Acta Neurochir (Wien) (2005) 147: 565–567
DOI 10.1007/s00701-004-0470-6

Acta Neurochirurgica
Printed in Austria

Case Report

Huge epidural hematoma after surgery for spinal cord stimulation

A. Franzini, P. Ferroli, C. Marras, and **G. Broggi**

Department of Neurosurgery, Istituto Nazionale Neurologico "C. Besta", Milan, Italy

Published online March 3, 2005

Summary

Objective and importance. Spinal epidural haematoma (SEH) following implantation of an epidural spinal cord electrode is a very rare complication but one that must not be overlooked. This case is unusual because of the almost "holocord" extension of the haematoma and the excellent recovery obtained by prompt surgical treatment.

Clinical presentation. A 69 years old man with normal serum coagulation parameters was submitted to spinal cord stimulation (SCS) for chronic pain syndrome. After a minimal L1 laminotomy the patient developed paraplegia due to a large haematoma at D4-L2.

Intervention. Surgical removal of the entire clot by a D4-L2 laminectomy was performed immediately.

Conclusion. Large epidural haematoma can result from SCS and this complication may be cured by appropriate and prompt surgery.

Keywords: Chronic pain; laminectomy; spinal cord stimulation; spinal epidural haematoma.

Introduction

Spinal cord stimulation (SCS) has an established role in the management of chronic pain of non-malignant origin [7]. Good or excellent results were obtained in a patient with lumbosacral rhizopathy, reflex sympathetic dystrophy, phantom limb, post-herpetic neuralgia and spinal cord injury [7]. However the precise site of action of SCS for pain control is still undetermined. Lindbolm postulated that the SCS effect could be either due to a direct inhibition of the pain-mediating interneurons or activation of inhibitory marginal zone gelatinosa neurons [6]. Other studies have shown that the effects of SCS may be mediated through brain stem mechanisms [8].

Implantation within the epidural space under direct vision seems to be safer than the percutaneous technique [7]; usually a plate-type quadripolar electrode is utilized, and a minimal laminectomy is required. The possible complications of SCS are neurological damage resulting from intra-operative root or spinal cord injury, infection, CSF leak, hyperalgesia/exacerbation of the chronic pain, and spinal cord compression by intraspinal clot or epidural haematoma [4]. A case of paraplegia caused by an epidural haematoma at the site of the electrode implantation is reported.

Case report

A 69-year-old man was referred to the Istituto Nazionale Neurologico Carlo Besta for treatment of chronic right lower limb pain which had been persisted since 1977 following a traumatic fracture of L3 injuring the cauda equina and resulting in complete paraplegia. Following immediate surgical decompression and stabilization a complete recovery of the motor function was observed within 6 weeks. Sensory function, however, remained partially impaired manifesting itself as a hypoesthesia to static light pressure, a dynamic mechanical allodynia and, most significantly, an intolerably sharp, burning pain in the right lower limb that lacked any precise radicular localization. This pain had remained unaltered for more than 20 years despite numerous medical interventions. These included: non-steroidal and steroidal antinflammatory drugs, anti-epilectics, antidepressants and opiates which were used alone or in various combinations. On this admission a neurological examination excluded all other neurological deficits besides these sensory disturbances. A lumbar CT scan and MRI ruled out any direct radicular compression. Spinal cord stimulation (SCS) was therefore proposed to resolve this medically intractable post-traumatic neuropathic pain.

On April 5 2003, under general anaesthesia, a quadripolar electrode strip (Resume, Medtronic Inc, Minneapolis) was positioned in the epidural space through a minimal L1 laminectomy. In the immediate postoperative period a progressive loss of motor power was noted in the lower limbs and within approximately two hours his paraparesis became a complete flaccid paraplegia with bilateral numbness starting caudally at the mammillary line. CT and MRI examination revealed a large nearly "holocord" epidural haematoma (Fig. 1). Surgical evacuation of the

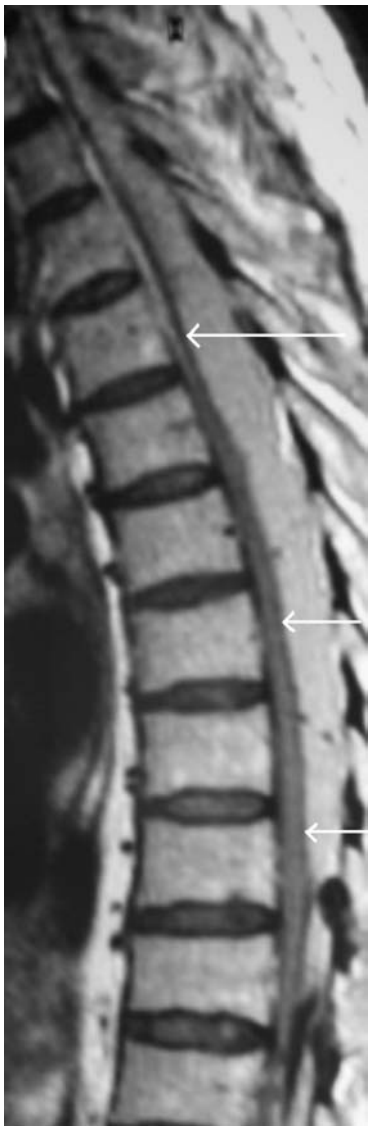

Fig. 1. Holocord epidural haematoma as shown by immediate post-implant MRI. The artifact induced by the SCS electrode is clearly visible at the thoraco-lombar junction. The arrows point the posterior boundaries of the hematoma

entire clot through a D4-L2 laminectomy was then performed immediately. Blood samples were obtained to re-check the coagulation parameters (including platelet function tests) which had previously been obtained upon admission. No coagulopathies were found. The patient promptly recovered and the day after surgery he was again able to stand and walk. Following this complication and its resolution, the patient's neuropathic pain remained silent for a couple of days and then reappeared. The patient was then treated with continuous chronic stimulation and we were able to obtain a 30% of pain reduction with the following parameters of stimulation: amplitude 2.5 V, pulse width 160 μsec, frequency 60 Hz.

Discussion

During the last 25 years SCS has earned an important role in the clinical management of chronic pain and it is commonly used to treat chronic pain of multiple origin [7]. The complication of SCS procedures is neurological damage that may result from both direct root or spinal cord injury or cord compression from an intraspinal clot. To our knowledge only one case of spinal epidural haematoma secondary to SCS has been reported [1]. In that report, the haematoma was found to have extended beyond the site of electrode implantation. This case appears to be the only instance where the intraspinal hematoma was observed to extend so far from the site of implantation and such a dramatic clinical progression.

Spinal epidural haematoma is a severe acute complication of SCS. In our series of 397 implant for SCS this was the only patient in whom such a complication was encountered (0.3%).

SEH can occur spontaneously (43.6% of all intraspinal hematoma) or be related to coagulation disorders (28.5%), vascular malformations (9.1%), tumors, trauma, and spinal surgery (0.1%) [4, 5]. Minimally invasive procedures, such as an epidural bock, have also on occasion been reported to cause SEH in healthy persons (incidence 7×10^{-4}) [2, 9].

An extensive search of the literature has revealed that in addition to coagulopathies the following associations are observed with SEH: age (bimodal distribution with peaks during childhood and during the fifth and sixth decades of life), male sex (male-to-female ration 4:1) and multilevel laminectomies [3, 4]. SEH may be considered to be at an increased risk in these patients and extra precautions for meticulous haemostasis during the procedure should be considered. Periodical assessment of motor and sensory function should be performed for the first 36 hours; local nursing guidelines should therefore acknowledge the increased possibility of this complication in such patients and the appropriate action that should be taken. Any delays in recovery from anesthesia should also prompt a full neurological examination and possibly an MRI or CT myelogram to rule out or diagnose the occurrence of an SEH quickly.

Conclusion

This case report demonstrates that a large epidural haematoma can result from SCS and the resulting paraplegia may be cured by appropriate and early surgery despite the involvement of the highly vulnerable thoracic spinal cord. In addition, these findings should serve as a reminder that this complication may occur following even a simple and well-standardized procedure such

as the placement of an epidural electrode through a minimal laminectomy and therefore extra precaution should be taken in patients considered to at increased risk. This knowledge should be helpful to neurosurgeons in the presentation of informed consent and, more importantly, in facilitating the prompt recognition and management of this severe occurrence.

References

1. Barolat G (2000) Spinal cord stimulation for chronic pain management. Archives of Medical Research 31: 258–262
2. Gilbert A, Owens B, Mulroy M (2002) Epidural hematoma after outpatient epidural anesthesia. Anesthesia & Analgesia 94(1): 77
3. Kou J, Fischgrund J, Biddinger A, Herkowitz H (2002) Risk factors for spinal epidural hematoma after spinal surgery. Spine 27(15): 1670–1673
4. Kreppel D, Antoniadis G, Seeling W (2003) Spinal haematoma: a literature survey with meta-analysis of 613 patients. Neurosurg Rev 26: 1–49
5. Lawton MT, Hamilton MG, Beals SP, Joganic EF, Spetzler RF (1995) Surgical management of spinal epidural hematoma: relationship between surgical timing and neurological outcome. J Neurosurg 83(1): 1–7
6. Lindblom U, Tapper N, Wieesenfeld Z (1977) The effect of dorsal column stimulation on the nocieptive response of dorsal horn cells and its relevance for pain suppression. Pain 4: 133–144
7. North RB, Wetzel FT (2002) Spinal cord stimulation for chronic pain of spinal origin: a valuable long term solution. Spine 27(22): 2584–2591
8. Rees H, Roberts MH (1989) Antinociceptive effects of dorsal column stimulation in the rat: involvement of the anterior pretectal nucleus. J Physiol 417: 375–388
9. Stoll A, Sanchez M (2002) Epidural hematoma after epidural block: implications for its use in pain management. Surg neurol 57: 235–240

Comments

This is a very unusual complication for a minimal invasive procedure such as an implantation of electrodes at L1. It alerts us that there is no such thing as a small operation or a procedure where nothing may happen. Every patient requires clinical monitoring after invasive diagnostic tests or surgical interventions regardless of how small they may seem. I only disagree with the authors on one point: I do not think, that a laminectomy of 11 levels was required to treat this patient. With such extensive lesions – be it tumors, absecesses or hemorrhages – we have used hemilaminectomies of alternating sides. This method gives adequate overview but preserves most of the posterior bony anatomy and thus stability of the spine.

J. Klekamp
Quakenbruck

This paper concerns a case report about a classical complication after intraspinal surgery. What was the reason why the haematoma extended that far? Was there any artery that had been damaged during the first operation, with a bleeding site that was discovered at the second operation? Furthermore, I do not understand why the authors did not perform a laminotomy instead of a laminectomy for that many levels.

J. Goffin
Leuven

Correspondence: Giovanni Broggi, Istituto Nazionale Neurologico "C. Besta", Dipartimento di Neurochirurgia, Via Celoria 11, 20133 Milano, Italy. e-mail: neurochirurgia@istituto-besta.it