

A Less Invasive Posterior Approach for the Management of Extended Secondary Epidural Abscess

Technical Note

Eine Weniger Invasive Technik Zum Management von Ausgedehnten Sekundären Epiduralabszessen

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Key words

- Spondylodiscitis
- epidural abscess
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Bibliography

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Abstract

Spondylodiscitis is considered to be the main cause of epidural abscess. In this report, the authors present their concept for the management of the extended epidural abscess that occurs in combination with spondylodiscitis. It consists of debridement and fusion for spondylodiscitis together with epidural abscess drainage using a microscopically assisted percutaneous technique. In the period from April 2000 to April 2004, 5 patients with spondylodiscitis and an accompanying extended epidural abscess were operated on. The mean age of the patients was 66 years. There were 4 males and one female. The follow-up period ranged from 3–12 months. To manage the extended epidural abscess, the authors created one or two drainage sites along the extension of epidural abscess. These drainage sites were made using a microscopically assisted percutaneous approach. In all presented cases, the offending organism was *Staphylococcus aureus*. The postoperative infection markers showed marked regression. The postoperative control MRI demonstrated effective drainage of the extended epidural abscess. Regarding the neurological deficits, 3 patients previously classified as Frankel C showed an improvement to Frankel E within 3 months postoperatively. From these results, it seems that our technique (ventro-dorsal abscess drainage combined with a microscopically assisted percutaneous approach) could be a successful method for the management of the extended epidural abscess associated with spondylodiscitis.

Zusammenfassung

Ausgedehnte sekundäre (im Zusammenhang mit einer Spondylodiscitis auftretende) Epiduralabszesse stellen ein Problem dar. Die meisten Patienten sind älter und multimorbid. Neben der ausgedehnten operativen Herdsanierung (meist ventro-dorsales Debridement) muß der epidurale Abszess ausreichend drainiert werden, was eine zusätzliche Operationsbelastung für den Patienten nach sich zieht. Im Rahmen dieser Arbeit wird ein weniger invasives Zugangsverfahren zur Abszessdrainage vorgestellt und anhand klinischer Fälle hinsichtlich der Effektivität geprüft.

Methodik: Es handelt sich um eine retrospektive Studie. Der Terminus ausgedehnter epiduralabszess wurde definiert mit einer Abszessausdehnung von mehr als 6 Wirbelkörperhöhen (Definition der Autoren). Im Zeitraum April 2000 bis April 2004 wurden fünf Patienten mit einer Spondylodiscitis in Kombination mit einem ausgedehnten Epiduralabszess operativ versorgt. Der Altersdurchschnitt war 66 Jahre. Der Nachbeobachtungszeitraum reicht von 3–12 Monaten. Die bei drei Patienten vorhanden neurologische Ausfallsymptomatik wurde mit Frankel-Score determiniert. Nach der operativen Herdsanierung (ventro-dorsales Debridement und Spondylodese) erfolgte in gleicher Sitzung die Abszessdrainage über je nach Ausdehnung des Abszesses ein oder zwei dorsale Zugänge zum Spinalkanal unter Anwendung der so genannten mikroskopisch assistierten perkutanen Zugangstechnik. Über einen 2 cm langen Hautschnitt wird nach schrittweiser Dilatation der paraspinalen Muskulatur ein Arbeitskanal eingebracht. Über diesen wird dann unter Verwendung des Operationsmikroskopes der Spinalkanal eröffnet und der Abszess durch einen nach kranial und kaudal vorgeschobenen Silikonkatheter ausgespült.

Ergebnisse: In allen fünf Fällen wurde Staph. aureus als Erreger nachgewiesen. Es gab keine intra- und postoperativen Komplikationen. Alle Entzündungen konnten erfolgreich saniert werden. Die postoperativen MRT-Kontrollen zeigten eine effektive Drainage des Epiduralabszesses in Konkordanz zu der Entzündungserologie. Drei Patienten mit präoperativen neurologischen Ausfällen (Frankel C) verbesserten sich innerhalb von drei Monaten auf Frankel E.

Schlussfolgerung: Die hier vorgestellte weniger invasive Methodik erlaubt eine ausreichende Abszessdrainage. Eine zusätzliche operative Belastung des Patienten wird minimiert.

Introduction

Epidural abscess can complicate pyogenic infection of the spine and is referred to as secondary epidural abscess [10]. However, secondary epidural abscess can also result from spinal canal injections [11], Spinal Cord Stimulator implantation [3], epidural catheter [18], or facet joint infiltration [2].

Although spondylodiscitis is a disease which occurs in older patients with multiple morbidities and compromised immune systems, there are some indications for operative intervention:

- ▶ Failure of conservative treatment
- ▶ Vertebral body destruction
- ▶ Severe pain which does not respond to analgesics
- ▶ Para and intra-spinal abscess
- ▶ Neurological deficits.

Different surgical techniques have been used for the treatment of spondylodiscitis, e.g. percutaneous transpedicular discectomy, laminectomy, debridement and fusion, and debridement and fusion augmented by posterior instrumentation [10, 12–14, 19].

Primary epidural abscess is an entity that occurs independently of spondylodiscitis or any of the previously mentioned primary causes. The management of primary epidural abscess depends on the neurological findings. In other words, when the patient presents with neurological deficits, surgical drainage of the abscess is usually indicated [10]. However, conservative treatment is preferred when the patient has no neurological deficits [1].

The authors present here their concept for the management of the extended epidural abscess that occurs in combination with spondylodiscitis. It consists of debridement and fusion for spondylodiscitis together with epidural abscess drainage using a microscopically assisted percutaneous technique.

Material and methods

As there is no definite definition of extended epidural abscess in the literature, we have defined extended epidural abscess as an abscess which extends for 6 vertebral levels or more.

In the period from April 2000 to April 2004, 5 patients with spondylodiscitis and an accompanying extended epidural abscess were operated on in our institution (◉ Fig. 1).

The mean age of the patients was 66 years. There were 4 males and one female. The level of spondylodiscitis was either in the cervical or lumbar spine. Culture and antibiotic sensitivity analysis were done for all patients and patients were given the specific antibiotic for a period of at least 3 months. The patients were followed up and examined in the outpatient clinic. The

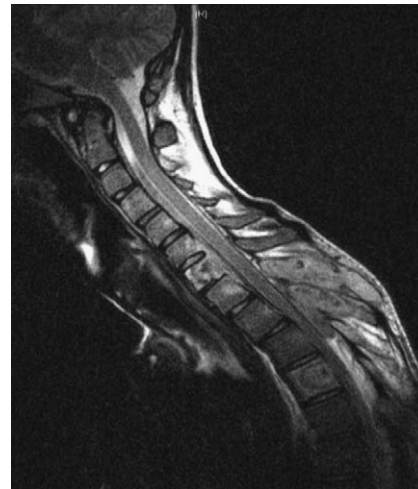


Fig. 1 Spondylodiscitis C7-Th1 with epidural abscess extending from C3 to Th3.

neurological state of the patients was classified according to Frankel [6]. The follow-up period ranged from 3–12 months. The clinical data of the patients are given in ◉ Table 1.

Operative technique:

In lumbar spine spondylodiscitis, the operative principles consist of ventral debridement with decompression of the spinal canal and drainage of the epidural abscess. This is followed by ventral fusion using autogenous iliac bone graft and lastly, posterior fixation and fusion of the affected level. In the cervical spine, ventral debridement of the affected level followed by anterior fusion and fixation by plate and screws are all that is needed.

To manage the extended epidural abscess, we created one to two drainage sites along the extension of the epidural abscess. These drainage sites were made using a microscopically assisted percutaneous approach (◉ Fig. 2). This less invasive approach was developed for the treatment of lumbar disc herniation and spinal canal stenosis (cervical and lumbar) [5, 7–9]. The level of interest was localized using an image intensifier (lateral view). A paramedian, 15-mm skin incision was made, followed by transmuscular dilatation of the paravertebral muscles to the limit that allowed introduction of the working channel. The handle allows the working channel to be directed in different directions. The working channels (Fa. Medicon, Tuttlingen, Germany) are available in 3 different lengths (45, 55, 65 mm), with an outer diameter of 11 mm and inner diameter of 9 mm. The operative microscope was then moved into the field, and the inter-laminar space was identified as an anatomical landmark. Next, a lami-

Table 1 Clinical data of the patients

Patient	Age	Sex	Level of spondylo-discitis	Level of epidural abscess	Neurological deficits	Preoperative neurological state	Postoperative neurological state	Follow-up period (months)
1	75	male	C3/4	C3-L5	incomplete quadriplegia	Frankel C	Frankel D	12
2	71	male	C5/6	C5-Th12	incomplete quadriplegia	Frankel C	Frankel E	11
3	62	female	L3/4	L5-Th4	incomplete paraplegia	Frankel C	Frankel E	8
4	69	male	C4/5	C4-Th11	incomplete quadriplegia	Frankel C	Frankel E	6
5	52	male	L2/3	L3-Th4	no deficits	Frankel E	Frankel E	3

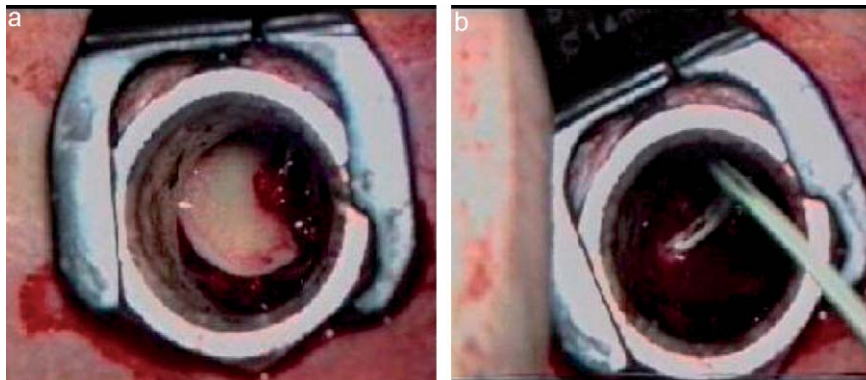


Fig. 2 Operative microscopic view through the working channel. (a) Epidural abscess drainage after opening the spinal canal. (b) Silicon catheter in the epidural space for irrigation.

notomy was performed, extending cephalad above the insertion of ligamentum flavum on the inferior surface of upper lamina and including a small part of the upper edge of the inferior lamina. The epidural abscess was drained through these drainage sites, and a flexible silicon catheter (Cavafix) was inserted in the epidural space. The catheter was advanced as far as possible in both the cephalic and the caudal directions. We are of the opinion that advancement of the catheter for two segments above and two segments below the entry point is sufficient to assure adequate drainage of the abscess. Then irrigation of the epidural space was carried out using Lavasept (Polymeres Biguanid-Hydrochlorid) solution.

Results

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The offending organism in all cases was *Staphylococcus aureus*. The postoperative infection markers (ESR, CRP, leukocyte count) showed a marked regression. The postoperative control MRI demonstrated effective drainage of the extended epidural abscess. Regarding the neurological deficits, 3 patients previously classified as Frankel C showed an improvement to Frankel E within 3 months postoperatively. One patient with Frankel C improved to Frankel D and was able to walk for short distances.

Discussion

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A number of different techniques have been described in the literature for the treatment of extended epidural abscess. These vary from open decompression and late closure [4, 22] to limited decompression (one level laminectomy or hemilaminectomy with the use of a Fogarty embolectomy catheter [20] and percutaneous CT-guided needle aspiration [15]. Panagiotopoulos et al. described a minimally invasive technique (limited laminectomies or hemilaminectomies in combination with the use of a

silicon catheter epidurally) which proved to be effective for the drainage of this extended spinal epidural abscess [17]. In comparison, our technique appears to be a less invasive approach as it avoids muscle dissection and has a very minimal effect on the stability of the spine in order to avoid potential kyphotic deformities or instability of the spine following multiple level laminectomies. In addition, shorter operating times and less blood loss decrease the risk of intraoperative and postoperative morbidity in these compromised patients. We chose Lavasept for its good bacteriostatic effect and to avoid iatrogenic oxygen embolism that may occur with hydrogen peroxide.

Possible limitations for our technique include: previous spinal surgery (because of the adhesions), severe spinal canal stenosis which can be expected in this older group of patients, long standing history with thick pus and adhesions and lastly, inadequate experience in carrying out a microscopically assisted percutaneous approach.

Conclusion

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From the results presented here, it seems that our technique (ventro-dorsal abscess drainage combined with a microscopically assisted percutaneous approach) could be a successful method for the management of the extended epidural abscess associated with spondylodiscitis.

Through this microscopically assisted percutaneous approach, the epidural abscess can be sufficiently drained with the advantage of only minimal operative trauma.

To our knowledge, there are no reports on a similar treatment concept in the literature. However, for the final assessment of the validity of this technique, further follow-up studies are required.

References

- 1 Ahl T, Hedstrom M, Heijne A von et al. Acute spinal epidural abscess without concurrent spondylodiscitis. Successful closed treatment in 10 cases. *Acta Orthop Scand* 1999; 70: 199–202
- 2 Alcock E, Regaard A, Browne J. Facet joint injection: a rare form cause of epidural abscess formation. *Pain* 2003; 103: 209–210
- 3 Arxer A, Busquets C, Vilaplana J et al. Subacute epidural abscess after spinal cord stimulator implantation. *Eur J Anaesthesiol* 2003; 20: 755–757
- 4 Baker AS, Ojemann RG, Swartz MN et al. Spinal epidural abscess. *N Engl J Med* 1975; 293: 463–468
- 5 Boehm H, Greiner-Perth R, El-Saghir H, Allam Y. A new minimally invasive posterior approach for the treatment of cervical radiculopathy and myelopathy. Surgical technique and preliminary results. *Eur Spine J* 2003; 12: 268–273
- 6 Frankel HC, Hancocck DO, Hyslop G. The value of postural reduction in the initial management of closed injuries of the spine with paraplegia and tetraplegia. *Paraplegia* 1969; 7: 179–192
- 7 Greiner-Perth R, Boehm H, El-Saghir H. Microscopically assisted percutaneous nucleotomy, an alternative minimally invasive procedure for the operative treatment of lumbar disc disc herniation: preliminary results. *Neurosurg Rev* 2002; 25: 225–227
- 8 Greiner-Perth R, Boehm H, El-Saghir H, El-Ghait H. Der mikroskopisch assistierte perkutane Zugang zur dorsalen Wirbelsäule. Ein neues minimalinvasives Verfahren zur Behandlung von Wirbelsäulenprozessen. *Zentralbl Neurochir* 2002; 63: 7–11
- 9 Greiner-Perth R, Boehm H, Allam Y, El-Saghir H. A less invasive approach technique for operative treatment of lumbar canal stenosis. *Zentralbl Neurochir* 2004; 65: 1–6
- 10 Hadjipavlou AG, Mader JT, Necessary JT et al. Hematogenous pyogenic spinal infections and their surgical management. *Spine* 2000; 25: 1668–1679
- 11 Hooten WM, Kinney MO, Huntoon MA. Epidural abscess and meningitis after epidural corticosteroid injection. *Mayo Clin Proc* 2004; 79: 682–686
- 12 Hopf C, Meurer A, Eysel P et al. Operative treatment of spondylodiscitis. What is the most effective approach? *Neurosurg Rev* 1998; 21: 217–225
- 13 Klockner C, Valencia R. Sagittal alignment after anterior debridement and fusion with or without additional posterior instrumentation in the treatment of pyogenic and tuberculous spondylodiscitis. *Spine* 2003; 28: 1036–1042
- 14 Krodel A, Sturz H, Siebert CH. Indications for and results of operative treatment of spondylitis and spondylodiscitis. *Arch Orthop Trauma Surg* 1991; 110: 78–82
- 15 Lyu RK, Chen CJ, Tang LM et al. Spinal epidural abscess successfully treated with percutaneous, computed tomography-guided, needle aspiration and parenteral antibiotic therapy: case report and review of the literature. *Neurosurgery* 2002; 51: 509–512
- 16 Moghaddam AM, Kilincoglu BF, Atalay B et al. Holocord epidural abscess: case report. *Adv Ther* 2003; 20: 324–328
- 17 Panagiotopoulos V, Konstantinou D, Solomou E et al. Extended cervicolumbar spinal epidural abscess associated with paraparesis successfully decompressed using a minimally invasive technique. *Spine* 2004; 29: E300–E303
- 18 Phillips JM, Stedeford JC, Hartsilver E et al. Epidural abscess complicating insertion of epidural catheters. *Br J Anaesth* 2002; 89: 778–782
- 19 Schinkel C, Gottwald M, Andress HJ. Surgical treatment of spondylodiscitis. *Surg Infect* 2003; 4: 387–391
- 20 Schultz KD, Comey CH, Haid RW. Technical note. Pyogenic spinal epidural abscess: a minimally invasive technique for multisegmental decompression. *J Spinal Disord* 2001; 14: 546–549
- 21 Solomou E, Maragkos M, Kotsarini C et al. Multiple spinal epidural abscesses extending to the whole spinal canal. *Magn Reson Imaging* 2004; 22: 747–750
- 22 Verner EF, Musher DM. Spinal epidural abscess. *Med Clin North Am* 1985; 69: 375–384