Lumbar fusion outcomes in patients with rheumatoid arthritis

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Abstract Although outcomes after cervical fusion in rheumatoid arthritis (RA) patients are widely published, outcomes of lumbar fusion in RA patients has not been reported. Nineteen patients with RA, identified using ICD-9 and CPT codes, who underwent instrumented posterolateral lumbar fusion were matched for age, gender, smoking status, date, and level of surgery to a contemporaneous non-RA group. Medical records and radiographs were reviewed by the primary author who had no role in the treatment of these patients. The average age was 64 years in the RA group and 65 years in the non-RA group. The male to female ratio was 2:17 and 1:18, respectively. There were three smokers and two diabetics in each group. An average of 1.5 levels was fused in each group. Average follow-up was 24 and 27 months, respectively. In the RA group, 15 patients were taking DMARDs with 7 of those also taking oral steroids; 4 patients were taking NSAIDs only. There were seven complications (37%) in the RA group versus four (21%) in the non-RA group; wound infections in three patients (16%) in the RA group versus one (5%) in the non-RA group; and non-union in two patients (11%) in the RA group versus three (16%) in the non-RA group. Clinical outcomes were similar between the two groups with 74% of patients achieving good to excellent results in the RA group compared to 63% in the non-RA group ($p = 0.692$). Surgeons and their RA patients who undergo an instrumented

lumbar fusion can expect a slightly higher complication rate than patients without RA which may be related to osteopenia and immunosuppression.

Keywords Lumbar fusion · Complications · Rheumatoid arthritis · Case-control · Clinical outcome

Introduction

Rheumatoid arthritis (RA) is an inflammatory arthropathy affecting the diarthrodial joints. The etiology of the joint destruction is believed to originate from autoimmune mediated inflammation. Patients often test positive for serum rheumatoid factor. Clinical manifestations are seen throughout the musculoskeletal system including the hands, hips, knees, and spine [8]. Joint destruction is often accompanied by attenuation of the soft tissues about the joints leading to instability and subluxation. Osteopenia and relative immunodeficiency are frequent comorbidities that can arise from both the natural history of the disease, as well as immunosuppressive medications including corticosteroids used to treat the illness.

Although cervical spine pathology is more common in rheumatoid patients, lumbar spine pathology is not infrequent. Lumbar spine pathology in patients with RA includes spondylitis, degenerative scoliosis, degenerative spondylolisthesis, disc space narrowing, endplate erosion, facet erosion, facet cysts, compression fractures, and stenosis [2, 4–7, 9]. Although the clinical outcomes of patients with rheumatoid arthritis (RA) who undergo musculoskeletal surgery, and specifically cervical spine surgery [8], are widely published in the literature, the clinical outcomes of patients who undergo lumbar spine surgery are relatively unknown. The purpose of our study was to determine if

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patients with RA who undergo decompression and instrumented posterolateral lumbar fusion have similar outcomes to patients without RA who undergo the same procedure.

Methods

Using an existing hospital database at a large spine referral center, we retrospectively reviewed patients who were identified using ICD-9 and CPT code searches. Patients with and without RA were matched for age, gender, smoking status, date of surgery, and level of surgery. The study design was approved by local IRB and human studies committees. Data from patient medical records were collected for standard demographic, medical history, surgical technique, clinical follow-up, and radiographic follow-up, with special attention to complications.

All patients were evaluated by one of six experienced and fellowship trained spine surgeons at a large spine referral center. All patients had failed appropriate trials of non-operative treatment including physical therapy, anti-inflammatory medications, activity modifications, and epidural steroid injections. Recommendations for surgical decompression with instrumented posterolateral fusion were made by the treating surgeon based on a thorough history and physical examination supported by imaging studies including static and dynamic radiographs, MRI, and CT myelograms. All patients had symptomatic lumbar spinal stenosis requiring decompression. The primary indications for surgery were neurogenic claudication and leg pain. Indications for instrumented fusion surgery included iatrogenic instability secondary to a requirement for extensive facet resection, or pre-operative spondylolisthesis or degenerative scoliosis with listhesis. Neither discograms nor diagnostic injections were routinely used.

Patients with and without rheumatoid arthritis underwent the same preoperative evaluations, operative procedures, and postoperative routines.

Preoperative antibiotics were routinely administered. The posterior spine was exposed through a standard mid-line approach. A wide decompression of the canal and affected nerve roots was performed. Pedicle screws were inserted into the appropriate levels with nerve root monitoring. Screw placement was confirmed with intraoperative postero–anterior and lateral radiographs. Lordotic connecting rods were attached to the polyaxial pedicle screws heads. The posterior aspect of transverse processes and adjacent posterior elements were decorticated. Bone grafting was performed with autogenous local bone, iliac crest and/or rhBMP-2.

All patients were continued on antibiotics until the drain was removed on post-operative day 2. Patients were mobilized on the first post-operative day with physical

therapy. Discharge to home or a rehabilitation facility was based on comorbidities, progress with therapy, and social support. Clinical and radiographic follow-up was performed at 6 weeks, 3, 6 months, 1 and 2 years.

Clinical results were graded on the scale used by Herkowitz and Kurtz [3]. Excellent results had essentially no pain and no activity restrictions. Good results had occasional pain with major improvement from preoperative status. Fair results had intermittent pain with some improvement from preoperative status. Poor results had major pain and disability with little to no improvement from preoperative status.

Data were analyzed using Fisher's test for differences in categorical scales such as diagnoses, indications for surgery, complication rates and Herkowitz scales; and paired *t*-tests for difference in continuous variables such as operative time and blood loss.

Results

From 1998 to 2004, 19 patients with RA who underwent instrumented posterolateral lumbar fusion were identified and matched to a control, non-RA group from the same period. The average age was 64 and 65 years, respectively. The male to female ratio was 2:17 and 1:18. There were three smokers and two diabetics in each group (Table 1). The diagnoses of spinal stenosis with degenerative spondylolisthesis and/or degenerative scoliosis were similar between the groups. Bone graft type was similar between the two groups. An average of 1.5 levels was fused in each group, most commonly at L4–5. Average follow-up was 24 and 27 months, respectively.

In the RA group, 15 patients were currently taking disease modifying anti-rheumatic drugs (DMARDs) with 7 of those also taking oral steroids. The other four patients were taking non-steroidal anti-inflammatory drugs (NSAIDs) only.

Table 1 Patient demographics and surgical data

	RA	Non-RA	<i>p</i> -value
<i>N</i>	19	19	
Age (years)	64	65	0.721
Male:female	2:17	1:18	0.999
Smokers	3	3	0.999
Diabetes	2	2	0.999
Levels fused	1.5	1.5	0.999
Length of stay	6.31	6.83	0.267
Blood loss	616.67	644.18	0.426
OR time	3:19	3:57	0.036

There were seven complications (37%) in the RA group versus four complications (21%) in the non-RA group. Wound infections occurred in two patients (11%) in the RA group versus one patient (5%) in the non-RA group. Non-union occurred in two patients (11%) in the RA group versus three patients (16%) in the non-RA group. Implant complications occurred in three patients (16%) in the RA group and no patients (0%) in the non-RA group. One patient in the RA group underwent a non-instrumented fusion after severe intra-operative osteopenia deterred the surgeon from placing pedicle screws. The other two patients in the RA group had evidence of pedicle screw loosening on radiographic follow-up.

With the numbers available, there were no significant differences in the rate of complications and non-unions between the RA and non-RA groups (Table 2).

Clinical outcomes were similar between the two groups with 74% of patients achieving good to excellent results in the RA group compared to 63% in the non-RA group ($p = 0.692$) (Table 3).

Discussion

Rheumatoid arthritis is an autoimmune disease with patients often having a positive rheumatoid factor. Patients suffer from an inflammatory arthropathy of the diarthrodial joints. In the spine, the disease manifests as destruction of the facet joints as well as the disc space. Current medical therapy has improved the clinical manifestations. Patients are typically placed on disease modifying antirheumatic drugs with oral steroids used sparingly during acute exacerbations. Patients are osteoporotic and immunodeficient secondary to the effects of the disease and the medications prescribed.

In the spine literature, there are numerous publications regarding the cervical spine in rheumatoid patients. Kim and Hilibrand [8] recently summarized the pathology and surgical treatments of the disease in the cervical spine. The major pathology that exists includes atlantoaxial subluxation, atlantoaxial impaction, and subaxial subluxation. Surgical treatment of symptomatic patients with intractable

Table 3 Clinical outcomes ($p = 0.692$)

	RA	Non-RA
Excellent	6	5
Good	8	7
Fair	5	5
Poor	0	2

pain or neurologic deficits consists of decompression and fusion. Radiographic indications for surgery include a posterior atlantodental interval ≤ 14 mm, any amount of atlantoaxial impaction, subaxial stenosis with a canal diameter ≤ 14 mm, or a cervicomedullary angle $\leq 135^\circ$. Surgical treatment is risky, but it has been shown to improve neurologic outcomes. Most patients also experience pain relief and an improvement in overall quality of life. Wound complications occur in up to 25% of patients. Generalized osteopenia can cause difficulties with instrumentation. Risks also include non-union and recurrent instability (adjacent segment disease). The current perioperative mortality is reported at 5–10% [8].

There is a relative paucity of literature regarding the lumbar spine in rheumatoid patients. Characteristics of the pathology are better described than the surgical treatments and outcomes. Pathology includes spondylitis, degenerative scoliosis, degenerative spondylolisthesis, disc space narrowing, endplate erosion (correlated with clinical symptoms), facet erosion and cyst formation. Severe osteoporosis often leads to compression fractures. Canal stenosis including cauda equina and paraplegia has been reported in advanced cases [2, 4–7, 9].

Reported surgical treatments include case reports of successful treatment of cauda equina symptoms with decompression and fusion [4, 7]. In another series, seven patients with various lumbar spine pathologies were treated with decompression and posterior lumbar interbody fusion. The authors reported relief of back and leg pain with improved gait and ADLs. There was a high rate of reported complications which included collapse of adjacent vertebra (4/7), instability of adjacent level (3/7), migration of pedicle screw (2/7), collapse of grafted bone (1/7), decubitus and infection (1/7) [5].

Limitations of the current study include the inherent limitations of retrospective data in a case control design. The relatively small sample size is likely a reflection of the small number of patients with rheumatoid arthritis who undergo lumbar decompression and fusion procedures. We could identify only 19 patients at a large spine center over a 6-year period. Selection bias may be present, such that patients with rheumatoid arthritis who are poor surgical candidates and are at high risk for complications after

Table 2 Complications

	RA	Non-RA	p -value
Total complications	11	7	0.329
Wound infections	2	1	0.999
Nonunion	2	3	0.999
Implant complications	2	0	0.486
Adjacent degeneration	6	4	0.721

surgery have already been advised not to undergo surgery. Patients with RA with similar spine pathologies and the same degree of disability who have not undergone spine surgery can be compared to the cohort of patients with RA who underwent spine surgery.

Due to the retrospective nature, standardized clinical outcome measures were not available for the majority of patients. Our clinical outcome data are limited by its subjective nature. Another limitation is that fusion status was graded by standard radiographs in the majority of cases. We now routinely use fine cut computed tomography scans to evaluate fusion status, and believe this is more accurate than standard radiographs [1].

The results of this study suggest that patients with RA who undergo an instrumented lumbar fusion can expect similar clinical results and complication rates compared to patients without RA who undergo the same procedure. Indications for fusion are similar as well. Although we could not demonstrate a statistically significant difference with the numbers available, there was a trend towards more wound complications and implant related complications in the RA group. The complications related to instrumentation are likely due to the relative osteopenia of patients with RA, while the wound healing difficulties are likely due to the relative immunodeficiency. Strategies to minimize these complications are indicated when treating degenerative lumbar spine conditions in patients with RA.

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