Hydrodiscectomy with the SpineJet system in the Treatment of Lumbar Diskogenic Back Pain

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Purpose

Back pain due to spine degenerative disc disease is the major cause of disability, affecting up to 40% of people in Western countries. Conservative care with anti-inflammatory drug therapy, physical therapy and physiotherapy provide relief in a significant proportion of patients. Spinal surgery is indicated in non-responsive patients after at least 4 weeks of conservative treatment to prevent reversible structural changes in nerve roots due to chronic compression.

In recent years several percutaneous approaches had been introduced to reduce postoperative morbidity.

Recently, a new high-pressure water jet system (SpineJet HydroCision, Inc., Boston, MA, USA) was introduced for spinal surgery and percutaneous microdiscectomy. This device is a non-thermal, fluid jet-based instrument designed for percutaneous discectomy.

This study was carried out to evaluate the safety and efficacy of percutaneous hydrodiscectomy with SpineJet device, performed under local anaesthesia, in patients affected by discal protrusions and contained herniations.
Fig. 1: SpineJet Percutaneous System

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Methods and Materials

Population

From March to June 2011, 20 patients (13 men, 7 women; mean age 49 years) affected by lumbar discal protrusions and contained herniations were treated in our Institution with percutaneous hydrodiscectomy with SpineJet device.

Patients had to satisfy specific inclusion and exclusion criteria to be enrolled. Inclusion criteria were the presence of lumbalgic and/or sciatalgic pain due to lumbar discal protrusions and contained herniations, absence of major neurologic deficit, and lack of response after at least 4 weeks of conservative management. Moreover intersomatic space at hernia levels has to be larger than 4 mm.

All patients were evaluated by radiography and MRI in order to confirm the presence of contained disc herniation and intersomatic space anatomy.

Conservative care consisted of the use of posture and activity modifications, physical therapy focusing on lumbar stabilization exercises, and oral nonsteroidal anti-inflammatory drugs.

Patients presenting a sequestered or extruded disc herniation, non-qualifying results on provocative discography, marked spinal stenosis due to extensive osteophytosis, spondylolisthesis, bone congenital abnormalities, evidence of infection, cauda equina syndrome, tumour or spinal instability are not considered candidates for this procedure. The presence of heavy opioid usage and uncontrolled psychological disorders were also considered as exclusion criteria.

Technique

SpineJet percutaneous discectomy system generate a controlled highpressure water jet through a cannulated system to remove a predictable quantity of nucleus regardless of disc hydration or age with minimal annular defect through a Venturi effect.

The system contains four basic components: a disposable quick connector, a disposable hand piece, a power console, and a foot switch. The power console pressurizes sterile water (pressure is user-controlled from approximately 87.7 to 1096.1 kg/cm2) that is supplied from a standard 3L irrigant supply bag. The pressurized water is pumped to the disposable hand piece and then exits the distal tip of the hand piece as a high-velocity jet, which crosses a short gap and is collected in an evacuation tube. Tissue directed into the gap is excised and drawn into the evacuation tube along with the water jet. The evacuation tube is connected to a standard waste container.
Before each procedure magnetic resonance imaging (MRI) of the lumbar spine were evaluated and a clinical evaluation with a general survey of relevant medical problems were performed in the radiology department. The procedure and associated potential complications were explained to the patient, and their prior informed consent was obtained.

Hydrodiscectomy was performed in the angiography room with the patient in a prone or semi-oblique position, under mild sedation.

The involved disc space was localized under fluoroscopic guidance and the soft tissues, on the side of predominant pain, infiltrated with local anaesthetic approximately 8-10 cm from the midline with a 22 Gauge needle.

Using a posterolateral extrapedicular approach, with a 45 degree angle of inclination, a 16-gauge 6-inch-long Crawford type spinal introducer needle was inserted through the annulus fibrosus. A proper needle position in the intersomatic spaces between L1 and L5 and L5-S1 space utilized to avoid the exiting nerve root was adopted as previously described in our previous experience.

The anteroposterior projection was used to check the needle had not transgressed the transpedicular line, at a site just medial to the medial border of the pedicles above and below the disc space. Through the needle we performed discography, injecting contrast medium within the nucleus pulposus, in order to confirm the diagnosis of discogenic pain with positive provocative elicitation of concordant pain as well as to verify the integrity of the annulus fibrosus.

Then a Kirschner guidewire has been introduced to advance the 10 G access cannula mounted on a dilatator in the proper position. The access cannula remained in place within the outer annulus during the entire procedure, providing access for the spinal wand into the nucleus (Fig.2). After the dilatator removal, SpineJet PercResector probe was inserted through the access cannula and activated for 3 minutes per level to remove the protruded disc materials and decompress the nerve (Fig 3). Hydrodiscectomy was followed by the selective infusion of beta- methasone and lidocaine through the access cannula.

After all the instruments were removed the 4 mm skin incision is closed with Steril-Strips and the patient placed supine on the bed for 2 hr. Postoperatively patients were allowed unlimited walking, standing, and sitting, but were instructed to limit any lifting, bending or stooping for 2 weeks. Return to sedentary or light work was permitted at 3-4 days following the surgery. Formal physical therapy with an emphasis on lumbar stabilization exercises started 3 weeks after the procedure.
Images for this section:

Fig. 1: SpineJet Percutaneous System

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Fig. 2: Insertion of the access cannula on the dilatator catheter

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Fig. 3: Hydrodiscetomy with the PercResector inserted in the access cannula

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Results

Successful procedure was performed in all cases. 3 patients had persistence of pain at 6 months follow-up. Significant improvement rate of ODI (baseline 52.7±25.3 and FU 18.2 ± 23.5, p=0.02) (Fig 4), VAS (baseline 7.3 ± 1.9 and FU 2.4 ± 2.8, p<0.001) (fig 5) and NRS (baseline 8 ± 1.9 and FU 2.4 ± 2.9, p<0.001) (Fig 6) was evaluated at 6 months follow-up.
Fig. 4: ODI results at baseline, 10 days and 6 months follow-up

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**Fig. 5**: VAS results at baseline, 10 days and 6 months follow-up

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Fig. 6: NRS results at baseline, 10 days and 6 months follow-up

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Conclusion

Hydrodiscectomy is a promising treatment option for selected patients with symptomatic disk herniation who present with lumbalgic and/or sciatalgic pain, have failed conservative therapies, and are not considered candidates for open surgery.
References


