

Posterior transarticular V-shaped osteotomy of lumbar spine for the treatment of TCS: a case report and literature review

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Abstract: Tethered cord syndrome (TCS) is common in young children and adolescents. The symptoms of adult patients are relatively hidden and the incidence is low. If clinicians lack of the awareness of it, it is easy to miss and misdiagnose^[1]. A male patient who found clubfoot deformity for 3 years and aggravated for 1 year was reported in this article, whose lower extremities were of equal length and both of feet showed clubfoot deformity and ankle were stiff, unable to dorsiflexion especially on the right side. Low spinal cord and longitudinal malformation at L3-4 level and intervertebral disc bulge and degeneration at L2-3 and L3-4 level and intervertebral disc bulge and degeneration and lumbar degenerative changes and thoracolumbar slightly posterior arch at L5-S1 level were showed in the MRI of the whole spine. After admission, tethered spinal cord release and L3-4-5 pedicle screw fixation were performed.

Keywords: Tethered cord syndrome, Horseshoe foot, Treatment

Tethered cord syndrome (TCS) refers to the fact that the end of the spinal cord is tethered to the inelastic structure of the sacrococcygeal region under the action of a series of factors, which leads to traction of the spinal cord and a series of symptoms such as numbness, pain, weakness, local skin morphological changes, defecation dysfunction and foot deformity of the back or lower limbs. Most of the patients have symptoms of neurological deficits, which affect their quality of life; some patients have no symptoms of neurological deficits, but only have sacrococcygeal skin masses, vegetations, ulcers, sinus tracts, and hair hyperplasia^[2]. Early surgical treatment can prevent neurological damage or aggravation of symptoms^[3], but some patients have new symptoms of neurological damage or aggravation of the original symptoms after surgery. Therefore, whether TCS patients should undergo surgical treatment or not and the timing of surgical treatment are the focus of clinicians.

We analyzed a case of congenital tethered cord syndrome with clubfoot retrospectively. After surgery to completely release the adhesion between the dura and the ligamentum flavum, the symptoms were significantly improved. The treatment process of this case is reported as follows.

1. Clinical data

A male patient, 13 years old and 5 months old, was admitted to the hospital due to the discovery of clubfoot deformity for 3 years and aggravation for 1 year. Physical examination: The range of motion of the cervical spine is acceptable, the range of motion of both upper limbs is acceptable, and there is no obvious abnormality in the muscle strength and skin sensation of both upper limbs. There were no varicose veins, ulcers and ulcers on the skin of the whole body, tenderness between the spinous processes of the lumbar spine (-), percussion pain (-), bilateral straight leg raising test (-), Millgram's sign (-), bilateral "4" Word test (-), femoral nerve pull test (-), knee tendon reflex (++) and anal sphincter reflex were normal. Both of the lower extremities are of equal length, the right lower extremity muscle atrophy, the right lower extremity iliopsoas, gastrocnemius, hamstring, and quadriceps muscle strength is "IV", and the muscle strength of the left lower limb was not obviously abnormal; the feet showed horseshoe

varus deformity, and the ankle joint was stiff and could not be stretched backwards, especially on the right side; there was no obvious abnormality in the skin sensation of both lower limbs. Auxiliary examination: Low spinal cord and longitudinal malformation at L3-4 level and intervertebral disc bulge and degeneration at L2-3 and L3-4 level and intervertebral disc bulge and degeneration and lumbar degenerative changes and thoracolumbar slightly posterior arch at L5-S1 level were showed in the MRI of the whole spine. Preliminary diagnosis: 1, congenital tethered cord syndrome 2, congenital horseshoe foot.



Figure 1: MRI of the whole spine: the shape of the spinal canal is intact, the spinal cord is low, the normal enlargement of the Conus medullaris disappears and is gradually thinning and lengthening into the sacral canal.

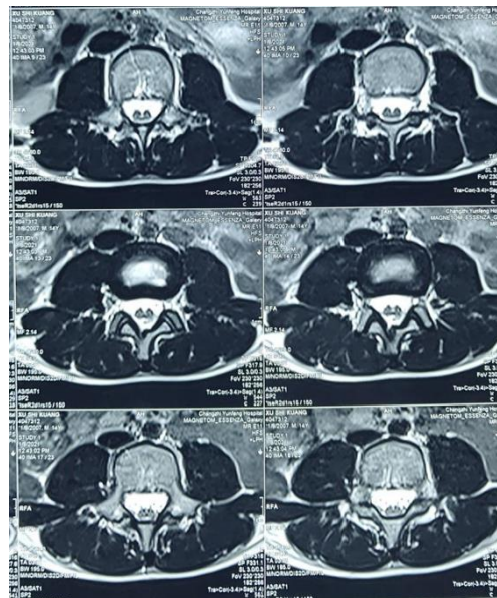


Figure 2: Diastematomyelia at lumbar MRI: L3-4 level and septum can be seen in L3-4 spinal cord.



Figure 3: Anterior and lateral position of bilateral ankle: enlarged arch and varus deformity.



Figure 4: Photo of the child's feet.

2. Surgical methods

After successful anesthesia, we take the midline of the lumbar back to make a longitudinal incision, cut open the skin and subcutaneous tissue and the lumbar dorsal muscle fascia, bluntly separate the bilateral sacral spinous muscles along both sides of the spinous process of L3-4-5, and expose the bilateral articular process. After accurate positioning, the needle insertion point was selected on the left articular process of L3, the bone cortex was drilled with a bone drill, and the fine hand vertebrae enter along the medullary cavity of the L3 pedicle, One pedicle screw was screwed in. By the same method, 6 pedicle screws were implanted on the right side of L3 and bilateral pedicles of L4 and L5. The laminae of L3-4 and L4-5 were exposed, and L5 laminae were spina bifida. L3-4-5 laminae were resected with lamina forceps. During the operation, low spinal cord was seen, and severe adhesion between dura and ligamentum flavum was seen in L3-4-5 segments, especially in L3-4 segments. The adhesion between the dura mater and the ligamentum flavum was completely released, and the spinal cord pulsed well. Interarticular osteotomy was performed between L3-4 and L4-5 bilateral articular processes with lamina forceps, internal fixation rods were installed and nuts were fixed. The segments of L3-4 and L4-5 were compressed about 10mm, the spinous process was cut into bone fragments, and implanted into the articular processes of L3-4 and L4-5. The spinal nerve root was loosened correctly. The position of internal fixation was satisfactory by C-arm X-ray machine, and no active bleeding was found. Saline washed the incision and placed drainage tube. And we close the incision layer by layer. After operation, the movement of both lower limbs was good, the muscle strength could be recovered, and the deformity of left foot was significantly improved.

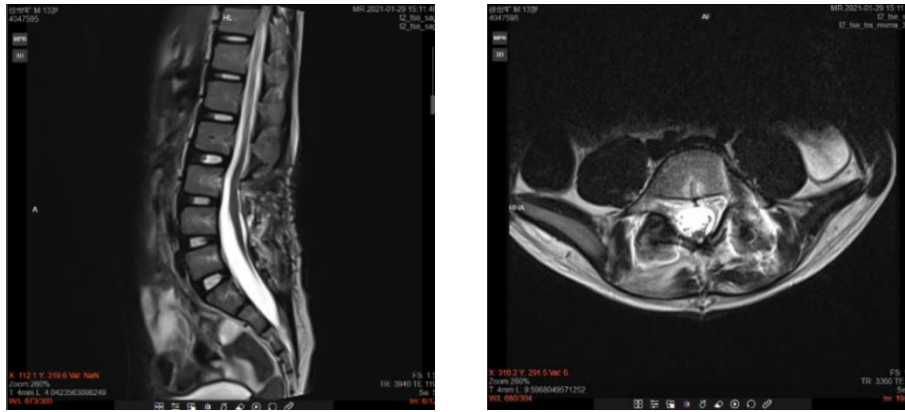


Figure 5: Postoperative neurolysis and decompression with satisfactory results.

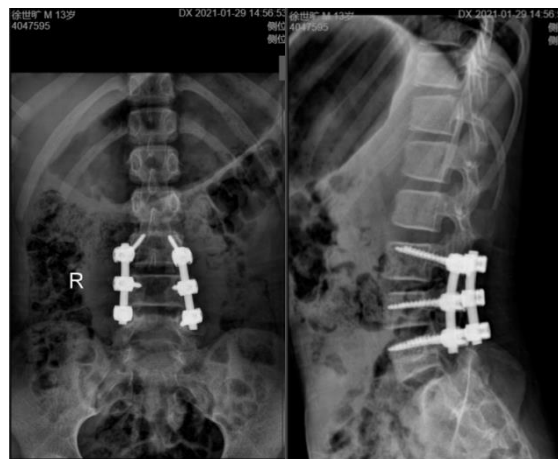


Figure 6: Rechecking the anterior and lateral position of lumbar vertebrae after operation, the position of internal fixation is acceptable and fixed in position.

3. Discuss

3.1 Etiology

At present, the most common congenital pathogenic factors are terminal filament dysplasia, spinal deformity, spinal canal insufficiency, diastematomyelia, intraspinal teratoma, lipoma and so on^[4], which are called primary tethered cord syndrome.

3.2 Clinical manifestations

Due to the different etiology, pathological changes and traction degree of tethered cord syndrome, the age and severity of nerve injury symptoms are quite different. Some of them have symptoms after birth, others are asymptomatic after birth, and appear symptoms at different age stages, so there are tethered cord syndrome between children and adults, but most of them occur in infancy and are rare in adults^[5]. The neurological symptoms of mild cases are not obvious, and even lower limb paralysis may occur in severe cases. The main clinical manifestations are as follows: (1) lumbosacral median skin abnormalities, such as soft tissue mass, clumps, sunken skin, etc. (2) lower limb deformities, sensory and motor disorders: such as lower limb shortening, muscle atrophy, muscle weakness, paralysis, foot underdevelopment, equinovarus deformity or Sellar area, hypoesthesia of foot skin, etc. (3) sphincter dysfunction: such as dilated large bladder, trickle urinary incontinence, stress urinary incontinence or enuresis^[6], fecal incontinence and so on.

3.3 Imaging examination

MRI is the first choice for the diagnosis of tethered cord syndrome at present, which can not only directly display the spinal cord and Conus in many directions, but also find related concomitant lesions,

which provides an important basis for removing the tethered cord and determining whether local repair is needed after operation and preventing cerebrospinal fluid leakage. Therefore, routine MRI examination should be performed before lumbosacral surgery or dural anesthesia to determine whether there is tethered spinal cord or not, so as to avoid spinal cord nerve injury during operation for patients with clinically suspected TCS^[7].

3.4 Diagnosis

Patients with tethered cord syndrome often go to orthopaedics because of deformities of the spine and limbs. As long as the orthopedic surgeon has enough knowledge of the disease, according to its medical history, clinical manifestations and combined with MRI examination, early diagnosis can be made (it is generally believed that TCS can be diagnosed when the spinal Conus is below L2)^[6].

3.5 Treatment

At present, the only method of TCS is surgical treatment^[8-9], which can alleviate the symptoms of patients in varying degrees. The earlier the operation time is, the lighter the spinal cord injury is, the more obvious the symptom relief is. The late spinal cord will form irreversible injury, and the effect of operation will be relatively poor^[1]. The timing of surgery: sudden onset with rapid progression of symptoms seems to be the best indication of surgery.

Although the incidence of TCS is low in the literature, most of the cases were treated with surgery after diagnosis. And at present, the only effective treatment is surgical release, the purpose of clinical application of tethered cord lysis is to remove the focus and release the spinal Conus and adhesion around the cauda equina and cut off the terminal filament to repair the dura mater^[10]. It has been reported that complete release of TSC can significantly improve the local microcirculation of the Conus and cauda equina nerve and promote the postoperative recovery of the involved nerve function.

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