Acta Neurochirurgica 73, 229—242 (1984)

ACTA
NEUROCHIRURGICA

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Microsurgical Anterior Approach to Cervical Discs* Review of 60 Consecutive Cases of Discectomy Without Fusion

By

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With 5 Figures

Summary

During the past six years 60 patients have undergone anterior cervical microsurgical discectomy without exogenous intercorporal grafting using the operating microscope. This alternative method of treatment is a further refinement of previous techniques for the removal of cervical disc protrusions, which fulfils all the criteria of effective surgery. Discectomy provides ample exposure of the neural elements through the disc space. The visualisation of the underlying pathology is adequate through direct light and magnification of the operating microscope. A radical surgery is possible without danger of injury to the nervous structures or to the vertebral artery. The functional stability of the adjacent vertebral segment is present immediately after discectomy. A spontaneous fusion occurs in 70% of cases in six months to one year. Risks and complications of the procedure are few. Long term results are excellent, with overall benefit from surgery in 95% of cases. Comparing the results of anterior microdiscectomy without bone grafting with those of other procedures, there are no significant differences.

Keywords: Intervertebral disc displacement; cervical radiculopathy and myelopathy; anterior approach to cervical spine; microsurgical discectomy without fusion.

Introduction

Until recently, most reports recommended an exogenous osseous anterior fusion of the vertebral bodies after removing the disc.

* Presented at the 7th European Congress of Neurosurgery in Brussels, September 1983.

But in the past twenty years some studies have shown that cervical disc disease may be adequately treated surgically by anterior discectomy alone, without the need of insertion of a bone graft at the discectomy site. Also the results of our own series of 60 cases, which are presented in this paper, demonstrate comparable results.

The introduction of the microsurgical technique brought new dimensions in the treatment of cervical disc disease. Under direct vision, with the safety of magnification and good lighting, it is possible to see the hole in the annulus and remove the extruded disc fragment or the osteophyte to decompress the nerve root or the spinal cord. The microscope compensates for the restricted space in the surgical field.

Methods

Our method of anterior cervical microdiscectomy and osteophyt-ectomy without exogenous bony fusion has been standardized in the last three years. The anterior cervical spine is approached from the right side. The entire contents of disc space are removed down to the posterior longitudinal ligament and laterally to the uncinate process, leaving the cartilaginous plates intact. To see the underlying pathology directly in cases of laterally extruded discs it is an essential part of the procedure to tilt the operating table 20–25° towards the side of the lesion. The procedure is performed under magnification and direct light of the operating microscope. The hole in the annulus, through which the disc had ruptured, is identified and the posterior longitudinal ligament opened and partially resected only on the side of the pathological process. A free sequester can be exstirpated with a microrongeur and the epidural space explored for further fragments with a nerve hook (Fig. 1). The dura of the lateral part of the spinal cord and 1–2 mm of nerve root can be seen to be free of encroachment (Fig. 2). In cases of posterior osteophytes we use a high speed angled air drill, remove them carefully, giving access to the lateral recess. The patient is allowed out of bed with a cervical collar on the day of surgery and discharged after a week. He is permitted to return to full activity 2–3 months after surgery.

In cases of advanced spondylosis an adequate exposure of the neural elements through a collapsed disc space that resists being spread apart is very difficult. In these cases, we prefer the Cloward's dowel procedure. Only exceptionally we use the posterior approach in cases of uncertain diagnosis, especially if a tumour is suspected.

Material

Between January 1977 and January 1983, 60 patients underwent anterior cervical microdiscectomy or osteophyt-ectomy without exogenous graft (Tab. 1).

No patient was included in the series if the total follow-up period was less than six months. Only one patient reported prior cervical injury and four patients prior cervical surgery: cervical discectomy 2, cervical fusion 2.

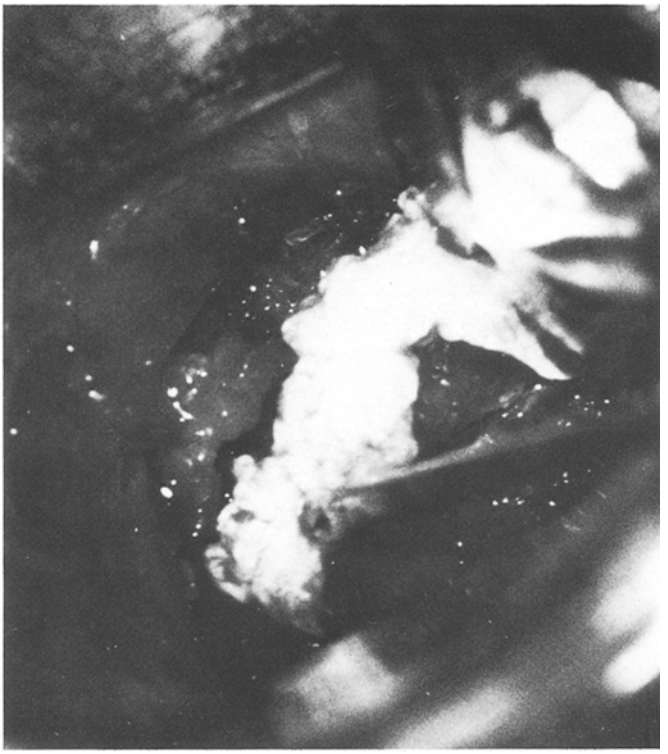

Fig. 1. Microsurgical exstirpation of a free sequestor of a ruptured disc from the epidural space

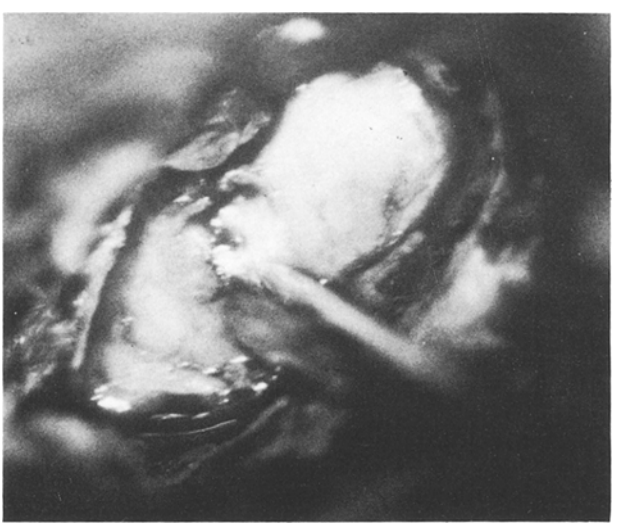

Fig. 2. Microscopic view of the edge of the dural sac and the medial aspect of the nerve root after partially removed posterior longitudinal ligament

The clinical picture in all patients was that of a lateral or medial cervical disc syndrome. All patients undergoing surgery had refractory signs and symptoms of radiculopathy after at least three weeks of appropriate physiotherapy. Neck pain alone was not considered as an indication for surgery (Tab. 2).

Table 1. *Clinical Data of the Patient Population*

	No.	%
Sex		
Male	37	62
Female	23	38
Age	26–65 years	
Average	46.5 years	
Symptom duration	2 weeks–4 years	
Average	6.5 months	
Duration of follow up period	6 months–6 years	
Average	3.5 years	

Table 2. *Symptoms and Signs in 60 Patients*

	No.	%
1. *Cervical*		
Neck pain	59	98
2. *Radicular*		
Brachialgia	59	98
Motor deficit	34	57
Reflex changes	53	88
Sensory deficit	55	92
3. *Medullar*		
Long tract signs	6	10

Electromyography was performed in 16 cases, when clinical features were confusing.

Cervical myelography is routinely performed preoperatively, with cervical spine X-ray films, recently with computerized tomography of the cervical spine (Tab. 3).

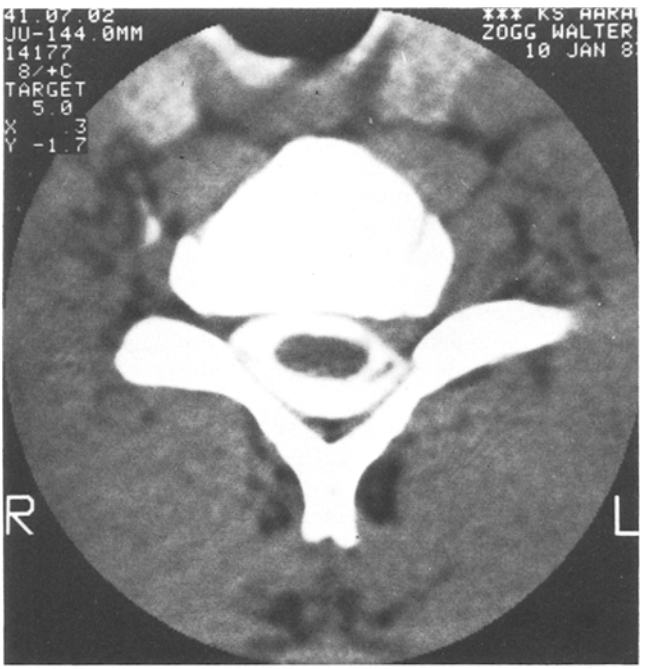

Fig. 3. Computerized tomographic Amipaque myelography: encroachment upon the nerve root on the left side by a ruptured disc at the 6/7 level

Table 3. *Preoperative Radiographic Findings*

	No.	%
Cervical spine X-ray films		
normal	27	45
spondylotic changes	33	55
Cervical Myelography		
normal	2	3
root sleeve abnormality	37	62
ventral-lateral defect	10	17
narrow cervical canal (±)		
cord compression	11	18
Computed axial tomography		
performed in	12	20
diagnostic in	2	16
additional to myelography	10	84

Osteophytes and foraminal spurs were seen frequently in both soft and hard disc cases. A narrow intervertebral space was noted in approximately one quarter of all cases. In 12 cases (20%) the spondylotic changes of the vertebral bodies had a different localisation from the herniated disc.

Positive contrast cervical myelography was performed on all patients but two, who had only CAT examination of the cervical spine. If the myelography was normal, surgery was not performed, except two cases of severe radiculopathy, resistent to every other kind of therapy.

The computerized tomography of the cervical spine using Amipaque, indicates the encroachment of a nerve root or the spinal cord. It is a useful additional examination to myelography[35] (Fig. 3).

A ruptured disc, with partially or totally extruded fragments in the epidural space was the most common operative finding (Tab. 4).

Table 4. *Operative Findings*

	No.	%
Ruptured disc	35	54
Soft protrusion	20	31
Osteophyte	10	15

There were 65 levels operated with 60 patients (Tab. 5).

Table 5. *The Operated Level*

	No.	%
3/4	1	1
4/5	2	3
5/6	20	31
6/7	36	55
7/Th 1	6	10

In most of the cases one level surgery was performed (Tab. 6).

Table 6. *Number of Operated Levels*

	No.	%
One level	56	93
Two levels	3	5
Three levels	1	2

The most frequently affected side was the left.

Results

Each patient included in this study was examined by the author at least twice after surgery: after 6 weeks and again after six months, and most of them once every year. Preparing this study, we sent a

Table 7. *Regression of Symptoms and Signs After Surgery*

	No.	%
1. *Cervical*		
Neck pain	34	58
2. *Radicular*		
Brachialgia	47	80
Motor deficit	26	76
Reflex changes	23	43
Sensory deficit	36	65
3. *Medullar*		
Long tract signs	5	83

Table 8. *Overall Results in 60 Cases Undergoing Anterior Discectomy*

	No.	%
Excellent	34	57
Good	15	25
Fair	8	13
Poor	3	5

Excellent: complete subjective relief, neurological signs improved, full activity.
Good: minimal persistence of symptoms, neurological signs improved or unchanged, full activity.
Fair: persistence of some symptoms, persistent limitation of activity.
Poor: no improvement or deterioration after surgery, no activity.

questionaire to each patient for self-estimation of the long term results. The subjective estimate of postoperative improvement and effect on working capacity was compared with the neurological findings and X-ray controls of the cervical spine. 52 patients gave positive responses to questionaire (87%).

Fig. 4. Incomplete osseous fusion of the vertebral bodies 6/7, six months after anterior surgery without graft. There is a lack of motion on dynamic studies

The complete improvement of clinical symptoms and signs is satisfactory (Tab. 7).

According to the grading system of Odom, Martins, Robinson *et al.* the results of surgery were categorized as follows (Tab. 8).

Applying these criteria for our cases, the results of surgery are encouraging. Adding up the positive results, we have an overall benefit from surgery in 95% of cases.

Standard antero-posterior and lateral flexion-extension films were taken at 3 days, 6 weeks, 6 months, and then yearly. An anterior angulation above the surgical site had no clinical significance. Only three patients showed slight motion at the operative

Fig. 5. Complete anatomic osseous fusion between the bodies of 5/6 one year after microsurgical anterior discectomy. The normal cervical lordosis is apparent. The ventral osteophytes were already present at the time of surgery

site after surgery, for a few weeks. The functional stability of the cervical spine was reached immediately after surgery. The initial radiological changes in the process of fusion showed that the involved interspace collapsed immediately after operation, with narrowing of the space between adjacent vertebral bodies and later loss of the superior and inferior cortical margins of the vertebral bodies. The presence of bone trabeculae and cortical bone bridging was the criteria for complete osseous fusion of the adjacent vertebral bodies (Tab. 9) (Figs. 4 and 5).

The radiological results of surgery were evaluated according to

Table 9. *Postoperative X-ray Studies of Cervical Spine*

	No.	%
Cervical lordosis	48	80
Angulation	12	20
Functional stability	57	97
Osseous fusion	42	70

Table 10. *Operative Complications in 60 Cases*

	No.	%
Neurological complications		
Neck pain	7	12
Brachialgia	1	2
Sensory deficit	3	5
Technical complications		
Vocal cord paresis	1	2
Dysphagia	21	35

Table 11. *Recurrences*

	No.	%
Same level	0	0
Adjacent level	2	3

the alignment of the vertebral bodies. We found little correlation between the postoperative X-ray appearance and clinical outcome.

No operative mortality occurred. No patient sustained spinal cord, nerve root, or vertebral artery injury. Several patients developed only transient exacerbation of some neurological symptoms (Tab. 10).

Reoperation was necessary on two patients because of a new lesion on the adjacent segment, four years after the initial surgery. No recurrences on the operated level occurred (Tab. 11).

Discussion

Experiences with the anterior approach have shown that the bone graft is not essential to the success of this operation, because the signs and symptoms of cervical disc disease improve as effectively without as with a fusion procedure. Omitting the interbody bone graft, simplifies the procedure and eliminates the graft related complications[1,3,4,30,31,32,38]. This operation visualizes the dura, removes the disc material completely and provides the neural elements of the spine with immediate relief from pressure. The risk of injury to the spinal cord, roots or vertebral artery with this technique are minimized when using the operating microscope[2,11,13,16,18,27,39,40,44].

The primary goal in anterior cervical surgery is the removal of offending lateral disc fragments or osteophytes[7,21,23,28]. Incomplete removal with preserving columns of disc in approaching the area compressing the nerve root is advocated by those authors who suppose that by removing the bulk of the disc the pressure on the nerve will be also relieved[10,13–15,23]. On the contrary many Neurosurgeons insist on "radical removal" of offending disc for proper decompression of the root and spinal cord, as well as to prevent recurrences[16,21,28,41].

Some authors find opening and resection of posterior longitudinal ligament dangerous and useless[2,11,23,28,44].

For many others, it is an essential part of the procedure to visualize the dura and root, to explore the epidural space and to be sure that the decompression is adequate[7,13,16,18,21,34,39,41,42].

Concerning the importance of removal of posterior osteophytes, the opinions are also contradictory. Authors who do not remove osteophytes state that the actual root compression is caused by the "soft" disc and not by the osseous ridge[23,44].

Careful removal of posterior osteophytes for adequate decompression of the nerve root or spinal cord is an important part of the surgery of cervical discs for many other authors[7,8,12,16,18,21,28,34,39,41].

Comparing the results of anterior microsurgery without bone grafting with those of grafting procedures[5,7,15,16,19–21,23,25,26,29,41,44] and those of other possible approaches[6,9,10,17,22,24,33,34,36,37,43] and

applying the same criteria for evaluation, there are no significant differences in overall benefit from surgery in the treatment of cervical discs. The microsurgical discectomy is technically simpler and safer than the other procedures, with less risk and fewer complications, however, with equally good results.

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