

Soft Cervical Disc Herniation: a Retrospective Study of 100 Cases

A. Dubuisson, J. Lenelle, and A. Stevenaert

Department of Neurosurgery, University Hospital of Liège, Liège, Belgium

Summary

During the period from January 1975 to January 1991, 100 patients with soft cervical disc herniation were operated on by either the anterior (84 patients) or posterior (16 patients) approach. There were 33 women and 67 men, aged from 25 to 67 years (average: 41.5); 97% presented with radicular symptoms and/or signs while 15% presented with long tract symptoms and/or signs. The patients were evaluated by computed tomography and/or myelography. Thirty-six % of the lesions occurred at the C5/6 level and 54% at the C6/7 level. Seventy-seven % reported total or partial relief of pre-operative symptoms and signs postoperatively. Patients presenting with radiculopathy had better outcome than those presenting with combined radicular and spinal cord involvement.

Keywords: Cervical soft disc herniation; cervicobrachialgia; Cloward procedure; posterior approach.

Introduction

Cervical discopathy can lead to 2 different disc lesions: soft or hard disc herniations. In general, both lesions are studied together in the literature^{5, 9, 13, 14}. The clinical presentation and postoperative outcome of these 2 disc lesions differ^{12, 14, 17}. The purpose of presenting this paper is to study the clinical presentation, the radiological and operative findings, to discuss the various operative strategies described in the literature and to evaluate the clinical results after surgery in 100 cases of soft cervical disc herniation.

Clinical Material and Methods

Since 1982, Cloward's operation has been the treatment of choice for cervical disc disease in our department. During the period from February 1982 to January 1991, 84 patients with soft disc herniation were operated on by this anterior approach. Before 1982, 16 patients were operated on by a posterior approach. The clinical symptoms and signs, radiological and operative findings, complications and postoperative course were recorded retrospectively from the patients' charts. We obtained a follow-up clinical status of at least one year in 71 patients. Eighteen of these were contacted by telephone.

Summary of Cases

There were 33 women and 67 men (sex ratio 2:1), ranging in age from 25 to 67 years (average 41.5). The age and sex distribution is shown in Fig. 1. Pre-operative symptoms and signs are outlined in Table 1. Among the 100 patients, 58 complained of neck pain radiating to the shoulder, 97 presented with radicular symptoms and 15 with spinal cord compression symptoms and signs. Six patients had painless neurological deficit. On clinical examination, limited mobility of the cervical spine was noted in 50% of cases, single dermatomal sensory loss was found in 56%, single myotomal motor weakness was present in 27% and root-related hyporeflexia was observed in 59% of cases.

A history of significant precipitating injury – mostly direct or flexion-extension injuries – was reported in 39 cases (physical effort: 20, road accident: 5, sport accident: 14). Prior to surgery, conservative treatment had been carried out on most of the patients without satisfactory results. Six patients had unbearable pain that required rapid relief by surgery. The time from the onset of symptoms to surgical treatment ranged from a few days to 2 years (average: 8.2 months). Fifty-two % of the patients were operated on less than 3 months after the onset of symptomatology.

Plain radiograms of the cervical spine, performed in 79 cases,

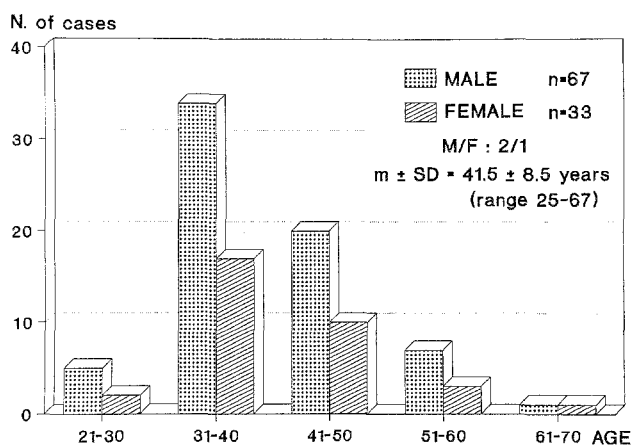


Fig. 1. Age and sex distribution in 100 patients suffering from cervical disc herniation

Table 1

<i>Cervical symptoms and signs</i>	
Neck pain	58
Restricted movements	50
<i>Radicular symptoms and signs</i>	
Radicular pain	94
Paraesthesiae	37
Arm weakness	48
Sensory deficit	74
Motor deficit	52
Muscle atrophy	12
Abnormal reflex	59
<i>Spinal cord symptoms and signs</i>	
Motor deficit in lower limbs	8
Pyramidal signs in lower limbs	15
Sensory changes in lower limbs	7

Symptoms and signs in 100 patients with cervical disc herniation.

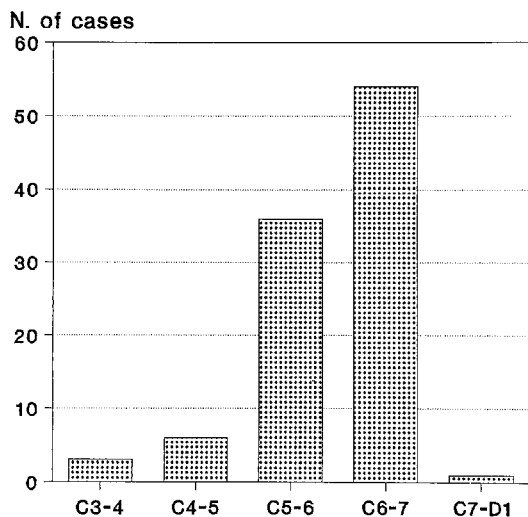


Fig. 2. Level of cervical disc herniation (100 patients)

were normal in 14 patients (18%) and showed non-specific spondylotic or foraminal osteophytic changes in 38 patients (48%). The examination revealed narrowing of the affected disc space in 25 cases (32%) and specific foraminal osteophytic changes in 20 cases (25%).

Electromyography (45 patients) was normal in 16% of cases and detected specific neurogenic signs in 49% of patients while non-specific radiculopathies were discovered in 35% of patients.

CT scanning was performed on 76 patients and, as can be expected in this series, always showed a cervical soft disc herniation. Five were of the posterocentral type, 58 of the posterolateral type (of which 13 also extended into the foramen) and 4 were exclusively foraminal. Myelography (90 cases) showed an unilateral root sleeve defect in 81 cases (90%), associated with a ventral spinal dural compression in 21 cases. Among these, 7 exhibited spinal cord compression. A narrow cervical canal was detected in 9 cases. Disc herniation was at the C3/4 level in 3%, at the C4/5 level in 6%, at the C5/6 level in 36%, at the C6/7 level in 54% and at the C7 Th1 level in 1% (Fig. 2).

Surgical indications were unbearable pain or pain unresponsive to medical treatment, spinal cord signs or persistent radicular signs.

Operative Technique

Eight surgeons were involved but 4 of them performed 82 of the 100 operations. Before 1982, 16 patients were operated on by a posterior approach. Laminotomy with removal of the herniated disc material was done in 10 cases while in 6 cases, the presence of a narrow cervical canal lead to laminectomy (multiple level in 5 cases; one level in 1 case).

After 1982, operation was performed by the anterior approach (Cloward's technique) in 84 patients. Iliac crest grafts were used for 78 operations (93%) while Bop graft (biocompatible osteo-induction polymer) was used for 6 operations. Double discs were operated on in 11 patients because of soft disc herniation at one level and cervical spondylosis at another level. One patient was operated on at the wrong level and this was corrected surgically 3 days later. Multiple simultaneous disc herniations did not occur in this series but 2 patients underwent 2 successive operations respectively 15 and 40 months apart for 2 successive cervical disc hernias. The state of the posterior longitudinal ligament was mentioned in the operative note in 66 cases; a hiatus was present in 44 cases (67%). The ligament was systematically removed. A free discal fragment was found inside the spinal canal in 23 cases. A pure soft disc herniation was found in 81 cases while associated spondylotic spurs were also present in 19 cases. Postoperatively, the 84 patients operated on by the anterior approach wore a soft collar for 3 months and control radiographs were obtained at day one, 6 weeks, 3 and 6 months postoperatively.

Complications

Among the 16 patients operated on by the posterior approach, one developed a CSF fistula which needed re-operation; one patient presented an asymptomatic phrenic paresis and another one a greater deficit affecting the lower limbs postoperatively.

Among the 84 patients operated on by the anterior approach, a tear in the dura matter was accidentally brought about in 2 patients (2.5%). The dura was repaired with stitches and biological glue; one of the 2 patients suffered spinal cord injury with pyramidal signs postoperatively. One patient presented recurrent nerve palsy, persistent for 9 months and another patient a suprascapular nerve palsy, also persistent for 9 months. At the donor site, one patient developed a painful scar, another a haematoma that needed to be evacuated

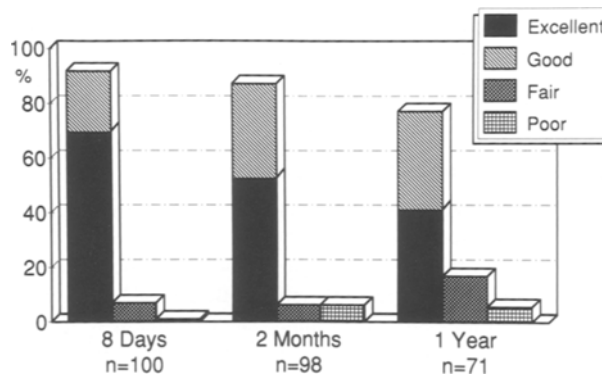


Fig. 3. Clinical results at 8 days, 2 months and one year postoperatively

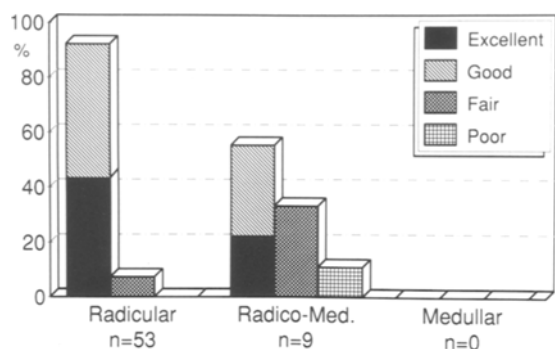


Fig. 4. Clinical results one year postoperatively, according to the clinical presentation, for 62 patients operated on by the anterior approach

and a third an infection which resolved with antibiotics. The only general complication was postoperative venous thrombosis of the leg which was treated with anticoagulants. No graft complication occurred at the cervical site when iliac crest grafts were used. Among the 6 cases with Bop graft, one developed graft necrosis and another graft impaction into the inferior vertebral body following a minor head injury. Both were treated conservatively.

Operative Results

Clinical results at 8 days (100 patients), 2 months (98 patients) and one year (71 patients) postoperatively are listed in Fig. 3. "Excellent" or "Good" refer to complete or almost complete relief of pre-operative symptoms and signs. "Fair" means improvement with some persistent limitation of activity and/or requirement of medication. "Poor" denotes either no change or deterioration of the pre-operative condition. The average follow-up period was 8.4 months (range 2 to 150).

Ninety-two % of the patients reported immediate total or partial relief of pre-operative symptoms and 77% remained improved at one year postoperatively. We obtained a follow-up at one year for 9 patients operated on by the posterior approach: one patient was cured, 5 had a fair outcome and 3 were stabilized. Figure 4 illustrates the clinical results one year postoperatively according to the clinical presentation, for 62 patients operated on by the anterior approach: among the 53 patients presenting with radiculopathy, 92% were cured or improved while 8% still experienced residual discomfort. Of the 9 patients with associated radicular and spinal cord signs, 56% had excellent or good results, 33% a fair result and 11% remained unchanged. Follow-up X-ray films at 6 months (anterior discectomy with fusion - 65 patients) revealed good osseous fusion in 63 cases. Mild kyphosis ($< 5^\circ$) was found in 17 cases (26%). As said earlier, 2 patients developed graft impaction and graft necrosis. One of them developed cervical kyphosis of 13° .

Discussion

Soft cervical disc herniation is a prolapse of disc material and can nowadays be easily distinguished pre-operatively from cervical spondylosis by CT scan. Soft disc hernia usually causes acute or subacute cervical

radiculopathy (average symptom duration before surgery: 8.2 months in our series) whereas the more frequent chronic cervical radiculopathy is often the result of osteophyte formation.

Soft disc herniations of the cervical spine are said to be rarely provoked by a specific injury^{11, 14, 17, 19}. Nevertheless such a history was present in 39 of our cases. Grisoli *et al.*⁷, Jomin *et al.*⁸ and Lunsford *et al.*¹² respectively found 36, 33 and 45% of anterior cervical trauma or stress in their series. Chronic trauma rather than acute neck trauma appears to be a more important causative factor. In our series, 90% of the lesions occurred at either the C5/6 or C6/7 level. These interspaces are those most frequently subjected to everyday mobility and stress.

Multiple-level cervical herniations are rare: less than 2% for Scoville *et al.*¹⁷, 6.5% for Jomin *et al.*⁸. None of our patients had simultaneous multiple soft disc herniations but 11 underwent two-level anterior discectomy and fusion for the association of disc herniation at one level and osteophytic spurs at another. According to us, this last association is more frequent than 2 associated soft disc herniations. Two patients developed 2 successive cervical disc herniations that required 2 successive operations. Three patients had been previously operated on for lumbar disc herniation.

The large male predominance (67%) is found by the majority of authors^{4, 5, 7, 8, 10, 12, 17}. The age distribution (mean age: 41.5 years) is similar to those in other series^{4, 5, 7, 8, 10, 12, 14, 17, 19}. Like in many other series^{3-5, 7-8, 12-14}, cervicobrachialgia was the presenting symptom in most of our patients. Cord signs were present in 15% of cases: pyramidal and sensory changes in the lower limbs are the predominant symptoms and signs. Sphincter dysfunction is rare¹¹. Narrowing of the cervical canal is a significant factor in the development of myelopathy. Posterocentral disc herniation and the volume of prolapsed disc material are also important^{11, 19}. For anatomical reasons, the majority of disc herniations develop in a posterolateral direction. We found disc material inside the foramen in 22% of cases, which is more than Lesoin *et al.*¹⁰ who found 7% of foraminal disc herniations. This can partly be explained by different definitions of foraminal herniation. In most cases, we found several free disc fragments inside the spinal canal and one inside the foramen.

Among complementary examinations, plain X-ray films are of little help: in only 32 of our cases was narrowing of the affected interspace found. Moreover, cervical spondylosis at levels other than the affected

one is frequent and radiological signs of cervical disc disease are often seen in asymptomatic persons of the same age range.

Little is said about electromyography in the literature. In their series, Lunsford *et al.*¹² found approximately one third of normal examinations, one third of specific radiculopathies and one third of non-specific radiculopathies. In our series, E.M.G. detected specific neurogenic signs in half of the cases and was normal in 16%. We believe that E.M.G. can give one more objective argument especially in case of difficult diagnostic cases and may sometimes help in taking the decision for surgery.

CT scanning has revolutionized the radiological evaluation by permitting an accurate diagnosis of soft disc herniation. It easily shows the localization and volume of disc herniation and the anteroposterior diameter of the spinal canal. It also allows the differential diagnosis with spondylotic spurs. We use cervical myelography as a complementary examination when the decision to operate has been taken. It better demonstrates the compressive effect on the nerve root. Moreover, all the cervical root sleeves are seen, giving sometimes an indication for multiple-level surgery. In this series, we did not have any experience of magnetic resonance imaging since the technique was introduced in our hospital in 1990. More recently, it was performed in difficult diagnostic cases or allergic patients. MRI showed perfectly both the disc herniation and its compressive effect on the nerve roots. It is likely that this technique will replace myelography in the future.

Our surgical indications are the same as in the literature^{5, 8, 19}: unbearable pain, persistent pain or recurrence after conservative treatment, neurological deficit and myelopathy. Working incapacity and age are also taken into consideration. Although some surgeons still prefer the posterior approach^{1, 9}, anterior discectomy with^{4, 5, 8, 12-14} or without^{2, 7, 12, 13, 15} fusion has become a standard procedure. The well-known technical difficulties of the posterior approach arise from the presence of the spinal cord and of large, short cervical nerve roots. Danger exists of spinal cord or nerve root injury. The anterior approach is a safer procedure that permits removal of soft or hard elements compressing the nerve roots or spinal cord. We have used Cloward's technique since 1982. We think that it affords greater decompression of the ventral epidural space and permits better removal of migrated disc material than pure discectomy. A hole in the posterior longitudinal ligament was present in 67% of our cases,

through which disc material had migrated in 23 cases. Ablation of the posterior ligament is another controversial issue in the literature. We always resect it in belief that it permits better inspection of the ventral epidural space. Whether to graft the vertebrae after discectomy or not is another debate among authors. Advocates of non-fusion state that occurrence of degenerative changes above or below a fused segment is frequent some years after fusion, that incidence of fusion after simple discectomy is only slightly less than after grafting. Morbidity at the donor site is eliminated. Pache *et al.*¹⁶ obtained better results with simple discectomy than with discectomy and fusion by the method of Smith and Robinson but the 2 groups are not similar since the bad results are partly due to myelopathy of long pre-operative duration. For Martins *et al.*¹³, equally good results are obtained after discectomy with or without fusion and they suggest discectomy be performed in cases of pure soft disc herniation and discectomy with fusion in cases with associated spondylosis. The disadvantages of discectomy without fusion however exceed in our mind its advantages: without fusion, the height of the interspace is reduced and there is reduction of the size of the foramen, mild kyphosis frequently develops and the incidence of fusion is often diminished when compared to series in which grafting is performed. We believe that fusion is necessary to assure cervical stability and to decompress the nerve roots and spinal cord as much as possible. Morbidity at the donor site was not a problem in our series. Gore *et al.*⁶ compared cervical roentgenograms of 90 patients who had anterior fusion with age and sex-matched people. There was no difference in the incidence of degenerative changes between the 2 groups at the levels above and below the fusion with the exception of anterior osteophyte formation which was more frequent in the surgical group. In our series, a few cases were operated on using a Bop graft. After serious complications had occurred in 2 cases (graft fracture), its use was discontinued. Iliac crest grafting offers better strength and a better chance of osseous fusion.

Krupp *et al.*⁹ perform foraminotomy in case of lateral cervical disc herniation. The operation is carried out with the patient in the half-sitting position. They have a low incidence of complications. In particular, instability of the cervical spine does not ensue. They obtain excellent and good results in most cases with 92% of the patients returning to their previous occupation. Aldrich¹ used posterolateral microdiscectomy

in 36 patients presenting with monoradiculopathy caused by posterolateral disc sequestration. Partial facetectomy (never more than 50%) permits exposure of the nerve root and removal of the migrated disc material. No complication results and good to excellent results are obtained in all cases. The author insists on strict patient selection criteria.

Cervical chemonucleolysis has been recently introduced for the treatment of cervical disc herniation⁸. However, the series is limited to 34 cases and poor results were obtained in 6 cases who ultimately needed to be operated on. Theron *et al.*¹⁸ have treated 78 cases of cervical disc herniation by percutaneous automated cervical discectomy. The technique can be used on an outpatient basis. Overall results are excellent or good in 71% of cases.

In our study, 92% of the patients reported immediate improvement. For Espersen *et al.*⁵, the patient's condition one year postoperatively can be considered stable. Unfortunately, we obtained a follow-up of at least one year for only 71 patients. Among them, 77% remained improved. Recurrent neck or shoulder pain was the most common complaint. These results are similar compared with other series^{3, 5, 8, 12, 14}. Long duration of symptoms and occurrence in old people seem to result in a poor outcome^{3, 14}.

Conclusion

Soft cervical disc herniation is a common cause of acute or subacute cervicobrachialgia and can lead to myelopathy in about 15% of cases. Herniation more frequently occurs at C5–6 or C6–7 level and often affects young or middle-aged men. One third is provoked by specific injury. The most useful complementary examinations are myelography, CT scanning and probably MRI. Anterior approach by Cloward's procedure gives excellent or good results in most cases and involves few complications. Herniectomy by laminotomy or laminectomy done in the past most often gave only fair or poor results.

References

1. Aldrich F (1990) Posterolateral microdiscectomy for cervical monoradiculopathy caused by posterolateral soft cervical disc sequestration. *J Neurosurg* 72: 370–377
2. Benini A, Krayenbuhl H, Bruderl R (1982) Anterior cervical discectomy without fusion. Microsurgical technique. *Acta Neurochir (Wien)* 61: 105–110
3. Bertalanffy H, Eggert HR (1988) Clinical long-term results of anterior discectomy without fusion for treatment of cervical radiculopathy and myelopathy. A follow-up of 164 cases. *Acta Neurochir (Wien)* 90 (3–4): 127–35
4. Cloward RB (1958) The anterior approach for removal of ruptured cervical discs. *J Neurosurg* 15: 602–17
5. Espersen JO, Buhl M, Ericksen EF, Fode K, Klaerke A, Kroyer L, Lindeberg H, Modsen CB, Strange P, Wohler L (1984) Treatment of cervical disc disease using Cloward's technique. I. General results, effect of different operative methods and complications in 1,106 patients. *Acta Neurochir (Wien)* 70: 97–114
6. Gore DR, Gardner GM, Sepic SB, Murray MP (1986) Roentgenographic findings following anterior cervical fusion. *Skeletal Radiol* 15 (7): 556–9
7. Grisoli F, Graziani N, Fabrizi AP, Peragut JC, Vincentelli F, Diaz-Vasquez P (1989) Anterior discectomy without fusion for treatment of cervical lateral soft disc extrusion: a follow-up of 120 cases. *Neurosurgery* 24 (6): 853–9
8. Jomin M, Lesoin F, Lozes G, Clarisse J (1985) Les hernies discales cervicales. Deux cent trente observations. *Sem Hôp Paris* May 9, 1985
9. Krupp W, Schattke H, Muke R (1990) Clinical results of the foraminotomy as described by Frykholm for the treatment of lateral disc herniation. *Acta Neurochir (Wien)* 107: 22–29
10. Lesoin F, Jomin M, Villette L, Autricque A, Clarisse J (1987) Hernie discale cervicale foraminale. Traitement par discoforaminotomie. *Neurochirurgie* 33: 74–78
11. Lourie H, Shende MC, Stewart DH (1973) The syndrome of central cervical soft disc herniation. *JAMA*: 226 (3): 302–305
12. Lunsford LD, Bissonetti DJ, Janneta PJ, Sheptak PE, Zorub DS (1980) Anterior surgery for cervical disc disease. *J Neurosurg* 53: 1–11
13. Martins AN (1976) Anterior cervical discectomy with and without interbody bone graft. *J Neurosurg* 44: 290–295
14. Mosdal C (1984) Cervical osteochondrosis and disc herniation. Eighteen years' use of interbody fusion by Cloward's technique in 755 cases. *Acta Neurochir (Wien)* 70: 207–225
15. Murphy MG, Gado M (1972) Anterior cervical discectomy without interbody bone graft. *J Neurosurg* 37: 71–75
16. Pache T, de Tribolet N (1986) Hernie discale cervicale avec ou sans arthrose. Operation par discectomie simple ou avec spondylocléose associée? *Schweiz Med Wochenschr* 116(2): 358–66
17. Scoville WB, Dohrmann GJ, Corkill G (1976) Late results of cervical disc surgery. *J Neurosurg* 45: 203–210
18. Theron J, Huet H, Courtheoux F (1992) Nucléotomie percutanée cervicale automatisée. Percutaneous automated cervical discectomy. *Rachis* 4(2): 93–105
19. Yoshiki Y (1985) Soft disc herniation of the cervical spine. *Int Orthop* 9: 19–27

Correspondence: Annie Dubuisson, M.D., Department of Neurosurgery, University of Liège, Domaine Universitaire du Sart-Tilman, B-4000 Liège 1, Belgium.