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Research Article

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Diagnostic Value of Transforaminal Injections of Steroids in Recurrent Disc Herniations

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Abstract

Introduction: Persistent or recurrent radicular pain is a common problem after disc surgery. Interventional techniques are increasingly important for treatment of post surgery syndrome.

Objectives: The diagnostic value of transforaminal injections of steroids (TFIS) in patients after disc surgery in relation to a recurrent disc herniation.

Material and methods: The study was designed as a retrospective practice audit covering a time period of 4 years. The study was set in a single spine center in which all patients underwent lumbar disc surgery, post-operative follow-up and subsequent treatment.

Patients with postsurgical radicular pain were treated with TFIS. The association between a successful response and the occurrence of a recurrent disc herniation on magnetic resonance imaging (MRI) and the necessity of a re-operation was evaluated. A successful response to treatment was defined as at least 50% reduction of pain on a numerical rating scale (0 - 10) persisting for longer than 3 month.

Results: Of 1009 patients who underwent microsurgical lumbar disc surgery, 156 had persistent radicular pain. TFIS achieved pain reduction of at least 50% in 30.6% of these patients. A bad outcome after TFIS is highly sensitive for detecting a recurrent disc herniation (true positive rate 0.94). The odds ratio is 17.5. No patient with positive result after TFIS had to undergo a re-operation.

Conclusions: TFIS appears to be effective only in a minority of patients with persistent radicular pain after lumbar disc surgery particularly early after operation if a mechanical compression of the nerve is absent. TFIS has a diagnostic value with a high sensitivity for a recurrent disc herniation in MRI and for the necessity of a re-operation.

Keywords

Postoperative pain; Disc herniation; Pain management; Radiculopathy; Radiating pain; Steroids; Spine

Introduction

Although decompression of the nerve root and therefore the improvement of radicular pain is the mainstay of disc surgery, pain may persist or recur despite well-indicated and well-performed surgery. Generally, microdisectomy has been associated with success rates of about 80% [1-3]. The distinction between low back pain (axial) or radicular leg pain is important [4-6].

Transforaminal injection of steroids (TFIS) is a specific treatment for lumbar radicular pain, but to date, has been studied almost only in patients who have not undergone surgery. The recent comprehensive review of Mac Vicar et al. [7] gives a systematic analysis of the published data. Only a few apparently negative studies were found [8-10]. These studies relied on group data and did not explore success rates. Mac Vicar et al. [7] conclude that up to 70% of patients achieve 50% relief of pain at 1 or 2 month after treatment and about 30% achieve complete relief [11]. TFIS is more often successful in patients with contained disc herniations [10] or patients with low-grade compression. There is some evidence [12] or even strong evidence [13-16] for both short and long term relief after TFIS. The evidence base for treatment of post surgery syndrome with interventional techniques has grown in recent times [4,17]. The recent review of Chan and Peng [4] suggests a treatment algorithm for those patients with predominantly radicular pain.

The present study was undertaken to determine if there is an association between the response to TFIS and the occurrence of a recurrent disc herniation on magnetic resonance imaging (MRI) and the necessity of a reoperation. The question is investigated if there is a diagnostic value of TFIS in patients after disc surgery. Further, the present study with an investigation period of 4 years corroborates a precursor study with only two years investigation period [18].

Materials and Methods

An electronic medical record system was used to identify all patients in a single spine centre who had received a microsurgical lumbar disc surgery on one or two levels. In all cases, the ligamentum flavum was dissected without removal of any bone or with very little removal of the lamina. Patients who had undergone laminectomy or other types of operation were excluded, as were patients with a lumbar disc surgery in history. The follow up was conducted in a practice setting. Every patient was seen one month after the operation for follow up und later according to the complaints of the patient. The pain therapy procedures were performed in an interventional pain management ambulatory surgery centre.

All patients were treated with non steroidal anti-inflammatory medication for the first days and started with physiotherapy about two weeks after the operation. If patients were treated with steroids before or in the first weeks after operation was not explored. The vast number of patients after disc surgery required no further treatment. In patients requiring treatment for pain after the operation, a distinction was strictly made between non-radiating pain and radicular pain. Only patients with persistent radicular pain and with a follow up of minimum three month were included in the present study. These patients were treated with a transforaminal injection with a combination of triamcinolone (10 mg) and bupivacaine (0.25%), at the level and side of the operation. Injections were performed with fluoroscopic visualization using established techniques [19]. A subpedicular approach to the “safe-triangle” was used.

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In most patients a post-operative MRI was performed. Different radiologist and different machines were used. There was no discrepancy in the written evaluation of the radiologist and the judgment of the neurosurgeon. The result was evaluated with respect to a definite recurrent disc herniation with compression of the nerve root.

One outcome measure was the reduction in pain and the duration of pain relief. A successful response to treatment was defined as at least 50% reduction of pain persisting for longer than 3 month. A numeric rating scale was used to measure the radicular pain in the leg (0 no pain, 10 maximum pain). In addition the association between a successful response and the occurrence of a recurrent disc herniation on magnetic resonance imaging (MRI) and the necessity of a reoperation was evaluated. The diagnostic value of transforaminal injections of steroids in recurrent disc herniations was determined. The statistical analysis was performed using Chi-square-tests (exact Fisher test), likelihood ratio and odds ratio.

Results

Between January 2007 and December 2010, 1009 lumbar disc operations were performed. 628 patients were men (62.2%), 381 women (37.8%). The age of the patients was between 17 and 86 years, the mean age being 49.0 years. Only 24 patients had surgery at two adjacent levels (L3/4/5 in 8 cases and L4/5/S1 in 16 cases). The most frequent levels were L4/5 (498 cases, 49.4%) and L5/S1 (440 cases, 43.6%). 11 patients were operated on both sides of the same level. A later operation for a recurrent disc herniation had to be done in 91 patients (9.0%).

156 patients (15.5%) presented with radicular leg pain after surgery and were included if the follow up time was at least 3 month (124 patients) (Table 1). These patients were treated with TFIS. Only 38 patients (30.6%) treated with TFIS reported greater than 50 % reduction in pain. The results were slightly better if the injection was performed during the first 3 month after the operation (44.4% good results early after operation versus 22.8% later, P = 0.02).

Despite good reduction in pain, an MRI was obtained in 23 of these 38 patients. Three had a recurrent disc herniation, and one had a herniation at a different level but no patient underwent a second operation. MRI was performed in 81 of the 86 patients who did not respond to TFIS. Of these 51 (63.0%) had a recurrent disc herniation and two had a herniation at a different level. A second operation because of the recurrent herniation had to be performed in 36 patients.

Transforaminal injections receive a further significance in relation to the diagnosis of a recurrent disc herniation. Table 2 shows the recurrence of a disc herniation on MRI in relation to the results of the transforaminal injection. 51 patients had an MRI with disc herniation and did not respond to the injection. 33 patients had a negative MRI and did not respond. 3 patients had a positive result after injection despite a positive MRI and 34 patients had a positive result after injection with a negative MRI. Therefore, a post-operative transforaminal injection in patients with post-operative radicular pain is highly sensitive (the true positive rate is 0.94) for detecting a recurrent disc herniation. The specifity (true negative rate) is only 0.51. The chance to have a recurrent disc herniation is 18 times higher if TFIS is negative compared to a positive result (odds ratio = 17.5).

Table 3 shows the association between a re-operation and the response to TFIS. No patient with a positive result after TFIS had to undergo a revision operation. With a negative result after TFIS in 36 patients a re-operation was necessary, 50 patients were not operated again. After transforaminal injection, no adverse effects were encountered.

Table 1: Characteristics of 124 patients with persisting radicular pain after surgery, treated with TFIS.

		Successful Outcome		MRI positive	Re-OP
		Yes	No		
Number		38	86	54	36
Follow-up (month)		5-62	4-53	4-49	4-49
	Mean	25.3	18.0	19.0	18.7
Men		23	57	37	25
Women		15	29	17	11
Age (years)		18-82	17-83	23-75	23-75
	Mean	50.7	49.0	49.1	49.0
Level					
	L3/4	4	1	0	0
	L4/5	15	49	33	21
	L5/1	17	35	20	14
	L4/5/1	2	1	1	1
Side					
	Left	22	41	26	21
	Right	16	43	26	14
	Both	0	2	2	1
TFIS					
	1-3 month	20	25	14	11
	Later	18	61	40	25
MRI					
	Positive	3	51		
	Negative	19	28		
	Different level	1	2		
Re-OP		0	36	36	
Adverse effects		1	1	1	1

Table 2: The association between recurrence of a disc herniation on MRI and response to TFIS. P<0.001 (Fisher's exact test).

	MRI pos.	no recurrence
TFIS neg.	51	33
TFIS pos.	3	34

Table 3: The association between reoperation and response to TFIS. P < 0.001 (Fisher's exact test).

	Re-OP	no OP
TFIS neg.	36	50
TFIS pos.	0	38

Discussion

Although a most recently published algorithm for the therapy of patients with failed back surgery syndrome recommends the usage of therapeutic interventions [4], only limited results after therapeutic interventions in patients suffering pain of post surgery syndrome are

available [20]. The present study corroborates a precursor study with two years investigation period [18] and is also concordant with the literature, which is limited to two studies, published in 1998 and 1999, in which less than one third of patients treated with nerve root sleeve injections of steroids obtained greater than 50% relief of pain at 6 months follow-up [21,22]. In the present study the success rate is also only 30.6%.

Striking are the extremely poor results in patients with a recurrent herniation of the disc. The present study was undertaken to determine if there is an association between the response to TFIS and the occurrence of a recurrent disc herniation and if there is a diagnostic value of TFIS in patients after disc surgery.

The rationale for transforaminal injection of steroids is that lumbar radicular pain is caused by inflammation of the nerve roots as a result of an inflammatory response to the herniated disc material or post-operative influences. This rationale is supported by circumstantial evidence from laboratory studies [23-29]. For predominantly radicular pain, the transforaminal injection of local anesthetic and corticosteroids may greatly assist in diagnosing a certain spinal level as the source of pain [30].

Different etiologies of postoperative radicular pain are possible: a bad patient selection, inadequate decompression Intraoperative, foraminal stenosis, epidural fibrosis, or recurrent disc herniation or residual disk fragments [5,31,32]. Epidural fibrosis and scarring is seen in most patients with pain after lumbar surgery and as a consequence, nerve roots may become tethered [33-38]. The severity of scar tissue correlates with recurrent radicular- and activity-related pain [34,36].

Therefore, TFIS might be more successful in postsurgical patients in whom radicular inflammation is the cause of the pain. A disc herniation, scar tissue or both means mechanical compression of the nerve. This is consistent with the study of Ghahreman and Bogduk [16] who found that a favorable response to TFIS was associated with lower grades of nerve compression.

The diagnosis of a recurrent disc herniation is made with MRI. MRI provides very useful information in investigating the cause of symptoms. Gadolinium-enhanced MRI helps with the differentiation of scar tissue (postoperative epidural fibrosis) from recurrent or residual disc herniation [39]. Therefore for the statistical analysis the results in MRI were considered (Table 2). Transforaminal injections of steroids after disc surgery are highly sensitive for a recurrent disc herniation in MRI. With an odds ratio of 17.5 and a good sensitivity it can be an indicator if an MRI after an operation is necessary. A positive result after transforaminal injection means a probability of 6 % (false negative rate) for a recurrent disc herniation. More striking are the results shown in table 3. No patient with a positive response after TFSI had to undergo a second operation. The false negative rate is 0.

In conclusion TFSI is a therapeutic option only for 30.6 % of patients with recurrent or persistent radicular pain after lumbar disc surgery. This success rate is not impressive, but it applies for a condition for which there is no proven treatment. In particular patients with an inflammatory process early after operation will benefit. Moreover, TFIS has a diagnostic value with a high sensitivity for a recurrent disc herniation in MRI and for the necessity of a re-operation. In patients with a positive response to TFIS further diagnostic including MRI is dispensable. The results of the present study serve to inform decisions and choices in the management of lumbar radicular pain after disc surgery.

An advantage of this study is the limitation to one specific operation method (only microdiscectomy) in a considerable number of consecutive patients with a predetermined treatment regime in a practice setting where both the operation and the peri-operative pain management were done by two neurosurgeons. There are limitations of this study. This audit is retrospective and observational, and therefore does not represent a high level of evidence.

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