

HIP REDUCTION IN CEREBRAL PALSY WITH SOFT TISSUE OPERATIVE PROCEDURES

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Abstract: Hip reduction in cerebral palsy patients with a soft tissue procedure was analysed during operative procedure. Eleven patients with unilateral dislocation of the hip and a quadriplegic form of cerebral palsy underwent soft tissue operation on the hips. Tenotomy of the adductor and flexor muscles of the hip was performed. The contralateral hip sustained only tenotomy of the adductor muscles. The average age of the patient study group was 8.5 and the follow-up period was 4 years. In all patients, repositionings of the hip were achieved and stabilization was maintained postoperatively at the regular outpatient follow-up. The range of extension and abduction motion were increased postoperatively compared to the preoperative range of motion. Retention of the hip was maintained within 20 degrees of abduction.

Tenotomy of the adductor and flexor muscles enables hip reduction without opening the joint capsule in quadriplegic cerebral palsy patients. The hip became painless and the improvement in the hygiene was evident.

Key words: cerebral palsy, hip dislocation, hip reduction, tenotomy.

Introduction

Hip dislocation frequently occurs in the quadriplegic type of cerebral palsy in non-ambulatory patients. This always results in significant morbidity in terms of pain, decreasing the range of movement of the hips, pelvic obliquity and the occurrence of scoliosis.

The frequency of hip dislocation ranges from 7% to 60%. [3, 6, 8] This entity is a result of flexo-adductor contractures of hip muscles, increased valgus and antetorsion of the proximal femur and oblique pelvis and scoliosis. The dislocation is gradual, by increasing of the migration percentage according to Reimers [7] and in numerous cases it is followed by acetabular dysplasia. Besides the hygienic reasons for the operative treatment, the pain and decubital problems in the dislocated hip are also factors for a decision on performing surgical treatment. Femoral head deformation and its contact with the supra-acetabular part of the iliac bone causes pain which disables hip motions, and that is how it contributes to the worsening of the contractures [4].

Hip dislocation can be reduced with varus derotational osteotomy and augmentation of the acetabulum with the Salter, Dega or Pemberton procedures. Open reduction combined with pelvic osteotomy and osteotomy of the proximal femur are the procedures for dislocated hips. All of these are bone procedures with a large amount of blood loss, fixation of the bone and lengthy immobilization. Tenotomy of the adductor muscles combined with tenotomy of the flexor muscles can reduce the dislocated hip into the acetabulum with no blood loss. Correction of pelvic obliquity improves the ability to sit in a wheelchair and can decrease scoliosis.

Material and Methods

This study evaluated eleven cases (5 male and 6 female) of non-ambulatory patients with a quadriplegic type of cerebral palsy with different degrees of mental retardation.

None of them had undergone any conservative or operative treatment in the preceding years, except irregular physical therapy. Previous radiographs of the pelvis were not available because the patients had not had any orthopaedic examination or regular follow-ups with an orthopaedic surgeon. Dislocation of the hips with migration percentage valued according to Reimers at 100% were present in all cases, with oblique pelvis and scoliosis, so their ability to sit in a wheelchair was made more difficult.

Migration percentage was used for evaluation purposes, because it represents a way of determining the paralytic dislocation of the hip. This is the way to follow hip dislocation dynamics and proper intervention was performed in due time. The migration percentage represents the relation between the uncovered part of the femoral head and the whole femoral head measured in millimetres and multiplied by 100.

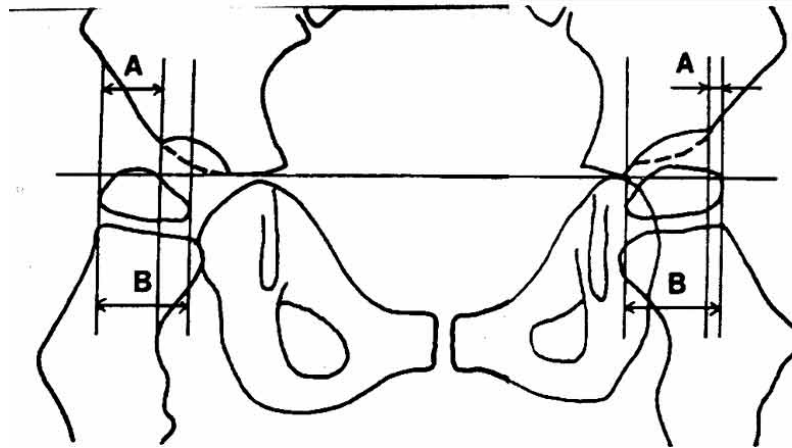


Figure 1 – Reimers migration percentage is calculated from an anteroposterior pelvis radiograph by drawing Hilgenreiner's line and Perkins line. The amount of A, lateral to Perkins line is divided by B, whole width of femoral head

Слика 1 – Миграциониої проценти според Рајмерс се пресметува на антероростериорна радиографија со повлекување на Хилгенрајнерова и Перкинсонова линија. Распојанието А, латерално од Перкинсоновата линија, се дели со распојанието Б, дијаметарот на главата на фемурот

The preoperative range of motion of the dislocated hip was measured (abduction, adduction, flexion, Thomas test). The Thomas test, presented in 1876, is used when diagnosing flexor contractures of the hip. The patient is in a supine position, the contralateral hip and knee in maximum flexion. This gives an opportunity for stabilization of the pelvis, eliminating lumbar lordosis and neutralising the hamstrings. We measured flexor contracture between the central axis of the femur and the operating table the patient had been positioned on.

Postoperatively, we took the same measurement including retention of the hip into the acetabulum in adduction movement. We did not measure internal and external rotation of the hip, because they have no influence on the hip dislocation.

The operative treatment was performed by two incisions: medially by resection of the *m. adductor longus*, *m. gracillis*, *m. adductor brevis* and the tendon part of the *m. ileopsoas*. In the same act, the anterior branch of the *n. obturatorius* was resected; the second incision was under the *spina iliaca anterior superior* by resection of the *m. sartorius*, *m. rectus femoris*. The same incision was made on the non-dislocated hip without neurectomy of the *n. obturatorius* and without resection of the *m. rectus femoris* and *sartorius*. Postoperatively both hips were plastered with abduction of the lower extremities for a period of one week. After removal of the plaster, the patient started physical exercises.

Results

All patients were non-ambulatory, with complete dislocation of one hip. Oblique pelvis and scoliosis were present in all cases. Flexion and adductor contracture were present in all patients preoperatively.

Table 1 – Табела 1

Preoperative range of motion of the hips
Предоперативен опсег на движења на колковийте

Patients	Age	Sex	Type of CP	Amb.	MP	Side	Thomas Test	Flex.	Abd.	Add.
1	6.7	M	Quad.	No	100	R	20	90	20	20
2	5.9	M	Quad.	No	100	L	30	100	20	10
3	8.4	F	Quad.	No	100	R	20	90	10	20
4	11.5	F	Quad.	No	100	R	40	120	0	20
5	7.9	M	Quad.	No	100	L	30	90	10	30
6	11.7	F	Quad.	No	100	L	10	120	20	30
7	10.1	F	Quad.	No	100	L	20	110	10	20
8	6.4	F	Quad.	No	100	R	40	90	0	20
9	6.9	M	Quad.	No	100	L	20	100	20	20
10	7.7	F	Quad.	No	100	L	30	100	10	30
11	10.8	M	Quad.	No	100	L	20	90	10	20
Average	8.5						25.454	100	11.818	21.818

Due to unilateral pelvic obliquity and scoliosis, dislocation of the hip was unilateral in all cases (four right-side, seven left-side hips). The postoperative range of motion of the dislocated hips had improved regarding abduction and extension.

Table 2 – Табела 2

Postoperative range of motion of the hips
Постоперативен опсег на движења на колковийте

Patients	Age	Sex	Type of CP	Amb.	MP	Side	Thomas Test	Flex.	Abd.	Add.
1	6.7	M	Quad.	No	42	R	0	100	60	20
2	5.9	M	Quad.	No	38	L	10	110	50	30
3	8.4	F	Quad.	No	55	R	10	100	60	20
4	11.5	F	Quad.	No	31	R	0	120	70	20
5	7.9	M	Quad.	No	39	L	10	130	60	30

Patients	Age	Sex	Type of CP	Amb.	MP	Side	Thomas Test	Flex.	Abd.	Add.
6	11.7	F	Quad.	No	45	L	10	120	70	20
7	10.1	F	Quad.	No	35	L	0	110	80	30
8	6.4	F	Quad.	No	31	R	20	100	70	30
9	6.9	M	Quad.	No	37	L	10	100	70	20
10	7.7	F	Quad.	No	42	L	10	100	80	30
11	10.8	M	Quad.	No	39	L	0	90	60	30
Average	8.5				39.4		7.272	109	66.363	25.454

Reposition of the dislocated hip and decrease of the migration percentage were noted in all cases. In 7 of the cases, the dislocated hip repositioned spontaneously during abduction within the operative procedure. Due to the incongruence between the head of the femur and the acetabulum, an effect of spontaneous repositioning was not achieved in 4 of the cases. Radiographs of the hips showed a decrease of the pelvic obliquity in eight cases and reduction of the hips in all cases.

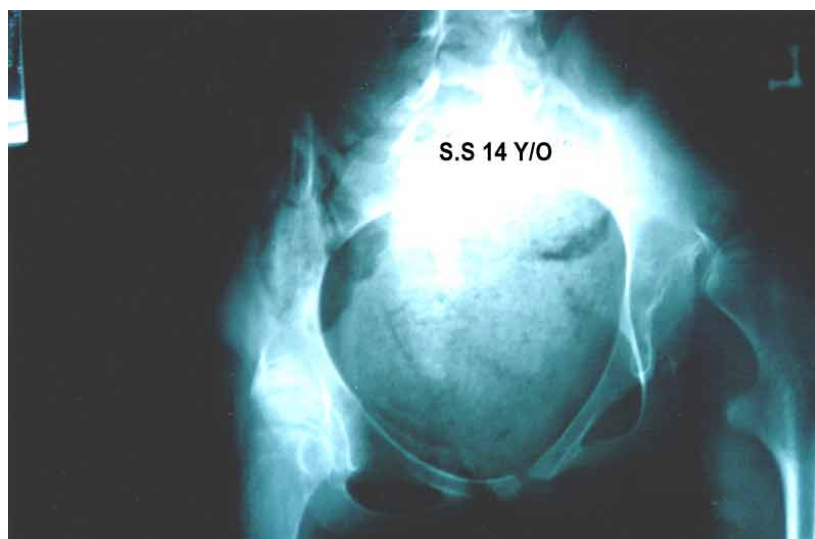


Figure 2 – Dislocation of the left hip and pelvis obliquity in 14 years old patient
Слика 2 – Луксација на левиој колк и коса карлица кај 14-годишен пациенти

Migration percentage decrease and coverage of the femoral head into the acetabulum improve. Femoral head deformation is obvious, the hip committed stable in more than 20 degrees of abduction.



Figure 3 – Reduction of the left hip
Слика 3 – Рејпозиција на левиот колк

If we did further adduction of the leg (lower than 20 degrees) the hip would become unstable and dislocation occur. Postoperative measurements of the hip movements showed that abduction of the hips ranged between 50 and 80 degrees (average 66.3 degrees).

In all patients the position in bed and in a wheelchair improved, and pains were minimal while the hips were widening.



Figure 4 – Range of abduction in both hips after surgical procedures
Слика 4 – Ојсеџ на абдукација на двајта колка њосџојерајџивно

Discussion

Dislocation of the hip in spastic cerebral palsy is found in the highest percentage in patients with quadriplegia and also in non-ambulatory patients. Samilson 1975 [8] found that in 20% of patients with quadriplegia there was no dislocation of the hip. The reasons for the appearance of dislocation are the flexo-adductor contractures of the hip. These make the head of the femur migrate upwards and outward. On the other hand, Selva 1998 [9] after the revealing of 27 hips, points to anterior dislocation of the hip and the presence of the extensor-abductor contractures.

Other reasons for the dislocation is the antetorsion of the neck of the femur which at the period of birth is equal with the normal values, but within a period of two years increases extremely and reaches up to 70 degrees. [1] It is considered that the valgus deformation does not result in dislocation. The increased value of the neck-shaft angle is the result of the antetorsion of the neck of the femur. [1, 2] When an x-ray is performed with the inner rotation of the lower extremities, the degrees of valgus deformation appear lower.

Laplaza [5] in a study of 415 hips pointed out that dislocation of the hip correlated with femoral anteversion. He found no statistical significance correlating with the femoral neck-shaft angle. Oblique pelvis and scoliosis are also factors in hip dislocation.

The appearance of hip dislocation in non-ambulatory patients makes sitting more difficult, and makes long-term lying in one position impossible. Patients who have some possibilities of standing or walking, with the maturing of the central nervous system, are unable to develop that ability because normal movements as well as the balance are disturbed because of the dislocation. Maintenance of hygiene, the appearance of decubitus in the sacral region and in the regions of great trochanters as well as fractures of dyaphysis of the femur are frequent. The pain which comes as a result of contact between the femoral head and the acetabular rim, of pressure on the joint capsule or of spasm of the flexo-adductor muscles results in harder physical therapy. This phenomenon shortens the muscles even more and makes the pain more acute, and the patient enters a vicious circle which makes the condition even worse. Femoral head deformation comes about as a result of flexo-adductor contractures and increased pressure over the acetabulum and labrum, and it is obvious on the X-rays. An indication for operative treatment in all patients was the appearance of pain while sitting, the appearance of decubitus and difficult maintenance of hygiene. The phenomenon of hip reduction was gained during the operation by tenotomy of the adductor and flexor muscles. It is interesting that there was no need to open the joint capsule to make resection of the acetabular structure, as is the case with open hip reduction. Tenotomy of adductors of the contralateral hip was performed in order to obtain a decrease in pelvic obliquity, which results in a partial correction of scoliosis. The correction of pelvis anteflexion by teno-

tomy of the *m. rectus femoris*, *m. sartorius* and *m. iliopsoas* is an important factor in the operative treatment because it leads to a decrease in the flexor component which dislocates the hip posteriorly.

With this operation more complicated procedures for open reduction on the femur and acetabulum are avoided, there is no loss of blood, and the whole procedure is completed in a very short period of time. Postoperative rehabilitation, which starts seven days after the operation, is performed with a whole range of movements because the hip open reduction is avoided. We maintained hip reduction with abduction braces.

Although the postoperative period of 4 years is rather short, stability of the hip is present and the patients had no dislocation during the transfer from bed to wheelchair and *vice versa*. Since these patients are never in a position to stand it is most likely that dislocation of the hip will occur.

Conclusion

The fact that the problem of flexo-adductor contracture is solved and spasm of the muscles is decreased gives hope that there will not be a repeated dislocation of the hip.

We consider that this operation benefits patients who are non-ambulatory and have no ability to stand, saves them from various multiple procedures and enables a better quality of everyday activities in their life.

REFERENCES

1. Beals RK. (1969): Development changes in the femur and acetabulum in spastic paraplegia and diplegia. *Dev Med Child Neurol*; 11: 303–13.
2. Bleck EE Griffin PP. (1997): The cerebral palsied hip. *Clin Orthop*; 338: 42–51.
3. Gamble GJ., Rinsky L., Bleck EE. (1990): Established hip dislocation in children with cerebral palsy. *Clin Orthop*; 253: 90–99.
4. Heinrich S., MacEwen D., Zembo M. Hip. (1991): Displasia, Subluxation and Dislocation in Cerebral Palsy: An Arthrographic Analysis. *J Pediatr Orthop*; 11: 488–493.
5. Laplaza JF., Root L. (1994): Femoral Anteversion and Neck-Shaft Angles in Hip Instability in Cerebral Palsy. *J Pediatr Orthop*; 14: 719–723.
6. Lonstein EJ., Beck K. (1986): Hip dislocation and subluxation in cerebral palsy. *J Pediatr Orthop*; 6: 521–526.
7. Reimers J. (1974): Contracture of the hamstrings in spastic cerebral palsy. *J Bone Joint Surg*; 56B: 102–109.
8. Samilson LR., Tsou P., Aamoth G., Green W. (1972): Dislocation and subluxation of the hip in cerebral palsy. *J Bone Joint Surg*; 54–A865–872.

9. Selva G., Miller F., Dabney K. (1998): Anterior hip dislocation in children with cerebral palsy. *J Pediatr Orthop*; 18: 54–61.

Резиме

РЕПОЗИЦИЈАТА НА КОЛКОТ КАЈ ПАЦИЕНТИ СО ЦЕРЕБРАЛНА ПАРАЛИЗА, СО ПОМОШ НА МЕКОТКИВНИ ОПЕРАТИВНИ ТЕХНИКИ

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Апстракт: Анализа на репозицијата на колкот кај пациенти со церебрална парализа, со помош на мекоткивни оперативни техники.

Единаесет пациенти со унилатерална дислокација на колкот и квадриплегична форма на церебрална парализа беа подложени на мекоткивна операција на колковите. Беше изведена тенотомија на аддукторната и флексорната мускулатура на колкот. Контралатералниот колк беше подложен само на тенотомија на аддукторната мускулатура. Просечна возраст на испитаниците беше 8,5 години и истите беа следени 4 години постоперативно. Кај сите пациенти беше постигната репозиција на колкот, а редовните контроли покажаа постоперативно одржување на стабилноста. Опсегот на екстензија и абдукција постоперативно беше зголемен во споредба со предоперативните наоди. Ретенцијата на колкот беше до 20 степени абдукција.

Тенотомијата на аддукторната и флексорната мускулатура овозможува репозиција на колковите кај пациентите со квадриплегична форма на церебрална парализа без отворање на зглобната капсула. Болката во колковите се губи и се овозможува подобра хигиена.

Клучни зборови: церебрална парализа, луксација на колк, репозиција, тенотомии.

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