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Uniportal Endoscopic Transforaminal Discectomy Associated with Cylindrical Percutaneous Interspinous Spacer

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Abstract

Background: The benefits from endoscopic spine surgery are well documented in literature. The use of interspinous spacers remains controversial, but the results reported in the studies just compare open decompression versus indirect decompression with interspinous spacers. Percutaneous cylindrical interspinous spacer portal is recommended at 16 cm from midline and endoscopic transforaminal discectomy from 10-12 cm. The risk of using an extreme lateral portal is greater. The literature recommends general anesthesia for interspinous instrumentation. We hypothesized that patients could benefit from a minimal invasive endoscopic decompression and an indirect decompression using the same portal for endoscopic transforaminal discectomy and the interspinous spacer instrumentation changing the introduction angle. This will reduce the recovery time, reoperation rate, soft tissue damage, anesthetic risk, and the possibility of damage to abdominal and retroperitoneal organs.

Methods: We collected data from 152 consecutive patients from January 2008 to June 2016. All patients were candidates for endoscopic transforaminal discectomy and/or foraminoplasty and had surgical indications for interspinous spacer instrumentation. Mild sedation and local anesthesia was used during the endoscopic procedure. The interspinous spacer instrumentation was performed with local or epidural anesthesia.

Results: Of the 152 patients that had the minimum 2 years follow up, we lost 10 patients at the end. Another 7 had another surgery. Average age was 49 years old, 80 males and 72 females. A total of 214 lumbar interspinous spacers were used. 84 patients referred their primary problem was axial pain (facets/discs) and 68 radicular pain (with central and/or foraminal stenosis). VAS lumbar pain dropped from 7.2 to 0.8 at 2 years, radicular pain from 6.1 to 0.4. The preoperatory ODI was 54.8 and went down to 12.4 at 24 months. More than 90% of the patients reported excellent or good results.

Conclusion: No complications associated with the combination of both procedures. In proper selected cases, the uses of interspinous spacers and endoscopic transforaminal decompression have good results. Minimally invasive procedures can help patients to prevent or retard a greater surgery like fusion or laminectomy.

Keywords: Kissing spine syndrome; Minimally invasive surgery; Spondylolisthesis; Axial pain

Introduction

The first lumbar interspinous process spacer (IPS) was introduced by Knowles in the 50's [1] and many other devices have been developed during the last decades. Currently, just two spacers are FDA approved and used in the United States of America (Coflex and Superion) [2], with some other approved and used all across Europe and Latin America.

The surgical indications for lumbar interspinous process spacer in the United States of America are central and/or foraminal stenosis, neurogenic claudication, grade 1 degenerative spondylolisthesis, patients > 50 years [3]. In Europe, they also include: lateral recess stenosis, degenerative disc disease (DDD), facet syndrome, disc herniation, prevention and treatment for adjacent segment disease, DDD with reducible grade 1 retrolisthesis on the x-rays, kissing spine syndrome. Contraindications include: osteoporosis, listhesis grade 2 or greater, spondylolysis, fracture on the pars interarticularis or in the spinous process, ankylosis, infection, cauda equina, moderate to severe scoliosis [3-6].

Parchi et al. described in that the pressure on the posterior annulus decreases 63% during extension and 38% while standing on foot with the spine in a neutral position. Also, the nucleus pulposus pressure decreases 41% and 20% respectively. The IPS increase the stability in extension, a few can stabilize during flexion, but they don't compensate axial rotation o lateral stability [7].

Decreasing the pressure on the disc and facets should reduce axial pain. Our objective is to solve the axial and/or radicular pain of the patient with minimally invasive surgery procedures, using endoscopic transforaminal decompression and the same portal for the lumbar interspinous process spacer. The patients who fulfill the criteria should benefit from both procedures, lowering the risks associated with traditional open decompression (blood loss, wound infections, general anesthesia, fibrosis, hospitalization time) and IPS indirect decompression alone (reoperation rate).

Methods

Patients characteristics

We collected data from 152 consecutive patients from January 2008 to June 2016. No specific consent was needed. The surgeries were performed in different private hospitals in Monterrey, Nuevo León, México (Table 1). The first 30 patients received In-Space IPS and the rest with cylindrical threaded spacer from peak or titanium (Figure 1).

Inclusion criteria

All patients received unsuccessful conservative treatment first.

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152 consecutive patients from January 2008 to June 2016	Levels
M80	1:95
F72	2:52
Loss of 10 patients at 2 years	3:5
7 had a revision surgery	-
Average 49 years old (35-72)	Surgeries performed in different private hospitals in Monterrey, NL, Mexico

Table 1: The surgeries were performed in different private hospitals in Monterrey.

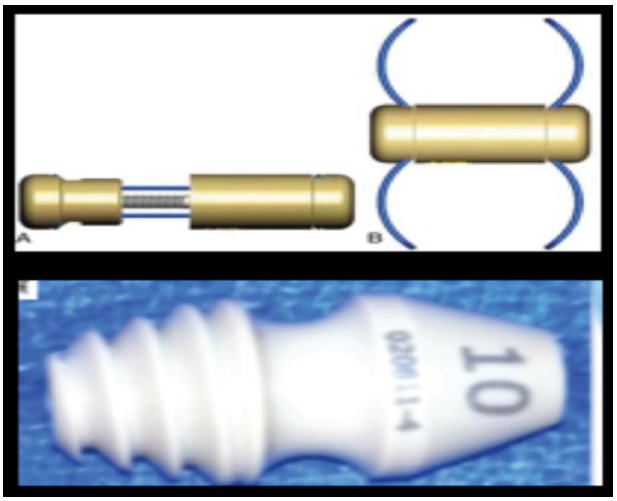

Figure 1: Cylindrical IPS, with wings and threaded.

We included patients with axial and/or radicular pain. They had to be candidates for both procedures to be included (Table 2). All patients were treated with endoscopic transforaminal decompression of the disc and foramen (soft tissue and/or bone resection in the foramen=foraminoplasty) plus indirect decompression and dynamic stabilization with lumbar interspinous process spacer.

Surgical technique

Patients were placed in prone position, under mild sedation and local anesthesia. Transforaminal endoscopic discectomy was performed on the affected level, using endoscopes from 2.7 mm to 4.0 mm of working channel as needed in every particular case. Percutaneous cylindrical interspinous spacer portal is recommended at 16 cm from midline and endoscopic transforaminal discectomy from 10-12 cm.

We measure the entry point in the preoperatory MRI, staying around 12 cm approximately in every case for L4-L5 and L5-S1 (Figure 2). For higher levels, always check the height of the kidneys and the retroperitoneal space. In case of working spaces like L3-L4 and L4-L5 at the same time, the entry point in L4-L5 can be used to be further away from the retroperitoneum.

After the discectomy was performed, the soft tissue decompression (i.e., annulus, foraminal ligaments, yellow ligament, facet capsule and cysts,) were removed. If necessary, bone foraminoplasty was performed. After we finished the decompression, using the same portal access a guide was placed under fluoroscopic control in the interspinous space, progressive dilatators were used from 8 mm to 14 mm as needed in every case (Figure 3).

We used local anesthesia or epidural block depending on the how much pain the patient referred before the surgery. The epidural catheter was placed after the discography, but the blockage was made 10-15 minutes before we finished the endoscopic decompression. Patients with facet syndrome also received facet joint anti-inflammatory injections. All patients received a foraminal block after the decompression.

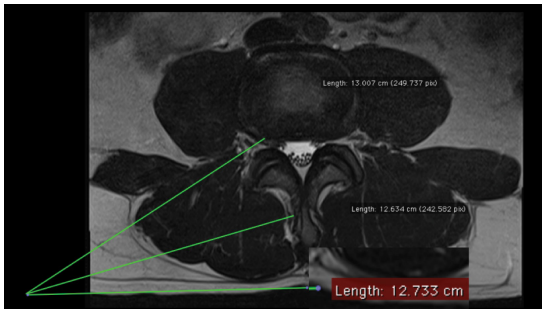

Figure 2: Access to the interspinous space can be achieved through the same portal. When the dilatators are used as described in each technique for percutaneous cylindrical spacers, the muscle mass is depressed to achieve the other side horizontally.

Surgical Indications inclusion criteria
Patients included should be candidates for both procedures
Transforaminal endoscopic Decompression: Disc herniation black discs, axial pain, radicular pain, foraminal pain and extraforaminal stenosis
Lumbar interspinous process space: Central and foraminal stenosis, neurogenic claudication, grade 1 degenerative spondylolisthesis, lateral recess stenosis, degenerative disc disease (DDD), facet syndrome, disc herniation, prevention and treatment for adjacent segment disease, DDD with reducible grade 1 retrolisthesis on the x-rays, kissing spine syndrome, prevention on re herniation on massive re herniation

Table 2: Candidates for both procedures was included.

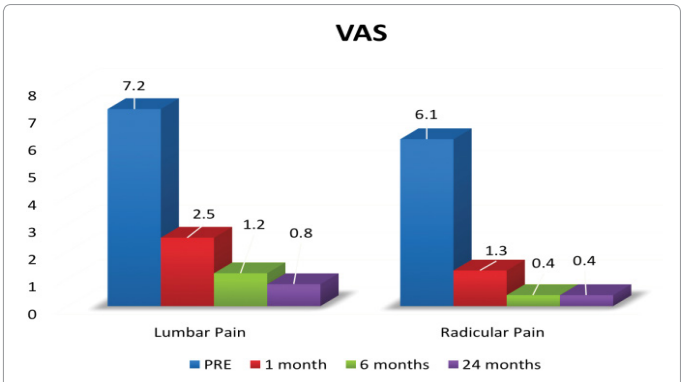

Figure 3: (A) Pre and (B) post-operatory MRI, right L4-L5 foraminoplasty and IPS. The patient had neurological claudication on the right side and sometimes paresthesia on left L5 nerve. C) Endoscopic foraminoplasty in the same patient shows a complete decompression of the thecal sac and transit L5 root.

Follow up and analysis

We collected data retrospectively for VAS lumbar and radicular pain, Oswestry Disability Index, age, sex, diagnosis, worked levels and procedure performed. The data was collected for preoperatory status, 1 month, 6 months and 24 months. Also, the general satisfaction of the patient at 2 years.

Results

Of the 152 patients that had the minimum 2 years follow up, we lost 10 patients at the end. Another 7 had another surgery. Average age was 49 years old, 80 males and 72 females. A total of 214 lumbar interspinous spacers were used. 84 patients referred their primary problem was axial pain (facets/discs) and 68 radicular pain (with central and/or foraminal stenosis) (Figure 4).

VAS lumbar pain dropped from 7.2 to 0.8 at 2 years, radicular pain from 6.1 to 0.4 (Figure 5). The preoperatory ODI was 54.8 and went down to 12.4 at 24 months. More than 90% of the patients reported excellent or good results (Figure 6).

We had 14 complications related to decompression and the interspinous spacer, 7 required revision surgeries. One spacer migrated through the interlaminar space; removal of the implant and open decompression was performed. Laminectomy and fusion for two patients with spondylolisthesis who had spinous process (SP) fracture. One patient with L5 spinous process fracture was resolved with Percudyn screws. One patient had a SP fracture after a car accident, we removed the spacer and performed an open decompression. One spacer was dislocated laterally and was replaced with a DIAM spacer. Another patient had bone reabsorption in the L5 SP (IPS in L4-L5 and L5-S1), the spacers were removed we performed an open decompression.

The 7 non-surgical cases were 3 asymptomatic patients with partial subluxation of the spacers, 2 superficial wound infections, 1 had SP fractures secondary to multiple myeloma, 1 patient with 3 spacers had reabsorption of the intermedius SP. There were 2 non-related complications to the technique with no additional treatment needed (2 thecal sac punctures during the epidural catheter placement). The reoperation rate was 5% at 2 years.

The most difficult level is the space L5-S1, mainly because of the height of the iliac crest and because the spinous process of S1 is often very small or absent. If the iliac crest was the problem, a lateral bending of the lumbar spine was performed, moving the pelvic limbs away from the introduction side, to lower the crest and expose the interspinous space and allow the spacer to enter, usually with some inclination that corrects when disconnect the implant holder.

One important aspect to consider is the interlaminar space in L5-S1. The spacer can migrate inside the canal causing compression, so if it is bigger than the spacer, avoid using it.

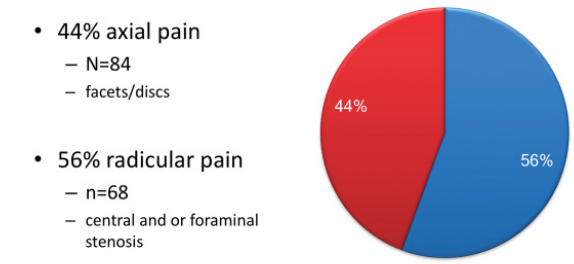

Figure 4: Significant decrease in pain.

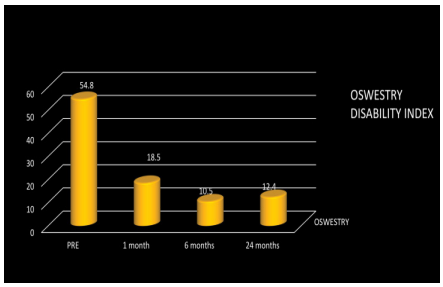

Figure 5: VAS lumbar pain dropped from 7.2 to 0.8 at 2 years, radicular pain from 6.1 to 0.4.

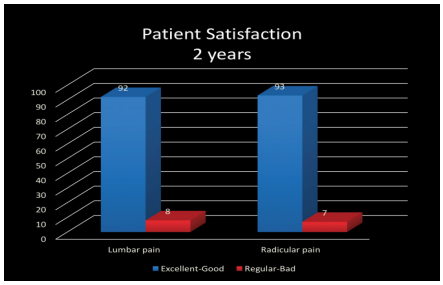

Figure 6: Patients reports significant improvement in their quality of life.

Discussion

Current results in literature compare open decompression versus indirect decompression using IPS treating lumbar spinal stenosis. There is no significant difference between lumbar and radicular pain. However, there is less perioperative complications, bleeding and hospitalization days with IPS and lower reoperation rates with open decompression [8].

There is one study that compares open versus minimally invasive IPS (DIAM *vs.* APERIUS), 1575 patients, and 89% of excellent or good results using the modified Macnab criteria outcome [9].

On 2016, a systematic review made by Phan et al. reported similar results in clinical outcome, complications and reoperation rates between open decompression plus lumbar interspinous process spacer versus open decompression alone. The results between open decompression *vs.* IPS are similar to those reported previously [10].

The results on endoscopic decompression are well documented [11,12], with very good results on transforaminal and interlaminar approaches, reducing risk of general anesthesia, blood loss and recovery time. No publications about endoscopic decompression associated with indirect decompression with IPS where found on literature.

Conclusion

No complications related with the combination of both procedures. Lumbar spine endoscopy associated with the use of interspinous spacers is an effective solution in proper selected cases. Studies comparing the use of spacers plus open decompression have similar results in the medium term compared to pure decompression. In the hands of expert surgeons, endoscopy can achieve adequate decompression, avoiding the risks of open surgery. With both joined surgeries, the need to perform open decompression and fusion in patients with important comorbidities or in young patients can be delayed or avoided.

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