OUR EXPERIENCE IN THE TREATMENT OF KNEE FLEXION CONTRACTURE IN CEREBRAL PALSY

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ABSTRACT. Objectives: This study aimed to assess the results of surgical treatment for correcting knee flexion contractures (KFC) in cerebral palsy (CP). Methods: We reviewed 25 patients (15 boys and 10 girls, average age 14.2 years) after 5.6 years (2-9 years). In all cases (35 knees) we performed hamstring lengthening combined with posterior knee capsulotomy (30 cases), rectus femoris transfer (2 cases), patellar tendon plication (5 cases) and posterior cruciate ligament release (2 cases). Results: KFC significantly improved from 24 to 14 degrees. Popliteal angle improved from 65 to 46 degrees. The great majority of cases (75%) had a better ambulatory status. Complications included transient sciatic nerve palsy (5 cases), wound dehiscence (4 cases) and recurrent flexion contracture (7 cases). Conclusions: Surgical treatment is only a part of correction procedures in CP. Hamstring lengthening may be sufficient for the correction of KFC but is better to be associated with posterior capsulotomy to prevent recurrences. After operation is necessary a long rehabilitation program in specialized departments.

Keywords: cerebral palsy, child, contracture, gait, knee joint/surgery

INTRODUCTION
Cerebral palsy (CP) is an entity defining encephalopathies that may be due to prenatal, natal, or postnatal causes. Although the primary problem is in the central nervous system, patients need medical treatment due to peripheral symptoms: increased muscle tone and inadequate muscle control.

Knee flexion contracture (KFC) is the most common problem in CP. Untreated KFC lead to gradual deformation of the femoral condyles. Crouch gait is reported in the majority of CP patients, being 74% in diparetic and 88% in quadriparetic patients.

The purpose of this article is to assess the reasons of KFC, analyze assessment methods, overview compensatory mechanisms and discuss treatment alternatives.

I. Causes of KFC:
- Hamstring spasticity
- Hip flexion contracture
- Gastrocnemius tightness
- Postoperative triceps weakness
- Posterior knee capsule tightness

II. Assessment methods of KFC:
- Clinical methods:
  - Observation: lumbar kyphosis, forward bending of the trunk, posterior pelvic tilt.
  - Determination of the popliteal angle.
  - The Silverskiold test (gastrocnemius contracture)
  - Video-based observational gait analysis (VBOGA)
- Computerised gait analysis

III. Management of KFC:
In principle, the pelvis, hip, knee, and ankle should be assessed as a whole:
- Correction of rotational deformities
- Lengthening of shortened muscles
- Shortening of elongated muscles
- Correction of joint contractures
- Ground reaction orthosis
- Recuperation

Indications:
I. Mild KFC (<10 degrees): conservative treatment

II. Middle KFC (10-30 degrees): surgical treatment (>10 years):
- hamstring lengthening
- posterior knee capsulotomy, if necessary

III. Severe KFC (>30 degrees): surgical treatment (>10 years):
- posterior knee capsulotomy (seldom sufficient):
  - hamstring lengthening, patellar tendon plication and distal tibial tubercle transfer may be performed in the same session

MATERIAL AND METHODS

We reviewed all the patients with CP who underwent surgical correction of KFC in our hospital between 1981 and 2005. Despite the fact that we are not a children hospital we have a good experience in this pathology.

We treated 25 patients (15 boys, 10 girls). The average age at surgery was 14.2 years and the average duration of follow-up was 5.6 years. The great majority of cases were between 10-30 degrees (23 cases). Only 2 cases were up to 30 degrees.

In all this cases we performed hamstring lengthening (35 knees). The procedures performed simultaneously were:
- Posterior knee capsulotomy: 30 cases
- Rectus femoris transfer: 2 cases
- Patellar tendon plication: 5 cases
- Posterior cruciate ligament release: 2 cases

Regarding to the surgical technique we prefer to approach the articulation with 2 incisions (postero-medial and postero-lateral) following the procedures described by Wilson (1) and Baciu (2). After the lengthening of semi-membranosus, semi-tendinosus and biceps femoris it is possible to correct the popliteal angle with 10-15 degrees. If not, is necessary to execute the posterior capsulotomy and, in some cases, posterior cruciate ligament release. Rectus femoris transfer was necessary in only 2 cases. Excessive hamstring lengthening should be avoided because it causes anterior pelvic tilt and stiff knee gait.

Cast immobilization for 21 days is followed by a intensive rehabilitation program.

Rehabilitation approaches to children with CP are comprehensive. In addition to medical and surgical applications, physiotherapy, occupational therapy, speech therapy, orthosis, recreational activities, school and education adaptation are included in rehabilitation approaches. It is impossible to obtain good results after surgery without rehabilitation.

RESULTS AND DISCUSSIONS

Fixed KFC significantly improved from 24 degrees to 14 degrees (average improvement 8 degrees). Popliteal angle significantly improved from 65 degrees to 46 degrees. Regarding ambulatory status the great majority of cases (75%) improved from their preoperative status.

Complications:
- Sciatic nerve palsy: 5 cases. Gradually, all the patients recovered in 2-6 months.
- Wound dehiscence: 4 cases. Cicatrisation by secondary intention using only dressing changes.
- Recurrent flexion contracture: 7 cases. Factors associated with failure:-severe fixed knee flexion contracture:2 cases
  - quadriplegic type: 2 cases
  - male gender: 5 cases
  - age < 12 years: 4 cases

From 10 cases with recurrent contractures only 2 were revised (hamstring lengthening + capsulotomy). Both cases recurred to 40 degrees knee flexion at five years of follow-up.

Management of KFC in CP is a major challenge to the rehabilitation team. The surgical treatment is only a part of this complex, necessary in some cases. Medical assessment of a child with CP is essential. Some of them may have medical conditions like epilepsy, congenital heart disease or...
malnutrition that could complicate surgery and postoperative care. There are not the same two patients with CP. Each patient should be evaluated individually.

The outcome of hamstring lengthening to prevent KFC has not been well defined. Heydarian et al. (3) found a significant positive effect four years after hamstring lengthening with the mean KFC reduced from 16 to 9 degrees. Dhawlikar et al. (4) reported that the popliteal angle improved markedly at one year, but then regressed over time. Woratanarat et al. (5) conclude that hamstring lengthening will not impact the KFC if children are allowed to sit and lie with knees flexed all the time. Based on the data of our study it’s better to associate the hamstring lengthening with posterior capsulotomy to prevent recurrent contractures.

CONCLUSIONS

- Management of KFC in CP is a major challenge and is necessary to be effectuated by a large rehabilitation team.
- Surgical treatment is only a part of correction procedures
- As a principle, the pelvis, knee, and ankle should be considered as a whole
- Hamstring lengthening may be sufficient for the correction of KFC but is better to be associated with posterior capsulotomy to prevent recurrences.
- Recurrence of KFC occurred in 25% of cases and the revisions have bade results
- The most common complication was sciatic nerve palsy but spontaneously resolved within six months

REFERENCES