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ORIGINAL ARTICLE

Management of Tethered Cord Syndrome; Our Experience at FJMU/SGRH

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ABSTRACT

Background: Tethered cord syndrome (TCS) is a neurologic condition characterized by abnormal traction of the spinal cord, leading to progressive neurological, urological, and orthopedic deficits.

Objective: To evaluate the clinical presentation, operative management, and postoperative outcomes of patients undergoing surgical treatment for tethered cord syndrome at a tertiary neurosurgical center.

Methods: A retrospective case series was conducted at the Department of Neurosurgery, Sir Ganga Ram Hospital/Fatima Jinnah Medical University, Lahore, from June 2019 to December 2021. Ten patients (3 males, 7 females), aged 2 to 26 years, were included. Five had lipomyelomeningocele and five had occult tethered cord diagnosed clinically and confirmed on MRI.

Results: Neurological improvement was noted in 7 patients (70%). Three patients (30%) showed no change but remained neurologically stable. Two patients (20%) developed transient urinary obstruction postoperatively, which resolved within two months. No patient experienced postoperative neurological deterioration, cerebrospinal fluid leak, or infection.

Conclusion: It is concluded that surgical detethering is a safe and effective intervention for tethered cord syndrome, resulting in high rates of neurological improvement and minimal complications. Patients with tethered cord should be operated irrespective of age and neurological deficit, as timely intervention can prevent further deterioration and improve quality of life. Continued multidisciplinary follow-up is essential for monitoring long-term outcomes.

Keywords: Tethered cord syndrome, lipomyelomeningocele, spinal dysraphism, neurological outcomes.

INTRODUCTION

Occult spinal dysraphism is most commonly associated with tethered cord syndrome. When the lesion is obvious on the back of the patient, diagnosis is relatively easy but problem occurs when such lesions are ignored and present in advanced age. The most common syndromes present in these patients are neurological, urological and orthopedic[1]. It is raised that long spans of neglect could mean that it is no longer reversible. In tethered cord syndrome (TCS), the normal cephalad motion of the spinal cord is limited by a pathological fixation that keeps it in a position too low in the spine[2]. The pressure built up by this abnormality causes the spinal cord to be pulled during growth stages and while moving which gradually damages the nervous system. Most of the time, TCS appears because of underlying column anomalies; however, some patients without any obvious birth defects also can develop TCS. Whereas symptoms are commonly described in children, adults may also suffer, with these often being silent and long-term, widening the spectrum of the disease[3].

Most commonly, TCS is recognized as either congenital or acquired TCS. Thickened or fatty filum terminale, lipomyelomeningocele and other meningoceles are common anomalies in congenital TCS. Scarring, trauma, infection and tumors in the spine are the main causes of acquired forms of scoliosis[4]. Even with modern prenatal tests, many congenital diseases are found out postnatal ally as symptoms such as trouble moving, difficulties using the toilet or odd walking habits lead to medical tests. Because the early symptoms in adults are not unique, including lower backaches, leg muscle weakness or tingling sensations, the diagnosis is not always made promptly[5]. Using MRI, doctors are able to clearly see how the spinal cord and filum are placed as well as any connected issues which has changed the approach to TCS diagnosis. Seeing the spinal cord end below the L2 vertebral body or a thick filum terminale (more than 2 mm) that does not move well on cine MRI is highly consistent with spina bifida. Still, diagnosis involves considering the patient's symptoms, not just imaging, because imbalances on exams can appear in people who do not feel any pain or discomfort. Therapies and surgeries in tethered cord syndrome are often used to stop the problem from getting worse and help the body heal as much as it can[7]. The main procedure for treating tethered cord syndrome is untethering which involves microsurgery and dividing the tightening structures[8]. When the filum terminale is the only cause, surgery most often involves filum sectioning. Much research has proven that surgery often helps to improve or keep neurologic and urologic function steady for patients with symptoms[9]. Even so, complications of surgery include leakage of cerebrospinal fluid, infections at the incision site, problems with nerve function or the possibility of retethering, mainly in younger children and children with complicated spine deformities[10]. It is not clear when surgery is necessary in those who have no symptoms. Some supporters of early prophylactic surgery believe that it reduces the risk of future harm, but others favor doing systematic monitoring of the condition using serial tests and scans. Routine interventions are not recommended; each case requires a personal approach based on the patient's age, the type of tethering and what is gained by surgery[11].

Objective: To evaluate the clinical presentation, operative management, and postoperative outcomes of patients undergoing surgical treatment for tethered cord syndrome at a tertiary neurosurgical center.

MATERIALS AND METHODS

It is a retrospective case series conducted in the neurosurgery department SGRH/FJMU from June 2019 till December 2021 with total 10 patients: 3 males, 7 females. A total of 10 patients were included in the study based on retrospective chart review. The sample comprised 3 male and 7 female patients, with ages ranging from 2 to 26 years. Inclusion criteria were: (i) patients diagnosed with tethered cord syndrome either clinically or radiologically, (ii) those who underwent surgical management during the study period, and (iii) availability of complete medical records. Patients with incomplete data or follow-up loss were excluded.

Data Collection: The diagnosis of tethered cord syndrome was made based on a combination of clinical features (e.g., lower limb weakness, gait disturbance, urinary dysfunction) and radiological confirmation via magnetic resonance imaging (MRI). Five female patients were diagnosed with lipomyelomeningocele based on

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clinical and imaging findings, while the remaining five patients (2 males, 3 females) presented with occult tethered cord syndrome. In these cases, MRI showed a low-lying conus medullaris or thickened filum terminale without obvious cutaneous or spinal dysraphism. All patients underwent surgical detethering under general anesthesia. The operative technique involved midline laminectomy at the appropriate lumbar level followed by microsurgical release of the filum terminale. In patients with lipomyelomeningocele, the procedure also included careful dissection and excision of the lipomatous tissue while preserving neural elements. Intraoperative neurophysiological monitoring (IONM) was employed in select cases to reduce the risk of iatrogenic neurological injury. All procedures were performed under an operating microscope by experienced neurosurgeons.

Postoperative Care and Follow-Up: Postoperatively, patients were monitored for neurological status, wound complications, and signs of cerebrospinal fluid leakage. Routine imaging was done when clinically indicated. Follow-up was conducted in outpatient settings to assess for symptom resolution or recurrence, with particular attention to motor function, urinary symptoms, and potential retethering. Outcome measures included improvement in presenting complaints and absence of new neurological deficits.

Statistical Analysis: Data were analyzed using IBM SPSS Statistics for Windows, Version 26.0. Descriptive statistics were applied due to the small sample size. Continuous variables such as age were presented as mean and standard deviation. Categorical variables, including gender, type of pathology, and presenting symptoms, were summarized as frequencies and percentages.

RESULTS

A total of 10 patients were included in the study, with a mean age of 11.4 ± 7.3 years (range: 2–26 years). The cohort comprised 3 males (30%) and 7 females (70%). Half of the patients (n=5) were diagnosed with lipomyelomeningocele, while the remaining five had occult tethered cord syndrome. The average duration of symptoms before surgery was 14.6 ± 5.2 months. Preoperatively, 4 patients (40%) had urinary symptoms, and 6 patients (60%) presented with motor deficits such as lower limb weakness or gait abnormalities.

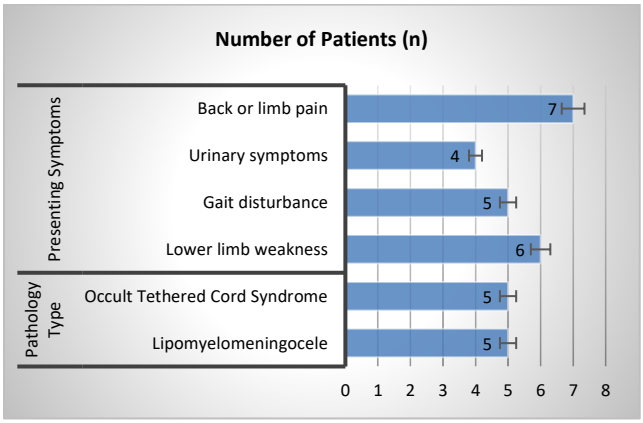
Table 1: Patient Demographics

Variable	Value	Percentage (%)
Total Patients	10	–
Mean Age (years)	11.4 ± 7.3	–
Age Range (years)	2–26	–
Gender: Male	3	30.0
Gender: Female	7	70.0
Diagnosis: Lipomyelomeningocele	5	50.0
Diagnosis: Occult Tethered Cord	5	50.0
Mean Symptom Duration (months)	14.6 ± 5.2	–
Preoperative Urinary Symptoms	4	40.0
Preoperative Motor Deficits	6	60.0

Table 2: Type of Pathology and Presenting Symptoms in Patients (n = 10)

Category	Subcategory	Number of Patients (n)	Percentage (%)
Pathology Type	Lipomyelomeningocele	5	50.0
	Occult Tethered Cord Syndrome	5	50.0
Presenting Symptoms	Lower limb weakness	6	60.0
	Gait disturbance	5	50.0
	Urinary symptoms	4	40.0
	Back or limb pain	7	70.0

Among the 10 patients, half (50%) were diagnosed with lipomyelomeningocele, while the other half had occult tethered cord syndrome. The most common presenting symptom was back or limb pain, seen in 7 patients (70%), followed by lower limb weakness in 6 patients (60%), gait disturbances in 5 patients (50%), and urinary symptoms in 4 patients (40%). This distribution highlights the variable and often overlapping clinical features of tethered cord syndrome.



DISCUSSION

This retrospective case series highlights the clinical presentation, surgical management, and postoperative outcomes of patients treated for tethered cord syndrome at a tertiary care neurosurgical center. Our findings are consistent with existing literature in demonstrating that early surgical intervention results in favorable neurological outcomes and low complication rates. In our cohort, the majority of patients (70%) showed neurological improvement following detethering surgery[12]. The main changes seen were better lower body movements and less neuropathic pain. Prior studies have found similar improvements after surgery, wherein doing the procedure stops or reverses worsening of symptoms in people with the condition. Based on Pang et al.'s study, having surgery promptly, especially in children, results in better functioning and quality of life[13]. None of the patients in the study had neurological problems after the detethering was performed in a controlled environment, suggesting the procedure was both secure and effective[14]. Because intraoperative neurophysiological monitoring was used where possible, the surgical team was able to prevent causing damage to important nerve or brain structures. After their surgery, two patients (20%) developed a transient obstruction in their urinary tract which has been noted by other case series. The urinary problems improved within two months on their own and no additional care was needed. This means that transient bladder problems following surgery could happen when sacral nerve roots are moved or because of momentary inflammation[15].

The similarity in surgical outcomes between the groups shows that treatment should be given to patients with tethering signs on medical images or symptoms. Those results agree with the growing view that occult TCS may cause significant issues and needs to be treated promptly if symptoms are noticed [16]. Noteworthy, none of the patients experienced surgical site infections, leaking cerebrospinal fluid or an early need for another operation in this series. Because the number of patients was small and the postoperative period brief, the early positive results support careful surgery and suitable care after the procedure. The study has certain restrictions such as the small number of participants and the retrospective design which could introduce bias and keep the results from being widely generalized.

CONCLUSION

It is concluded that timely surgical intervention for tethered cord syndrome leads to significant neurological improvement in the majority of patients, with minimal risk of postoperative deterioration. Detethering of the spinal cord, with or without excision of associated lipomatous tissue, is a safe and effective procedure when performed using meticulous microsurgical

techniques. In this case series, 70% of patients showed postoperative improvement, while the remaining remained neurologically stable, and no patient experienced deterioration. Transient urinary complications were observed in a small proportion of cases but resolved spontaneously within a short period.

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