Immediate Postoperative Reversal of Disc Herniation Following Facetal Distraction-Fixation Surgery: Report of 4 Cases

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■ BACKGROUND: **We report cases of 4 patients where Goel facet distraction surgery resulted in restoration of herniated disc back into the intervertebral disc space in the immediate postoperative period. Such a fate of herniated disc has not been recorded earlier.**

■ METHODS: **During the period 2010 to 2011, 4 patients with single level 'contained' herniated disc that extended to the posterior surface of adjoining vertebral bodies and resulted in severe cord and root compression were surgically treated. The posterior longitudinal ligament was essentially intact in all 4 cases. Surgery involved facetal distraction technique using Goel facet spacers as a standalone method of treatment.**

■ RESULTS: **Immediate postoperative imaging showed nearly complete disappearance of the disc bulge, restoration of the cervical cord girth and distraction-fixation arthrodesis of the spinal segment. All patients had remarkable and sustained clinical improvement. At a 5-year follow-up, all 4 patients were well and showed no evidence of recurrent symptoms or recurrence of herniated disc-related imaging findings.**

■ CONCLUSIONS: **The indications for facetal distraction surgery, its mechanisms of action and its suitability in the presented cases are discussed.**

INTRODUCTION

In 2010, we described the possibility of use of facet distraction-fixation in the treatment of degenerative diseases of the spine in general and cervical spondylotic disease in particular.[1-4] The technique involves impaction of Goel facet spacers within the distracted facet joints on both sides. Distraction of the facets resulted in reversal of a number of pathological events that are related to spondylotic disease. We report a series of 4 cases wherein a large part of the disc herniation was restored into the confines of the disc space, an event that was confirmed by investigations in the immediate postoperative period and after a minimum follow-up of 5 years. Disc restoration resulted in decompression of the cord and root and remarkable and sustained clinical recovery. Such a fate of the herniated part of the disc has not been reported earlier. The success in the reported cases consolidates our belief that facet distraction-fixation technique reverses the spondylotic changes in the spine circumventing the need of direct handling of any part of the bone, ligament, osteophyte, or disc.

METHODS

Four patients, aged 37, 45, 46, and 51 years, were treated in our department in 2010–2011. Written and oral informed consent were obtained from all patients. There were 3 males and 1 female. Findings of the clinical examination at the time of admission and essential parameters on imaging are summarized in Table 1 (Figures 1–3) All 4 patients had a large, single-level disc herniation that extended onto the posterior surface of adjoining vertebral bodies. In all cases, the posterior longitudinal ligament appeared intact, as suggested by its apparent superior and inferior continuity and by the smooth margin of the posterior disc bulge.

Surgery

The essential steps of surgery have been described previously[1,4] and are summarized here. The patient was placed prone with the head end of the operating table elevated by 30 degrees. Gardner-Wells traction was applied to stabilize the head during surgery, and the direction of the traction resulted in a near-floating head position and avoided pressure on the face.

A midline skin incision was made. The spinous process of the axis was exposed to identify the exact level of surgery. The facets on both sides were exposed by a subperiosteal dissection. The

Key Words
- Cervical spondylosis
- Facet distraction-arthrodesis
- Goel facet spacer
- Intervertebral disc

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Table 1. Clinical and Radiologic Parameters

Patient	Sex	Age, Years	Symptoms	Level of Involvement	Preop VAS Score	Preop JOA Score	Level(s) Distracted	Postop VAS Score	Postop JOA Score
1	F	51	Neck pain, spasticity, left-sided limb weakness	C4-5	8	9	C3-4, C4-5, and C5-6	2	14
2	M	37	Tingling, numbness, and weakness of all 4 limbs	C3-4	4	8	C3-4 and C4-5	2	12
3	M	46	Neck pain, right lower limb weakness	Atlanto-occipital assimilation, C2-3 fusion with C3-4 PID	8	15	C3-4 and C4-5	1	17
4	M	45	Neck pain, weakness of all 4 limbs	C4-5	7	11	C3-4, C4-5, and C5-6	2	15

VAS, visual analog scale (0, no pain to 10, maximum pain); JOA, Japanese Orthopedic Association score; PID, prolapsed intervertebral disc; Preop, preoperative; Postop, postoperative

physical appearance of the facets and the articulation was evaluated and correlated with imaging findings to determine the extent of fixation required.

The number of levels requiring fixation was assessed based on the evidence of facetal instability observed during the operation. More than 1 level of fixation was done in all cases despite the fact that disc herniation was observed essentially at 1 level. The number of levels fixed depended on direct inspection and manual manipulation of the facets to assess their stability. The facets at these levels were distracted using osteotomes ranging in size from 1.5 mm to 4 mm. The flat end of the osteotome was introduced into the facet joint and then turned 90 degrees to make it vertical to effect distraction. The articular cartilage was widely removed using a screwing motion of the osteotome. A Goel cervical facet spacer was then inserted into the joint by gentle hammering over the base of the spacer impactor. The spacers were 8 mm in diameter and either 2.5 or 3 mm in height.

The interspinous ligaments were widely removed in the treated spinal segments. A bone graft was harvested from the iliac crest and then placed over the adequately prepared host bone area of laminae, facets, and spinous processes. In addition, small pieces were forced into the region of the joint adjoining the spacer. Postoperatively, the traction was discontinued, and the patient was placed in a 4-poster hard cervical collar for a 3-month period.

Routine postoperative investigation on the day after surgery (at approximately 18 hours postsurgery) showed significant migration of the herniated portion of the disc back within the confines of the disc space. A cerebrospinal fluid signal could now be observed anterior to the cord at the affected level in at least 2 cases. The cord girth was restored to near normalcy (**Figures 1–3**). The changes in intervertebral bone measurements after the surgery are elaborated in **Table 2**.

Fusion of the spinal segments was defined as the absence of motion and alterations in the interspinous process, interlaminar body, and intervertebral body distances on flexion-extension radiographs obtained at a 3-month follow-up. Based on this criterion, successful fusion was obtained at all treated spinal levels. The visual analog scale and Japanese Orthopedic Association scores were recorded at 3 months, 6 months, 1 year, and 2 years. The scores recorded at 2 years are shown in **Table 1**. All patients remained essentially symptom-free at a minimum follow-up of 5 years. Bone fusion could be clearly observed in the treated vertebral segments.

DISCUSSION

Various approaches to treating intervertebral disc herniation have been proposed and therapeutically adopted[5-9]; however, it seems that the last word in this treatment remains to be determined. For centuries, traction has been used as a therapeutic modality for degenerative spinal problems. The effectiveness of this form of treatment can be gauged from its lasting popularity and clinical success. There have been anecdotal reports of reversal of disc herniation following traction.[10-12] Facetal distraction surgery that aims to achieve segmental arthrodesis, as proposed by us, results in sustained traction and fixation of the spinal segment in a distracted position. We have shown that facetal distraction can result in reversal of several pathological events related to spondylotic disease.

Owing to the oblique bone profile of the facets, their distraction produces a circumferential increase in intervertebral height. The procedure results in an increase in spinal canal and root canal dimensions by distracting the boundaries of the bony canal and stretching of the "buckled" ligaments. The disc height is increased, likely resulting in restoration of its water content. Accordingly, facet distraction-arthrodesis is a reliable alternative form of treatment of single- or multiple-level degenerative spondylotic disease—related radiculopathy or myelopathy.[4,5] In 2011, we reported our satisfactory clinical experience with this form of treatment. Our ongoing study in this area involves analysis of the indications for this treatment approach in patients with kyphotic spinal deformity associated with degenerative spinal disease.

In the case scenario presented here, anterior cervical discoidectomy is a rather straightforward operation and would have been the obvious choice. The familiarity of most surgeons with the anterior cervical discoidectomy and fusion technique in anterior cervical disc surgery and the ease of surgery with the patient in the supine position are additional advantages. However, contained disc herniation, or the disc bulge seen in the presence of an intact posterior longitudinal ligament, probably made the case suitable