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ORIGINAL STUDY

The McHale procedure in the treatment of the painful chronically dislocated hip in adolescents and adults with cerebral palsy

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We retrospectively studied the results achieved in adolescent and adult patients with cerebral palsy, following management of chronically painful dislocated hips with the McHale procedure.

Thirteen patients with seventeen procedures were included in the study. The indication for surgery was pain in all patients. Limitation in sitting was also reported in eight cases and nursing care was difficult in ten of thirteen patients.

All patients underwent clinical and radiological examination of the hips, and a questionnaire was answered by both parents and caretakers.

Improvement was noted in all patients with respect to pain. In six patients sitting was tolerated for longer intervals and 10 out of 13 patients were easier to nurse owing to improved mobility of the hip.

Although these results appear promising, the procedure had a high complication rate, including heterotopic ossification, residual pain caused by hardware, fracture and pulmonary complications, for which a second procedure was necessary in several cases. There was also in several cases a prolonged period of pain postoperatively, for which an additional procedure was needed in eight patients.

The McHale procedure is a technique that can provide pain relief and improvement in motion. There is however a high incidence of failure and complications.

Keywords : cerebral palsy ; hip dislocation ; McHale procedure.

INTRODUCTION

Hip dislocation and subluxation are among severe problems associated with cerebral palsy (CP). Additionally, there is often mental retardation and other physical problems.

A chronically dislocated hip, when present for several years, will cause severe pain in more than 50% of patients (*3*).

In young children with CP, hip dislocation can be prevented by bracing or by surgical treatment as soon as subluxation occurs. If the hip dislocates, it can often still be reduced in young infants, who will also benefit from the remaining growth with its remodelling capacity.

In an adolescent, however, reduction of the hip is not recommended since it does not achieve pain

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Table I. — Data on patients, complications and reoperations after McHale osteotomy

Patient	side	gender	Age at surgery	Follow up	complications	reoperations
1	R	M	21 y	51 m	None	
2	R	M	13 y	48 m	Persistent pain, heterotopic ossification	Removal of hardware
2	L			48 m	Persistent pain	Proximal femoral resection
3	R	M	40 y	87 m	none	Elective hardware removal
3	L		36 y	57 m	none	
4	R	M	18 y	132 m	Persistent pain	Removal of hardware
5	L	M	30 y	124 m	Femur fracture	Proximal femoral resection
6	R	M	16 y	107 m	Screw protruding in acetabulum	Removal hardware
7	R	M	29 y	44 m	Heterotopic ossification	
8	L	F	25 y	65 m	Persistent pain	Removal of hardware
9	L	F	21 y	90 m	Persistent pain	Removal of hardware
10	R	F	14 y	101 m	Persistent pain	Removal of hardware
10	L		14 y	101 m	Persistent pain	Removal of hardware
11	R	M	10 y	23 m	Persistent pain	Removal of hardeware
11	L		10 y	23 m	Failure of hardware- dislocation lesser trochanter	Removal of hardware
12	L	M	18 y	29 m	Pneumonia, fibrous ankylosis hip	
13	R	F	27 y	41 m	Persistent pain	Removal of hardware

control. Other treatment options should be considered. Many procedures have been described including nonoperative treatment, soft tissue release, Girdlestone's resection arthroplasty, femoral head resection-interposition arthroplasty, hip arthrodesis, total hip replacement and the McHale procedure. The choice between these options is generally based on the functionality and the complaints of the patient.

The McHale procedure aims at relieving pain, restoring mobility and making sitting and nursing care possible in the adolescent and adult non-ambulatory CP patient.

PATIENTS AND MATERIALS

Twenty patients with spastic quadriplegia underwent a McHale procedure in our department, between 1994 and 2004.Thirteen patients (17 hips) could be evaluated. Two patients died of unrelated causes and five moved without leaving a contact address.

All thirteen patients were recalled to the orthopaedic clinic for an extended questionnaire, a clinical examination and radiological evaluation of hip and pelvis. Six patients were unable to return. Their parents and care takers were interviewed by telephone and a clinical examination of the hip mobility was performed by the general practitioner or the physiotherapist. A recent radiograph was sent to the department.

The mean age at surgery was 21 years (range, 10-40 years) (table I).

The main indication for surgery was pain in all patients. Five patients also had problems with sitting : three had pain after sitting in a custom made wheelchair for one hour, one patient could not sit at all because hip flexion was too painful, and one patient had never been able to sit. Nursing care was more or less difficult for eleven patients owing to pain and extreme flexion adduction contracture of the hip.

Five patients had already undergone psoas and adductor release during infancy in an attempt to prevent hip dislocation. One patient had undergone a bilateral varus-derotation osteotomy, combined with soft tissue release. Seven patients had no previous hip surgery.

Operative technique

The hip was exposed through a lateral approach. After incision of the capsule, the femoral head, often distorded with erosive cartilage changes, was exposed. Using an oscillating saw the femoral head was removed at the base of the femoral neck. A laterally based wedge of bone was removed at the level of the lesser trochanter to perform a

Fig. 1. — Preoperative radiograph showing hip dislocation on the right side. A : AP view of the pelvis : B : Lateral view of right hip

Fig. 2. — Postoperative radiograph of the patient in fig 1 after a successful McHale procedure on the right side with the lesser trochanter positioned in the acetabulum.

closing wedge valgus osteotomy. The osteotomy was fixed with a plate and six screws. The lesser trochanter was placed into the acetabulum. The ligamentum teres was attached to the lesser trochanter by suturing to the psoas tendon, hence stabilising the lesser trochanter into the acetabulum (fig 1 & 2).

After capsulorrhaphy the wound was closed in layers with a suction drain in place.

Postoperative care

The postoperative care varied and was based upon the intraoperative findings and upon the former activity level of the patient.

Four patients were immobilised in a hip spica cast for 3 to 6 weeks, three patients had long leg casts in abduction, one patient was placed in skin traction for 10 days, five patients only used a abduction pillow.

RESULTS

We evaluated the patients 23 to 132 months postoperatively (with an average of 69 months). Most patients had not been in follow-up for several years and were thus re-evaluated after a long period of time.

We assessed pain, range of motion (ROM) of the hips and ability to tolerate sitting and nursing care (table II).

On radiographs the presence of heterotopic bone formation and proximal migration of the femur was evaluated.

Parents and caretakers asked about complaints of pain declared that there was a significant improvement postoperatively : the pain disappeared completely in nine of the thirteen patients. One patient who underwent a bilateral McHale procedure,

Table II. — Results after McHale osteotomy

Patient	Side	Pain	Perineal care	Sitting ability	Hip flexion (°)	Hip abduction
1	R	Pain free	improvement	improvement	120	50
2	R	periodically	improvement	No change	90	50
2	L	periodically	improvement	No change	90	50
3	R	Pain free	improvement	improvement	70	50
3	L	painfree	improvement	improvement	90	40
4	R	Pain free	no change	improvement	70	40
5	L	Pain free	No change	improvement	70	30
6	R	Pain free	No change	No change	90	35
7	R	improvement	improvement	No change	90	35
8	L	Pain free	Improvement	improvement	90	20
9	L	Pain free	Improvement	No change	90	30
10	R	Pain free	Improvement	No change	90	35
10	L	Pain free	improvement	No change	90	30
11	R	Painful left hip	improvement	No change	90	30
11	L	periodically	improvement	No change	90	25
12	L	Pain free	improvement	Improvement	90	5
13	R	improvement	improvement	No change	90	25

continued to experience pain during short periods of time every day, according to his caretakers, but they however observed a major improvement. Another patient with a bilateral procedure had one pain free hip, but the other hip was periodically more painful than preoperatively because of a dislocation of the lesser trochanter from the acetabulum, causing proximal migration of the femur.

The last two patients still had some pain when placed in their customized wheelchair for longer intervals or when the hip was manipulated.

Six patients were able to sit for longer pain-free intervals than before surgery, but the ability to sit did not change for seven patients.

According to the caretakers, nursing was easier for ten of the thirteen patients, because of absence of pain, but moreover, because of the improvement in hip mobility. For three patients no difference in nursing care was reported.

On assessing ROM of the hip, we found a hip flexion of at least 90° in 14 of 17 hips. ; flexion was limited to 70° in three patients. Eleven of seventeen operated hips reached full extension. In four hips, there was a deficit of extension of 10° to 30°. In two patients the hips were nearly fixed in 90° of flexion. There was an average abduction of 35° in 16 hips, with a range from 20° to 50°. Only in one patient was abduction very limited because of pain.

Postoperative radiographs showed minimal heterotopic ossification in two hips, 3 months postoperatively. Indomethacine was started immediately in these patients to prevent further ossification. Follow-up radiographs showed no further evolution and the ossifications were asymptomatic.

The surgery, however, had a high complication rate. During the first two years after surgery seven patients had prolonged pain about the operated hip (table I).

In one patient there was a failure of the osteosynthesis with dislocation of the lesser trochanter on the left side . This patient also underwent a McHale osteotomy on the right side without any problem. The hardware was removed on both sides without further surgery on the failed side. In another patient one of the screws was protruding into the acetabulum. The radiographs of the five remaining patients did not show any abnormality possibly causing the pain. One of these five patients underwent removal of hardware on the right side, while on the left side a proximal femoral resection below the lesser trochanter was performed because of persisting irritation after removal of plate and screws (fig 3 & 4).

Fig. 3. — Preoperative radiograph showing bilateral dislocation of the hip (hardware from derotation osteotomy *in situ* on the right side).

Fig. 4. — Final radiograph of the patient in fig 3, appearance after successful McHale osteotomy on the right side and proximal femoral resection because of pain on the left side.

After hardware removal five of these seven patients were completely free of pain. In a sixth patient, there was significant improvement in pain, and only the patient with redislocation still had periodically more pain.

Another patient fractured his femur at the level of the most distal screw. A proximal femoral resection at the level of the fracture was performed. In both patients with femoral resection, minimal heterotopic ossification and proximal migration was seen, but they were both pain free with a sufficient range of motion.

One patient developed a severe postoperative pulmonary infection. She was admitted to an intensive care unit for two months. Because of this immobilisation, she developed fibrous ankylosis of the hip, which was fixed in 90° of flexion and 25° of abduction, without pain however. According to her caregivers, this did not cause functional problems thanks to the use of a custom made orthosis.

In a last patient, the plate and screws were removed on an elective basis during anaesthesia for a contralateral McHale procedure. The hardware was eventually removed in 11 of 17 hips and a proximal femoral resection was performed in two other hips.

DISCUSSION

In very young children, hip subluxation and dislocation can be corrected with soft tissue release or femoral and pelvic osteotomies. Onimus *et al* (*8*) demonstrated in 1991 that adductor and psoas tenotomies are preferably performed between 2 and 3 years of age, before a hip dysplasia develops. Soft tissue release performed before the age of 4 could prevent lateral migration of the hip in 90% of the children concerned.

Surgery on very young children is not always a guarantee that dislocation will not occur at a later age. Settecerri *et al* (*9*) described a redislocation rate of 16% after 5 years in children who underwent a varus osteotomy of the femur for subluxation or dislocation of the hip.

Treatment of a painful, chronically dislocated hip in adolescents and adults with spastic quadriplegia is a difficult task. Reduction of the hip is no longer an adequate treatment as the remodelling capacity is lost and often both femoral head and acetabulum are severely dysplastic.

The patients in this study were severely disabled and were wheelchair bound or bedridden. In such cases an operation will rarely improve function, but

quality of life can often be improved. The goal of an operative procedure is in the first place to relieve pain, restore ability to sit and ease perineal care.

Various procedures can be used in the treatment of the chronically dislocated hip in adults and adolescents : resection of the femoral head with or without interposition arthroplasty, subtrochanteric valgus osteotomy, hip arthrodesis, total hip replacement or the McHale procedure.

All these techniques seem to result in pain reduction, but each procedure has its advantages and limitations.

A first therapeutic option is resection of the femoral head. Girdlestone described a procedure consisting of resection of the femoral head alone, but this procedure is less successful in patients with spasticity because of proximal migration of the shaft back into the acetabulum (*6*). An alternative is resection of the femoral head with interposition of soft tissues. Postoperative skeletal or skin traction is used to prevent proximal migration. This technique gives good initial pain control, although maximal pain relief was only achieved 5 months after surgery. However when proximal migration of the femur occurs because of progressive increase of adductor contracture, leading to heterotopic ossification, pain often increases again, although ability to sit is mostly well preserved (*2, 11*). Leet *et al* (*6*) compared patients treated with a femoral head resection interposition arthroplasty with patients who underwent a McHale procedure. They saw in both groups that there was decrease in hip pain and improved sitting tolerance, but there was a shorter hospital stay and a lower complication rate in those treated with the McHale osteotomy. The higher complication rate in the group treated with only femoral head resection was probably due to a longer period in a recumbent position. There was also a higher incidence of heterotopic ossification and proximal migration of the femur in the patients treated with proximal femoral resection-interposition arthroplasty. The results reported by Leet *et al* (*6*) seem to be superior to those in our series, mainly because of the absence of reintervention.

Subtrochanteric valgus osteotomy is another valuable treatment option according to Hogan *et al* (*5*). They investigated the results of this procedure in 24 non-ambulatory patients (31 hips). According to their study there was relief of pain and improvement in ease of care and transfers. The most important criticism on this procedure is postoperative pain and development of pressure ulcers due to the retained femoral head. They report a resection of the femoral head in only three patients : one at primary surgery and two in a second procedure in combination with hardware removal because of persisting pain. Although there were a number of early complications such as pulmonary and urinary tract infections, all patients seemed to have adequate pain control and increased tolerance for sitting. Outcome was not influenced by these early complications.

Fucs *et al* (*4*) reported on 14 patients with cerebral palsy with a painful chronically dislocated hip, treated with hip arthrodesis. All patients were pain free after surgery. The hip was fixed in an acceptable flexion and abduction position. In a few patients function even improved after the operation. A hip arthrodesis however cannot be performed in patients with deformity of the contralateral hip or important disorders of the spine. An added disadvantage is the need to apply a hip spica during several weeks.

A further treatment option is total hip arthroplasty. Buly *et al* (*1*) reported an improvement in pain complaints in 94% of the patients. The prosthesis had to be removed in only 14% in the course of 10 years. The population described by Buly *et al* is a very heterogeneous group of cerebral palsy patients. It is uncertain which results would be achieved in patients with total body involvement such as in spastic quadriparalysis. It is also a rather invasive operation with an identified morbidity and mortality.

McHale *et al* developed a new procedure in 1991 (*7*) : they combined resection of the femoral head with a subtrochanteric valgus osteotomy. This operation was used in five patients (six hips). After an average follow-up of 37 months, pain free mobility was achieved with an average flexion of 90° and an average abduction of 30°. All patients were able to sit for longer pain free intervals. Evaluation of radiographs showed no proximal migration, and minimal heterotopic ossification was

seen in only one patient. The plate had to be removed in one patient because of persisting pain ; in another patient it was removed on an elective basis during anaesthesia for spine surgery.

In our series with a longer follow-up, we found comparable results concerning pain control and mobility. However, we saw more hardware complications and a higher incidence of heterotopic ossification, which does not seem to affect the comfort of the patients. In our series two patients also underwent a proximal femoral resection and one hip redislocated, which is a failure rate of 17%

The McHale procedure certainly reaches the goal of pain control in patients with painful chronically dislocated hips. All patients had enough mobility to be able to sit and to make nursing care possible. There was an important improvement in quality of life.

In eleven of thirteen patients, parents and care takers were satisfied with the result of the operation and would opt for the same procedure again.

However we did observe that nine of thirteen patients had to undergo further surgery. In seven patients there was irritation and pain caused by the hardware, and one patient had a fracture of the femur.

In one patient the postoperative period was complicated with severe respiratory problems. It is known that patients with quadriplegia have a high risk to develop postoperative problems, especially when multilevel disability is present. Furthermore there is an important fracture risk due to disuse osteopenia (*10*). The necessity to perform a second operation is however a drawback that should not be overlooked.

CONCLUSION

For a painful chronically dislocated hip in cerebral palsy, only surgery can be an adequate solution. Several techniques are commonly applied, each with its own indications, advantages and disadvantages.

The McHale procedure can provide pain control, increase sitting tolerance and ease nursing care, in the treatment of a painful hip dislocation in adolescent and adult non-ambulatory patients with spastic quadriplegia. However, the technique has a high failure rate. The majority of our patients needed a second intervention because of persisting pain after surgery. Various alternative techniques are described that also achieve these goals and should perhaps be considered valuable alternatives to the McHale osteotomy.

In our department the McHale osteotomy is seldom performed. Only a patient with spastic quadriplegia who is not ambulatory and suffers severe pain from a hip dislocation, is considered a candidate for this procedure. With this technique proximal migration of the femur and heterotopic ossification are rarely seen. Therefore we still prefer this procedure to femoral head resection in the treatment of a chronically dislocated hip in a patient with spastic quadriplegia.

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