Results of Muscle Release for Lateral Hip Migration in Cerebral Palsy

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An adductor longus and gracilis muscle release procedure combined with anterior branch obturator neurectomy was reviewed in 36 children with cerebral palsy and lateral migration of the hip. The aim was to evaluate the results clinically, functionally and radiologically. There were 24 males and 12 females (average age 4.5 years); 75% were diplegics, 22.2% quadriplegics and 2.8% hemiplegics. All the patients but one were spastics. The results have shown that muscle release with anterior branch obturator neurectomy was effective in improving or preventing further lateral migration of the hip. Subsequent adduction contracture developed in two cases (5.5%). The results in the remaining patients were judged clinically satisfactory as abduction remained in an acceptable range. There was significant functional improvement in seven cases (16.6%). The best results were achieved in patients who were less than 6 years of age at the time of surgery. It was concluded that management of lateral migration of the hip in cerebral palsied children by muscle release combined with anterior branch obturator neurectomy was safe and effective in preventing further migration.

Hip deformities in cerebral palsied children are common problems, they are manifested as adduction, flexion and/or internal rotation clinically, lateral migration, subluxation or dislocation radiologically, and may result in functional compromise with increasing pain and may require more complicated nursing care.

Muscle imbalance has been implicated as a factor in subluxation and dislocation. The benefits of early treatment of hip subluxation and prevention of dislocation have been documented in the literature.

Several soft tissue operations such as denervation, and transfer or release of the insertions of the over active muscles have been proposed.

Total denervation procedures such as intrapelvic obturator neurectomy is not recommended, partly because it gives no opportunity to correct any adductor shortness and because it is very likely to result in too much adductor weakness in a mildly or moderately affected patient.

Muscle transfer procedures have created controversy among authors. Stephenson & Donovan, ...
first reported adductor transfer in cerebral palsy and subsequently others \cite{18-20} have recommended this procedure in preference to the adductor release. This view was later challenged by those who found no statistically significant difference in the outcome between the two procedures. \cite{24,21,13}

Others have cast doubt on the ability of the transferred muscles to remain in place in a spastic child, or to function in a retarded child as successfully as in children with normal intelligence. \cite{2}

Of the muscle release operations, subcutaneous adductor longus tenotomy, though very simple, should be resisted, because the saphenous vein or one of its branches, can be cut inadvertently and also a recurrence of adductor contractures may occur in 75\% of patients. \cite{22} In addition, with this latter procedure other muscle contractures which contribute to the deformities are ignored. Surgical release of the insertions of overactive muscles with or without anterior branch obturator nervection is considered to be safe, simple and reliable. \cite{13,16}

In this series, muscle release with anterior branch obturator neurectomy for lateral migration of the hip was carried out in 71 cerebral palsied hips. The aim of the study was to evaluate the results of this procedure clinically, functionally and radiologically.

**Patients and Methods**

All patients with cerebral palsy affecting the lower limbs seen at King Khalid University Hospital between April 1985 and April 1989 were reviewed. Only those who showed radiological evidence of lateral migration of the hip and who had muscle release with anterior branch obturator neurectomy were included.

The data collected included age, sex, pattern of the disease, extent of muscle release, pre- and postoperative clinical, functional, and radiological evaluation, follow-up and postoperative complications.

All patients had adductor longus and gracilis release in combination with anterior branch obturator neurectomy. In addition to this procedure some patients who showed a flexion deformity of the hip in excess of 30° had either iliopsoas release or recession as described by Bleck. \cite{13} All patients were immobilized in an abduction plaster cast with the knees in extension. After removal of the cast the patients were sent to the Physiotherapy Department for training.

The range of passive abduction of the hips with knees in flexion and extension, and the degree of hip flexion deformity as measured by the Thomas test were recorded pre-, and postoperatively and at follow-up.

The pre- and postoperative functional level of each patient was documented using the Hoffer et al. classification. \cite{21} Patients were grouped into:

**Walkers:**
(a) Community walker;
(b) Household walker;
(c) Physiological walker.

**Non-walker i.e. wheelchair:**
(a) Independent;
(b) Assistive transfer ability;
(c) Dependent.

A patient was considered functionally improved if he showed an increase of one grade or more in his functional level.

Pre- and postoperative anteroposterior (AP) radiographs of the pelvis which were taken with the limbs in a neutral position were reviewed. Migration percentage (Fig. 1) was recorded. This is defined by Reimers \cite{24} as the fraction 'expressed in percent' of the visible part of the femoral head which on an AP radiograph has migrated beyond Perkins' line delineating the 'acetabular rim'.

The hip was considered radiologically improved if a reduction of migration percentage occurred postoperatively.

**Results**

There were 36 patients with a total of 71 hips involved: 24 (66.7\%) were males and 12 (33.3\%) females. Their ages ranged from 2 to 10 years with an average of 4.5. Twenty-seven patients (75\%) were diplegics, 8 (22.2\%) quadriplegics and 1 (2.8\%) hemiplegic. All the patients except one with athetosis were spastics and all had adductor longus and gracilis release in combination with anterior branch obturator neurectomy. In addition to this, 32 hips (45\%) were treated with iliopsoas recession.

The follow-up ranged from 1 to 3 years with an average of 2 years. The preoperative passive range of abduction, with hips and knees in flexion was from 0 to 30° with an average of 20°. Abduction with hips and knees in extension ranged from 0 to 15° with an average of 10°. Flexion deformity ranged from 10 to 50° with an average of 30°.

Postoperatively, the passive range of hip abduction with hips and knees in flexion was from 50 to 70° with an average of 60°, and abduction with hips and knees in extension ranged from 40 to 60° with an average of 50°. Hip flexion deformity ranged from 10 to 30° with an average of 20°.

At follow-up, it was noted that subsequent adduction contractures had developed but abduction remained...
in an acceptable functional range (abduction more than 30°) in all but two patients (5.5%) who needed repeated surgery.

Functionally, none of the patients was a community or household walker preoperatively. Three (8.3%) were physiological walkers and the others were non-walkers having a wheel-chair: five (14%) were independent, 13 (36%) assisted, and 15 (41.7%) dependent.

Postoperatively, the objective assessment of functional level showed that only seven patients (16.6%) showed a significant improvement. One patient (2.8%) became a community walker, two (5.5%) became household walkers; four (11.1%) physiological walkers; there were 29 non-walkers having a wheelchair viz three (8.3%) independent, 12 (33.3%) assisted and 14 (38.9%) dependent. None of the patients became worse but 83.4% showed no or little improvement. All those who showed functional improvement were of the spastic diplegic group.

Radiologically, the preoperative migration ranged from 30 to 90% with an average of 40%. Postoperatively, 52 hips (73.2%) showed a reduction of migration percentage by an average of 12% (Fig. 2) and 19 hips (26.8%) showed no significant improvement or deterioration.

Postoperative wound drainage and/or infection occurred in four patients (5.6%).

Further analysis of the overall results has shown that most improvement occurred in children who were 6 years or under at the time of surgery.

Discussion

In the follow-up of children with cerebral palsy, the status of the hip must always be a matter of concern to the orthopaedic surgeon.22 Lateral migration of the hip is a relatively common occurrence which may lead to subluxation or frank dislocation.4 Prevention of such a complication is possible and should be the goal.1

There is considerable disparity among reported results of treatment procedures, with wide variation and controversies. Root & Spiro26 in a comparative study of 52 patients who had adductor tenotomies with or without obturator neurectomy and 50 patients who had adductor transfer reported an incidence of recurrence which needed resurgery in 10% in the tenotomy group as compared with nil in the transfer group, and only 2% in the tenotomy group showed functional improvement compared with 33% in the transfer group.

These findings were challenged by Goldner21 who reported equally satisfactory results by merely recessing the detached muscles distally and anchoring them with a suture to the epimysium overlying the adductor brevis, and by Bleck13 who found no recurrence (abduction less than 20°) in any of his patients who had adductor longus and gracilis myotomy with anterior branch obturator neurectomy.

Shultz et al.,4 in a study comparing the results of release and transfer procedures in 40 hips found no statistically significant difference in the radiographic outcome of the two procedures.

The role of iliopsoas release or lengthening is still controversial. Reimers24 disputed that iliopsoas lengthening had any effect in reduction of subluxation and prevention of dislocation. His findings were in disagreement with those of Kalen & Bleck27 who stated that in patients who had adductor myotomy and iliopsoas recession, the success rate in preventing further subluxation was 72% but for those who had adductor myotomy with or without anterior branch obturator neurectomy the success rate was only 36%.

Figure 2. A: X-Ray pelvis showing 40% migration percentage before operation; B: 1 year postoperatively showing a reduction of migration percentage to 25% on the right and 30% on the left.
The variations in the outcome of the treatment procedures could be due to lack of uniformity in variables such as the age of the patient, physical and mental severity of the disease, type and extent of spasticity, the pre- and postoperative care, extent of surgery and methods used to assess the results.

The aim of this study was to evaluate the results of muscle release clinically, functionally and radiologically. No attempt was made to evaluate further the effect of iliopectas release or recession because there was little uniformity between patients.

The results in this series have shown that muscle release procedures beside being simple were safe. The postoperative complication rate was less than 6% and all complications were minor. The operations were effective in improving and/or preventing further lateral migration of the involved hip with 73% showing radiologic improvement, 26.8% no change and none was worse, but functionally, only 16.6% of the patients had a significant improvement.

Despite the fact that subsequent adduction contractures developed, movements remained in an acceptable functional range and only 5.5% of the hips needed repeated surgery.

It has long been recognized that the earlier the treatment the better the results. This has been confirmed in this study where further analysis of the results has shown that the best outcome was among those who had surgery at or before 6 years of age.

**Conclusion**

Adductor longus and gracilis muscle release with anterior branch obturator neurectomy for lateral migration of the hip in cerebral palsied children was safe and effective in improving and/or preventing further lateral hip migration. Clinically, the results were satisfactory and although subsequent adduction contracture developed, adduction remained in an acceptable functional range. A significant objective functional improvement occurred in a relatively small number of patients. The best results were achieved in those patients who were 6 years or less at the time of surgery.

**References**


