

SHORT REPORT

Bilateral subdural haematomata and lumbar pseudomeningocele due to a chronic leakage of liquor cerebrospinalis after a lumbar discectomy with the application of ADCON-L gel

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J Neurol Neurosurg Psychiatry 2005;76:1031–1033. doi: 10.1136/jnnp.2004.046276

The anti-adhesion gel ADCON-L has been available since the end of the 1990s. During disc surgery it can be applied to the spinal nerve roots and the dura mater spinalis in order to inhibit fibroblast migration and thus avoid postoperative adhesions or excessive keloids, respectively. Due to the way ADCON-L works, inadvertent, intraoperative dural lesions may stay open much longer than usual because ADCON-L inhibits the natural healing process. Possible consequences are a chronic leakage of cerebrospinal fluid in combination with intracranial hypotension syndrome.

We report on a patient who underwent lumbar disc surgery with application of ADCON-L gel. Postoperatively he suffered from acute headache, nausea, and vomiting. A lumbar pseudomeningocele was demonstrated on magnetic resonance imaging (MRI). Furthermore, cranial MRI revealed bilateral, chronic subdural haematomata which indicated intracranial hypotension syndrome or continuous leakage of cerebrospinal fluid at the lumbar site.

With conservative treatment the problems were gradually reduced and eventually the subdural haematomata were no longer detected. The pseudomeningocele persisted over a 4 month period of observation.

Because of the complications we found, the local application of ADCON-L during lumbar disc surgery should be critically evaluated.

Postoperative scarring and fibrous adhesions frequently develop after lumbar discectomies. These fibrous adhesions may stretch or compress nerve roots thus causing postoperative kinematic pains or even new radicular lesions.

Since the end of the 1990s the anti-adhesion gel ADCON-L has been available for application to the operational site to avoiding postoperative scarring. ADCON-L inhibits fibroblast migration and thus protects the nerve roots, the dura, and the spinal canal from postoperative adhesions and is completely absorbed within 4–6 weeks.¹ Its effectiveness was tested in animal experiments and also on humans.^{2–4} Several studies discuss the clinical usefulness of ADCON-L gel after lumbar discectomies.^{2–7} In addition to the desirable reduction of excessive postoperative scarring, side effects and complications following ADCON-L application have been reported.^{8–9}

We report a patient who underwent lumbar discectomy with the application of ADCON-L gel and who had severe postoperative complications.

CASE REPORT

In 2000, a 46 year old medical doctor underwent a lumbar discectomy at L5/S1. In 2003, the patient again suffered from

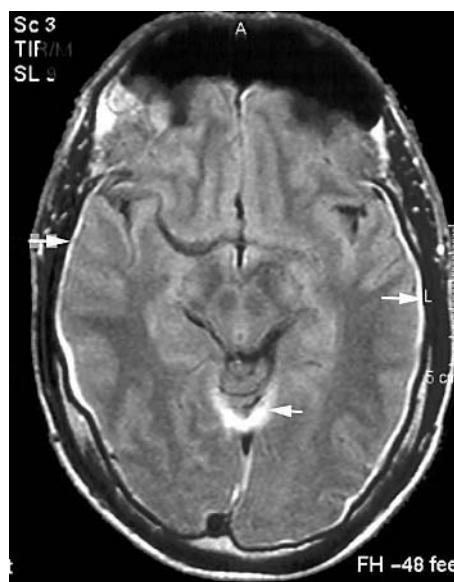


Figure 1 Cranial MRI (axial FLAIR sequence) showing bilateral, small subdural haematomata (arrows) and subdural haemorrhage on the tentorium.

acute back pain. After flavectomy and foremanotomy the right S1 radicle was exposed and several subligamentous disc sequestra at L5/S1 were excised. ADCON-L gel was then applied.

Two weeks after the operation the patient experienced acute, diffuse headaches, especially when sitting or standing. He also complained of nausea, vomiting, and vertigo. Neurological examination revealed a slight stiffness of the neck. When walking or standing up, the patient swayed and complained about increasing headaches and blurred vision.

Cranial magnetic resonance imaging (MRI), especially FLAIR sequences, showed hyperintense, subdural haematomata in each of the cerebral hemispheres and subdural haemorrhage on the tentorium and in the interhemispheric space (figs 1 and 2).

The brain parenchyma and the large cerebral vessels showed no pathological changes.

MRI of the lumbar spine confirmed the resection of the right vertebral arch of L5. At the same location a collection of intraspinal and epidural cerebrospinal fluid was found, which extended through the defective vertebra to the deep paraspinal muscles (figs 3 and 4). The meninges at L5

Abbreviations: MRI, magnetic resonance imaging

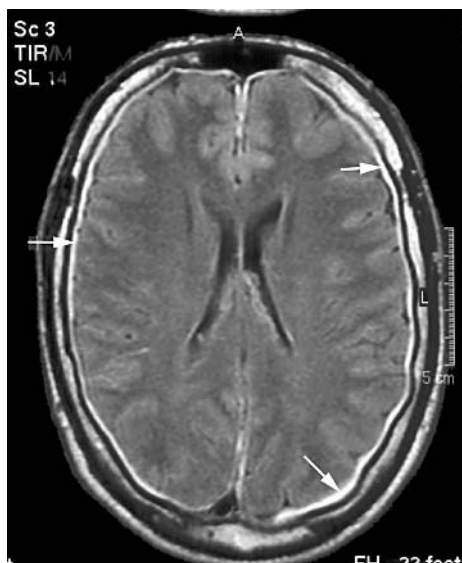


Figure 2 Cranial MRI (axial FLAIR sequence) also showing bilateral, small subdural haematomata (arrows).

showed poorly defined outlines. There was no extruded or sequestered intervertebral tissue.

Laboratory parameters including blood count, electrolytes, coagulation parameter, pancreas and liver enzymes, retention values, thyroid parameter, C-reactive protein, and protein electrophoresis were within the reference ranges.

Review of clinical history, clinical picture, and MRI led to a diagnosis of postoperative fistula of cerebrospinal fluid with the formation of a lumbar pseudomeningocele and bilateral subdural haematomata due to intracranial hypotension syndrome caused by a chronic, lumbar leakage of cerebrospinal fluid.

The patient did not want another surgical intervention in order to close the dural leak. With conservative treatment of the symptoms the patient's problems disappeared within 4 weeks; however, he continued to experience headaches under stress, a lack of concentration, and a general decrease in vitality.

Three months after the discectomy, MRI showed complete absorption of the subdural haematomata (figs 5 and 6), but it also revealed that the lumbar pseudomeningocele had not changed in size.

DISCUSSION

During lumbar disc surgery very small dural tears can happen unintentionally.^{8, 10} If these lesions are not noticed during the operation, the dural tear closes spontaneously in most cases with the help of fibroblasts or fibrocytes. The local application of ADCON-L gel inhibits the immigration of fibroblasts and thus the natural healing of small tears. A possible consequence is a constant leakage of cerebrospinal fluid and hence intracranial hypotension syndrome, which is characterised by acute headaches, nausea, and vomiting.

In about a dozen cases complications due to chronic dural leaks have been reported after lumbar discectomies with the application of ADCON-L gel.^{2, 8, 9} Hieb *et al* performed lumbar discectomies on 27 patients and applied ADCON-L gel locally; five patients developed a dural leak. A further 79 patients, who did not receive treatment with ADCON-L gel, did not develop dural leaks.⁸ In most cases a leakage of cerebrospinal fluid in the operational site was documented by myelography.^{8, 9} A considerable extradural collection of cerebrospinal fluid documented by MRI was also described as a sign of a

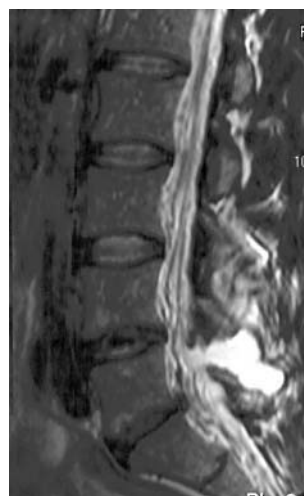


Figure 3 MRI of the lumbar spine (sagittal T2 sequence) showing pseudomeningocele at L5/S1 with extension from the dorsal dura to the paraspinal muscles.

cerebrospinal fluid fistula.⁸ Because of persisting headaches and other physical symptoms, surgical closure of the dural leak became necessary in most cases.^{8, 9} The problem was solved for a few patients with closed subarachnoid drainage.^{8, 11}

In the case of our patient, MRI demonstrated extradural collection of cerebrospinal fluid in the lumbar site of operation which suggested a dural leak, that is, a pseudomeningocele. In addition, the subsequent continuous leakage of cerebrospinal fluid at the lumbar site evidently caused pronounced intracranial hypotension syndrome so that bilateral chronic subdural haematomata developed. The patient suffered from acute, diffuse headaches, especially when standing up, and also from nausea, vomiting, and a considerable decrease in vitality. Subdural haematomata are rare but severe complications which may develop as a result of intracranial hypotension syndrome.^{12, 13}

In almost all described cases, as in the case of our patient, symptoms of intracranial hypotension syndrome appear only 2–3 weeks after the operation.^{8, 9}

As far as we know, the combination of subdural haematomata and lumbar pseudomeningocele after a discectomy with the application of ADCON-L gel has not previously been described.



Figure 4 MRI of the lumbar spine (transverse T2 sequence) showing pseudomeningocele at L5/S1 with extension from the right dorsolateral dura through the postoperative defective vertebra to the paraspinal muscles.

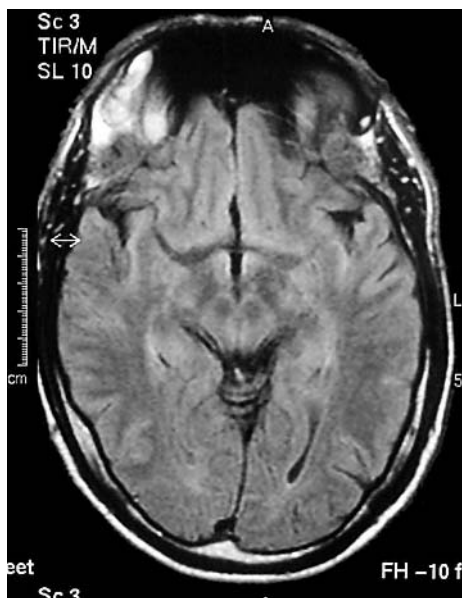


Figure 5 Cranial MRI (axial FLAIR sequence) 3 months after the discectomy showing complete absorption of the subdural haematomata.

Considering the documented cases and the complications suffered by our patient, patients should be forewarned of the potential risk of cerebrospinal fluid leakage and intracranial hypotension syndrome following the application of ADCON-L gel.

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Competing interests: none declared

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Received 26 May 2004

Revised version received 27 August 2004

Accepted 10 October 2004

REFERENCES

- 1 **Frederickson RC**. ADCON-L: a review of its development, mechanism of action, and preclinical data. *Eur Spine J* 1996;**5**:7–9.

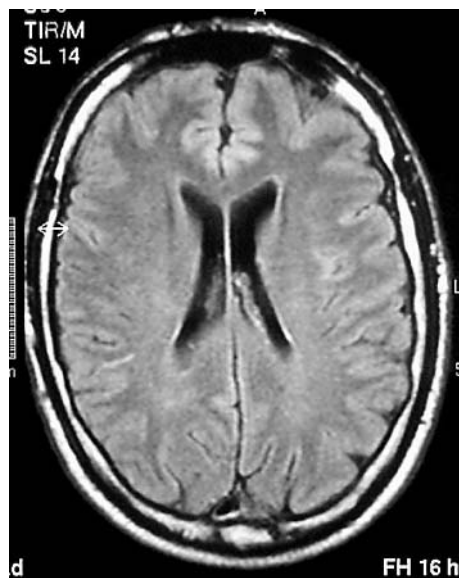


Figure 6 Cranial MRI (axial FLAIR sequence) 3 months after the discectomy which was normal.

- 2 **de Tribolet N**, Porchet F, Lutz TW, *et al*. Clinical assessment of a novel antiadhesion barrier gel: prospective, randomized, multicenter, clinical trial of ADCON-L to inhibit postoperative peridural fibrosis and related symptoms after lumbar discectomy. *Am J Orthop* 1998;**27**:111–20.
- 3 **Einhaus SL**, Robertson JT, Dohan FC Jr, *et al*. Reduction of peridural fibrosis after lumbar laminotomy and discectomy in dogs by a resorbable gel (ADCON-L). *Spine* 1997;**22**:1440–6.
- 4 **Robertson JT**, Maier K, Anderson RW, *et al*. Prevention of epidural fibrosis with ADCON-L in presence of a durotomy during lumbar disc surgery: experiences with a pre-clinical model. *Neuro Res* 1999;**21**:61–6.
- 5 **Ganzer D**, Giese K, Volker L, *et al*. Two-year results after lumbar microdiscectomy with and without prophylaxis of a peridural fibrosis using ADCON-L. *Arch Orthop Trauma Surg* 2003;**123**:17–21.
- 6 **Kessel G**, Bocher-Schwarz HG, Schwarz M. Use of ADCON-L to prevent peridural fibrosis following re-operation for recurrent lumbar radiculopathy: clinical results. *Minim Invasive Neurosurg* 2002;**45**:129–31.
- 7 **Richter HP**, Kast E, Tomczak R, *et al*. Results of applying ADCON-L gel after lumbar discectomy: the German ADCON-L study. *J Neurosurg* 2001;**95**:179–89.
- 8 **Hieb LD**, Stevens DL. Spontaneous postoperative cerebrospinal fluid leaks following application of anti-adhesion barrier gel: case report and review of the literature. *Spine* 2001;**26**:748–51.
- 9 **Le AX**, Rogers DE, Dawson EG, *et al*. Unrecognized durotomy after lumbar discectomy: a report of four cases associated with the use of ADCON-L. *Spine* 2001;**26**:115–7.
- 10 **Jones AA**, Stambough JL, Balderston RA, *et al*. Long-term results of lumbar spine surgery complicated by unintended incidental durotomy. *Spine* 1989;**14**:443–6.
- 11 **Kitchel SH**, Eismont FJ, Green BA. Closed subarachnoid drainage for management of cerebrospinal fluid leakage after an operation on the spine. *J Bone Joint Surg Am* 1989;**71**:984–7.
- 12 **Gaucher DJ Jr**, Perez JA Jr. Subdural hematoma following lumbar puncture. *Arch Intern Med* 2002;**162**:1904–5.
- 13 **Thomke F**, Bredel-Geissler A, Mika-Gruttner A, *et al*. [Spontaneous intracranial hypotension syndrome. Clinical, neuroradiological and cerebrospinal fluid findings.] *Nervenarzt* 1999;**70**: 909–15 (in German).