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# TENOTOMIES OF THE ADDUCTOR MUSCLES WITH AND WITHOUT NEURECTOMIES OF N. OBTURATORIUS IN PATIENTS WITH SPASTIC CEREBRAL PALSY — A COMPARATIVE STUDY

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**Summary: Objective:** The hip dislocation especially in spastic form of cerebral palsy frequently occurs. It results in significant morbidity in terms of pain in the dislocated hip and destabilization of the pelvis. The aim of this study was to evaluate the migration percentage in patients where only tenotomies of the adductor muscles were performed compared to patients where tenotomies of the adductor muscles were combined with neurectomy of the obturator nerve.

**Methods:** We retrospectively evaluated 50 patients (80 hips) divided in two groups. In 32 patients (47 hips) tenotomies of the adductor muscles were performed, in 18 patients (33 hips) tenotomies of the adductor muscles were combined with neurectomy of the obturator nerve in order to prevent and to decrease the incidence of hip dislocation. We used the Reimers' hip migration percentage to evaluate the stability of the articulation.

**Results:** In the group where tenotomies of the adductor muscles were combined with neurectomy of the obturator nerve, we cannot find a statistically significant difference when compared to the group where only tenotomies of the adductor muscles were performed. In the two year follow up period after the operations, a decrease of the migration percentage was noted in both groups of patients with gradual increase in the following period.

**Conclusion:** There was no significant difference in the end result when performing tenotomies of the adductor muscles combined with neurectomy of the

obturator nerve compared with tenotomies of the adductor muscles only.

**Key words:** Cerebral palsy, hip dislocation, adductor contractures.

## INTRODUCTION

The dislocation of the hip in patients with spastic cerebral palsy results in pain, stance and gait disorders, ulcerations of the skin and frequently fractures of the lower extremities. Dislocation of one or both hips frequently occurs (1). These patients also have serious problems with the perinea care and need a third person everyday care.

The surgical treatment of the dislocated hips in patients with spastic cerebral palsy is consisted of extensive bone reconstructions and soft tissue procedures followed with prolonged post operation immobilization and rehabilitation.

Tenotomies of the adductor muscles of the hip is one of the procedures that will in most cases successfully treat dislocation of the hip and reduce the Reimers' hip migration percentage. In patients that are non-ambulatory, they are combined with neurectomy of n. obturatorius.

The goal of this study is to establish if there is significant difference in the end result while performing tenotomies of the adductor muscles only and when they are combined with neurectomy of n. obturatorius in patients with spastic cerebral palsy.

## PATIENTS AND METHODS

Our study included 50 patients (80 hips) with spastic cerebral palsy that were non-ambulatory, all of

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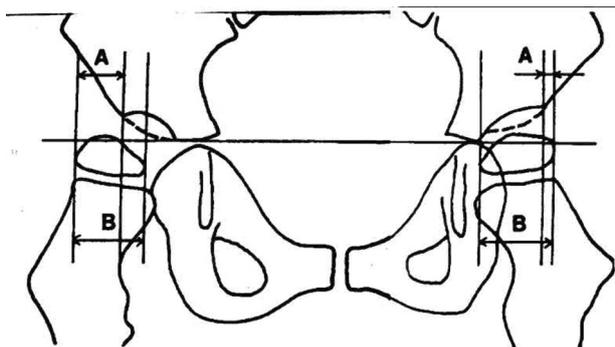


Figure 1. Reimers' migration percentage — the value is calculated using the A-P radiograph of the pelvis and the Hilgareiner and Perkins line. The value A laterally of the Perkins line is divided with B, the whole length of the head of the femur and it is multiplied by 100

them treated at our clinic. The patients were divided in two groups. In the first group of 32 patients (47 hips) only tenotomies of the adductor muscles were performed, while in the second group of 18 patients (33 hips) tenotomies of the adductor muscles were combined with neurectomy of n. obturatorius. The mean age of the patients was 6.5 years (3.2–12.4 y.). The same standard operation was performed in all of the patients.

The surgical procedure was performed with transversal skin incision parallel with the inguinal skin fold. The underlying fascia was dissected longitudinally and m. adductor longus was isolated and resected at its tendinous origin. The external branch of n. obturatorius was isolated of the surrounding tissue and a part of 1 or 2 cm was resected only in the patients of the second group.

M. gracilis, m. adductor brevis, and occasionally parts of m. adductor magnus were resected if that was necessary to obtain at least 70 degrees of abduction of the hip. Postoperatively the hips were immobilized with abduction cast in position of maximal abduction and 10 to 15 degrees of flexion in the hip for 7 days. After removing the cast immobilization, early rehabilitation program was started.

Evaluation of the postoperative results was performed using Anteroposterior (A-P) radiographs of the pelvis with the hips. The stability of the hip was measured using the Reimers' hip migration percentage (Figure 1) which was measured preoperatively, postoperatively and in the following 6, 12, 18 and 24 months (2).

## RESULTS

The results of the measurements showed postoperatively reduction of the migration percentage in both groups (Table 1, Table 2).

With the t-test of dependent samples we tested the difference in the mean values of the migration percentage preoperatively and after 6 months and preoperatively and 24 months after the performed tenotomies. The statistical analysis confirmed high statistical significance ( $p < 0.01$ ) in two relations, and we can conclude that in patients where tenotomies of adductor muscles were combined with neurectomy of n.obturatorius the migration percentage has a significantly lower value in the postoperative period (Table 3).

With the t-test of dependent samples we tested the difference in the mean values of the migration percentage preoperatively and after 6 months and preoperati-

Migration percentage	N	Mean	Median	Min.	Max.	Std. Dev.
Pre op.	33	48.94	48	33	65	7.76
Post op 6 m.	33	31.39	31	20	45	5.55
Post op 12 m.	33	33	33	22	47	5.21
Post op 18 m.	33	34	34	22	48	6.18
Post op 24 m.	33	35.85	35	24	49	6.09

Table 1. Migration percentage in the group where tenotomies of the adductor muscles were combined with neurectomy of n. obturatorius

Migrational percentage	N	Mean	Median	Min.	Max.	Std. Dev.
Pre op.	47	65.49	67	36	96	13.92
Post op. 6 m.	47	40.64	40	22	68	10.36
Post op. 12 m.	47	40.47	38	20	70	10.31
Post op. 18 m.	47	42.64	40	25	75	10.44
Post op. 24 m.	47	45.21	42	25	75	10.66

Table 2. Migration percentage in patients where only tenotomies of the adductor muscles was performed

	Differences	t-test for dependent samples				
		Mean	N	t	p	Sig./N/Sig.
Migrational percentage	Pre op.	48.94				
	Post op 6 m.	31.39	33	14.99	0.000001	Sig.
	Pre op.	48.94				
	Post op. 24 m.	35.85	33	13.447	0.000001	Sig.

Table 3. Differences/Migration percentage

	Differences	t-test for dependent samples				
		Mean	N	t	p	Sig./N/Sig.
Migrational percentage	Pre op.	65.49				
	Post op. 6 m.	40.64	47	19.76	0	Sig.
	Pre op.	65.49				
	Post op. 24 m.	45.21	47	14.44	0	Sig.

Table 4. Differences/Migration percentage

vely and 24 months after the performed tenotomies. The statistical analysis confirmed high statistical significance ( $p < 0.01$ ) in the two relations, and we can conclude that in the patients where only tenotomies of the adductor muscles were performed, the migration percentage has significantly lower values in the postoperative period (Table 4).

## DISCUSSION

Tenotomies of the adductor muscles and neurectomy of n. obturatorius are standard surgical procedures in patients with spastic cerebral palsy (3, 4).

The surgical benefits of this operative intervention are: improvement of the perinea care, improvement of the range of motion of the hip and prevention of subluxation of the hip.

The abduction is the most compromised motion in the hip in patients with cerebral palsy. In our series of patients there was improvement of the abduction after the surgical procedures.

Different soft tissue procedures are recommended in the treatment of the spastic hip, that are usually combined between each other including partial or total adductor tenotomy, partial or total neurectomy of n. obturatorius, resection of m. iliopsoas or its tenotomy, all with primary goal to achieve muscular balance.

In our group of patients we had to do tenotomy of m. iliopsoas in only three hips that is why we didn't mention it in the surgical method. The goal of the adductor tenotomy is to reduce the muscular imbalance and to prevent dislocation of the hip.

The evaluation of the subluxation of the femoral head was described by Reimers (5).

The uncertainty of the evaluation of the migration percentage using this method is  $\pm 10\%$ . In order to eliminate this percentage of error during measurements, Kalen and Blek (6) recommended that the results can be considered good when the migration percentage improves for more or equal to 10% on the following postoperative radiographic controls.

It was noted by some authors that the migration percentage is less than 1% per year in normal children, but it can rise for up to 10% per year in children that are non-ambulatory (6, 7, 8).

The studies that are considering the prevention of the hip dislocation with surgical soft tissue procedures are mostly confusing because they include non-ambulatory patients, patients that are treated with different surgical techniques at different age.

The age when the surgical intervention is performed is very important factor in the prevention. Identical problem of heterogeneous group appeared in our series, but there were no differences in the surgical treatment and the postoperative treatment of the patients.

Sharrard and Allen report stabilization or improvement after the release of the adductors in 75% of the cases, with better results achieved in children operated before their 4 year (9).

Reimers reports best results in children operated under 4 years of age (5).

Silver observed improvement of the migration percentage of 39% preoperatively to 17% postoperatively on the regular follow-up in 60 of 76 patients operated at the age of 47 months (8).

Kalen and Blek proved that the mean age for successful operative interventions is 4,5 years, while the mean age of failure of the adductor tenotomies as a sin-

gle procedure or combined with resection of m. iliopsoas was 5,7 years (6).

Zylberstejn obtained 86,96% good results in patients where neurectomy of the superficial branch of n. obturatorius was combined with tenotomy of m. adductor longus and m. gracilis and 87,50% good results in patients where only neurectomy of the superficial branch of n. obturatorius was performed (11).

The abductor contractures following the extensive surgical interventions of the soft tissues are a great complication usually after extensive release of m. adductor longus, m. adductor brevis and m. gracilis and after complete transection of the n. obturatorius (10). In our group of patients we didn't notice abductor contracture in the early postoperative period or at the last control.

## Sažetak

# TENOTOMIJE MIŠIĆA ADUKTORA SA I BEZ NEUREKTOMIJA OBTURATORNOG NERVA KOD PACIJENATA SA SPASTIČKOM CEREBRALNOM PARALIZOM — KOMPARATIVNA STUDIJA

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**Uvod:** Dislokacija kuka, posebno kod spastičnog oblika cerebralne paralize, se često dešava. To rezultira značajnim morbiditetom u smislu bola u dislociranom kuku i destabilizacije karlice. Cilj ovog istraživanja bila je procena migracionog procenta kod pacijenata kojima su rađene samo tenotomije mišića primicača u odnosu na pacijente kod kojih su tenotomije mišića primicača kombinovane sa neurektomijom obturatornog nerva.

**Metod:** Retrospektivno smo evaluilari 50 pacijenata (80 kukova) podeljenih u dve grupe. Kod 32 pacijenta (47 kukova) izvedene su tenotomije mišića primicača, kod 18 pacijenata (33 kuka) tenotomije mišića primicača su kombinovane sa neurektomijom obturatornog nerva u cilju prevencije i smanjenja incidence dislokacije kuka. Koristili smo Reimer-ov migracioni procenat za evaluaciju stabilnosti zgloba.

We noted statistically significant improvement of the hip migration percentage in both groups two years after the operation. Neurectomy of the obturator nerve which we performed in the second group didn't show statistically significant improvement of the results. On the contrary the limitation of this procedure only to non ambulatory patients additionally limits its use.

## CONCLUSION

The study confirms the effectiveness of the tenotomies of the adductor muscles and the prevention of the migration of the hip in patients with cerebral palsy.

Neurectomy of the obturator nerve with tenotomy of the adductor muscles does not achieve better results comparing with tenotomy of the adductor muscles only.

**Rezultati:** Nije nađena statistički značajna razlika razlika u poređenju krajnjih rezultata između grupe u kojoj su rađene tenotomije mišića primicača kombinovane sa neurektomijom obturatornog nerva i grupe u kojoj su rađene samo tenotomije mišića primicača.

U dvogodišnjem postoperativnom periodu praćenja pacijenata zabeleženo je smanjenje migracionog procenta u obe grupe, sa blagim porastom u narednom periodu.

**Zaključak:** Nije bilo statistički značajne razlike u poređenju krajnjih rezultata između dve grupe nakon izvođenja tenotomija mišića primicača u kombinaciji sa neurektomijom obturatornog nerva s jedne strane, i nakon izvođenja samo tenotomija mišića primicača s druge strane.

**Gljučne reči:** cerebralna paraliza, dislokacija kuka, kontraktura aduktora.

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