Transthoracic disc excision with interbody fusion

12 patients with symptomatic disc herniation followed for 2–8 years

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Thoracic disc herniation is a rare and slowly progressing disease, commonest at the lower thoracic spine. We performed transthoracic discectomy and interbody fusion in 12 patients with an average age of 46 years suffering from symptomatic herniated thoracic disc. Pain and neurologic impairment were the commonest symptoms at admission. The outcome at a mean follow-up of 4 (2–8) years concerning pain were excellent or good in 10 patients, fair in 1 and unchanged in 1 patient. There were no approach-related complications. All 7 patients with incomplete neurologic impairment preoperatively improved postoperatively at least 1 Frankel grade. Posterior complementary fusion at the thoracolumbar junction was necessary in 2 patients because of increasing symptomatic local kyphosis.

Although the number of patients is small, due to the rarity of the disease, it seems that the transthoracic approach for anterior discectomy and fusion is an appropriate treatment for symptomatic thoracic disc herniation. Proper patient selection, preoperative planning and surgical technique resulted in good pain relief, neurologic recovery in cases associated with incomplete neurologic impairment and restoration of the sagittal profile of the thoracolumbar spine.

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Although thoracic disc herniation was described almost 150 years ago (Key 1838), the diagnosis and treatment remains a challenge, due to its variable presentation and often severe sequelae (Bhole and Gilmer 1984, Hochman et al 1980, Van Landingham 1954). The incidence of thoracic disc herniation with some clinical significance was estimated to be 1 per million (Carson et al. 1971). Others, however have estimated that 2–3 out of 1000 patients with back pain have thoracic disc herniation (Love and Kiefer 1950). The overall incidence of thoracic disc herniation was estimated to be 0.2–0.8% of all disc herniation operations (Logue 1950, Otani et al. 1977).

The difficult diagnosis of thoracic disc herniation is due to the variety of signs and symptoms (Ravichandran and Frankel 1981). Back pain, thoracic pain radiating anteriorly to the chest, myelopathy (lower extremity weakness, numbness, paresthesia and bowel and bladder dysfunction) are the commonest symptoms. Myelography, CT and MRI have been successfully used for diagnosis of thoracic disc herniation (Ross et al. 1987, Parizel et al. 1989). Our prospective study includes 12 patients who were operated on using the anterior transthoracic approach for thoracic disc excision and interbody fusion.

Patients and methods

From 1986 to 1994, 15 patients with symptomatic thoracic disc herniation were examined. 3 patients with previous operation in the thorax, severe cardiopulmonary disease or active lung disease were excluded from this study. 12 consecutive patients (8 men) with an average age of 46 (37–63) years were treated operatively at the Orthopaedic Department by PGK. The time from the start of symptoms until admission to the Hospital averaged 2 (0.5–5) years. 3 patients had two-level disc herniation and 1 patient had a three-level herniation (total of 17 discs; Table 1). The uppermost disc herniation was at the level T5–T6 and the lowermost at the T12–L1. 12 of the 17 of the herniations were between the T9 and L1 vertebrae. 7 medial, 5 medio-lateral and 5 lateral disc herniations were treated.

Frankel's classification was used for motor assessment. 7 out 12 patients demonstrated a diminished sensation preoperatively; 2 had bilateral sensory loss and 5 showed numbness in both legs caudal to the level of disc herniation. Earlier diagnoses included multiple sclerosis, Scheuerman's kyphosis and degenerative disc disease. Previous trauma was implicated as cause of the symptoms in 8 patients. All 12 patients

Table 1. Observations in 12 patients operated for thoracic disc herniation

Case	Sex	Age	Prev.[a]	Disc level (thoracic)	Frankel preop.	Symptoms on admission	Clinical results [b]	Frankel at follow-up	Compl.[c]
1	F	38	T	5/6, 7/8, 10/11	A	Paraplegia, back and lower limb pain	F / F	A	1
2	F	45	S	10/11	E	Back and lower limb pain	G / E	E	
3	M	37	T	12/L1	D	Paraparesis, back and left-sided limb pain	G / E	E	2
4	M	51	T	9/10	A	Paraplegia, chest and back pain	F / F	A	3
5	M	63		9/10, 10/11	B	Paraparesis, lower back pain	G / G	D	4
6	M	56	T	6/7, 8/9	B	Paraplegia, chest pain, neurogenic claudic.	G / G	D	5
7	M	41	T	11/12	C	Monoparesis, back pain, neurogenic claudic.	G / E	E	
8	M	49	T	9/10, 11/12	B	Paraplegia, back pain, neurogenic bladder	G / E	E	6
9	M	51	D	7/8	B	Paraparesis, chest pain, neurogenic claudic.	G / G	D	2
10	M	37	D	9/10	C	Monoparesis, back and lower limb pain	G / E	E	3
11	M	43	T	10/11	E	Back and chest pain	G / E	E	
12	M	53	T	9/10	E	Back pain	G / E	E	

[a] Previous history: D degenerated disc disease, S Scheuermann kyphosis, T trauma.
[b] Clinical results (immediate / at follow-up): E excellent, G good, F fair.
[c] Complications: 1 multiple sclerosis, 2 increasing kyphosis, 3 thoracotomy discomfort, 4 ventricular tachycardia, 5 pneumonia, 6 urinary tract infection.

had plain AP and lateral radiographs of the spine, as well as either myelograms (1 case), enhanced CT (2 cases), or MRI (9 cases). Since the introduction of MRI, it has been routinely used for diagnosis of thoracic disc herniation. Some cases still require combined CT and myelography to distinguish disc herniation from posterior osteophytes and calcifications.

All patients were treated by decompression using the transthoracic approach and interbody fusion under general endotracheal anesthesia (Figures 1 and 2). The transthoracic approach was used because it greatly improves visualization of the anterior anatomic structures, enables adequate decompression and fusion (rib graft), avoiding any maneuvers which could damage the spinal cord. Intraoperatively controlled hypotension and the wake-up test were used. Evoked potentials were monitored postoperatively to evaluate the spinal cord recovery.

All patients were fitted postoperatively with a custom-made plastic brace usually for 3 months, or until fusion has occurred radiographically. The patient was allowed out of bed immediately after removal of the drain and application of the brace, usually on the third postoperative day. The average stay at hospital was 12 (7–15) days.

All patients were followed for an average period of 4 (2–8) years with clinical and radiographic evaluation. The subjective relief of pain, the resolution of other symptoms, and the objective improvement of motor function were evaluated postoperatively. An excellent result was pain free patient with complete neurologic recovery or normal neurologic examination; good was Frankel Grade D or mild pain requiring occasional analgesics; fair was incomplete neurologic recovery or persistent pain requiring analgesics;

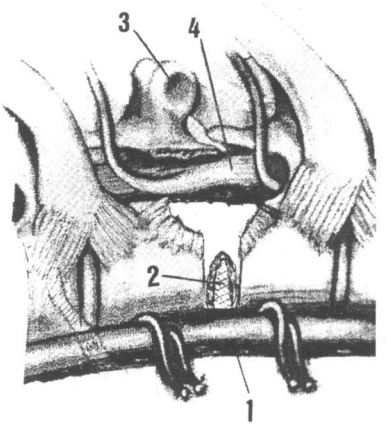


Figure 1. Schematic demonstration of the intraoperative findings during anterior decompression and fusion. 1) aorta with ligated segmental vessels, 2) rib graft implanted at the anterior part of the resected intervertebral disc, 3) transverse process facet preserved after disarticulation of the resected rib, 4) dural sac after decompression.

and poor result was when the Frankel grade was worse postoperatively than preoperatively.

Results

The blood loss averaged 200 (120–500) mL. Only 2 patients with Frankel Grade A preoperatively did not improved postoperatively; 1 woman with a three-level thoracic disc herniation (T5/6, T7/8 and T10/11) in addition to multiple sclerosis in the early postoperative period and a man with long-standing T9/T10 disc herniation and paraplegia. All 7 patients with incomplete neurologic lesions improved at least one Frankel

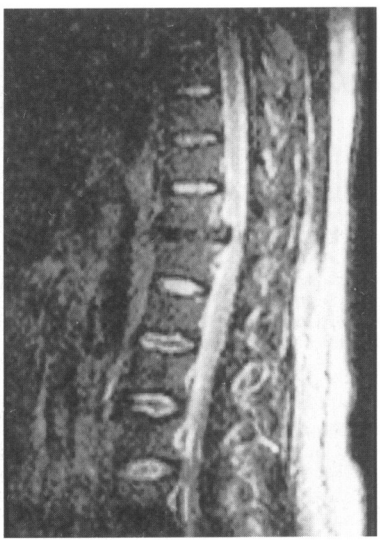
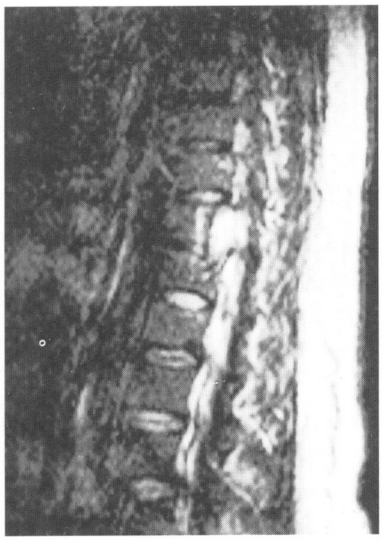


Figure 2. Preoperative MRI showing a thoracic disc herniation at the level T11–T12.



Postoperative MRI showing a wide decompression at the same level particularly at the posterior third of the intervertebral space with fusion at its anterior half.

grade. No patient deteriorated postoperatively. The neurologic improvement achieved immediately postoperatively, showed a progressive improvement up to 6-8 months postoperatively and remained unchanged. Pain usually resolved or substantially improved within 3-4 weeks postoperatively.

7 of the 12 patients had excellent results, 3 had good and 2 had fair results. When Frankel grades A to E are coded as 1 to 5, respectively, the average neurologic recovery was 1.6 grades (from grade 2.8 preoperatively to Grade 4.4 postoperatively). All patients showed radiographically solid fusion at the discectomy(ies) level(s) with incorporation of the rib graft 3–4 months postoperatively.

Complications

Immediate postoperative ventricular tachycardia was observed in a 63-year-old man without previous history of heart disease; it resolved in 1 hour with medication. Urinary tract infection was diagnosed 5 days postoperatively in a 49-year-old woman with incomplete paraplegia and bladder dysfunction. A 56-year-old man had pneumonia 1 week postoperatively which resolved with intravenous antibiotic therapy. 2 men had an increase in a preexisting thoracolumbar transitional kyphosis with concomitant pain. A posterior complementary TSRH instrumentation and fusion was performed (Figure 3). Temporary local discomfort at the thoracotomy site for up to 6 weeks occurred in 2 patients, and could be controlled with nonopiate analgesics.

Discussion

The major presenting finding of most of our patients was neurologic impairment. Most patients presented with pain either in the thorax, the lumbar spine or radiating to the lower extremities, similar to previous reports (Albrand and Corkill 1979, Carson et al. 1971). This diversity of symptoms makes the diagnosis difficult and underscores the need for a high index of suspicion. Although several authors have suggested that the presence of Scheuermann disease with disc-space irregularity or calcification of a disc should be a clue to the presence of a herniated disc (Bhojraj and Dandawate 1994), such findings were present in only 3 of our patients.

Multilevel thoracic disc herniations have been reported in about 29 cases (Boriani et al 1994, Korovessis et al 1996). In one review of 280 patients who underwent myelography for diagnosis of thoracic disc herniation, a peak incidence was noted in the fourth decade with three quarters of the protruded discs occurring below T8 level (Arce and Dohrmann 1985). In our study 8 of 12 patients were in the fourth decade and 13 of 17 herniated discs were below T8 level.

The coexistence of multiple sclerosis and other neurological degenerative diseases, although rare, should be excluded using MRI, somatosensory evoked potentials and electromyography to avoid unnecessary operations (Korovessis et al. 1996). One patient with paraplegia associated with disc hernia-

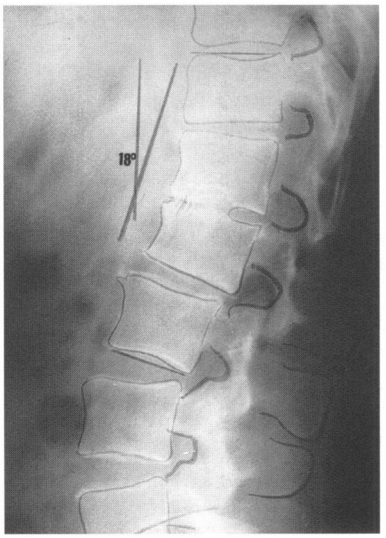
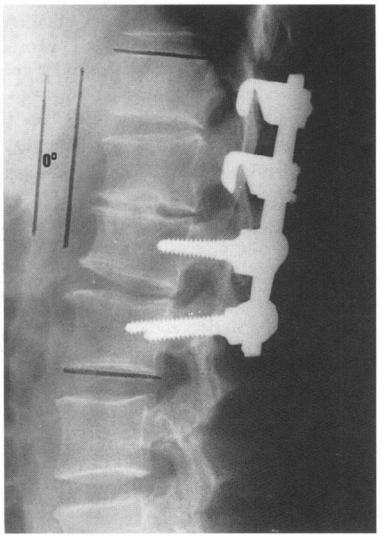


Figure 3. Lateral view of the thoracolumbar spine demonstrating an anterior fusion at the level T12–L1 because of a disc herniation in a 37-year-old man with a postoperative T11–L2 angulation of 18°.



Postoperative view of the thoracolumbar area after TSRH instrumentation and complete correction of the painful regional kyphosis.

tion in 3 levels, was operated on, without improvement; later she was diagnosed with multiple sclerosis.

Our study differs from others in that it was prospective and all patients were operated on using the same technique by one surgeon. All patients were operated on using the anterior transthoracic approach with complete rib excision and interbody fusion. This approach allows excision of the herniated disc either medial or lateral or mediolateral, while remaining anterior to the dural sac, thus obviating the need for manipulation of the spinal cord. The resected rib was used for intervertebral fusion which occurred in all cases within 3-4 months. Particularly, the interposition of the rib in the intervertebral space corresponding to the anterior and middle vertebral column restores the normal intervertebral height and sagittal profile of the thoracolumbar spine, thus avoiding pathological segmental movement and subsequent local kyphosis. In only 2 patients with a preexisting thoracolumbar symptomatic kyphosis a complementary posterior arthrodesis with TSRH instrumentation was needed. We believe that an instrumental fusion should always be performed after disc excision at the thoracolumbar region. In contrast to the transthoracic approach in case of transversectomy, some authors (Tanaka et al. 1993) did not perform instrumental fixation after discectomy as preservation of the rib and costovertebral joint was believed to be sufficient for the stability of the spine. Lesoin et al. (1986) used Harrington rods to avoid secondary kyphosis in 13 patients operated either via laminectomy or transthoracic or via costotransversectomy.

In previous series, good and excellent results of anterior thoracic disc discectomy ranged from 43 to 100% (Albrand and Corkill 1979, Otani 1977). In our series, all patients with incomplete neurologic lesions improved and showed excellent and good clinical results. Although the preoperative duration of symptoms was less than in previous studies, no correlation could be made between the duration of symptoms and degree of improvement because of the small number of the patients.

The transthoracic approach for thoracic disc excision is not a risk-free procedure (Lesoin et al. 1986). It should be performed by experienced surgeons, the decompression should be careful and should always be followed by intervertebral fusion with restoration of the sagittal profile at the thoracolumbar junction.

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