Clinical Study

McHale Operation in Patients with Neglected Hip Dislocations: The Importance of Locking Plates

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Neglected hip dislocation in patients with cerebral palsy is a challenge for the pediatric orthopedic surgeon. Many patients experience pain, limitation of hip motion, and sitting and hygiene problems. Arthrodesis, proximal femoral head resection, and subtrochanteric valgus osteotomy are effective salvage procedures for patients with painful hip dislocation and restricted hip motion when reconstruction of the hip is not possible. Osteopenia is one of the problems that can complicate the postoperative course in these patients. Postoperative cast immobilization may further worsen the osteopenia and can predispose to fractures of the femur after cast removal. Standard plating of the proximal osteotomy may not always provide adequate stability of the fixation. In order to prevent postoperative osteoporotic fractures we use locking plates, without casting. Since 2003 until 2011, we operated on 9 patients (14 hips) with painful neglected hip dislocations. The first three patients (five hips) were operated on using standard nonlocking plates. All other patients (nine hips) were operated on using locking plates. During the followup, the hardware failed in one of these cases. All patients treated with locking plates had not been casted postoperatively, and none had loss of fixation or fractures during the followup.

1. Introduction

Neglected hip dislocation in patients with cerebral palsy is not an unusual problem in patients with severe neurological involvement [1–4]. Usually these patients are nonambulators categorized as gross motor function classification system (GMFCS) of five. Nearly 90 percent of GMFCS IV patients develop some degree of hip displacement [1]. The ideal treatment for hip displacement (dislocation or subluxation) is hip reconstruction combining soft tissue release, varus derotational osteotomy of the femur, and pelvic osteotomy [5–8]. When the femoral head is severely deformed and the acetabulum is too shallow for hip reduction, salvage procedures might be indicated. These patients usually experience hip pain, and their condition does not allow appropriate sitting or adequate nursing and hygiene (Figure 1). Described salvage procedures for nonreconstructible hips include proximal femoral head resection [4, 9, 10], valgus osteotomy [11–13], hip arthrodesis [14, 15], and total hip arthroplasty [16]. In 1990, McHale et al. described their technique of

subtrochanteric valgus osteotomy in 5 patients with spastic quadriplegia [11]. All patients were nonambulators and all achieved reasonable results after the procedure. This procedure became popular in cases in which hip reconstruction is not feasible. The technique involves using standard nonlocking plates and spica casting postoperatively to further secure the fixation. Known complications after the McHale procedure are persistent pain, femur fracture, and hardware failure [17].

Patients with severe cerebral palsy frequently suffer from osteopenia, disuse osteoporosis, and bone fragility [18, 19]. In fact, cerebral palsy is the most prevalent childhood condition associated with osteoporosis [20]. Furthermore, bone volumetric density decreases with increasing GMFCS level [21]. This condition may lead to hardware loosening and failure.

In addition, application of a spica cast following surgery in cerebral palsy patients may be associated with osteopenic disuse fractures, mostly distal femur and proximal tibia [5, 7, 22, 23].

FIGURE 1: Neglected hip dislocation complicated by hip contracture, nursing difficulties, and subsequent pressure sores.

In modern fracture surgery, locking plates gained increasing popularity due to increased rigidity and fracture site stability. These benefits can be precious when treating severe osteoporotic bones, as seen in nonambulatory cerebral palsy patients. Moreover, using these plates might eliminate the need for further securing the fixation with casts and may lead to decreased morbidity following surgery. These plates have been described as alternatives to traditional nonlocking plates in cerebral palsy patients undergoing proximal femoral varus osteotomy [24]. These plates provided stable fixation and are advantageous in osteoporotic bone.

In this study we describe a modification of the original McHale procedure. Instead of using standard plates, we use locking plates, which in turn allow us not to use spica casts postoperatively.

2. Patients and Methods

During 9 years (2003–2011) we operated on 9 patients (14 hips), with neglected hip dislocations (Table 1). All patients had cerebral palsy with spastic diplegia. All patients were GMFCS level 5. Mean age at the time of operation was 18.3 years (range 14–23). All patients suffered from limitation of abduction on the site of the dislocated hip, pain during sitting, and hygiene problems. Five patients were never operated on before, two underwent adductor release, and two others underwent soft tissue release and varus derotation osteotomy.

2.1. Operative Technique. A bump should be placed underneath the sacrum in order to improve access to the affected hip joint. Anterolateral Watson-Jones approach gives excellent exposure to the hip joint and proximal femur (Figure 2(a)). Resection of the femoral head (Figure 2(b)) is performed while the ligamentum teres is preserved for further attachment to the iliopsoas tendon. Subtrochanteric open wedge valgus osteotomy is performed distal to the lesser trochanter taking into account that 3 holes of the LCP plate should be proximal to the created osteotomy. After attachment of the ligamentum teres to the iliopsoas tendon, as originally described by McHale, a 4.5 mm LCP plate (locking compression plate, Synthes) is prebent and contoured to accommodate to the shape of the femur after the osteotomy. The plate is then fixed to the femur using locking screws.

An abduction pillow is used for the first 3 weeks after the operation. Gentle passive range of motion and sitting in a wheelchair is allowed immediately following surgery.

3. Results

Mean follow-up period was 74.8 weeks. The first 3 patients were operated on using standard nonlocking broad DCP plates (dynamic compression plate, Synthes). No spica cast was applied following surgery. One patient with bilateral procedure (Figure 3(a)) had lost plate fixation on the right side two weeks postoperatively. The patient was reoperated on using a LCP plate, and a spica cast was applied postoperatively for 3 weeks (Figure 3(b)). After removal of the spica cast pain and swelling were noted over the distal thigh and radiographs revealed a supracondylar femoral fracture (Figure 3(c)). Since then, we changed our protocol and the last six patients were operated on using 4.5 mm LCP plates (Figures 4(a) and 4(b)). Spica cast was not applied postoperatively. All nine patients achieved the preoperative goal: prolonged sitting, unrestricted abduction with easier change of diapers, and perineal care. In the LCP group, none had loss of fixation or post operative fractures.

4. Discussion

Hip displacement is common in nonambulatory cerebral palsy patients with severe neuromuscular involvement. According to Soo et al. [1], the incidence of hip displacement ranges from 0% in patients with gross motor function classification system level 1 (GMFCS) to 90% in patients with GMFCS level 5. Restriction of abduction, pain, pressure sores, and difficulty with sitting and perineal hygiene are well described [2, 3, 12, 25]. However, some advocate that the incidence of pain in patients with hip dislocation is low and neither hip displacement nor osteoarthritis is associated with hip pain. Noonan et al. suggested that surgical treatment should be based on the presence of pain and contracture and not on radiographic appearance of dislocation [26].

The treatment of hip subluxation and dislocation might be challenging. Early careful monitoring may prevent dislocation [27]. However, neglected hip displacement is still common in severely disabled patients with cerebral palsy. Surgical treatment for neglected hip dislocations includes constructive or salvage procedures, from total hip arthroplasty [16], to hip reconstruction [6, 7], subtrochanteric valgus osteotomy without resection of the femoral head [13], resection of the femoral head [9, 28, 29], resection of the femoral head with articulated hip distraction [30], and subtrochanteric valgus osteotomy with femoral head resection [11, 12]. Arthrodesis [14] is another option for nonreconstructible hips.

In 1978 Castle and Schneider [9] described proximal femoral resection and interposition arthroplasty in 12 patients and 14 hips (Castle procedure). The proximal femoral head was resected below the lesser trochanter, and a capsular flap across the acetabulum was constructed. The quadriceps muscle was sutured around the resected end of the femur. Postoperatively all patients were placed in Russell's traction

TABLE 1

N	Age/sex	Diagnosis/GMFCS	Previous hip surgeries	Fixation side	Postoperative spica cast	Followup (weeks)	Complications
1	14/F	Spastic diplegia Bilateral hip dislocation GMFCS 4	STR and VDRO	Nonlocking plate Unilateral	No	108	No
2	16/F	Spastic diplegia GMFCS 5	STR	Nonlocking plating Bilateral Reoperation on the Rt side using locking plate	Initially no 3 weeks of spica following reoperation	103	Loss of fixation on the right femur Reoperation and supracondylar fracture after cast removal
3	19/M	Spastic diplegia GMFCS 5	No	Nonlocking plating Bilateral	For 4 weeks	95	No
4	17	Spastic diplegia GMFCS 5	STR and VDRO	Bilateral LCP	No	87	No
5	23	Spastic diplegia GMFCS 5	No	Unilateral LCP	No	81	No
6	19	Spastic diplegia GMFCS 5	No	Bilateral LCP	No	69	No
7	21	Spastic diplegia GMFCS 5	No	Unilateral LCP	No	56	No
8	19	Spastic diplegia GMFCS 5	STR	Unilateral LCP	No	49	Skin irritation that resolved after plate removal
9	17	Spastic diplegia GMFCS 5	No	Bilateral LCP	No	26	No

STR: soft tissue release.

VDRO: varus derotational osteotomy.

GMFCS: gross motor function classification system.

F: female.

M: male.

FIGURE 2: (a) Watson-Jones approach; note wide exposure of the femoral head and proximal shaft. (b) Resection of the femoral head with preservation of ligamentum teres.

FIGURE 3: (a) Bilateral procedure with fixation failure on the right side two weeks postoperatively. (b) Reoperation using a LCP plate and a spica cast. (c) Supracondylar femoral fracture after removal of spica cast.

FIGURE 4: (a) Preoperative radiograph of bilateral hip displacement. Dislocation on the right hip and subluxation on the left hip. (b) Postoperative radiograph of bilateral modified McHale operation, using locking compression plates, and no spica cast.

until healing of soft tissues. These measures were taken in order to prevent recurrence of pain and deformity and proximal migration with gradual adduction deformity. Knaus and Terjesen [28] and Widmann et al. [29] described a similar procedure utilizing interposition of the iliopsoas and gluteal muscles to the hip capsule with improvement of pain, sitting ability, and perineal care.

McHale et al. presented their technique in 1990 in order to lessen the problems associated with the previously

described procedures, especially proximal migration of the femur. In their method, placement of the lesser trochanter in the acetabulum prevents proximal migration. Removing the femoral head prevents the pressure generated from the prominence of the femoral head. Furthermore, this technique moves the abductor force laterally. This in turn directs the remaining femur strongly into the acetabulum. According to Leet et al., in the McHale operation, compared to proximal head resection and traction, the length of stay in the hospital

is shorter, the postoperative superior migration of the femoral head is less pronounced, and the surgical and medical complications are lower [12].

To our view, the main drawbacks of the McHale procedure are the use of nonlocking plates in osteoporotic bones and the need for spica casting postoperatively. Using modern locking plates provides better stability and eliminates the need for spica casting, with its potential for femur fractures after cast removal.

5. Conclusion

The McHale procedure is widely used due to its effectiveness in achieving the goals of pain relief, increased range of motion, and improved seating ability. This technique was proved to be safe with few complications compared to other salvage procedures. Still, loosening and post spica casting fracture are, to our view, the major drawbacks of the procedure, due to decreased bone mass in these patients. We suggest a modification of using locking plates with no casting postoperatively. To our experience, this change in the technique is reliable and useful and provides the benefits of the original McHale procedure, with lessened morbidity. Therefore we believe that locking plate stabilization of subtrochanteric valgus osteotomy provides the most stable fixation without the need for post operative casting.

Conflict of Interests

The authors declare no conflict of interests regarding the publication of this paper.

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