ORIGINAL ARTICLE

Treatment of Facet Cysts Associated With Neurogenic Intermittent Claudication With X-Stop

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Background: Facet degeneration often leads to the formation of synovial facet cysts. As facet cysts invade the spinal canal, they become a contributing factor to spinal stenosis. Previous studies have demonstrated successful treatment of neurogenic intermittent claudication (NIC), a major symptom of spinal stenosis, with an interspinous process device.

Purpose: To compare clinical outcomes of patients with and without synovial facet cysts treated with an interspinous process device.

Study Design: Retrospective review of prospective data of consecutive patients undergoing the X-Stop procedure at an institution.

Outcome Measures: Visual Analog Scale; Oswestry Disability Index; sitting, standing, and walking tolerances; and satisfaction survey.

Methods: Review of all patients from 2006 to 2010 undergoing X-Stop procedure at an institution. Imaging studies were used to identify the presence and measure the size of the facet cysts in 285 patients with a minimum of 6-month follow-up. Comparative clinical outcomes determined if X-Stop is a successful treatment option for patients with NIC in conjunction with synovial facet cysts (< 3 mm, ≥ 3 mm).

Results: Fifty-eight of 285 patients (20.4%) were determined to have a synovial cyst as a contributing component of spinal stenosis. Twelve of 58 patients were noted to have a cyst ≥ 3 mm. The mean follow-up time for patients with and without a facet cyst was 21 months (6–55 ± 12 mo) and 22 months (6–61 ± 12 mo), respectively. The age of the patient at the time of the operation with and without facet cysts was 73 (± 10 y). Patients without synovial cysts, with synovial cysts, and cysts ≥ 3 mm had an average change in Oswestry Disability Index of 15.6, 15.8, and 16.2, respectively. Visual Analog Scale scores were 2.3, 1.8, and 2.3, respectively. In addition, on satisfaction surveys 72.4%, 82.0%, and 77.8% were either very or somewhat satisfied, respectively. Overall complications included 4 spinous process fracture, 4 hematomas, 1 wound infection, and 1 implant migration.

Conclusions: No statistical difference was noted in any of the outcome measures among patients with small facet cysts, large facet cysts, or without facet cysts when treated with an interspinous process device. We can thus conclude that X-Stop is an appropriate treatment consideration for NIC with or without the presence of synovial facet cysts.

Key Words: facet cyst, neurogenic intermittent claudication, interspinous process decompression, lumbar spinal stenosis

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Vosschulte and Borger[1] first described the neurogenic compression by synovial cysts of the spine in 1950, a report later confirmed by Kao et al in 1968.[1–4] The intrusion of the spinal canal by a synovial cyst, leads to direct compression of the traversing nerve root more commonly and the exiting nerve root of the effected segment. Facet cysts are a common finding in patients with neurogenic intermittent claudication (NIC).

Facet cysts are associated with facet joint degeneration and/or degenerative spondylolisthesis. Risk factors for lumbar facet osteoarthritis include advanced age, a relatively more sagittal orientation of the joint, and a background of intervertebral disk degeneration. As the disk space collapses, neural arch loading is greater, which leads to more rapid facet degeneration and often cyst formation in the spinal canal. The cascade of degenerative changes leads to altered biomechanics including degenerative spondylolisthesis. Niggemann et al[5] determined that facet effusion > 1.5 mm are highly predictive of degenerative spondylolisthesis.

Reported treatments for facet cysts, which less frequently respond to conservative care, include facet injection with steroids and surgical resection.[6] Surgical resection is often in conjunction with decompression as both imaging and intraoperative findings dictate. Alternative treatment options specifically for NIC also include interspinous spacers. X-Stop (Medtronic Inc., Minneapolis, MN) has shown to be an effective, relatively safe surgical intervention for spinal stenosis.[7] X-Stop places individual spinal segments into relative flexion, limiting the amount of local extension at the site of greatest stenosis.

Further, biomechanical studies of X-Stop on facet loading demonstrated significantly reduced mean peak pressure, average pressure, and contact area at implanted

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AQ5 TABLE 1. ■ ■ ■

	Average Preoperative	Average Postoperative	Average Difference			Satisfaction Survey					
						How Satisfied?	%	Do it Again?	%	Recommend?	%
All patients with facet cysts n = 58											
ODI	50.51	34.74	−15.77			Very satisfied	53.8	Yes	79.5	Yes	81.6
VAS	5.65	3.86	−1.79			Somewhat satisfied	28.2	No	17.9	No	15.8
Sitting time	91.17	100.64	9.47			Somewhat dissatisfied	5.1	Not certain	2.6	Not certain	2.6
Standing time	18.08	50.14	32.06			Very dissatisfied	12.8				
Walking time	13.85	42.88	29.03			% Total satisfied	82.0				
% With increase > 15 min			Complication %	5.17		% Total dissatisfied	18.0				
Sitting change	25.5		Revision %	6.90							
Standing change	46.9		Removal %	6.90							
Walking change	39.4										
Patients with substantial sized cysts (fluid ≥ 3 mm) n = 12											
ODI	47.00	30.71	−16.29			Very satisfied	77.8	Yes	77.8	Yes	77.8
VAS	5.40	3.07	−2.33			Somewhat satisfied	0.0	No	22.2	No	22.2
Sitting time	100.91	110.08	9.17			Somewhat dissatisfied	0.0	Not certain	0	Not certain	0.0
Standing time	10.91	51.34	40.43			Very dissatisfied	22.2				
Walking time	10.64	39.93	29.29			Total satisfied	77.8				
% With increase > 15 min			Complication %	0.00		Total dissatisfied	22.2				
Sitting change	16.7		Revision %	16.67							
Standing change	57.1		Removal %	0.00							
Walking change	42.9										
X-Stop patients without facet cysts n = 227											
ODI	51.79	36.23	−15.56			Very satisfied	48.7	Yes	67.3	Yes	76.2
VAS	5.76	3.44	−2.32			Somewhat satisfied	23.7	No	25.5	No	19.2
Sitting time	55.42	64.00	8.58			Somewhat dissatisfied	8.8	Not certain	7.2	Not certain	4.6
Standing time	19.45	52.16	32.71			Very dissatisfied	18.8				
Walking time	16.30	49.95	33.65			Total satisfied	72.4				
% With increase > 15 min			Complication %	3.08		Total dissatisfied	27.6				
Sitting change	35.0		Revision %	7.93							
Standing change	42.4		Removal %	4.41							
Walking change	46.0										

ODI indicates Oswestry Disability Index; VAS, Visual Analog Scale.

Of note, one of the advantages of X-Stop is the ability to implant the device under local anesthetic. Implantation was performed under local anesthetic in patients with or without facet cysts in 98.3% and 90.3%, respectively.

DISCUSSION

Lumbar spinal stenosis is a narrowing of the spinal canal leading to a reduction in space available for neural structures and their blood supply. The direct narrowing is because of a constellation of pathologies including thickened lamina, hypertrophied buckled ligamentum flavum, spondylolisthesis, disk bulge, and facet arthrosis. As the disk space collapses in the degenerative cascade, the facet joints assume a larger load transfer frequently leading to the development of synovial facet cysts. Facet cysts cause further narrowing of the spinal canal and consequently, spinal stenosis.

The indications for X-Stop are posture-dependent complaints of NIC. Zucherman et al and Kondrashov et al demonstrated the placement of an interspinous process device that is superior to nonoperative treatment for NIC at 1, 2, and 4 years postoperatively.[10–12] Further studies have reported the success of treating lumbar spinal stenosis in low-grade spondylolisthesis.[13,14] Synovial cysts are frequently associated with spondylolisthesis. Facet cysts accompanied by an increased amount of fluid signal within the facet joint are considered by many to be a telltale sign of instability. Although instability can be further evaluated with flexion and extension radiographies, X-Stop may obviate the need for fusion because of instability in low-grade spondylolisthesis.[7,13,14] Interspinous devices establish less painful segmental motion by diminishing pathologic motion.[9,14]

In review of our 512 patients, we wanted to identify whether the presence of facet cysts influence the prognosis of spinal stenosis treated with the X-Stop devices? No statistical difference was noted in any of the outcome measures among patients with small facet cysts, large facet cysts, or without facet cysts. Although not statistically significant, a trend was noted for better outcome parameters in the

levels.[8] Lindsey et al[9] also reported that placement of X-Stop does not significantly alter the kinematics of the motion segments adjacent to the instrumented level.

X-Stop has proven to be a successful treatment for spinal stenosis. Facet cysts are a pathologic finding often found in spinal stenosis. Does the presence of facet cysts influence the prognosis of spinal stenosis treated with the X-Stop device?

METHODS

A review of the prospective data of all X-Stop procedures from 2006 to 2010 was completed. All patients were asked to complete a series of outcome measures preoperatively and postoperatively at intervals of 6 months, 1 year, 2 years, and 5 years. Only patients with a minimum of 6 months clinical follow-up were included in this review. Previous studies have demonstrated that 2- and 4-year clinical outcomes are similar to 6-month outcomes with X-Stop.[10–12]

The outcome measures completed included Visual Analog Scale (VAS), Oswestry Disability Index (ODI), and satisfaction surveys. In addition, patients were asked to report on their sitting, standing, and walking duration tolerance at these intervals. If the tolerance level was unlimited, then a value of 3 hours was assigned for calculation purposes.

Data collection further delineated patients who had facet cysts (Fig. 1) and those who did not. This determination was made based on preoperative axial imaging (ie, computed tomtgraphy and/or magnetic resonance imaging). The size of the cyst was measured in millimeters and patients were further categorized according to the size of their largest facet cyst. They were labeled as substantially sized facet cysts measuring at least 3 mm or smaller facet cysts < 3 mm. No preevaluation clinical significance is associated with these values.

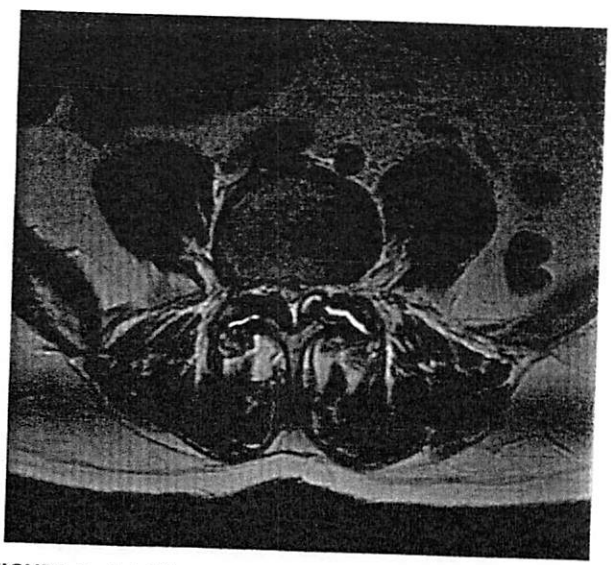

FIGURE 1. Axial image of T2-weighted magnetic resonance imaging demonstrating a left-sided facet cyst causing neural compression along.

The outcome measures as listed above were compared between the 3 groups (no cysts, < 3 mm cysts, and ≥ 3 mm cysts) (Table 1) to determine if the prognosis and outcomes were influenced by the presence of facet cysts.

RESULTS

From 2006 to 2010, a total of 512 patients were treated with X-Stop at 1 center. Data for 285 patients with at least 6 months clinical follow-up was available for analysis (56%). Of this, 227 patients were determined to have spinal stenosis without evidence of a synovial facet cyst. The remaining 58 patients were identified as having a facet cyst, 12 of which were measured as substantially sized (≥ 3 mm).

The mean follow-up time for patients with and without a facet cyst was 21 months (6–55 ± 12 mo) and 22 months (6–61 ± 12 mo), respectively. The age of the patient at the time of the operation with and without facet cysts was 73 (± 10 y).

Among the 227 patients without facet cysts, the average change in ODI was 15.6 (± 20). The VAS change for the same patient population was an average of 2.3. The percentage of patients with a minimum of 15-minute increase in tolerances for sitting, standing, and walking was 35%, 42.4%, and 46%, respectively.

In the 58 patients identified as having a facet cyst of any size, the average change in ODI was 15.8 (± 20). The VAS change for the same patient population was an average of 1.8. The percentage of patients with a minimum of 15-minute increase in tolerances for sitting, standing, and walking was 25.5%, 46.9%, and 39.4%, respectively.

In the 12 patients with a facet cyst ≥ 3 mm, the average change in ODI was 16.2 (± 16.5). The VAS change was 2.3. The percentage of patients with a minimum of 15-minute increase in tolerances for sitting, standing, and walking was 16.7%, 57.1%, and 42.9%, respectively.

On satisfaction surveys, patients were asked to rate their level of satisfaction. In the group without a facet cyst, 48.7% were very satisfied, 23.7% somewhat satisfied, 8.8 were somewhat dissatisfied, and 18.8% were very dissatisfied. A total of 67.3% of patients reported they would have the procedure again and 76.2% would recommend the procedure to someone else. 7.2% were not certain they would have the procedure again. Comparatively, patients with facet cysts had a satisfaction rate of 82% (53.8% very satisfied, 28.2% somewhat satisfied) and a dissatisfaction rate of 18%. The patients with facet cysts ≥ 3 mm had a 77.8% satisfaction rate and a 22.2% dissatisfaction rate. Similarly, the percentage of people who would recommend the procedure reflected their satisfaction rates.

The rate of complications for patients without a cyst, with a cyst < 3 mm, and ≥ 3 mm cysts was 3.1%, 5.1%, and 0%, respectively. Overall complications included 4 spinous process fracture, 4 hematomas, 1 wound infection, and 1 implant migration. There was no statistically significant difference among the 3 groups.

presence of facet cysts ≥3 mm. The X-Stop device is an appropriate treatment consideration for NIC with or without the presence of synovial facet cysts.

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