Clinical study

The spontaneous resorption of herniated cervical discs

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Summary The spontaneous resolution of herniated cervical discs has not been previously well documented. The authors analysed four cases who underwent spontaneous resolution of herniated cervical discs, and all other cases reported in the literature. A complex pathophysiologic mechanism that includes the release of basic fibroblast grow factors, endothelial cell proliferation, chemotaxis of inflammatory cells into the disc fragment, foreign body inflammatory reaction, neovascularization and phagocytosis and accounts for the resorption of herniated discs is reviewed. © 2001 Harcourt Publishers Ltd

Keywords: anterior cervical discectomy, cervical discs, herniated discs, non-surgical, radiculopathy

INTRODUCTION

The spontaneous resolution of herniated discs in the lumbar region has been previously well established. However, the conservative management of patients exhibiting magnetic resonance imaging (MRI) evidence of cervical disc herniations with follow-up MRI scans has received less attention in the neurosurgical literature. Although the resolution of cervical disc herniations has been well documented by computer tomography, very few cases of spontaneous resolution of cervical disc herniations have been documented by MRI. The following manuscript reports the spontaneous disappearance of acute cervical disc herniations in four patients treated conservatively and documented by MRI. The authors analyse the biochemical and biological factors that may be involved in the resorption of cervical discs. Other cases reported in the literature were collected and analysed in an attempt to determine their significance and validity regarding their clinical application.

CASE REPORTS

Case 1

A 71 year old female underwent an MRI scan of the cervical spine for evaluation of chronic neck pain. Neurological examination exhibited no muscle weakness and her sensory examination was intact. The deep tendon reflexes were symmetrical, and her gait was normal. The MRI showed a soft tissue mass at the C3-4 intervertebral disc space, extending into the spinal canal and effacing the subarachnoid space (Fig. 1A). The patient was managed nonoperatively and had improvement of the pain. Three years later, she was involved in a motor-vehicle accident, suffering a ‘whiplash’ injury, and developed paresthesias in both upper extremities. An MRI scan performed at that time showed that the C3-C4 previously diagnosed disc herniation was no longer seen (Fig. 2B).

Case 2

A 30 year old, right-handed woman developed headaches and neck pain following a car accident. Her neurological examination did not reveal any motor or sensory deficit. An MRI examination showed a significant herniated disc at C3-C4 eccentric to the right, encroaching the subarachnoid space and the right C4 root sleeve. The intervertebral disc spaces C4-C5 and C5-C6 were normal (Fig. 1A). Follow up clinical neurological evaluation showed only mild improvement but persistence of the neck pain. A follow up MRI examination performed 24 months later showed almost complete resolution of the disc herniation at C3-4 without loss of the disc space height. However, this follow up study showed a new central disc herniation at C4-C5, with slight compression of the anterior subarachnoid space (Fig. 1B).

Case 3

A 35 year old male developed muscle spasms of his neck and pain radiating to the right upper extremity, with a C7 root distribution. An initial MRI revealed a C5-6 disc herniation. He was managed conservatively with oral analgesics and physical therapy. The patient reported improvement of the symptoms in a few weeks. A routine follow up MRI scan performed 10 months later revealed that the C5-6 disc herniation had resolved with only a minimal residual disc bulge remaining.

Case 4

A 35 year old male developed muscle spasms of his neck and pain radiating to the right upper extremity, with a C7 root distribution. An initial MRI scan demonstrated some straightening of the cervical spine lordosis and a significant herniated disc at the C6-C7 intervertebral disc space (Fig. 3A, 3B). He underwent conservative treatment with analgesics and physiotherapy, with improvement of his symptoms. An elective follow up study 2 years later, requested by the patient, showed resolution of the disc herniation (Fig. 3C, 3D).

DISCUSSION

In 1945 Key first documented the spontaneous regression of an herniated disc by myelography. Forty years later, Teplick and Haskin demonstrated the resolution of a herniation by computer tomography (CT). Since then, numerous studies have documented the regression of lumbosacral intervertebral disc herniations that correlate with lumbosacral radiculopathy. However, the literature is sparse regarding the natural history of cervical disc herniations. Most reports in the literature consist of isolated cases or small series of patients, non-representative of the general population. Some reports have combined the findings and evolution of cervical and lumbar herniated discs that have not been operated upon. However, these herniations differ substantially in their anatomical, pathophysiological and biomechanical characteristics.
Cervical disc herniations typically present with a radiculopathy caused by compression of a cervical root or myelopathy due to spinal cord compression. Radiographic studies will allow the definitive diagnosis, and evidence the magnitude and level of the herniation. Documented cervical disc extrusions are considered by most neurosurgeons a definitive indication for surgery. This approach may stem from a fear of disc fragment migration with neurological deterioration. Surgical intervention is most frequently approached via an anterior discectomy with or without interbody fusion. Less frequently, a posterior approach has been used. Nevertheless, for most patients presenting with radiculopathy alone, a trial of non-surgical treatment is initially instituted. Non-surgical methods of treatment often include a cervical collar, bed rest, heat application, non-specific physical therapy, analgesics, non-steroidal anti-inflammatory drugs and muscle relaxant. In the event of continued pain, some physicians advocate a period of cervical traction. On the other hand, patients presenting with cervical myelopathy with or without an associated...
cervical radiculopathy are an indication for surgical intervention. Surgical therapy is therefore advocated by most surgeons for myelopathic patients, and/or those patients who have intractable pain and/or persistent neurological deficits after a failure of conservative therapy.

Few reports have documented the spontaneous resolution of herniated cervical discs both clinically and radiologically. Bush et al. reported improvement of cervical disc herniations in 12 of a series of 13 patients presenting with cervical radiculopathy. All patients but one had radicular pain and objective neurological signs of numbness, weakness and reduction or absence of reflexes that correlated with the level of herniated disc evidenced by MRI. These patients were treated with serial periradicular and epidural corticosteroid injections.

In another series of 37 patients followed by CT only, Maigne et al. reported a relationship between the initial size of a cervical disc herniation and its subsequent evolution. They found that the decrease in size for small disc herniations was not as marked as large disc herniations. Tables 1 and 2 summarise the characteristics of previously reported spontaneously resolved cervical discs. Most of these patients share some common features. First, patients are young adults, most of them below the age of 45. The herniated discs, documented either by CT or MRI, were of medium or large size, many with a posterolateral location and without calcification.

Most patients had a history of trauma. Many had extrusion of the nucleous pulposus through a disruption of the annulus fibrosus and posterior longitudinal ligament, rather than a disc protrusion caused by degenerative disease. Although only speculative, the mechanisms whereby the extruded discs into the spinal canal may regress have been previously addressed by several investigators.

In young patients, the nucleous pulposus has a greater water content. Having ruptured through the outer fibers of the annulus and the posterior longitudinal ligament, the disc material would lie within the epidural space. The proteoglycan of the herniated disc...
fragments due to its hydrophilic forces, but without hydrostatic pressure becomes initially edematous. Later on, the proteoglycan chains of the disc material undergo autolysis with the loss of their hydrophilic capacity, resulting in desiccation of the disc fragment. Normal nucleus pulposus of intervertebral discs are avascular and do not contain inflammatory cells. Proliferation of fibroblasts into herniated discs was first documented by Lindblom in 1950. In an experimental study performed in rabbits, Minimide et al. demonstrated that basic fibroblast growth factors play an important role in the formation of new capillaries, endothelial cell proliferation and chemotaxis of inflammatory cells into the herniated disc in a process that simulates normal angiogenesis, and phagocytosis, decreasing the size of the fragment. Immunohistochemical techniques have demonstrated the presence of CD68 positivity on these cells, confirming that they are macrophages. Presumably herniations that do not regress are formed predominantly by annulus fibrosus, or contained herniated discs rather than extruded fragments. Several factors influence the rate of patient recovery, including the topography of the disc herniation, the presence of extrusion and the proportion of fluid (water imbibition) in the disc fragment.

In the present series, all patients were symptomatic and under went imaging studies using the same scanner (1.5 T superconductive type). The scans were interpreted by the same neuroradiologist. The first case presented in this manuscript is very uncommon. Although the patient had an almost complete resolution of the initial type. The scans were interpreted by the same neuroradiologist. The first case presented in this manuscript is very uncommon. Although the patient had an almost complete resolution of the initial disc herniation, she developed new herniated discs at C3-C4 and C5-C6. Westmark et al. have documented the spontaneous regression of multiple herniated cervical discs. In contrast, the appearance of new disc herniations at contiguous levels from a resolved disc has not been reported in the literature.

There is a wide spectrum of potential outcomes among patients with herniated discs. In some patients the symptoms may resolve without radiological regression. Another group of patients may have a radiological regression of the herniated disc without clinical improvement. Tichang et al. reported no correlation between the persistence of the herniated disc on radiological studies and pain. In contrast, in a retrospective series of 77 patients with herniated lumbar discs, Komori et al. reported that 13 out of 64 improved clinically without a significant MRI improvement. These authors classified the disc herniations into three groups; among these, groups extruded discs had the highest incidence of spontaneous resorption which also correlated with the extent of disc extrusion. Finally, in some patients there may be persistence of symptoms and morphological changes, with worsening of the symptoms.

In patients that have clinical improvement without radiological regression, it is possible that the morphological regression does lag behind the clinical improvement. A future MRI could show morphological improvement. In contrast, as previously mentioned, there is persistence of symptoms in some patients with radiological resolution. In addition to mechanical compression, biochemical substances released by the disc, such as phospholipase-A2, nitric oxide, and some inflammatory changes required long regimens of pharmacologic treatment, including analgesics, corticosteroids (sometimes for more than one year) and some invasive therapies such as repeated extradural steroid injections. Most patients were young and actively working, and many of them required prolonged inactivity with the consequent absence from work. The decision whether to treat symptomatic patients non-surgically for a long period of time, hoping for a favourable resolution of neurological deficits, is very complex. There is certainly a risk of the patient developing permanent neurological deficits secondary to myelo malacia and possible cord atrophy. On the other hand, with surgical treatment most patients have a quick and complete resolution of their symptoms. The complication rate of surgery is low and often patients can be discharged home in 24–48 h following surgical intervention.

Although the authors present four isolated cases with spontaneous resolution of cervical discs shown by MRI imaging, this series is felt to be quite rare. Most patients in our experience do not have spontaneous resolution of cervical disc herniations. In the first case reported, the new appearance of contiguous disc herniations below the level of the initial disc herniation has not been previously reported.

REFERENCES