Clinical Benefits of Ultra-Minimally Invasive Spine Surgery in Awake Obese Patients in an Outpatient Setting: A Retrospective Evaluation of Transforaminal Endoscopic Discectomy with Foraminotomy

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Abstract

Background: The adverse effect of obesity on spine surgery outcomes has been postulated and reported multiple times but with some controversy. The impact of general anesthesia on patients with multiple medical comorbidities and the prolonged retraction times associated with thicker soft tissue have been implicated as potential factors in the higher complication rates seen in this population.

Objectives: Transforaminal endoscopic discectomy and foraminotomy is an ultra-minimally invasive outpatient surgical option available to obese patients that does not require general anesthesia and does not necessitate additional retraction due to additional thicker soft tissue. The purpose of this study was to assess the benefit of transforaminal endoscopic discectomy and foraminotomy in obese patients with single level lumbar disc herniations and lumbar radiculopathy.

Methods: After Institutional Review Board Approval, charts from 82 consecutive patients with BMIs of at least 30 kg/m² who had undergone single level endoscopic lumbar discectomies and foraminotomies were retrospectively identified and categorized according to BMI: Class I obesity, BMI 30.0-34.9 kg/m²; Class II obesity, BMI 35.0-39.9 kg/m²; or Class III obesity, BMI ≥40.0 kg/m². Patients aged 40 and older (average age 61.8, 40% female) with complaints of lower back and radicular pain who underwent endoscopic procedures between 2007 and 2012 were reviewed.

Results: The average pain relief 1 year postoperatively was reported to be 68.4% for Class I, 66.1% for Class II, and 43.5% for Class III. The average pre-operative VAS scores were 8.8 for Class I, 9.2 for Class II, and 9.0 for Class III, all as indicated in our questionnaire as describing severe and constant pain. The average 1 year postoperative VAS scores were 2.6 for Class I, 3.0 for Class II, and 3.2 for Class III, indicated in our questionnaire as mild and intermittent pain. There were no infections or other complications reported and the reherniation rate for the 1 year was 7.5% in Class I, 12.5% in Class II, and 0% in Class III.

Conclusion: Endoscopic discectomy is a safe and effective alternative to open back surgery. The 1 year follow-up data presented here appears to indicate that an ultra-minimally invasive approach to the obese spine patient that has a low complication rate, avoids general anesthesia, is performed in the lateral position, and is outpatient might be worth studying in a prospective, longer term way.

BACKGROUND

The global prevalence of obesity is increasing. More than one-third of U.S. adults (34.9%) are obese [1]. An association between Body Mass Index (BMI) and low back pain in the literature has been postulated; the evidence for an association has been unclear and conflicting [2-5]. In spine surgery there has been some controversy regarding whether obesity is associated with different rates of complication when compared to normal weight patients [6-17]. However, the impact of general anesthesia on patients with multiple medical comorbidities and the prolonged

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With aging and a lifetime of wear, a degenerated intervertebral disc bulges posteriorly, which combined with the thickened infolding of the ligamentum flavum and hypertrophy of the facets posteriorly, results in narrowing of the lumbar neural foramen and concomitant lumbar radiculopathy. In the obese patient, from a biomechanical standpoint, the increased forces on the lumbar spine (Force = Mass x Acceleration) would be expected to rise proportionately. When nonsurgical treatment fails for the obese spine patient, these patients usually only have surgical options that involve traditional open surgical procedures that require large incisions and general anesthesia available to them.

Transforaminal endoscopic lumbar discectomy is a minimally invasive spinal surgery procedure that was introduced by Kambin and Gellman in 1973 [19]. Advances in endoscopic visualization and instrumentation, as well as increased patient demand for more minimally invasive procedures, have led to an increased popularity of the technique, particularly outside of the United States. Other studies have shown that endoscopic discectomy is a safe and effective alternative to conventional procedures, and has the advantages of being a truly minimally invasive procedure [20-22]. The authors describe here their experience and have MRI, physical exam, dermatomal pain pattern, and favorable response to transforaminal injection.

RESULTS

Follow-up sheets were filled out by the patient with each visit indicating the location, severity, and duration of pain. Patients were asked to rate their pain using a 0 - 10 scale, a modified form of the Visual Analog Scale (VAS). Each patient had MRI confirmation of disc herniation or protrusion prior to the procedure. The overall pain relief in patients was calculated as a percentage of improvement between the preoperative and the 1 year postoperative VAS score. Overall success rate was then calculated on each of the 82 patients. MacNab criteria was applied to each patient by characterizing pain relief of 75-100% as excellent, 50-74% as good, 25-49% as fair, and 0-24% as poor [23]. Success is based on an excellent, good, or fair outcome.

MEASURES

Patients were selected for treatment based on the results of their MRI, physical exam, dermatomal pain pattern, and favorable response to transforaminal injection.

Patients were positioned in the lateral decubitus position with the operating room table reversed and the flank over the break in the table. The lateral decubitus position allowed for a patient’s large abdominal pannus to be supported away from the spine without causing pressure on the pannus, abdominal viscera, or venous system that would often occur in spine surgery performed in the prone position. A roll was placed under the flank and the table flexed to open the disc space. Anesthesia consisted of mild sedation using versed and fentanyl and 1% lidocaine local anesthetic. The level of anesthetic was titrated so the patient was able to communicate with the surgeon throughout the procedure. The Joimax TESSYS endoscopic system was used for the procedure. Percutaneous entry was established entering through the skin 8-18cm lateral to the midline (Figure 1). Using intermittent fluoroscopic guidance, alternating between tunnel view (bull’s eye), lateral and Anterior-Posterior (AP) view a 25 cm 18 gauge needle was advanced and placed in the disc space through Kambin’s triangle, between the exiting and traversing nerves. An AP fluoroscopic view was used so the disc space was not entered before the needle was past medial border of the pedicle. Sequential reemers and, if needed, the Joimax Shril® shaver drill system were used to enlarge the neural foramen by removing the ventral aspect of the superior facet (Figure 2). The beveled canula working channel was placed over the sequential dilators (Figure 1). Rotating the canula and endoscope allowed for 360 degree visualization of the annulus and exiting and traversing nerve roots. The technical success of the foraminotomy procedure was determined by the visualization of the traversing nerve root (Figure 1). Discectomy was performed with straight, up going, and bendable graspers.

Participants

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Transforaminal endoscopic discectomy and foraminotomy

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Independent from the above calculations, each patient is in order to determine overall success: patients receiving relief of over 25% after 1 year are considered to be successful cases. Figure 3 indicates the overall success rates defined by the McNab Criteria. Successful outcomes were seen in 88% of Class I patients, 100% of Class II patients, and 85% of Class III patients.
Five patients underwent a subsequent endoscopic discectomy at the same level by the same surgeon in order to remove a reherniation. Outcomes for these patients are reported as the outcomes 1 year after the second surgery. Reherniations were seen in 4 of the Class I patients (7.5%) and 2 of the Class II patients (12.5%). This reherniation rate of approximately 10% is similar to that for a traditional microdiscectomy approach [24]. The reherniation rate calculated for all classes was 6%. The only outcome measure studied here was a measurement of pain. No other functional measures, including walking and claudication measures, were collected or investigated.

Complications

There were no reports of infection, dural tear, thrombophlebitis, spinal instability, or vascular injury. There were no serious complications such as cauda equina syndrome or nerve damage resulting in paralysis. Five patients reherniated and had a subsequent endoscopic discectomy to treat the reherniation. The complication rate was 0% and the reherniation rate was 6%. No patients reported having worse pain post-procedure. Previously reported complications can include infection, dysesthesia, thrombophlebitis, dural tear, vascular injury, and death [22].

DISCUSSION

Much of the literature on spine surgery and obesity focuses on the impact of obesity on patients undergoing complex spinal fusion procedures [8,13,15-17]. Multilevel complex spinal fusions represent a complex solution to the problem of the degenerative spine. Endoscopic discectomy is an ultra-minimally invasive spine surgery procedure that does not require general anesthesia and can be performed successfully on a wide range of patients, including those from overweight to morbidly obese with back and radicular pain originating from central, paracentral, far lateral and sequestered herniated discs.

The level of discectomy was targeted based on physical exam, clinical presentation, MR imaging and response to transforaminal epidural steroid injection. As part of the preoperative discussion, more traditional standard open surgical options were discussed. The overwhelming response from this group was an aversion to more open surgical approaches especially if those approaches involved general anesthesia. The 82 patients treated included cases in which sequestered herniated discs seen cephalad or caudal to the disc space were removed using specialized flexible instruments. The instruments enabled the surgeon to
allowing for further caution when working in the epidural space, adding to the safety of the procedure.

Other studies have shown that endoscopic spine surgery is an effective procedure for treating multiple pathologies in the lumbar spine including lateral, paracentral, central, extruded and even contralateral herniated discs as well as lateral recess stenosis [20,25-27]. In this aspect, endoscopic discectomy could be successful in treating a significant segment of the back and radicular pain population without the complications of open back surgery.

For more traditional spine surgical procedures, larger patients require larger incisions; deeper more prolonged retraction, prolonged operating time and inferior visualization because the pathology is further away. With the unique nature of endoscopic spine surgery, a larger patient does not need a larger incision, operating times and retraction are not different, and no matter how deep the pathology is, the visualization is the same superior quality on the high definition video screen. Also, blood loss is minimal in endoscopic spine surgery regardless of the size of the patient. The absence of medical complications seen in this study such as deep venous thrombosis, atelectasis, and pneumonia may be a result of the fact that general anesthesia is not required or because patients are up and walking performing every day activities immediately after the procedure.

Studies have shown in a prospective fashion the utility of endoscopic lumbar surgery as an effective treatment for disc herniations and foraminal stenosis [20,26]. This study, on one hand, is only a retrospective investigation that offers 1 year follow up data for obese patients undergoing endoscopic spine surgery. On the other hand, the 1 year data appears to indicate that an ultra-minimally invasive approach to the obese spine surgery patient that has a low complication rate, avoids general anesthesia, and is outpatient might be worth studying in a prospective, longer term way much like MiDAS I (mild Decompression Alternative to Open Surgery) which demonstrated the efficacy of percutaneous laminectomy in a prospective way using mobility and pain measures [28].

CONCLUSION

Endoscopic surgery for lumbar degenerative disease is not proposed as a cure or solution to the degenerative spine but as a palatable remedy for the obese patient who wants some improvement without going through a surgery that requires general anesthesia and an inpatient hospital stay. Endoscopic discectomy is proposed as a safe and effective alternative to open back surgery. As the obese demographic increases in number and possibly grows in size, spine physicians need to consider treatment paradigms that factor in risk, patient down-time, and health care costs and that are specifically tailored to this larger population.

REFERENCES

2. Heuch I, Hagen K, Heuch I, Nygaard Ø, Zwart JA. The impact of body

Figure 3 Success of Endoscopic Discectomy Defined by MacNab Criteria. Fair, Good, and Excellent outcomes were achieved in 88% of Class I patients, 100% of Class II patients, and 85% of Class III patients.

circumnavigate and reach into the epidural space and as far as the mid-vertebral body (Figure 2). The unique surgical method and instrument design allowed for high success even in the obese population presented here. The patients were sedated intraoperatively but conscious so nerve damage could be avoided. The patient was asked throughout the procedure if he or she was experiencing leg pain, characteristic of manipulation of the nerve root. This nerve could be viewed and identified endoscopically


