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Original article

Microendoscopic diskectomy and interbody fusion (MEDIF): Results of a minimally invasive technique

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SUMMARY. Minimally invasive surgery techniques for the cervical spine such as anterior microendoscopic diskectomy and interbody fusion (MEDIF) to treat degenerative disease with central cord compression are not managed by all spine surgeons and yet they may be one of the treatments of choice. This study reports a series of patients treated with the METRx® system. *Objectives.* To show the clinical and surgical results of minimally invasive techniques in treating cervical degenerative disease. *Material and methods.* Between February 1998 and August 2002, a prospective study was conducted to assess the MEDIF treatment with threaded titanium cages in patients with cervical root disease with and without myelopathy. We used an endoscopic system to perform the surgical procedures and follow-up was based on the Odom clinical criteria and X-rays. *Results*. Forty-four patients were operated on (53 levels); 86% of them had good or excellent results; 89% had fusion. No implant migration was seen. Three patients required foraminotomy within 12 months after surgery because of unilateral radiculopathy at a cervical level other than the one treated. The average hospital stay was 12 hours and 75% of patients were able to return to work within 30 days after surgery.

Key words. Endoscopy, diskectomy, radiculopathy.

RESUMEN. Técnicas de cirugía mínimamente invasiva de columna cervical como la microdiscectomía endoscópica y fusión intersomática por vía anterior (MEDIF) para tratamiento de la enfermedad degenerativa con compresión medular central, no son del manejo de todos los cirujanos de columna y puede ser uno de los tratamientos de elección. Presentamos una serie de pacientes tratados con el sistema METRx®. *Objetivos.* Mostrar los resultados clínicos y quirúrgicos por técnica mínimamente invasiva en el tratamiento de la enfermedad degenerativa cervical. *Material y métodos.* De febrero 1998 a agosto 2002, se realizó un estudio prospectivo para evaluar el tratamiento MEDIF con cajas roscadas de titanio, en pacientes con radiculopatía cervical con y sin mielopatía. Utilizamos un sistema endoscópico para los procedimientos quirúrgicos, y seguimiento con base a los criterios clínicos de Odom y rayos X. *Resultados.* Se operaron 44 pacientes (53 niveles). Ochenta y seis por ciento tuvieron una buena o excelente evolución, 89% presentaron fusión, no hubo migración de los implantes y tres pacientes requirieron foraminotomía dentro de los 12 meses posteriores a la cirugía por presentar radiculopatía unilateral en otro nivel cervical al tratado. La estancia hospitalaria promedio fue de 12 horas y 75% regresó a trabajar en los primeros 30 días después de cirugía.

Palabras clave: endoscopía, discectomía, radiculopatía.

Introduction

Smith and Robinson first introduced anterior cervical spine fusion techniques in 1955 and Clowrad did so in 1958, by using a bone graft and osteosynthesis materials for fixation.[1,2]

Isolated decompression improved neurological symptoms. However, some patients continued having cervical

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pain and later developed a kyphotic deformity leading to an interbody fusion routine.[3-5]

Until the late 1900s, this procedure was the most common treatment for a broad variety of degenerative problems of the cervical spine involving anterior spinal cord compression.[6] However, several complications may occur due to collapse and rejection of the bone graft, nonunion, and local morbidity at the graft harvesting site (iliac crest).[1,5-10]

Many modifications have been made recently to the standard procedure, such as using minimally invasive surgical techniques to avoid complications of traditional procedures that include broader approaches and greater exposure of tissue.

Among the new techniques, the endoscopic approaches are being used for multiple surgeries with the help of dilators. Initially, this technique was used for lumbar diskectomy,[11] but today, it is applied to new routes and multiple approaches.[12-15]

Anterior endoscopic diskectomy with interbody fusion to treat degenerative disease with central spinal cord compression or bilateral radiculopathy is not a procedure known to most spine surgeons. In this study used an endoscopic approach was used to perform anterior microendoscopic diskectomy and interbody fusion (MEDIF) with titanium cylindrical cages (GM Reis®).[16]

The purpose of this paper is to present the clinical and surgical results of a minimally invasive technique to treat cervical spine degenerative disease with microendoscopic diskectomy and interbody fusion.

Material and methods

Between February 1998 and August 2002 a prospective study was conducted to assess the technical possibilities, fusion rate and clinical results in patients who underwent anterior microendoscopic diskectomy and interbody fusion (MEDIF) with an endoscopic approach to the cervical spine with the METRx system (Medtronic Sofamor-Danek).

Patients who upon physical examination had clinical evidence of bilateral radiculopathy with or without myelopathy and whose imaging tests (X-rays and MRI of the cervical spine) showed compression at the midline level, were treated with MEDIF as minimally invasive surgery, using titanium threaded cylinders (GM Reis) for interbody fusion.

The MEDIF technique was performed on 44 patients (26 females and 18 males); 53 cervical levels were operated on and mean patient age was 47.3 years (range: 27-64 years).

Only one level was operated in 35 patients (79.5%) and two levels, in 9 patients (20.5%). The most frequently operated level was C5-C6 in 26 patients (49.1%), followed by C4-C5 in 13 patients (24.5%), C6-C7 in 10 patients (18.9%), and C3-C4 in 4 patients (7.5%).

Two GM Reis® threaded cages were used in 37 patients (69.8%) with fusion at C5-C6 and C6-C7, whereas in other levels, C3-C4 and C4-C5, a single cage was used, given the technical difficulties resulting from the reduced disc space.

The mean operative time was two hours and the average hospital stay was 12 hours per patient. No intraoperative complications occurred.

For follow-up purposes, patients were personally surveyed and they answered a written questionnaire that measured how they were doing according to the ODOM modified clinical criteria[17,18] *(Table 1)*, and based on the subsidence or progression of the preoperative symptoms at 1, 3, 6, 12 and 24 months. All the patients were followed-up for at least one year.

The radiological follow-up involved X-rays taken at 3, 6, 12, and 24 months after surgery, to assess fusion and diagnose possible implant migration in any direction.

Surgical technique: the patient is placed in a supine decubitus position with a roll-shaped support under the shoulders and head at the midline. The cervical disc level to be treated is identified with fluoroscopy *(Figure 1)*. A horizontal incision about 1.8 cm long is made on the left side of the neck, at the target level, extending from the most anterior border to the ipsilateral sternocleidomastoid muscle and to the midline. The platysma and superficial fascia are opened with a pair of Metzenbaum scissors. The common carotid artery is moved laterally with finger dissection. Endoscopic dilators are introduced under fluoroscopic control between the carotid artery and the esophagus. The METRx endoscope is positioned over the disk to be removed *(Figure 2)*. The diskectomy and the excision of the posterior osteophytes are performed with very fine clamps and a high-speed power burr. For the interbody fusion, two titanium threaded cylindrical cages (GM Reis®) are used; they are tapered to preserve cervical lordosis *(Figure 3)*. No collar is needed after the surgery.

Results

During the 15 to 30-day postoperative period, 39 patients (88.7%) required no analgesia, compared to 84% of them who needed analgesia preoperatively.

Table 1. Odom modified criteria.

Excellent	Improvement > 80% of preoperative signs and symptoms with worsening ≤10%
Good	Improvement > 70% of preoperative signs and symptoms with some worsening (≤15%)
Average	Improvement > 50% of preoperative signs and symptoms with some worsening (≤20%)
Poor	Improvement < 50% of preoperative signs and symptoms with significant worsening (> 20%)

Table 2. Clinical course.

Follow-up period (months)	Total patients	Excellent	Good	Average	Poor
12	16	8	5	0	3
24	28	19	6	2	1
Total follow-up	44 (100%)	27 (61.4%)	11 (25%)	2 (4.5%)	4 (9%)

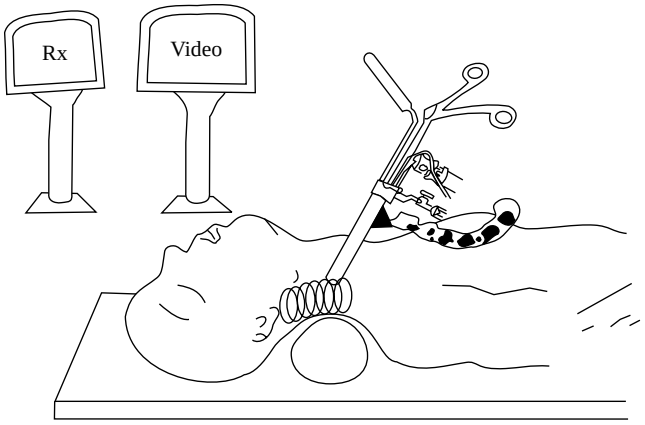

Figure 1. Schematic of patient positioned on the operating table, the METRx® endoscopic system, and monitors for the proper performance of the procedure.

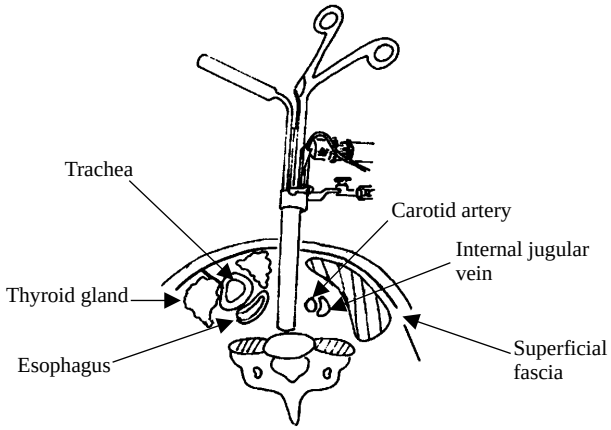

Figure 2. Schematic of an axial section of the neck illustrating the placement of the METRx® system and the major anatomical structures surrounding it.

Seventy five per cent of patients returned to their jobs within the first 30 days.

Twenty-eight patients (63.6%) were followed-up for two years and the rest of them for one year.

The results of the clinical evaluation using the ODOM criteria were good to excellent in 86% of patients at the end of follow-up *(Table 2)*.

Simple and dynamic X-rays showed fusion in 89% of cases with no alterations in the normal spine curvature or implant migration.

Figure 3. Anteroposterior and lateral X-rays of the cervical spine of a patient who underwent treatment with the MEDIF system at the C3-C4 level.

Because of unilateral radiculopathy, three patients underwent foraminotomy at a different cervical level 12 months after the surgery.

Discussion

Cervical degenerative disease, accompanied by central disk compression with or without myelopathy, is a disease commonly seen by spine surgeons. To solve these cases anterior microendoscopic diskectomy with interbody fusion (MEDIF) was performed using titanium threaded cages.[16] Although a posterior approach with foraminotomy may be indicated for disk herniation, it cannot solve the central compression problem.[15,19]

MEDIF is a minimally invasive technique allowing for a diskectomy, osteophyte resection and fusion to be performed through a small skin incision under fluoroscopic control.

Currently, there is experience available with the use of an anterior endoscopic approach for anterior diskectomy and foraminotomy. However, no data have been reported so far on anterior microdiskectomy and endoscopic fusion.

This study shows that the results with the MEDIF technique, in terms of decreased painful symptoms, neurological recovery, and fusion are similar to those reported with conventional anterior open cervical surgery with fusion using interbody cages or cervical plates.[15,19-21]

The endoscopic procedure produced no intraoperative morbidity because it causes only a minor wound of the

paraspinal tissues, involves less traction on the esophagus and trachea, and a smaller surgical incision, with appropriate operative times and a very short hospital stay. Patients did not need to wear a cervical collar during the postoperative period.

The titanium cage prevents bone graft collapse and results in appropriate fusion rates with no reports of migration during the follow-up period.

Some of the results found in this first series with the MEDIF technique include: immediate stability, good clinical response, absence of intraoperative morbidity, reduced operative time, and short hospital stay. This two-year experience looks quite promising; however, longer follow-up periods in addition to multicenter trials are necessary to determine the efficiency of this approach. At the same time, it should encourage spine surgeons to learn and use these innovative techniques in minimally invasive surgical approaches.

Bibliography

1. Cloward RB: The anterior approach for removal of ruptured cervical disks. *J Neurosurg* 1958; 15(6): 602-617.
2. Smith GW, Robinson RA: The treatment of certain cervical spine disorders by anterior removal of the intervertebral disc and interbody fusion. *J Bone Joint Surg Am* 1958; 40-A(3): 607-24.
3. Baba H, Furusewa N, Imura S, et al: Late radiographic findings after anterior cervical fusion for spondylotic myeloradiculopathy. *Spine* 1993; 18(15): 2167-2173.
4. Brunon J, Fuentes JM, et al: Chirurgie anterieure et anterolaterale du rachis cervical inferieur. *Neuochirurgie* 1996; 42(2): 105-122.
5. Teramoto T, Ohmori K, Takatsu T, et al: Long-term results of the anterior cervical spondylodesis. *Neurosurgery* 1994; 35(1): 64-68.
6. Szpalski M, Gunzburg R: Columna Cervical Degenerativa (d) Reichmann&Affonso Editores, 2001. pp. 264-291.
7. Bohlman HH, Eismont FJ: Surgical techniques of anterior descompression and fusion for spinal cord injuries. *Clin Orthop* 1981; (154):57-67.
8. Boni M, Denaro V: Traitement chirurgical des cervicarthroses rachidiennes. In: Duparc J, Schreiber A, Troisier O, eds. Instabilites vertebrales lombaires. Paris: Expansion Scientifique Française 1995.
9. Ducker TB, Zeidman SM: Cervical disk diseases, II: Operative procedures. *Neurosurg Q* 1992; 2: 144-163.
10. Watters WC, Levinthal R: Anterior cervical discectomy with and without fusion. *Spine* 1994; 19(20): 2343-2347.
11. Adamson TE: Microendoscopic posterior cervical laminoforaminotomy for unilateral radiculopathy: results of a new technique in 100 cases. *J Neurosurg* 2001; 95(1): 51-57.
12. Bonaldi G, Minozino G, Belloni G, Dorizzi A, et al: Percutaneous cervical diskectomy: preliminary experience. *Neuroradiology* 1994; 36(6): 483-486.
13. Fontanella A: Endoscopic microsurgery in herniated cervical discs. *Neurol Res* 1999; 21(1): 31-38.
14. Miccoli P, Berti P, Raffaelli M, et al: Minimally invasive approach to the cervical spine: a proposal. *J Laparoendosc Adv Surg Tech A* 2001; 11(2):88-92.
15. Saringer WF, Reddy B, Nobauer-Huhmann I, Regatschnig R, Reddy M, Tschabitcher M, Knosp E: Endoscopic anterior cervical foraminotomy for unilateral radiculopathy: anatomical morphometric analysis and preliminary clinical experience. *J Neurosurg Spine* 2003; 98(2): 171-180.
16. Burke TG, Caputy A: Microendoscopic posterior cervical foraminotomy: a cadaveric model and clinical application for cervical radiculopathy. *J Neurosurg* 2000; 93(1): 126-129.
17. Odom GL, Finney W, Woodhall B: Cervical disk lesions. *J Am Med Assoc* 1958; 166(1): 23-28.
18. Zoega B, Karrholm J, Lind B: Outcome in degenerative cervical disc surgery. *Eur Spine J* 2000; 9(2):137-143.
19. Roh SW, Kim DH, Cardoso AC, Fessler RG: Endoscopic foraminotomy using MED system in cadaveric specimens. *Spine* 2000; 25(2): 260-264.
20. Wirth FP, Dowd GC Sanders HF, Wirth C: Cervical discectomy. A prospective analysis of three operative techniques. *Surg Neurol* 2000; 53(4): 340-348.
21. Woertgen C, Rothoerl RD, Henkel J, Brawanski A: Long term outcome after cervical foraminotomy. *J Clin Neurosci* 2000; 7(4):312-315.