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ORIGINAL STUDY

Combined interbody cage and anterior plating in the surgical treatment of cervical disc disease

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The purpose of this study was to evaluate the results of treatment of symptomatic cervical disc herniation using interbody cages and anterior plate fixation. Fifteen patients were studied retrospectively. An MRI study of the cervical spine was performed preoperatively in all patients. The levels involved were C5-C6 in 9 cases, C6-C7 in 4 and C3-C4 in 1, while 1 patient had disc disease at the C5-C6, C6-C7 levels. Surgical treatment included anterior approach of the cervical spine, removal of the degenerative disc, excision of osteophytes and insertion of an interbody cage which was filled in with bovine allograft and demineralised bone matrix. The spinal unit was stabilized with an anterior plate and screws. No cervical splint was used postoperatively. The patients were followed up for 7 years on average after surgery. No failure or migration of the implants was noted, while bone fusion was achieved radiologically within 6 months postoperatively in all cases.

The benefits of this surgical technique are the maintenance of cervical lordosis and disc space height, the high fusion rate, as well as avoidance of cervical orthoses.

INTRODUCTION

Anterior decompression and interbody fusion of the cervical spine is a widely accepted treatment for patients with symptomatic cervical disc disease. The "gold standard" (*15*) includes using a tricortical iliac bone graft, which goes together with significant donor site morbidity, while the fibula allograft has been related to a high incidence of fusion failure (*23*).

Anterior cervical procedures for the treatment of cervical disc disease initially included the use of an iliac crest bone graft (*1, 5, 20, 21*). In the 1960's, several neurosurgeons began to use cement instead of bone graft for stabilisation of the cervical spine with disc disease (*9, 10*). Cervical discectomy without fusion led to satisfactory results in more than 85% of the cases (*7*).

In 1971, an H-plate with five holes was first used for stabilisation of the cervical spine (*2, 14, 17*). Kaiser *et al*, in their study, underlined the better

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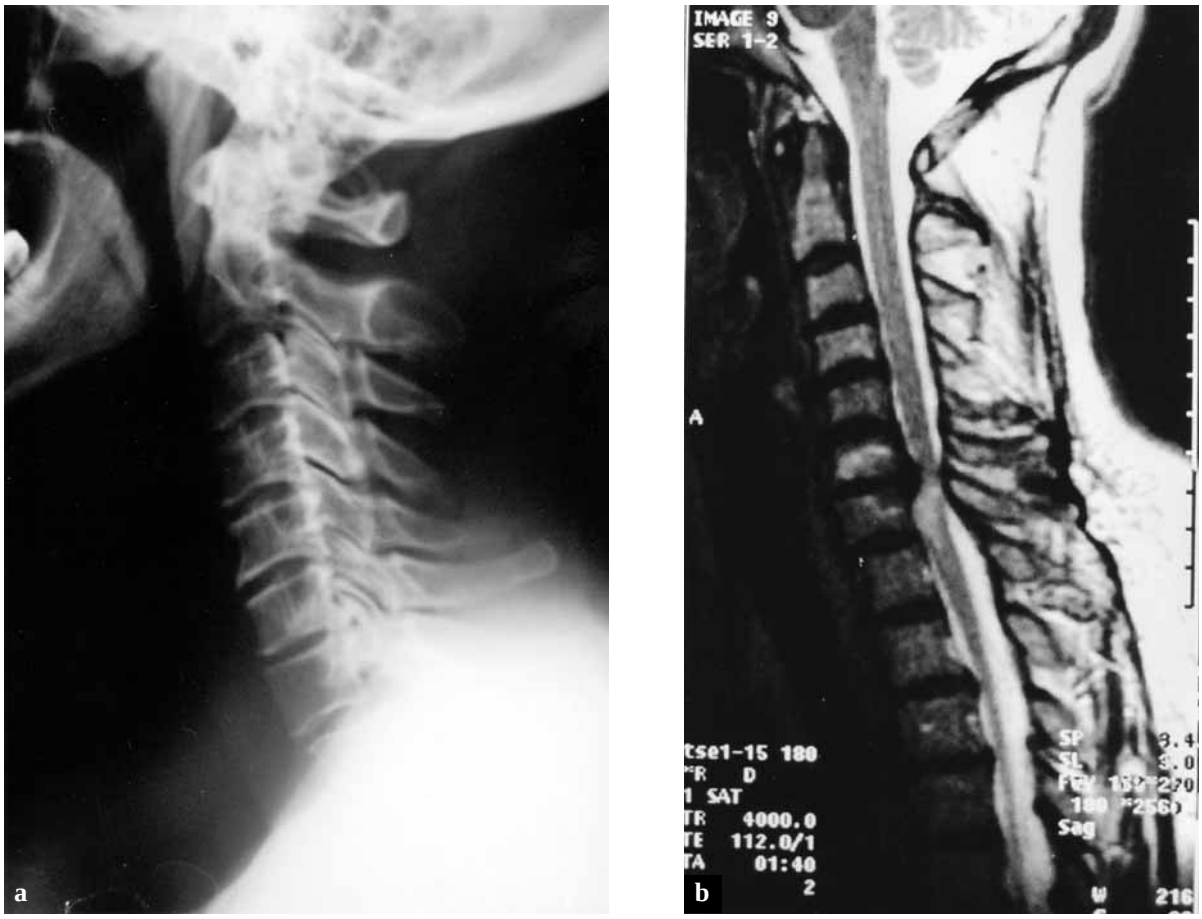

Fig. 1. — a. Lateral radiograph of the cervical spine of a patient with C6-C7 disc disease ; b. MRI of the same patient (sagittal section).

results achieved in terms of fusion, by combining an interbody allograft with an anterior cervical plate (*12*).

Interbody cages in the human cervical spine first appeared in 1996 and preliminary studies were published in 1997. Matge in 1998 (*16*) concluded that interbody cages offer better clinical results without graft donor site morbidity, in contrast to other contemporary interbody grafting methods.

The purpose of this study was to evaluate the results of the surgical excision of a herniated cervical disc and simultaneous rigid stabilisation of the involved level, combining an interbody cage filled in with allograft and anterior plating.

PATIENTS AND METHODS

We studied retrospectively 15 patients (11 men and 4 women, non-smokers), treated with cervical discectomy, followed by intervertebral cage insertion and anterior plate fixation. The patients attended our clinic from 1996 until 2002 ; their average age was 36.5 years (range : 28 to 64).

Radiographs and magnetic resonance imaging were performed in all patients. The diagnosis was cervical disc herniation caused by degeneration or trauma (fig 1).

The disc disease was at the C5-C6 level in 9 cases, at C6-C7 in 4, at C3-C4 in 1, while 1 patient had a double lesion at the C5-C6, C6-C7 levels.

Fig. 2. — a. Lateral radiograph of the patient in figure 1, three-years postoperatively, showing C6-C7 osseous bridging in front of and behind the cage. Adequate preservation of the disc space and cervical lordosis is exhibited ; b. Postoperative MRI (sagittal section) of the same patient with no cord pressure from disc C6-C7.

The absolute indication for surgical treatment was deterioration of the neurological symptoms. Surgical treatment was also undertaken when there was neurological dysfunction in the form of cervical root irritation or myelopathy, or when there was no relief of pain in cases treated with anti-inflammatory medication and a cervical collar, for 6 weeks at least.

The postoperative follow-up included neurological and radiological assessment, with measurement of cervical lordosis and intervertebral space height.

Surgical technique

The surgical treatment included an anterolateral approach of the cervical spine. Fluoroscopic confirmation of the proper level was done systematically. After removal of the disc and of the existing osteophytes with the aid of magnifying loupes X3.5, preparation of the end plates was done by curetting all the cartilage down to the subchondral bone, followed by placement of an intervertebral cage with the proper height, width and length. The cage used was the Cerlock cage (Biomat, Saclay, France). Lordosis was restored under image intensifier control by the cage introduction. The intervertebral space was stabilised with an anterior plate. TOP Cervical plates (Fehling, Germany) with bicortical screws were placed in all patients.

Bovine allograft (Lubboc, OST Development Clermont Ferrand, France) and demineralised bone matrix (Grafton, DBM Putty, Osteotech Eatontown, USA) were

packed inside the cage as well as in the space between the plate and the cage.

In one patient, two cages were inserted into two different levels.

RESULTS

There were no complications related to the surgical approach, and no failure or migration of the implants. The neurological radicular symptoms improved in all patients and none of them reported persisting neck pain aggravated with flexion-extension movements. Bone fusion was achieved radiologically after 6 months, with formation of osseous bridges behind the plate and ventrally and dorsally to the intervertebral cages. The height of the disc space (range : 6.2 to 8.7 mm), as well as the angle of cervical lordosis (range : -10° to -22°) were adequately preserved at the last follow-up. Postoperative MRI revealed reduction of anterior pressure on the spinal neural elements (fig 2). Cervical splints were not used postoperatively.

DISCUSSION

Anterior decompression and fusion constitutes the best choice for the surgical treatment of cervical disc disease affecting one to three levels. The posterior approach (laminectomy or laminoplasty) is mainly recommended when the lesion is over three levels, and in cases without cervical spine kyphosis (*11*).

Even though, theoretically, better results are achieved with autologous iliac bone graft in terms of fusion, many complications arising from the donor site have been reported, affecting up to 20% of cases (*8*).

This observation led to the use of alternative graft resources, including frozen allografts (*3*). Zbelick and Ducker (*23*), comparing autografts to allografts for anterior cervical fusion, claimed that for one-level cervical disc disease, the fusion rates were 95% in both options. However, for multilevel fusion, the non-union rates were 17% for the iliac bone graft and 63% for the allograft. Graft collapse presented in 5% of autograft cases and in 30% of allograft cases. Fernyhough *et al* (*6*) stated that the percentages of fusion failures were 27% for autografts and 41% for allografts.

The results of cervical fusion achieved with intervertebral titanium cages filled with autograft were comparable with those of structural autograft, with an additional major advantage of having no complications from the donor site (*9, 15*). In biomechanical tests and specifically in flexion and extension movements of the cervical spine, titanium cages were not proved to be superior to tricortical iliac crest autografts or buttress plates (*18*). Finally, studies with the use of intervertebral implants consisting of carbon fiber (*19*) or hydroxyapatite (*24*) are currently being conducted.

Kostuik *et al* were first to publish their experience using a plate system that prevents migration and loosening of the screws (*13*). The results of one-level fusion with or without buttress plate were comparable with low implant-related morbidity rates, while the outcomes for the two-level fusion were superior when using plating systems (*12, 22*). In a comparative cost analysis (*4*) between titanium mesh type cage with buttress plate and autologous iliac crest graft with a buttress plate, there was no statistically significant difference, on account of the hospital cost due to the morbidity from procurement of the iliac crest graft.

In our study, in which all but one of the cases were related to one-level cervical disc disease, an intervertebral titanium cage and an anterior buttress plate were used, taking into consideration the high incidence of bone fusion and biomechanical stability that could be expected from their combination.

Bone fusion was achieved in 100% of the cases, and no migration of the implants was recorded in the postoperative radiographs. Dynamic radiographs in flexion-extension were not made to assess fusion, as the plate prevents any mobility within the intervertebral space. We believe that this technique can create favourable mechanical and biological conditions for fusion, while avoiding any donor site morbidity.

Absence of complications from an autograft donor site, maintenance of normal lordosis and height of the intervertebral space and avoidance of cervical orthoses are the main advantages of this surgical method. However, a larger number of

cases with longer period of follow-up is required to achieve safer conclusions.

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