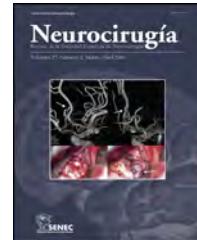




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Case Report

Myelopexy: A novel technique in posttraumatic syringomyelia

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ABSTRACT

Posttraumatic syringomyelia (PTS) is a well-reported phenomenon that usually takes place in the long-term course of patients following spinal cord injury. Different surgical procedures have been described: spinal corpectomy is usually a last option technique, but might be an excellent choice in patients with severe spinal cord injuries.

We present a young patient with complete spinal cord injury after spine trauma, who developed posttraumatic syringomyelia with progressive motor deterioration twelve years after fixation. We performed a novel surgical technique (myelopexy) with excellent resolution of syringomyelia, sparing the negative implications of complete cord transection. Some artistic illustrations made by one of the corresponding authors are included, to better understanding of operative details.

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Mielopexia: una técnica novedosa para la siringomielia postraumática

RESUMEN

La siringomielia postraumática (SPT) es un fenómeno bien documentado, que suele ocurrir en la recuperación a largo plazo de los pacientes después de una lesión de la médula espinal. Se han descrito diferentes procedimientos quirúrgicos: la corpectomía de la médula espinal es generalmente una técnica que se considera como última opción, pero podría ser una excelente elección para pacientes con lesiones graves en dicha zona.

Palabras clave:
Siringomielia
Corpectomía
Mielotomía
Traumatismo de columna vertebral
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Presentamos el caso de un paciente joven con una lesión completa de la médula espinal después de un traumatismo de la columna vertebral, que desarrolló una siringomielia posttraumática con un deterioro motor progresivo 12 años después de la fijación. Aplicamos una novedosa técnica quirúrgica (mielopexia) con una excelente resolución de la siringomielia, evitando las implicaciones negativas de la transección completa de la médula. Se incluyen algunas ilustraciones realizadas por uno de los autores para una mejor comprensión de los detalles de la intervención quirúrgica.

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Introduction

Syringomyelia after spinal cord trauma is a well-recognized phenomenon that usually occurs years after the initial injury.¹ In case of ascending syrinx formation with progressive clinical deterioration, surgical intervention may be advisable.

Various techniques have been described and employed such as laminectomy, spinal deformity correction, arachnoid adhesiolysis, duraplasty and different types of shunts. Corpectomies have been performed for years, but gained popularity in the last decade, especially in patients with complete spinal cord damage.²

We present a modification of this technique, which may achieve similar good results in terms of syringomyelia resolution, sparing the negative implications of complete cord transection.

Clinical case

We describe the case of a 20-year-old man with complete spinal cord injury below T6 level after spine trauma. A T3-T10 posterolateral fixation with pedicle screws and hooks was performed due to T6 unstable fracture, without decompressive laminectomy.

Ten years after trauma, thoracic syringomyelia was observed in MRI: the patient remained asymptomatic besides primary damage and no intervention was indicated, but follow-up was lost. Two years later (twelve since spine trauma) the patient requested neurosurgical evaluation, referring pain and dysesthesias in both arms. According to physical findings, muscle strength of both upper limbs was normal but decreased sensation was observed bilaterally in the C6-C7-C8 territories. MRI was performed, showing worsening of thoracic syringomyelia with mild cervical affection at C5-C6 level (Fig. 1). Few months later, the clinical scenario progressed to hand clumsiness and mild weakness. A new MRI showed a wider syrinx cavity within the cervical spinal cord up to C3-C4 (Fig. 2), and surgery was indicated. The patient did not present axial pain, significant kyphosis or hardware-related complications and no clear signs of scarring at T6-T7 level were found. Bibliographical reports of high failure rate and our own experience with syringo-subarachnoid shunts led us to look for different options. Finally, we selected corpectomy as first option due to low risk of neurological worsening in this patient



Fig. 1 – Sagittal T2-weight MRI scan showing complete thoracic syringomyelia with mild cervical syrinx formation.

and his own preference for long-term stability. Subsequently, an informed consent was obtained from the patient and our modified technique was carried out.

Surgical technique description:

The patient is set in prone position and laminectomy at the original injury level is performed (T6-T7 in this case). After dural opening, we did not find especially severe arachnoiditis under microscope evaluation in this patient, but adhesiolysis must be done if present. A 1.5–2 cm longitudinal midline dorsal myelotomy is made, so that the syrinx cavity can be exposed and drained. Afterwards, two 8/0 nylon sutures fix the piamater of the dorsal columns of both sides to the ipsilateral inner anterolateral surface of the duramater (Figs. 3–5). This maneuver allows the syrinx cavity to widely communicate with the subarachnoid space with a very low risk of future obstruction. Myelotomy needs to be long enough to allow sutures without excessive tension. Duramater is closed in a watertight fashion with a running 5/0 suture and sealant; alternatively an expansile duraplasty with allograft can be performed.



**Fig. 2 – Sagittal T2-weight MRI scan 5 months later.
Worsening of the cervical syringomyelia can be seen.**

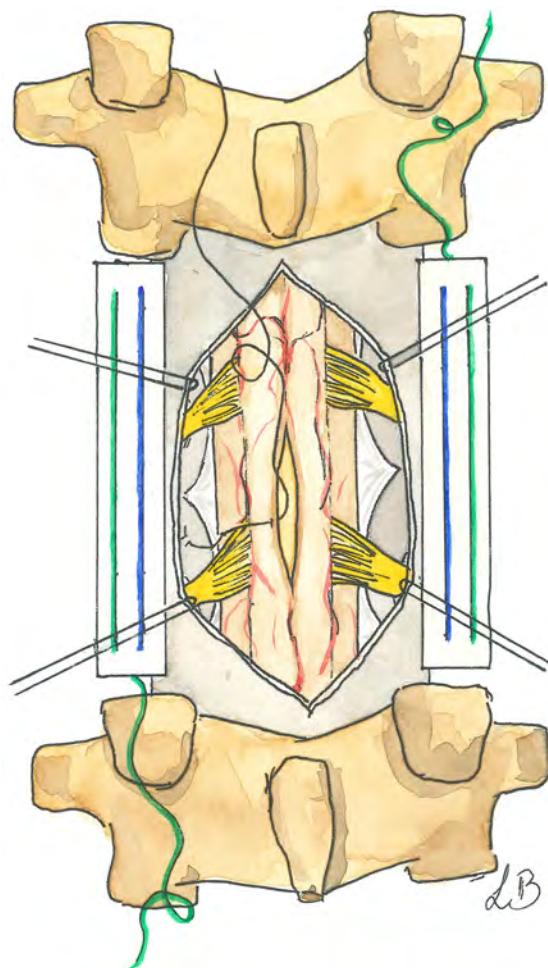


Fig. 4 – After syrinx cavity evacuation, pial sutures are done in both sides of myelotomy.

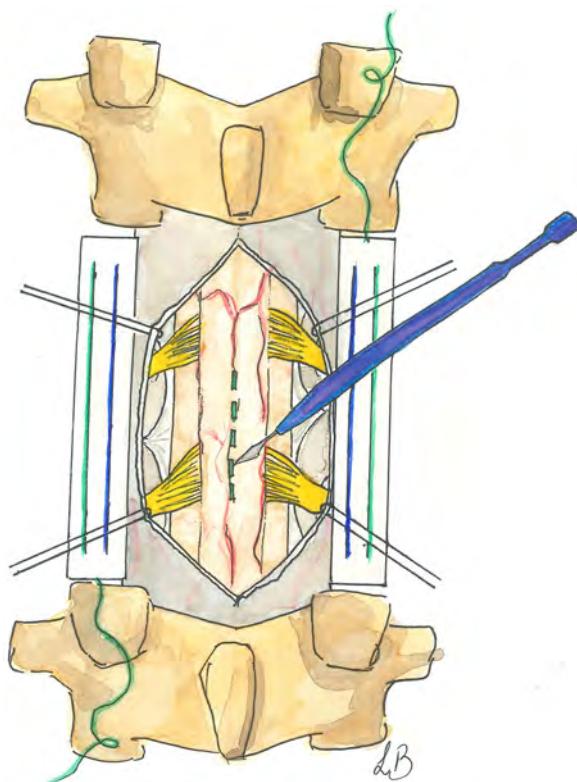


Fig. 3 – Illustration showing the one level posterior midline myelotomy that is performed after dural opening and adhesiolysis.

Outcomes

No postoperative complications occurred and the patient was discharged home two days after the procedure. Radiological results in terms of syringomyelia obliteration in MRI were excellent, and keep stable one year after surgery (Fig. 6). The patient did not present further neurological decline and improved weakness, but no changes in sensitive symptoms were observed.

Discussion

Posttraumatic syringomyelia (PTS) is a well-reported phenomenon that usually takes place in the long-term course of patients following spinal cord injury.¹ Natural history of PTS is not completely understood, but there are some factors that may contribute in its ethiopathogenesis: complete spinal cord injury and increased residual sagittal deformity and axial stenosis are related to a higher incidence of PTS.³ In our case, mild kyphosis and stenosis is present and laminectomy was not performed at the moment of spinal fixation. Nevertheless,

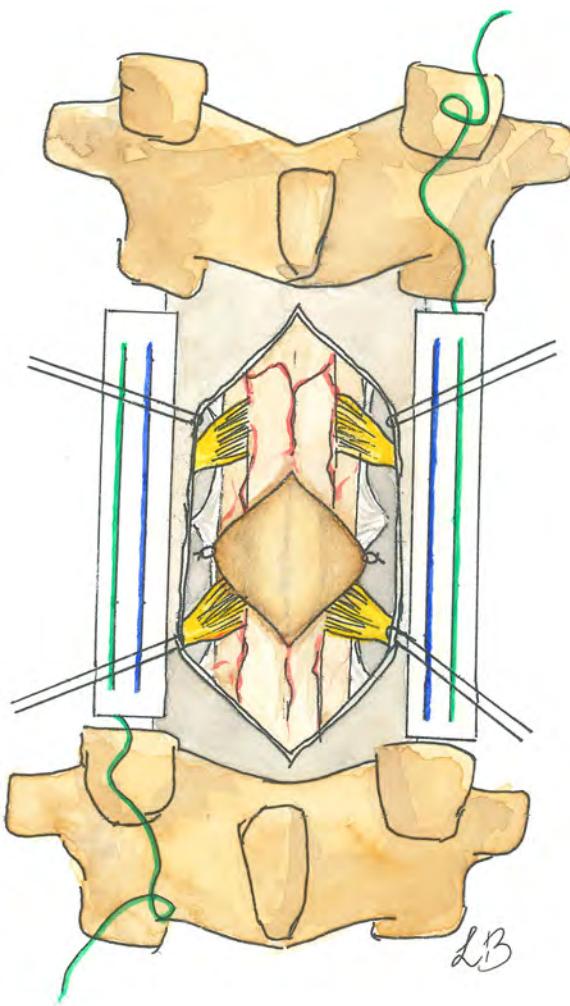


Fig. 5 – Final result after myelopexy showing wide opening and communication of syrinx and subarachnoid space.

recommendations to direct surgical decompression after complete spinal cord injury specifically to reduce the risk of future PTS is weak (low and very-low quality literature).³

Recommendations for surgery in PTS are strong in case of progressive weakness and weak against intervention if only sensitive symptoms are present or in case of asymptomatic ascending syringomyelia.³

There are several surgical procedures that have been described: shunt insertion, decompressive laminectomy with or without fusion, dethethering and duraplasty. Spinal cordecomy is generally a last option technique, but could be an excellent alternative in patients with severe spinal cord injuries due to more durable results.⁴

Many papers have reported good outcomes after spinal cord transection for PTS.^{2,5-8} In an excellent revision,⁹ Konar et al. recently analyzed the surgical outcomes of cordecomies for different indications: PTS, subacute posttraumatic ascending myelopathy (SPAM), central pain of spinal cord origin, spasticity, spinal cord tumors and myelomeningocele. They found 60 cases of cordecomy for PTS: results showed 78.3% excellent improvement, 13.4% stabilization and 8.3% deterioration.⁹ They found that the reported causes of failure

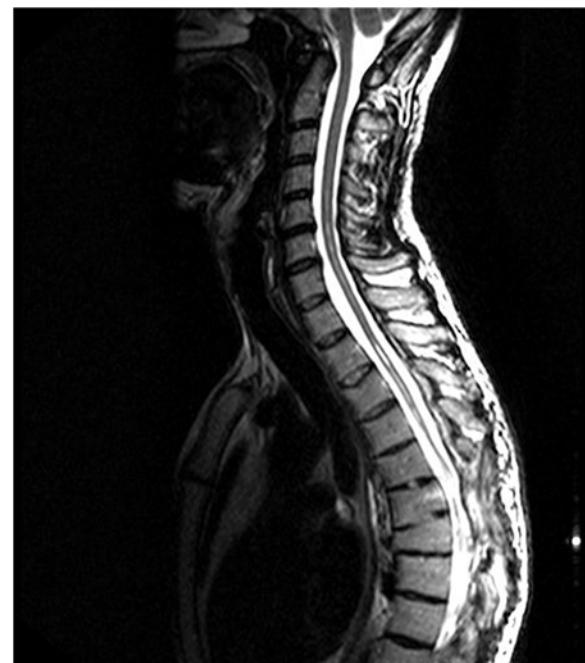


Fig. 6 – Sagittal T2-weight MRI scan one year after surgery that manifest almost complete obliteration of syrinx cavity.

of spinal cordecomy were arachnoid adhesion and scarring at the proximal level of the transected cord.

We described a different technique (myelopexy) for management of PTS in patients with complete spinal cord injury that shares similar principles and indications with cordecomy. We obtained a wide syringo-subarachnoid space communication by “openbook” myelotomy and fixation, which reduces syrinx pressure and prevents postoperative subarachnoid adhesions. Syringostomies and shunts present high rates of failure and infection,^{4,10} but we believe they still play a role in patients with incomplete spinal cord injury if adhesiolysis and expandile duraplasty have failed.

Presumed advantages of myelopexy compared with other techniques are: (1) low risk of adhesions and obstruction similar to cordecomy, although further follow up is needed; (2) avoidance of exogenous material: low risk of infection and no risk of device-malposition or migration; (3) less invasive than cordecomy; (4) potential use in patients with incomplete spinal cord injury below level of surgery in selected cases under neurophysiology monitoring.

Long-term results and more cases need to be reported in order to confirm these benefits.

Conclusions

Myelopexy is a simple and effective technique to reduce syrinx, but long-term results are still unknown. Spinal surgeons should keep it in mind when facing patients with symptomatic posttraumatic syringomyelia and complete spinal cord injury.

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Conflict of interest

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

REFERENCES

1. Schurch B, Wichmann W, Rossier AB. Post-traumatic syringomyelia (cystic myelopathy): a prospective study of 449 patients with spinal cord injury. *J Neurol Neurosurg Psychiatry*. 1996;60:61–7, <http://dx.doi.org/10.1136/jnnp.60.1.61>.
2. Ewelt C, Stalder S, Steiger HJ, Brandt GH, Heilbronner R. Impact of corpectomy as a treatment option for posttraumatic and non-posttraumatic syringomyelia with tethered cord syndrome and myelopathy. *J Neurosurg Spine*. 2010;13:193–9, <http://dx.doi.org/10.3171/2010.3.SPINE0976>.
3. Bonfield CM, Levi AD, Arnold PM, Okonkwo DO. Surgical management of post-traumatic syringomyelia. *Spine*. 2010;35:245–58.
4. Klekamp J. Treatment of posttraumatic syringomyelia: clinical article. *J Neurosurg Spine*. 2012;17:199–211, <http://dx.doi.org/10.3171/2012.5.SPINE11904>.
5. Post M, Noreau L. Quality of life after spinal cord injury. *J Neurol Phys Ther*. 2005;29:139–46, <http://dx.doi.org/10.1097/01.NPT.0000282246.08288.67>.
6. Kasai Y, Kawakita E, Morishita K, Uchida A. Corpectomy for post-traumatic syringomyelia. *Acta Neurochir (Wien)*. 2008;150:83–6, <http://dx.doi.org/10.1007/s00701-007-1421-9>.
7. Laxton AW, Perrin RG. Corpectomy for the treatment of posttraumatic syringomyelia: report of four cases and review of the literature. *J Neurosurg Spine*. 2006;4:174–8, <http://dx.doi.org/10.3171/spi.2006.4.2.174>.
8. Durward QJ, Rice GP, Ball MJ, Gilbert JJ, Kaufmann JC. Selective spinal corpectomy: clinicopathological correlation. *J Neurosurg*. 1982;56:359–67, <http://dx.doi.org/10.3171/jns.1982.56.3.0359>.
9. Konar SK, Maiti TK, Bir SC, Nanda A. Spinal corpectomy: a new hope for morbid spinal conditions. *Clin Neurol Neurosurg*. 2017;152:5–11, <http://dx.doi.org/10.1016/j.clineuro.2016.11.003>.
10. Sgouros S, Williams B. Management and outcome of posttraumatic syringomyelia. *J Neurosurg*. 1996;85:197–205, <http://dx.doi.org/10.3171/jns.1996.85.2.0197>.