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DURAL LESIONS IN LUMBAR DISC HERNIATION SURGERY – INCIDENCE, RISK
FACTORS AND OUTCOME

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Key words: Lumbar disc herniation, complication, dural lesion, surgery, outcome

Study design. Cohort study from a national register.

Objective. To determine the incidence of peroperative dural lesions in lumbar disc herniation surgery, and to identify risk factors as well as effect on long-term outcome.

Summary of Background Data. Operating inside the spinal canal in tales and obvious risk for iatrogenic dural lesion. Studies on risk factors and incidence have mainly been based on retrospective patient materials of limited size. Further, the effect of dural lesion on the long-term outcome has been debated.

Methods. A 5-year sample from SweSpine, the Swedish Spine Register, of patients operated on for lumbar disc herniation surgery with open or microscopic technique was studied. 5537 patients were operated on and 4173 (75.4%) completed a one-year follow-up. Age, sex and level distribution was the same as that reported on in other large studies on lumbar disc herniation surgery.

Results. The overall incidence of dural lesion in lumbar disc herniation surgery was 2.7%. The only preoperative factor that significantly increased the risk was previous operation where the incidence was 5% ($p < 0.01$). In some aspects of the SF-36 patients with dural lesions had inferior preoperative values than patients without but this correlated to previous operations, not to the dural lesion as such. At the one-year follow-up it was evident that the dural lesion as such did not influence the outcome. Working ability was more common in patients without dural lesions ($p = 0.01$) but related to previous operation and not the dural lesion as such.

The group lost to follow-up (24.6%) had exactly the same demographics as the group studied and the incidence of dural lesions in this group was 2.6%.

Conclusion. The incidence of the dural lesion at the time of lumbar disc herniation surgery in a vast patient material was 2.7%. Patients previously operated on had a double risk for a dural lesion. The long-term outcome was not significantly influenced by the dural lesion as such when compared to patients without a lesion. A dural lesion, thus, can be regarded as a technical problem which has to be solved at the time of surgery but which has no negative implications on the long-term outcome.

Abstract

In lumbar disc herniation surgery, dural lesions seem to be the most common complication today. Studies on incidence of and outcome after a dural lesion are mainly based on retrospective studies.

In a prospective study within the framework of the Swedish Spine Register, 4173 patients operated on for lumbar disc herniation were evaluated using pre- and 1-year postoperative protocols and complication registration.

Mean patient age was 41 (18-81) years and 53% of the patients were male. 93% of the operations were performed on the two lowermost lumbar levels.

The incidence of dural lesions in the material was 2.7%. In patients with previous disc surgery, the incidence was doubled, 5%, a significant increase ($p = 0.02$).

Patients with dural lesions preoperatively had more back pain and inferior scores in general health and role emotional domains of the SF-36. These factors however were due to the fact that they had been operated on previously, not related to the dural lesion as such.

The relative improvement after surgery was similar whether a dural lesion had occurred or not.

It is concluded that a dural lesion is a technical complication which must be solved at the time of surgery but which does not bear any negative implications on the long-term outcome for the patient.

Introduction

In operations in the spinal canal, the most common untoward event is dural lesion/incidental durotomy. The proximity to the dural sac in intraspinal operations means that the risk for injuring it cannot be neglected. Previous studies have reported prevalence of dural tears varying from 1 to 17 % depending on diagnosis and type of surgery performed. In a large series of spinal procedures [4], it was demonstrated that the morbidity was lower for younger patients and for disc herniation surgery. The risk factors for dural tear and the long-term outcome after such an event have been reported by several authors [1, 3, 13] but to our knowledge mainly in retrospective studies. In the large prospective SPORT study, an incidence of 4 % is related [14]. Contrasting results concerning the effect of dural lesion on the long-term follow-up exist where several authors [3, 6, 10] did not report inferior outcome after this complication while in a recent pair matched study [8] the long-term outcome in lumbar disc herniation surgery was inferior in the group afflicted with an incidental durotomy.

Prospective studies should be more apt to straighten out the question marks around the dural lesion complication and the Swedish Spine Register should prove suitable for this purpose. During the last 10 years, about 80 % of degenerative lumbar spine surgery in Sweden has been reported to the register which includes complication registration.

The purpose of the present study was to elucidate within the framework of the Swedish register, incidence, risk factors and effect on outcome of an incidental dural lesion in lumbar disc herniation surgery.

Patients and methods

In total 5537 patients were operated on for lumbar disc herniation with microscopic or open surgery during a 5-year period. Of these, 4173 completed the pre- as well as 1-year postoperative protocols of the Swedish Spine Register. Mean patient age was 41 years (range 18-81) and 53 % of the patients were males and 47 % females. The levels operated were: L5-S1 51%, L4-L5 42%, L3-L4 6% and higher levels 1%.

The Swedish Spine Register, Swespine, presented elsewhere [11, 12] contains patient administered pre- and postoperative data and surgeon completed surgical data.

Preoperative data include smoking habits, working conditions, consumption of analgesics, walking distance and back as well as leg pain on the VAS scale. Further, the Oswestry Disability Index, the SF-36 questionnaire and the EQ-5D also are completed by the patient.

Postoperatively, the same parameters are recorded as well as subjective improvement regarding leg and back pain and general satisfaction (satisfied/uncertain/dissatisfied) with outcome of surgery.

The surgical data include complication registration and registration of re-operation. Further, one patient related follow-up compilation also contains complications.

Comparisons of pre- and postoperative data recorded were performed by means of t-tests.

Results

The results presented refer to the 4173 patients who completed pre- and 1 year postoperative protocols. In total 112 occasions of dural lesions were reported in these patients, corresponding to an incidence of 2.7 %. Three of the patients were subjected to surgical treatment for CSF leakage before discharge from hospital.

An obvious risk factor for dural lesion was previous disc surgery, which increased the incidence to 5 % ($p = 0.02$).

Patients with dural lesions preoperatively had significantly more back pain and significantly lower outcome in the SF-36 score concerning the domains general health and role emotional (Table 1). These factors, however, were related to the fact that these patients had been operated on previously. Among other preoperative parameters, no significant differences between patients with and without dural lesions were encountered.

At 1-year postoperatively the improvement of back as well as leg pain, SF-36 and Oswestry scores were significant and similar for patients with and without dural lesion. Working ability was more common in patients without dural lesions ($p = 0.01$) but also this correlated to the fact that most patients with a dural lesion had had lumbar spine disc operations previously.

When the correlation between previous surgery, dural lesion and outcome was analyzed, it was evident that patients with previous surgery more often sustained dural lesions and more often had an unfavourable outcome than did patients undergoing first time surgery (Table 2).

Loss to follow-up: 1364 patients failed to complete the 1 year follow-up questionnaire corresponding to 25%. Of these, 36 (2,6%) had sustained a dural lesion at surgery, ie virtually the same proportion as in those with completed 1-year follow-up. In all other preoperative demographic parameters, the group lost to follow-up was compared to those followed-up and no statistically significant differences between the two groups were recorded.

Discussion

While enhanced preoperative information to the spine surgeon (MRI, CT), improved aids in surgery (microscope, head lamp, navigation) and improved prophylaxis (antibiotics, low molecular weight heparins, early mobilization) gradually have been introduced to spine surgeons, it is difficult to demonstrate that the complication rate in lumbar spine surgery today has decreased. More complex implants, surgical techniques and reconstructions may contrarily increase the complication rate. In the study of 18 122 hospitalizations for lumbar spine procedures in the state of Washington, Deyo *et al* [4] showed young age and diagnosis for surgery to have strong influence on the complication rate. Still a complication rate during hospitalization for disc surgery of 5.7 % was registered. Changes in complication rates over time are difficult to monitor and can probably only be obtained by the use of broad registration such as national registers or complication registration according to the ICD 10 system.

Dural lesions or unintended incidental durotomies seem to be the most common complication in intraspinal surgery and figures between 1 and 14 % have been presented in the literature. A dural lesion may be a minor problem treated by a suture or fibrin glue (Tisseel®) but may also be the entry point to the development of dural cutaneous fistulas, meningitis, arachnoiditis and epidural abscesses. The small but serious risk for the latter complications calls for immediate attention when dural lesion is noted during surgery. A number of treatment modalities have been presented ranging from direct closure by sutures to facial, muscular or artificial grafts, fibrin glue and closed subarachnoid drainage [7].

The risk for CSF leakage is unquestionably lower in disc surgery than in spinal stenosis surgery and this is probably related to the less extensive procedure and the usually more voluminous spinal canal volume in disc patients.

It is obvious that previous surgery is a strong risk factor for sustaining a dural lesion. The risk increase varies between double and fivefold [5, 9] and in the paper of Cammisa *et al* [3], 38% of those with dural lesions had been subjected to 1-6 procedures on the lumbar spine previously. It seems that the risk is higher for less experienced surgeons [15].

An unsolved question seems to be whether a dural lesion predisposes to an inferior long-term outcome than would be anticipated if the lesion had not occurred. Several papers in the literature point to a negative predictive outcome value of a dural lesion but others demonstrate no difference. Pair matched comparisons have been utilized to study the differences if any and Saxler *et al* [8] in such a study demonstrated inferior outcome in the presence of a dural lesion. However, all reports quoted have been retrospective reviews with the associated weaknesses of this type of data collection.

The Swedish Spine Register (Swespine), has been in broad use within the nation for the last 10 years and over 80 % of departments performing spine surgery in Sweden report their operations to the register. This gives a large prospective data base to study questions like complications. Pre- and postoperative variables are completely patient administered while data on the operation and the postoperative course are completed by the surgeon when the patient is discharged from hospital. In total 4 173 patients subjected to lumbar disc herniation surgery and completing pre- and 1 year postoperative data were included in our study which yielded a complication rate regarding dural lesions of 2.7%. In patients with previous surgery, the incidence was doubled, 5 %. The relative improvement after disc surgery was similar in patients with and without a per-operative dural lesion. The more pronounced back pain and the lower general health and role emotional of patients with dural lesions was related to the fact that these patients more often had been operated on previously. These differences to some extent remained at 1 year postoperatively but also at that time point correlated to previous surgery. Working ability was also less frequent in patients with dural lesions.

The most important aspects in dural lesion complications in our opinion are preoperative planning and prevention. Studying the preoperative MRI carefully, it is obvious where the

more risky parts of the procedure will be and, in the case of repeat surgery, it seems recommendable to identify the dura in an unoperated area in the proximity of the previous operation and then carry on the dissection gently into the scarred and fibrotic area. If a dural lesion is encountered, the operating table should be adjusted with the head down and back up position to facilitate the inspection of the area and, if possible to make a suture with non-resorbable 5-0 or 6-0 sutures. It probably is wisest to do this as soon as the injury is detected but sometimes the narrow circumstances may be improved if a disc fragment is resected prior to repair. When the suture is completed, the operating table is reversed with head up and back down to test the patency of the repair. Before closing the wound it might be advisable to cover with fibrin glue or if the suture is not tight enough a synthetic dural graft may be considered.

It is generally agreed that the patient should be recumbent after surgery, in most instances probably 24 hours is used as a postoperative routine. Some surgeons however advocate a longer bed rest, mainly based on the histomorphological sequence of dural repair in a canine model presented by Cain *et al* [2] demonstrating that it takes between 6 and a10 days to see fibroblastic bridging of the durotomy.

In conclusion this prospective study has showed an incidence rate of 2.7 % concerning dural lesion in lumbar disc herniation surgery. In patients with previous operations, the risk is doubled, 5 %. Patients with previous surgery have more back pain prior to surgery and a lower quality of life, which skews this group towards inferior 1 year outcome but the difference in outcome is clearly related to previous surgery and not the dural lesion as such. A conclusion that can be drawn from this study is that a dural lesion is a technical problem which should be solved during surgery and, if so, it bears no negative implications on the 1 year postoperative outcome.

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Table 1. VAS back and leg pain, SF-36 and Oswestry Disability Index (ODI) in patients with and without dural lesion after lumbar disc excision.

		No dural lesion	Dural lesion	<i>P</i> value
VAS back pain	Preop	46.0	51.2	0.08
	Postop	25.3	24.7	0.82
VAS leg pain	Preop	66.4	68.0	0.53
	Postop	22.5	25.0	0.34
SF-36				
<i>General health</i>	Preop	67.5	62.3	0.02
	Postop	67.9	66.1	0.46
<i>Role emotional</i>	Preop	39.6	31.2	0.07
	Postop	71.5	69.3	0.60
<i>Bodily pain</i>	Preop	22.2	22.2	0.96
	Postop	60.1	59.4	0.81
<i>Mental health</i>	Preop	59.8	58.9	0.67
	Postop	74.7	77.3	0.26
<i>Physical function</i>	Preop	37.9	37.7	0.94
	Postop	72.6	69.5	0.22
<i>Role physical</i>	Preop	8.0	7.1	0.68
	Postop	57.3	55.0	0.60
<i>Social function</i>	Preop	46.3	42.8	0.22
	Postop	79.6	78.1	0.56
<i>Vitality</i>	Preop	35.1	35.0	0.95
	Postop	58.2	60.5	0.40
ODI	Preop	48.7	50.4	0.44
	Postop	20.2	21.7	0.48

Table 2 Satisfaction with outcome of surgery one year postoperatively related to previous surgery and to occurrence of a dural lesion at present surgery in percent.

	Satisfied	Uncertain	Dissatisfied
No previous operation, no dural lesion	91	8	1
No previous operation, dural lesion	98	2	-
Previous operation, no dural lesion	41	43	16
Previous operation, dural lesion	92	8	-