

## Minimally invasive tethered cord release in children: A technical note

### *Çocuklarda minimal invazif bir yöntem ile gergin kord serbestleştirilmesi: Teknik not*

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#### ABSTRACT

Tethered cord release is commonly performed in pediatric neurosurgery. Nowadays, minimally invasive procedures are created growing interest due to its highly tolerable nature for surgery. It has been main purpose a minimal damaging on access route and maximum protection of normal structures in surgery. We present a surgical treatment of tethered cord syndrome, by which is provided the cord releasing unlike the many methods being applied with tissue removal. The main advantage of performing this surgery through 2 cm hole is to avoid removing ligamentum flavum and bony structure like lamina in addition to reduce the length of the incision and the related scar tissue. *J Clin Exp Invest 2014; 5 (1): 115-117*

**Technical note:** the patient was taken on the operating table in the sitting-prone position, and L5-S1 distance was determined by fluoroscopy. The skin and subcutaneous tissues was passed via a 2 cm vertical incision settled in 0.5 cm laterally from midline. L5-S1 distance and its covering ligamentum flavum are displayed by the guidance of L5 lamina. Williams's retractor was placed in the distance after fetching microscope. The foregoing procedures are the same with microdissectomic surgery. By a vertical incision made on the flavum, its both layer was lifted up and hanged with simple suture on the back tissue for a comfortable exposure of the Dura. Thecal sac was opened by 0.5 cm long vertical incision on the Dura after obtaining secure CSF drainage with the help of yellow-tipped syringe needle. With finding by a nerve hook, the phylum was burned and released securely. Then the Dura was sutured primarily for the closure by means of microsurgery instruments, and flavum was laid on it again.

**Key words:** Minimally invasive, tethered cord, children

#### INTRODUCTION

Tethered cord syndrome is a clinical condition of various origins that arises from tension on the spinal cord. Radiological findings may include the conus medullaris in a lower than normal position, fatty

#### ÖZET

Gergi omurilik serbestleştirilmesi pediatrik nöroşirürjide yaygın olarak yapılmaktadır. Günümüzde minimal invazif yöntemler gittikçe artan bir ilgi görmektedir. Cerrahi uygularken giriş yollarına en az hasar verilmesi ve normal dokunun azami korunması amaç olmuştur. Bizde günümüzde gergin omurilik sendromunun cerrahi tedavisinde uygulanan pek çok yöntemlerden farklı olarak olgudan hiçbir doku çıkartılmadan kordun serbestleştirilmesini sağlayan bir yöntemi tanıtmayı amaçladık. Bu yaklaşımın temel avantajı işlemin 2 cm kesi ile yapılması, ligamentum flavum ve lamina gibi kemik yapıların korunması ve buna bağlı gelişebilen skar dokusunun azalmasıdır.

**Teknik not:** Olgu sitting-prone pozisyonda operasyon masasına alındı ve skopi ile L5-S1 mesafesi belirlendi. Orta hattın 0.5 cm lateralinden 2 cm vertikal kesi sonrasında cilt ve cilt altı dokular geçildi. L5 laminası rehberliğinde L5-S1 mesafesi ve mesafeyi örten ligamentum flavum ortaya kondu. Mikroskop çekildi ve Williams Ekartörü mesafeye yerleştirildi. Buraya kadarki işlemler disk cerrahisiyle aynıydı. Mikroskop altında flavum'a vertikal kesi yapılarak her iki dudağı sırtlarındaki dokuya basit sütür ile asılarak duranın rahat görünümü sağlandı. 0.5 cm'lik vertikal kesi ile tekal sak açıldı. Sinir oku yardımıyla filum bulunarak serbestleştirildi. Dura primer olarak mikro cerrahi enstrümanları ile dikildi ve üzerine flavum tekrar serildi.

**Anahtar kelimeler:** Minimal invazif, gergin kord, çocuklar

infiltration of the filum terminale, and/or association with meningocele, lipomyelomeningocele, myelomeningocele, myelocystocele, split cord malformations or dermal sinus [1,2]. In the last two decades, surgeons have begun to comprehend the pathophysiology involving the tethered cord, and with a

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better understanding of this syndrome, they have begun to develop novel treatment strategies for its treatment.

Typical detethering procedures involve making a wide laminectomy for sufficient exposure of the thecal sac and underlying neural elements. The muscle dissection associated with this approach can be extensive and lead to significant blood loss and postoperative scarring in addition to unwanted complications such as CSF leakage, infection, epidural fibrosis and instability. Moreover, Mayer et al reported paraspinous muscle atrophy and decreased trunk strength after spinal surgery, while Sihvonen et al correlated instances of “failed back syndrome” with paraspinous muscle denervation and atrophy [3,4]. They postulated that such iatrogenic paraspinous muscle injury could lead to increased biomechanical strain postoperatively. Minimally invasive approaches to the lumbar spine also reduce the amount of muscle dissection and trauma. The aim of this study is to present a technique that is considered minimally invasive.

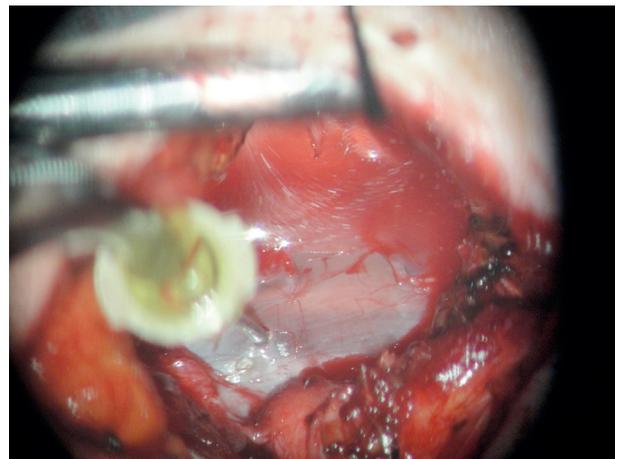


**Figure 1.** The target of first stage is to determine flavum. Crux of the process, the medial end of Williams's retractor is placed into the L5-S1 interspinous space by rescuing from bone structures and opened it. In this way, both sides of ligamentum flavum can easily be delineated.

#### Technical Note

A 14 year-old male patient was taken on the operating table in the sitting-prone position, and L5-S1 distance was determined by fluoroscopy. The skin and subcutaneous tissues was passed via a 2 cm vertical incision settled in 0.5 cm laterally from midline. L5-S1 distance and its covering ligamentum flavum are displayed by the guidance of L5 lamina [Figure

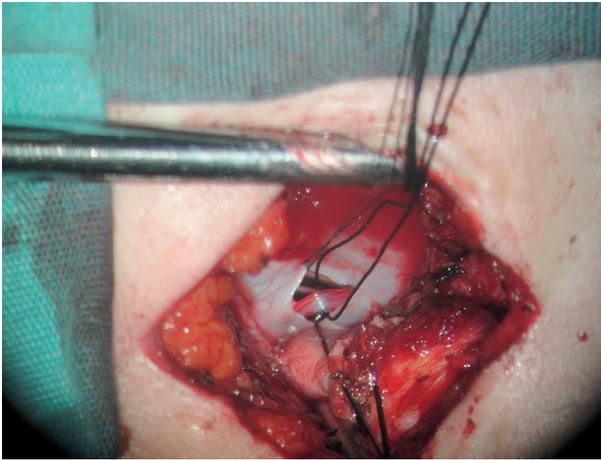
1]. Williams's retractor was placed in the distance after fetching microscope. The foregoing procedures are the same with microdissectomic surgery. By a vertical incision made on the flavum, its both layer was lifted up and hanged with simple suture on the back tissue for a comfortable exposure of the Dura [Figure 2]. Thecal sac was opened by 0.5 cm long vertical incision on the Dura after obtaining secure CSF drainage with the help of yellow-tipped syringe needle [Figure 3]. With finding by a nerve hook, the phylum was burned and released securely. Then the Dura was sutured primarily for the closure by means of microsurgery instruments, and flavum was laid on it again [Figure 4].



**Figure 2.** Flavum without being detached like a lid is opened and determined to the back tissue. Then, with the help of a syringe needle, CSF is drained to avoid nerve fibers from damage during the dura opening.



**Figure 3.** By hanging the edges of the dura is opened. In this way, the blood both is prevented from flowing inside thecal sac and provided the broad exposure.



**Figure 4.** The detection of phylum is displayed with the help of the nerve hook. After the dura is closed primarily, flavum is laid on it as a barrier or simply sutured to its counterpart.

## DISCUSSION

Nowadays, minimally invasive procedures are created growing interest due to its highly tolerable nature for surgery. These procedures are performed through tiny incisions instead of one large opening. Because the incisions are small, patients tend to have quicker recovery times and less discomfort. Child usually feels less pain, also has less scarring, and may recover more quickly than with conventional surgery, with the same benefits. So, minimally invasive surgery is becoming more and more common in hospitals.

Tethered cord release is commonly performed in pediatric neurosurgery. Our report is to demonstrate the use of a mini-open approach with a Williams's retractor to release a tethered cord. The use

of this mini approach allowed for a reduction in the size of the incision that reflects in surgery at least as a clinically significant difference in the blood loss when comparing large open surgeries. By this way, there is also no need to perform flavectomy, laminectomy or hemilaminectomy all those may give rise to major complications such as epidural fibrosis, CSF leakage, infection or instability. Surgical time was also significantly reduced especially after having experience. One-year follow-up of 12 patients in this way, any complication that may require additional treatment such as epidural fibrosis, CSF leakage, infection or instability was not encountered.

In conclusion, Neurosurgery has been a pioneer of minimally invasive procedures in surgery. The main advantage of performing this surgery through 2 cm hole interspinous approach is to avoid removing ligamentous and bony structure like flavum, lamina in addition to reduce the length of the incision and the related scar tissue. However, we cannot demonstrate a clinical difference when compared this mini-open approach with the open approach in treating tethered cords in children. There is a need for more studies with larger cohorts.

## REFERENCE

1. Akay KM, Erşahin Y, Cakir Y. Tethered cord syndrome in adults. *ActaNeurochir* 2000;142:1111-1115.
2. Kaplan JO, Quencer RM. The occult tethered conus syndrome in the adult. *Radiology*1980;137:387-391.
3. Mayer TG, Vanharanta H, Gatchel RJ, et al. Comparison of CT scan muscle measurements and isokinetic trunk strength in postoperative patients. *Spine* 1989;14:33-36.
4. Sihvonen T, Herno A, Paljärvi L, et al. Local denervation atrophy of paraspinal muscles in postoperative failed back syndrome. *Spine* 1993;18:575-581.