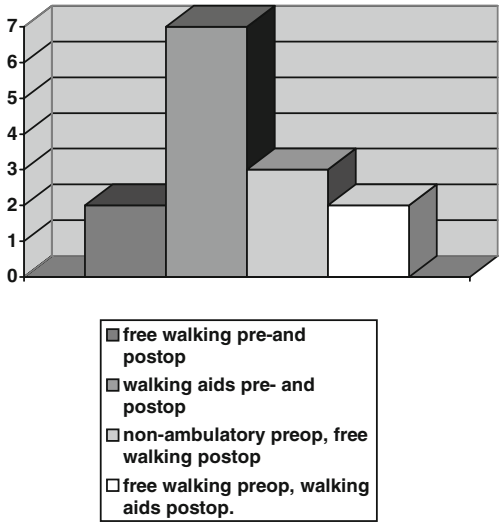

Fig. 4 Improvement in walking ability pre- versus postoperatively

In ambulatory patients, resection arthroplasty is not a satisfactory treatment option [2]. Even in nonambulatory patients with cerebral palsy Koffman et al. report of continuous pain in ten patients postoperatively. Only sitting tolerance was shown to improve in their study [11]. Schejbalova et al. reported 98% pain relief in nonambulatory patients with irreducible dislocation of the hip treated by Schanz proximal valgus osteotomy, which is not a treatment option in ambulatory patients [17].

Arthrodesis often leads to back pain, ipsilateral knee pain and contralateral hip pain [5]. It therefore is considered a contraindication especially in ambulatory patients with cerebral palsy with back pain or advanced osteoarthritis in contralateral hip joints [3, 7, 16, 20]. These patients usually have difficulties in walking because of their neuromuscular disorders with spastic muscle contractions. Pain in adjacent joints could increase the risk of loss of walking ability. The difficulties in walking with a stiff hip are well documented and can lead to unresolved problems for spastic patients. Patients with cerebral palsy seem to have a higher rate of nonunion. Out of eight patients with cerebral palsy who had a unilateral painful subluxed or dislocated hip, Root et al. noted successful fusion of the arthrodesis in six and nonunion in two which required a second procedure [16].

Even in cases where hip arthrodesis is not a contraindication, the preservation of hip motion should permit better patient care. In our series 12 out of the 13 operated patients had improvement in care; care deteriorated postoperatively in only one patient.

Total hip arthroplasty is an alternative, although the estimated risks of dislocation as well as rates of loosening and infection are considerably higher than in standard cases of osteoarthritis [4, 8, 16, 18].

Our investigation is the first study reporting long-term follow-up results in a large series of ambulatory patients with cerebral palsy after total hip arthroplasty. There is only limited data on hip arthroplasty in cerebral palsy in the literature. Patient groupings are often inconsistent and include neuromuscularly impaired patients with mental retardation, Down syndrome, schizophrenic patients and patients with cerebral palsy [15, 19]. Different groups have reported experience with total hip replacement in non-ambulatory patients and ambulatory patients with cerebral palsy [8, 16, 18]. Other investigations report results of small numbers of patients with cerebral palsy [11].

In our series dislocation rates are slightly higher than those reported in literature. Root et al. reported recurrent dislocation in two cases of 15 operated hips [16], and Buly et al. documented two cases in a collective of 18 due to incorrect implant orientation that were successfully treated by changing the prosthetic components [4]. Skoff et al. did not see any dislocations [19]. It remains unclear whether dislocation and revision rates in our series are slightly higher because only ambulatory spastic patients were included or whether other reasons are responsible. There was no correlation between the postoperative treatment in an abduction brace or abduction pillow and recurrent dislocation. All our patients with dislocation were treated with these devices after operation. Three patients that were treated without brace or pillow had no dislocation. Nevertheless, abduction pillows or hip spicas should be recommended for six weeks after operation to prevent dislocation.

In six hips soft tissue releases were performed. Only one of those hips had an aseptic loosening of the cup. In nine hips without soft tissue releases we saw two aseptic cup loosening and two cup dislocations. These results seem to point out that soft tissue releases in total hip replacements in patients with cerebral palsy might achieve better stability of the implant. To establish muscular balance around the hip joint, particularly for the adductors, is one of the difficulties. Tenotomy of the adductor muscles could lead to over-correction. This can be done at the end of the arthroplasty procedure if the stability of the hip prosthesis is compromised and adduction is tolerable.

The low incidence of loosening of the stem could be related to diminished activity levels. Patients with cerebral palsy might walk less compared to other patients with osteoarthrosis of the hip. They also frequently use walking sticks and other remedies.

This study confirms significant long-term average pain reduction after total hip replacement in patients with cerebral palsy.

Limitations of this study are the small number of patients, a great variety of implants and limited information on outcome because of the evaluation by telephone interview.

In conclusion, total hip replacement is an effective surgical procedure to treat painful arthritic hips in ambulatory patients with cerebral palsy. Stability of the cup and dislocations appear to be the main challenge. Large femoral heads might decrease the risk of dislocation. However, further investigations are needed to learn more about pelvic and femoral anatomy, muscle tension and bone stock in these patients.

Conflict of interest The authors declare that they have no conflict of interest.

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