

Indication of Soft-Tissue Release for Spastic Hip in Cerebral Palsy

Shohei Matsubayashi, Masahide Ikema, Yoshikazu Ninomiya, Kazumasa Yamaguchi

Department of Orthopedic Surgery, Nagasaki Prefectural Center of Medicine and Welfare for Children

Hisayoshi Kondo

Biostatistics Section, Division of Scientific Data Registry, Atomic Bomb Disease Institute Nagasaki University
Graduate School of Biomedical Science

Abstract : This study set out to determine the indications for soft-tissue release to treat a spastic hip in cerebral palsy. A total of 77 patients involving 154 hips were enrolled to receive soft-tissue release for spastic hip. Their mean age at operation was 6.2 years, and the mean follow-up duration was 9.3 years. We recorded the migration index (MI) on anteroposterior radiographs during follow-up. The patients were divided into two groups based on age at operation as <5 years and ≥ 5 years. The hip was defined as severe where the preoperative MI was $\geq 60\%$, and the treatment was defined as a failure where the MI at final follow-up was $\geq 60\%$. The correlation coefficient was 0.22 (N. S.) between pre-operative MI and final follow-up MI in the group <5 years. None of the 8 severe hips showed treatment failure in the group <5 years. The correlation coefficient was 0.60 ($p < 0.01$) between pre-operative MI and final follow-up MI in the group ≥ 5 years. Eight of 19 severe hips showed treatment failure in the group ≥ 5 years. These findings suggest that soft-tissue release is indicated for all patients <5 years of age at operation (with or without severe hip), and there are no indications for only soft-tissue release for severe hip in the group ≥ 5 years.

Introduction

In children with cerebral palsy, the hip has no dislocation at birth, but subluxation and dislocation then develop due to spasticity and contraction in the muscles around the hip.

The greatest risk to dislocation occurs during middle childhood ages (range from 4 to 12 years)³⁾. It has been suggested that an untreated dislocation would likely become painful in the natural course. Therefore, spastic muscles should be lengthened to prevent the development of

deformity. The success of soft-tissue release is closely related to the degree of subluxation at the time of the surgery¹⁾. And the better outcomes were observed in younger patients at the time of the surgery⁴⁾⁶⁾. We have used soft-tissue release as a treatment for 'scissors' posture, subluxation and for dislocation of the hip. Here we report the outcomes after soft-tissue release for hip in patients with cerebral palsy.

Aim

This study set out to determine the indications

Key words : cerebral palsy (脳性麻痺), hip dislocation (股関節脱臼), soft-tissue release (軟部組織解離術)

連絡先 : 〒 854-0071 長崎県諫早市永昌東町 24-3 長崎県立こども医療福祉センター整形外科 松林昌平
電話 (0957) 22-1300

受付日 : 平成 23 年 12 月 26 日

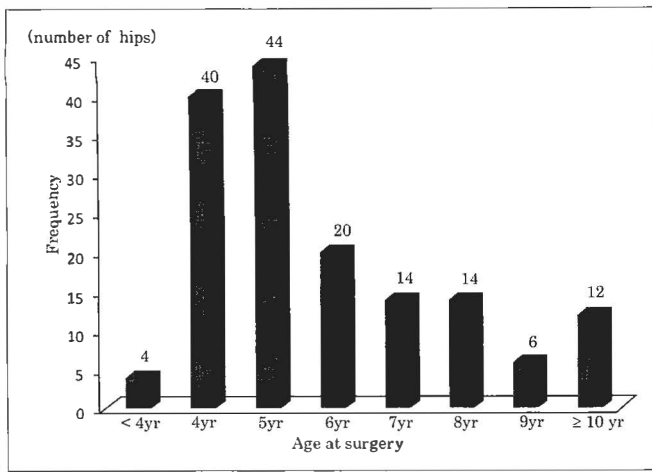


Fig. 1
Distribution of age at surgery

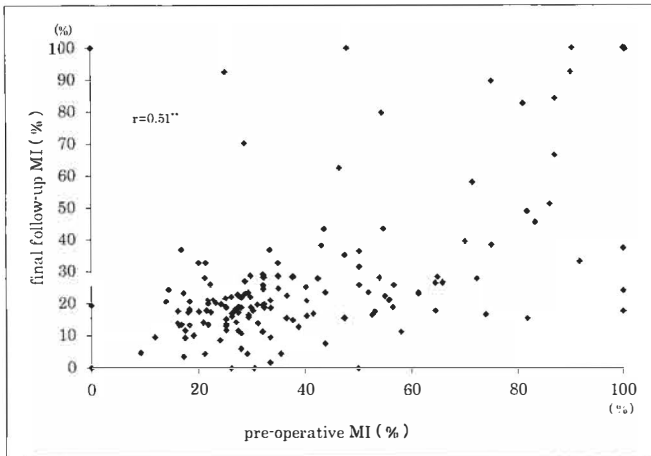


Fig. 2
Relationship between pre-operative and final follow-up MI (%)

for soft-tissue release to treat spastic hip in cerebral palsy.

Subjects and Methods

Between 1980 and 2005, a total of 154 hips in 77 patients were enrolled to receive soft-tissue release for spastic hip in our institution. The mean age at surgery was 6.2 years (range 2.4 years to 11.9 years). The mean follow-up duration was 9.3 years (range 5 years to 29.3 years). Follow-up included migration index (MI) on anteroposterior radiograph. The MI is calculated by dividing the width of the uncovered femoral head by the total width of the femoral head²⁾. This measurement is made by drawing Hilgenreiner's line horizontally, then Perkins' line vertically, and then expressing the amount of the femoral head lateral to Perkins' line as a

percentage of the total width of the femoral head multiplied by 100³⁾. Hips were divided into two groups based on age at surgery (<5 years and ≥5 years). A hip was defined as severe if the pre-operative MI was ≥60%. Furthermore, treatment was defined as a failure if final follow-up showed a MI ≥60%. We do not define the index procedure to be a failure if the hip required a repeat soft-tissue release⁵⁾. But hips that required bone surgery and femoral head resection are defined to become failure, we used the previous MI before bone surgery and femoral head resection.

A correlation analysis by the Pearson product correlation method was performed to evaluate the relationships between pre-operative MI and final follow-up MI in each age group.

In soft-tissue release, the adductor longus tendon was lengthened near its origin, and the

Fig. 3

Relationship between pre-operative and final follow-up MI (%)

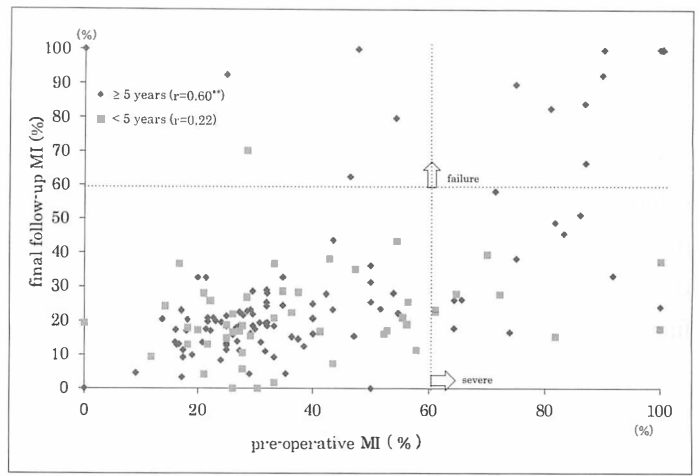


Table 1

Results of repeat soft-tissue release

S. R : Soft-tissue release,

F. R : Femoral head resection

N. F : Not failure

F : failure

First operation	<5yr	≥5yr
Not Severe	2 hips S. R	3 hips S. R 2 hips S. R 1 hip S. R
	N. F	N. F N. F F F. R
Severe	1 hip S. R	1 hip S. R 2 hips S. R
	N. F	F F. R N. F

gracilis is transected from its origin. The proximal hamstrings (semimembranosus, semitendinosus and biceps tendon) are fractionally lengthened near the ischium. The rectus femoris is z-lengthened near its origin. The iliopsoas tendon is released near the lesser trochanter. Release of the ilio-femoral and pecto-femoral ligaments or capulotomy is added if the hip cannot extend beyond -20° . The distal hamstrings are fractionally lengthened. We then applied two long-leg casts with an abduction bar for 3 weeks, and two long-leg braces for the next 6 months.

Results

The operations were mainly performed from 4 to 5 years (Fig. 1). There was a positive correlation ($r=0.95, p<0.01$) between pre-operative MI and final follow-up MI (Fig. 2). There was no significant correlation ($r=0.22, p=0.13$) between pre-operative MI and final follow-up MI in the

group <5 years. None of the 8 severe hips showed treatment failure in the group <5 years. There was a positive correlation ($r=0.60, p<0.01$) between pre-operative MI and final follow-up MI in the group ≥ 5 years. Eight of 19 severe hips showed treatment failure in the group ≥ 5 years (Fig. 3).

There were twelve hips that had repeat soft-tissue release (Table 1). And there was one hip that had repeat soft-tissue release and femoral shortening. This case was severe and ≥ 5 years, and became failure.

Discussion

The success of soft-tissue release is closely related to the degree of subluxation at the time of the surgery (Fig. 2). Cornell et al¹¹ found that all hips with an MI $>60\%$ failed. So we defined that a hip was severe if the pre-operative MI was $\geq 60\%$.

Miller et al³⁾ found that all hips with severe subluxation (a migration percentage of $\geq 61\%$) progressed to dislocation regardless of the age of the patient. So we defined treatment as a failure if final follow-up showed a MI $\geq 60\%$.

Reimers⁶⁾ observed a better outcome in the patients who were four years of age or less at the time of the surgery. Onimus et al⁴⁾ reported a good results in eleven of twelve patients who had undergone surgery before the age of four years. In this report, there were no correlations between pre-operative MI and final follow-up MI in the group < 5 years. Furthermore, none of the 8 severe hips failed in this group. These data showed that there is an indication of soft-tissue release in this group, regardless of pre-operative MI.

Presedo et al⁵⁾ reported that soft-tissue release are seldom indicated if there is severe subluxation or dislocation (defined as a migration percentage $\geq 60\%$). Flynn et al²⁾ reported that bone surgery is indicated for children 4 years of age or older who have severe subluxation (MI $> 60\%$) or dislocation. In this report, there was a correlation between pre-operative MI and final follow-up MI in the group ≥ 5 years. Moreover, eight of 19 severe hips became failure in this group. These data showed that there is no indication of only soft-tissue release for severe hip in this group. The bone surgery is needed at the time of the surgery or in the future. However soft-tissue

release may be appropriate in some cases who have multiple medical problems or have poor bone sock.

Conclusion

Soft-tissue release to treat spastic hip is indicated in the group < 5 years regardless of MI. However, there are no indications for only soft-tissue release for severe hip in the group ≥ 5 years.

References

- 1) Cornell MS, Hatrick NC, Boyd R et al : The hip in children with cerebral palsy. *Clin Orthop Relat Res* **340** : 165-171, 1997.
- 2) Flynn JM, Miller F : Management of hip disorders in patients with cerebral palsy. *J Am Acad Orthop Surg* **10** : 198-209, 2002.
- 3) Miller F, Bagg MR : Age and migration percentage as risk factors for progression in spastic hip disease. *Dev Med Child Neurol* **37** : 449-455, 1995.
- 4) Onimus M, Allamel G, Manzone P, et al : Prevention of hip dislocation in cerebral palsy by early psoas and adductors tenotomies. *J Pediatr Orthop* **11** : 432-435, 1991.
- 5) Presedo A, Oh CW, Dabney KW, et al : Soft-tissue releases to treat spastic hip subluxation in children with cerebral palsy. *J Bone Joint Surg Am* **87-A** : 832-841, 2005.
- 6) Reimers J : The stability of the hip in children. A radiological study of the results of muscle surgery in cerebral palsy. *Acta Orthop Scand Suppl* **184** : 1-100, 1980.

脳性麻痺の股関節に対する軟部組織解離術の手術適応

松林昌平・池間正英・二宮義和・山口和正

長崎県立こども医療福祉センター整形外科

近藤久義

長崎大学大学院原研情報

要 旨 【目的】脳性麻痺の股関節に対する軟部組織解離術の適応を明らかにすること。

【対象】1980～2005年の間、Y軟骨閉鎖以前に軟部組織解離術を行い、5年以上経過を追えた77例154股。手術時年齢は平均6歳3か月であった。術後観察期間は平均9年3か月。

【方法】単純X線像にて術前と最終観察時のMigration percentage(MP%)の関連をピアソンの積率相関係数を用いて評価し、5歳未満と5歳以上の2群にわけて比較。術前のMP% \geq 60%をsevere、最終観察時のMP% \geq 60%をfailureとした。

【結果】5歳未満では術前と最終観察時のMP%のピアソンの積率相関係数は0.22(N.S.)であり、術前severeの8例すべてがfailureにならなかった。5歳以上では術前と最終観察時のMP%のピアソンの積率相関係数は0.60($p<0.01$)であり、術前severeの19例中8例がfailureになった。

【結論】5歳未満では術前のMP%に関わらず適応がある。5歳以上のsevereに軟部組織解離術単独での適応は無い。