

Full-endoscopic Decompression of Foraminal Stenosis Caused by Facet Hypertrophy Contralateral to the Dominant Hand in a Baseball Pitcher: A Case Report

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Back pain and lower extremity pain have various causes and occasionally occur simultaneously, creating diagnostic difficulties. In addition, athletes require special consideration in terms of treatment. Here, we report a case of foraminal stenosis as a result of lumbar disc prolapse combined with facet hypertrophy contralateral to the dominant hand in a baseball pitcher that was successfully treated by minimally invasive full-endoscopic surgery. A 31-year-old left-handed male baseball pitcher presented with complaints of low back pain and right buttock pain while pitching. A diagnosis of foraminal stenosis caused by a disc bulge combined with facet hypertrophy contralateral to the dominant hand was made on the basis of physical and radiological findings. His symptoms improved immediately after transforaminal full-endoscopic lumbar discectomy and foraminoplasty under local anesthesia. He returned to play 3 months after surgery. Foraminal stenosis due to facet hypertrophy may occur in the side contralateral to the throwing arm in pitchers. Minimally invasive decompression using a full-endoscopic procedure is required for high-level athletes at this position.

Keywords: low back pain, full-endoscopic surgery, foraminal stenosis, facet hypertrophy, baseball player

Introduction

Low back pain and lower extremity pain originating from the lumbar spine are common in baseball players.^{1,2} Pain at these sites has several causes, including disc, facet joint, endplate, and nerve root abnormalities; of these, disc and facet joint problems are common.^{3,4} Diagnosis is relatively easy in many cases, but accurate diagnosis may be difficult if physical and radiological findings are atypical. Furthermore, the choice of surgical procedure is challenging when the pathology is complicated. If the patient is an athlete, the surgical method used must be minimally invasive to avoid damage to the muscles of the back and loss of mobility of the lumbar spine. Full-endoscopic discectomy, developed by Yeung and Tsou⁵ for lumbar disc herniation, is one such minimally invasive

procedure and is now being used to treat foraminal stenosis and lateral recess stenosis.⁶ Full-endoscopic discectomy via a transforaminal approach is usually performed under local anesthesia and requires only an 8-mm skin incision, allowing for preservation of the back muscles and mobility of the lumbar spine. Here, we report a case of a baseball pitcher with foraminal stenosis caused by a lumbar disc bulge combined with facet hypertrophy whom we treated by performing full-endoscopic surgery via a transforaminal approach.

Case Report

History

A 31-year-old left-handed male baseball player was referred to our hospital with a complaint of low back pain and right buttock pain during lumbar extension while pitching. His symptoms had started 5 years earlier and worsened despite conservative treatment with medication and rehabilitation. In the preceding 2 years, his performance had suffered as a result of the pain.

Physical examination

He noticed back and buttock pain in the acceleration phase of throwing. At that time, he noted bending of the trunk (lumbar spine) to the right when he tried to fully raise his pitching hand at maximal external rotation of the shoulder. He had back and buttock pain in the right bending position similar to the throwing pain. There was tenderness in the L5–S1 paravertebral muscles. The straight leg raise test was positive on the right side at 80° (left side negative in 90°). No muscle weakness was noted, and sensory and deep tendon reflexes were normal.

Radiological findings

Plain radiographs of the lumbar spine showed mild scoliosis with a right-sided lumbar curve (Fig. 1A). Computed tomography (CT) revealed facet hypertrophy and foraminal stenosis caused by a hypertrophic superior articular process at L5–S1 on the right side (Figs. 1B–D). On sagittal magnetic resonance imaging (MRI), there is no evidence of the nerve root compression (Fig. 2A). Figure 2B demonstrates the axial view of MRI through the L5 caudal endplate. On the right side, a yellow circle indicates the right side intervertebral foramen. As compared to the left side, the right foramen is very narrow. The intervertebral disc at L5–S1 shows slight bulging to the right foramen (Fig. 2C). Double

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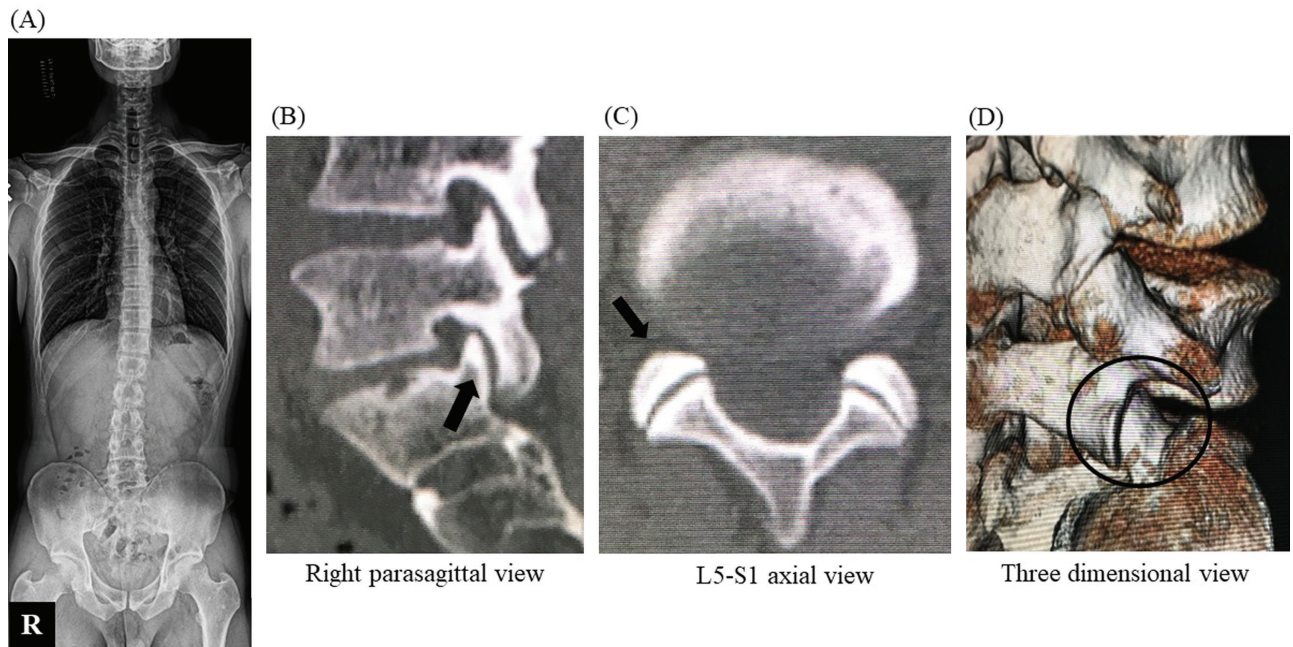


Fig. 1 (A) Standing whole spine radiograph showing mild right-sided scoliosis. CT images showing (B) bony stenosis of the intervertebral foramen and (C) right facet hypertrophy when compared with the left side. (D) Right oblique view on a reconstructed three-dimensional CT image shows a hypertrophic superior articular process (indicated by the arrow and circle) in the sacrum. CT: computed tomography.

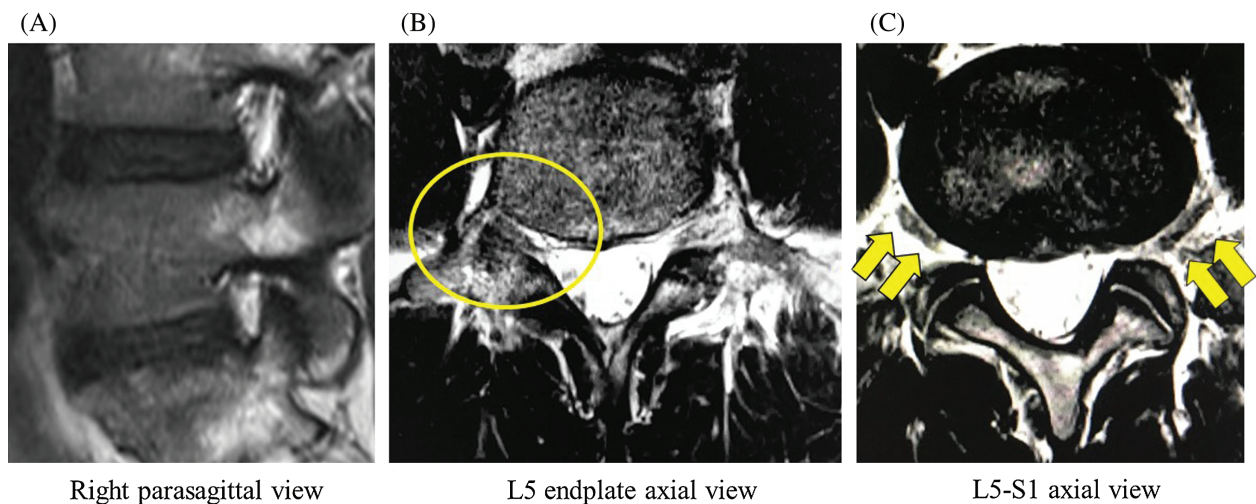


Fig. 2 (A) On sagittal MRI, there is no evidence of the nerve root compression. (B) demonstrates the axial view of MRI through the L5 caudal endplate. On the right side, a yellow circle indicates the right side intervertebral foramen. As comparing to the left side, the right foramen is very narrow. The intervertebral disc at L5–S1 shows slight bulging to the right foramen. (C) Double yellow arrows indicate the bilateral L5 nerve roots. While the left L5 nerve root is straight, the right L5 nerve is curved. It may suggest the disc material pushes the right L5 nerve root. MRI: magnetic resonance imaging.

yellow arrows indicate the bilateral L5 nerve roots. While the left L5 nerve root is straight, the right L5 nerve is curved. It may suggest the disc material pushes the right L5 nerve root (Fig. 2C). We confirmed that the pain had disappeared after a selective right-sided nerve root block at L5. Radiculography revealed high nerve root take-off angles from the right intervertebral foramina at L5–S1 (Fig. 3). The physical and radiological findings of lumbar scoliosis, lumbar disc

herniation, and right foraminal stenosis due to facet hypertrophy suggested L5 radiculopathy at L5–S1 on the right side.

Surgery

We opted to treat the lumbar disc herniation and right foraminal stenosis simultaneously by minimally invasive full-endoscopic surgery. Guided by the preoperative CT

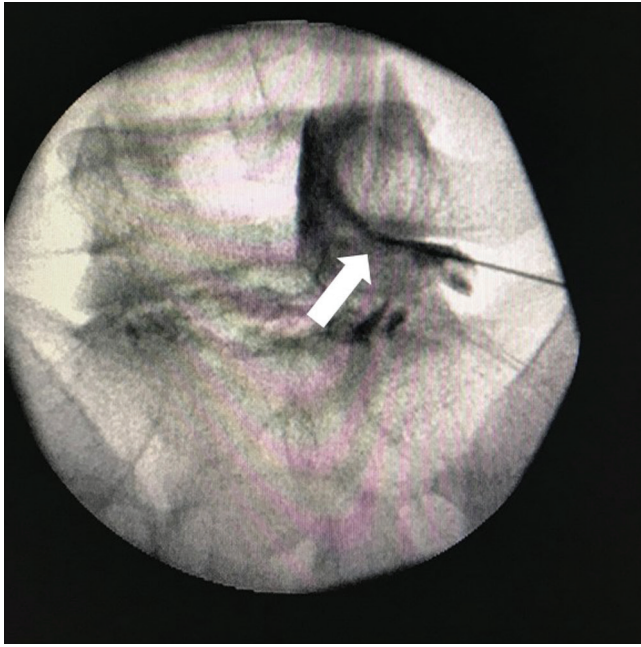


Fig. 3 L5 radiculography reveals high nerve root take-off angles from the intervertebral foramen at L5–S1 on the right side.

images, a surgical portal with an 8-mm skin incision was created on the right side 7 cm from the longitudinal midline of the disc at L5–S1 under local anesthesia. A cannula was then placed outside the disc, and the superior articular process at the sacrum was resected using a high-speed drill. When the intervertebral foramen was sufficiently enlarged, the bulging disc was confirmed and removed. Endoscopic view showed that there was nothing to compress the L5 nerve root around the L5 nerve root, indicating sufficient pulsation, so it was considered fully decompressed during the procedure. The operative time was 63 min and blood loss was minimal.

Postoperative course

Immediately after the surgery, the pain had completely resolved and the postoperative course was uneventful. Straight leg raise test was negative at 100°, since he was originally a very flexible player. Postoperative CT scans confirmed that the intervertebral foramen at L5–S1 was enlarged and that the superior articular process at the sacrum had been adequately resected (Fig. 4A). MRI revealed that the intervertebral foramina was enlarged and the right L5 nerve root was decompressed (Fig. 4B). Active stretching and core training were started in the early postoperative period. The patient was allowed to return to pitching at full effort 3 months later.

Discussion

It has been reported that 75% of elite athletes experience low back pain at least once during their competitive careers.^{7,8)} Many of these athletes have lumbar pathology that causes low back pain and lower extremity pain, resulting in deterioration of performance and/or missed playing time.

Therefore, prompt diagnosis and appropriate treatment are essential for these patients.

Diagnosis

The cause of low back pain can be difficult to identify, particularly when several pathologies are present. In the present case, the diagnosis was difficult because of three coexisting albeit relatively mild abnormalities seen on imaging. Thus, the accurate diagnosis remains unknown for about 5 years. We confirmed that the nerve root was compressed by lateral recess stenosis on the convex side of the curve caused by the scoliosis,⁹⁾ facet joint hypertrophy, and disc bulging. The pitching form of the patient was overhand throwing. In efforts to improve the effectiveness of his pitches, he was bending his trunk to the right. For many years, he had been throwing with right bending of the lumbar spine; thus, scoliosis may have occurred *de novo*. Finally, the L5/S1 foramen was narrowed by the scoliosis. Facet hypertrophy was also noted, and nerve compression was confirmed by selective radiculogram. Interestingly, the hypertrophic facet joint was on the side contralateral to the throwing side. We have previously reported that the facet joint contralateral to the throwing arm showed hypertrophy in professional baseball players and hammer throwers.^{10,11)} In this case, he was left-handed and the right facet joint was hypertrophic; the deformity was consistent with our previous report. Using finite element modeling, Sairyo et al.¹²⁾ demonstrated that during lumbar extension with rotation, the maximum load is applied around the opposite intra-articular pars, including the facet joint. There are also some studies in which high loads were applied to the side of the trunk opposite to the direction of lumbar rotation in baseball players.^{13,14)} It also appears that baseball pitching transmits rotational force from the lower limbs to the upper limbs. We believe that application of a high load to the contralateral facet joint by repeated rotation in the same direction caused the facet hypertrophy in this patient. When the pathology is complicated, as in this case, an accurate diagnosis may be made using radiculography and selective nerve root block.

Treatment

Careful consideration is essential when selecting treatment for athletes. Although conservative treatment is preferred, surgery may be selected when conservative measures have failed or an early return to competitive sports activity is a priority. However, professional athletes need to return to competition at a high level, so the options for spinal surgery are limited. In our case, there was an option of treating the direct causes of the patient's symptoms, that is, intervertebral foraminal stenosis and lumbar disc herniation. The main surgical options were conventional lumbar decompression such as laminectomy and foraminoplasty, and interbody fixation.^{15,16)} However, given the risk of iatrogenic damage to the back muscles and reduced mobility of the lumbar spine, these options are not appropriate for athletes. We thus opted to perform full-endoscopic surgery in this case because it is minimally invasive, allows an early return to sports activity without deterioration of performance, and makes it possible

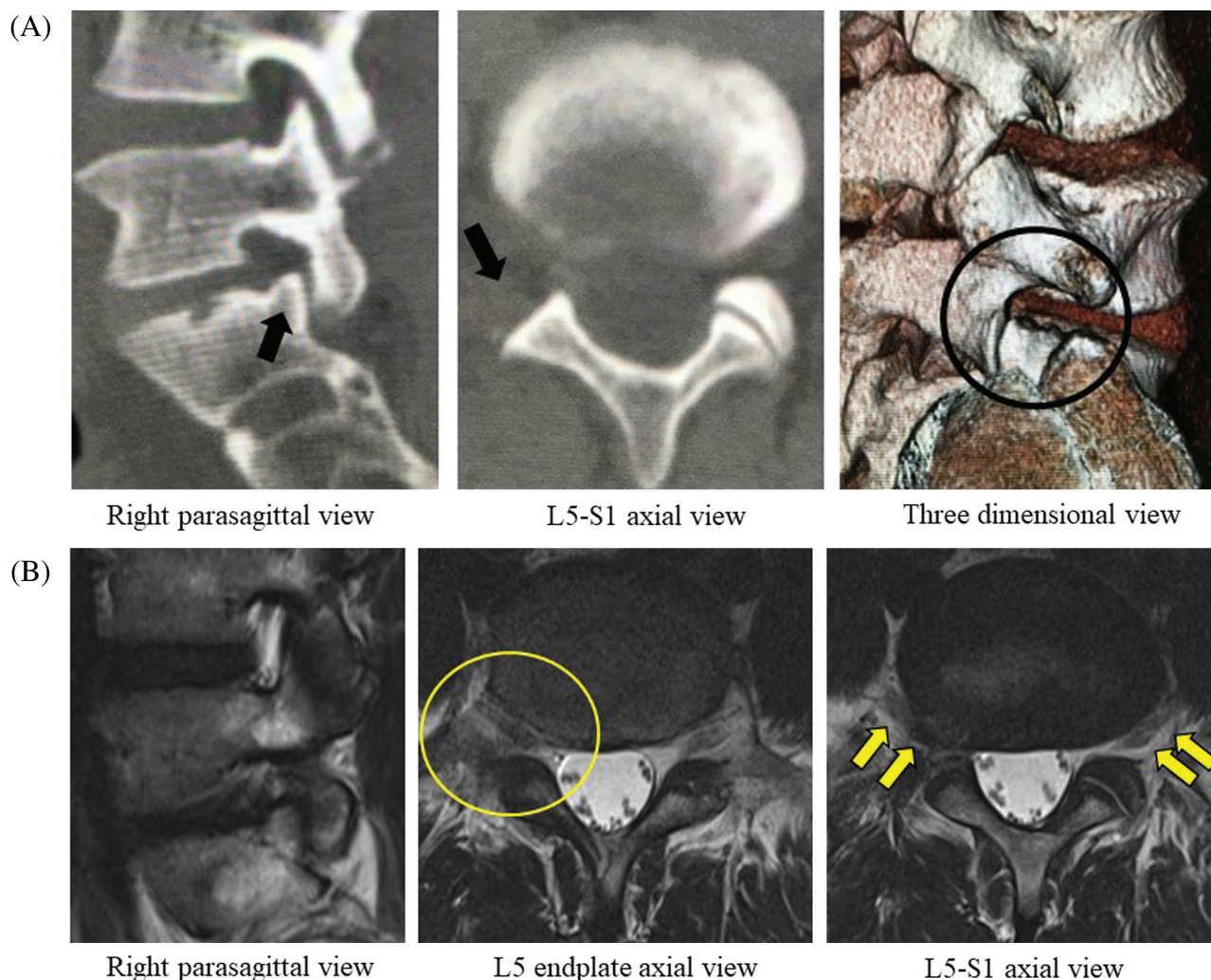


Fig. 4 (A) Postoperative CT images showing foraminal enlargement. The arrow and circle indicate adequate resection of the superior articular process of the sacrum on the right side. (B) On sagittal MRI, there is postoperative change and enlargement of foramen. Axial view of MRI through the L5 caudal endplate demonstrates that the right side intervertebral foramen indicated by yellow circle was enlarged, and the right L5 nerve can be confirmed. Double yellow indicates the bilateral L5 nerve roots. The right L5 nerve is straight as with the left L5 nerve root. CT: computed tomography, MRI: magnetic resonance imaging.

to treat two different etiologies simultaneously. In the literature, there is no report of transforaminal full-endoscopic foraminoplasty in elite athletes, to our knowledge. However, we have been performing full-endoscopic surgery for a variety of spinal conditions in elite athletes.^{10,17} For example, full-endoscopic discectomy and thermal annuloplasty have been performed for many baseball players enabling their return to sports activities within 3 months after the surgery.¹⁷ The full-endoscopic procedure requires only an 8-mm skin incision and damage to the back muscles is kept to a minimum. Furthermore, it can be completed under local anesthesia. Thus, full-endoscopic surgery is considered the least invasive spine surgery to date and is suitable for athletes. For these reasons, full-endoscopic surgery was performed for this case. Discectomy and foraminoplasty were carried out under full-endoscopic guidance. Earhart et al.¹⁸ reported that baseball players who underwent conventional surgery for lumbar

disc herniation took an average of 8.7 months to return to play. Iwamoto et al.¹⁹ reviewed the return to play rate and its duration, and found that after microdiscectomy, about 85% could return to sports activity within a duration of about 5 months. Considering these reports, returning 3 months after surgery is exceptional in this case. Compared with conventional surgery, full-endoscopic surgery may enable athletes to return to the original level of sports activity much faster. However, fixation surgery may be necessary to correct scoliosis and decrease in intervertebral disc height in the future if degeneration progresses due to continuation of playing baseball.

Conclusion

A baseball pitcher presented to us with back and buttock pain of unknown origin for about 5 years. The diagnosis was determined to be foraminal stenosis as a result of a disc

bulge combined with facet hypertrophy. Minimally invasive full-endoscopic foraminoplasty under local anesthesia was performed to enlarge the narrow foramen. The patient could return to pitching by 3 months after the surgery.

Conflicts of Interest Disclosure

All authors report no conflicts of interest concerning this article.

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