Posttraumatic Syringomyelia: A Technical Note

ÖZ


YÖNTEM ve GEREÇLER: On altı sene önce trafik kazası geçiren, torakal bölge altında ağrı, spastisite, paraparezi ve inkontinans şikayetleri olan, 33 yaşında erkek hasta bu yeni teknik ile ameliyat edildi. Manyetik Rezonans Görüntüləme (MRG) ölç克莱mesinde T4-5 seviyesinde siringomiyelinin kesilmesi, hastaya mikroşirürjik teknikler kullanarak siringoplevral şant ve bilateral proksimal ve distal subarknoid mesafeler arasında kateter yerleştirilmesi ameliyatı yapıldı.

BULGULAR: Cerrahi girişim 90 dakika sürdü ve yaklaşık 100 mL kan kaybı saptandı. Hastaya ameliyat edildikten sonra 4 gün sonra ağrı, spastisite, paraparezi ve inkontinans şikayetleri kısmi düzelme ile tamamlandı. Ameliyat sonrası 6. ayda yapılan MRG ile siringomiyelinin kısmi düzelmesi, 3 yıl sonra kontrolde ise hem siringomiyelinin kısmi düzelmesi, hem de klinik tablo tam düzelme saptandı.

SONUÇ: Bu yazida, minimal invazif bir siringoplevral ve subarknoid-subarknoid şant cerrahisinin kombinasyonu kullanılarak rapor edilmiştir. Minimal invazif bir yöntem etkili ve güvenlidir.

ANALITICAL SÖZÜKLÜLER: Travma sonrası siringomiyeli, Şant cerrahisi, Manyetik rezonans görüntüleme, Subarknoid-subarknoid bypass, Servikal spinal kord

INTRODUCTION

Syringomyelia is a disorder that is characterized by the development of an abnormal fluid-filled cyst (syrinx) in the spinal cord, which causes progressive neurologic symptoms as it expands (13).

Posttraumatic syringomyelia is one of the causes of delayed neurological deterioration in patients with spinal cord injuries (5). The prevalence of symptomatic posttraumatic syringomyelia (PTS) is approximately 4% among patients with spinal cord injuries, whereas the prevalence of asymptomatic PTS is approximately 28% (1,8).

No standard procedure for treating syringomyelia has been established, as both shunting and arachnoidolysis are used in neurosurgery practice to treat syringomyelia (7,9).

All theories to explain syrinx formation and extension have focused on cerebrospinal fluid (CSF) circulation and its disturbance as the origin of PTS (5). Surgical management is indicated in patients with progressive neurological deterioration. Treatment procedures may attempt to reestablish normal CSF circulation around the spinal cord; however, certain procedures, such as cord untethering and arachnoidolysis, are not always effective (5). In this study, we present the case of a patient with asymptomatic...
thoracic syringomyelia who was treated effectively using subarachnoid-subarachnoid and syringopleural shunts.

**CASE REPORT**

A 33-year-old man presented to our institution with increasing paraparesis, urinary incontinence and lower extremity pain/spasticity refractory to medical management. He had experienced lower extremity weakness and urinary problems after a car accident that occurred 16 years ago.

He underwent spinal instrumentation and fusion to treat a fourth thoracic vertebra fracture and syringopleural shunt insertion to treat cervical and thoracic syringomyelia at another institution. His neurological status was ASOA-0 (American Spinal Injury Association) for 6 months before presenting at our institution. The patient had gradually increasing back and leg pain spasticity in his lower extremities. His visual analog score for back pain was 7. Pain and temperature modalities were affected and unaffected, respectively. Thoracic MRI scans revealed a large syrinx at the T4-5 level (Figure 1).

The patient underwent surgery in prone position after the induction of general anesthesia. An incision was marked on the skin 3 cm in length down the midline at the T6 level, which was the location of the largest part of the syrinx, while working under microscope magnification. Bilateral hemilaminotomy and medial facetectomy were performed. Exposing the midline of the dura, a midline linear durotomy was made, and the dural edges were tented with 4/0 silk suture on each side. The syrinx was entered after a myelotomy which was made using a blade no. 11. Than, a silicon catheter, (6 cm long, outer diameter 2.5 mm, inner diameter 1.3 mm), was prepared and inserted into the syringomyelic cavity. The proximal part of the catheter was advanced in cephalad direction of myelotomy. The distal part was introduced into the pleura, and the catheter was stitched to the pial suture.

After opening local arachnoid adhesions over the spinal cord at the side of the trauma, two silicon catheters of 6 cm in length were stitched on the right and left sides of the spinal cord just cranial and caudal to the lesion in the subarachnoid space. Both catheters were fixed to the inner wall of the dura mater by a 5/0 silk suture bilaterally. The durotomy was closed in a running fashion with 4/0 vicryl suture. The wound was closed in layers using standard methods.

The postoperative course was uneventful. The patient was followed up 1, 3, and 6 months postoperatively and then every six months for 3 years. The final neurological examination revealed that the patient could have an ordinary life. Three- and 6-year follow-up radiologic examinations revealed the decompression of the intramedullary syrinx (Figure 2, 3).

![Figure 1](image_url): Preoperative sagittal MRI scans of the spine showed a large intramedullary syrinx in the cervical and thoracic regions. Adhesion was observed at the T4-5 level. A syringopleural catheter that was previously implanted is shown (white arrow).
DISCUSSION

Posttraumatic syringomyelia affects approximately 28% of patients with spinal cord injuries, and current treatments are often ineffective. The natural history of the disease is variable, with approximately 1-9% of spinal cord injury patients becoming symptomatic. In 32-40% of patients with posttraumatic syringomyelia, the clinical course remains stable. In 33-43% of patients, the syrinx slowly expands, whereas rapid deterioration occurs in 21-27% of patients (1,8).

To understand the underlying causes of syringomyelia, it is necessary to understand the structure and physiology of the normal spinal cord and CSF. Additionally, the structure and mechanisms of syrinx expansion (12) have been demonstrated. In syringomyelia, fluid flows diffusely and
preferentially toward the central canal and syrinx cavity via the perivascular extracellular space. Tethering and extensive arachnoidopathy increases perioperative risks and recurrence rate (16). Levi et al. used lysis of arachnoid adhesions and expansile duraplasty to create a subarachnoid space and did not implant a draining tube (12).

In a systemic review of the literature, Bonfield et al. reported that there was no strong evidence to support the superiority of one surgical technique over the others but stated that there is a slight preference for the use of spinal cord untethering with expansile duraplasty as first-line surgical treatment (3). Tator CH et al. reported that the use of a syrinx subarachnoid shunt is an effective method of treatment in many patients with syringomyelia (14). Klenkamp et al suggested that successful long-term management of a syrinx requires microsurgical dissection of the arachnoid scar and decompression of the subarachnoid space with a fascia lata (10).

Williams recommended that the syrinx be shunted in a low-pressure system, such as the pleural or the peritoneal cavity, for effective drainage. Furthermore, an internal posttraumatic gibbous or arachnoiditis, if present, should be dealt with at the same time. According to Williams, abolition of a pressure gradient and free flow of the cerebrospinal fluid are vital factors in minimizing the risk of recurrence of syringomyelia (15).

In an animal study, increasing caudal subarachnoid space compliance with a lumboperitoneal shunt did not affect local CSF flow into the spinal cord and syrinx. These results suggest that localized alterations in subarachnoid space compliance, rather than obstructions from traumatic arachnoiditis, may act as an important factor in syrinx pathogenesis (4).

In this study, we bypassed the upper and lower levels of the subarachnoid space at the arachnoid adhesions via silicon tubes to provide equal pressure at both sides. A review of the literature identified two theoretical studies. Theoretical analysis of syringomyelia associated with adhesive arachnoiditis revealed that subarachnoid bypass, which effectively evades the blocked portion of the subarachnoid space with a catheter, reduced the increased pressure inside the spinal cord (6).

In a computational study for focal spinal arachnoiditis, Biston et al. reported that peak fluid pressures were higher above the obstruction than in the absence of an obstruction. The peak pressures were strongly dependent on the permeability of the obstruction. Elevations in pressure in the subarachnoid space due to arachnoiditis may facilitate fluid flow into the spinal cord, enhancing syrinx formation (2).

Hayashi et al. reported their series including 20 patients using subarachnoid-subarachnoid bypass and achieved good results. We performed same surgical procedure, however we also added syringopleural shunt to decompress the syrinx.

For our patient, using a syringoperiopleural shunt and connecting the cephalic, upper high pressure subarachnoid space to the caudal, lower low pressure subarachnoid space improved the patient's clinical status, decreased the syrinx size, and provided a safe corridor for CSF passage around the spinal cord. Serial follow-up MRI scans were performed to evaluate the syrinx status and showed that the results of the operation were successful.

CONCLUSION

There is no standardized treatment for severe forms of arachnoid scarring. Providing a corridor for free CSF passage and untethering the spinal cord are almost impossible, even with surgery. A good solution for this may be to open an adhesion and insert a syringopleural shunt with a subarachnoid-subarachnoid bypass using silicon tubes. As this technical note reports the positive results of only one patient, a case series should be performed to validate the results of this one case.

REFERENCES