Percutaneous discectomy: an alternative therapy for symptomatic herniated discs.

Poster No.: C-0030
Congress: ECR 2015
Type: Scientific Exhibit
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Keywords: Hernia, Treatment effects, Puncture, Diagnostic procedure, Percutaneous, Fluoroscopy, CT, Neuroradiology spine, Musculoskeletal spine
DOI: 10.1594/ecr2015/C-0030

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Aims and objectives

The aim of our study is to demonstrate the usefulness of percutaneous discectomy guided with fluoroscopy and computed tomography (CT) in patients with symptomatic disc herniation. We included patients with low back or sciatic pain related herniated disc, and that after a period of conservative treatment, no symptoms would improve.
Methods and materials

It is a prospective observational study, including a total of 50 patients, 31 men (62%) and 19 women (38%) aged between 22 and 80 years, with a mean of 49 years. The diagnosis of sciatic radiculopathy was established by clinical history and physical examination performed by the physician and interventional radiologist. Each of the patients was assessed using magnetic resonance (MR) to localize the level of injury and exclude anatomic variants. The presence of a transitional vertebra, extralumbar ribs and thoracolumbar or lumbosacral transition anomalies are quite common anatomic variants that may create confusion at the time of decompression treatment affecting the nerve root (1). To avoid errors, locators are obtained full column to list the vertebral bodies from C2 and differentiate hypoplastic ribs, lumbar transverse processes specifying the diagnosis of an abnormality of transition.

Data
Variables related to personal patient data (gender and age), associated MRI findings in the symptomatic level (type of hernia according to the topographic location) with the current procedure (level or levels of lumbar hernias, percutaneous approach, and the presence or absence of complications) and finally, if patients have required reoperation by open surgery or discectomy. To evaluate this last section, the medical records in order to meet potential complications or consultations with other services (Neurosurgery and Traumatology) were reviewed.

Patients were clinically assessed by VAS (visual analogue scale) before and 3-6 months after surgery consultation either interventional radiology or by telephone survey. In the consultation, the scale was represented (Figure 1) in two rectangles, one for the assessment of low back pain and one for the sciatic radicular pain, 10cm in length each, undergraduate, where 0 is no pain and 10 is the worst pain imaginable. By telephone, the patient is respondent to make a subjective assessment of their pain (lumbar and sciatic) on a scale of 0 to 10. Thus, we classify the pain as mild if less than or equal to 3 cm, moderate between 4-6 cm and severe if 7 cm or more.

Procedure
The procedure is carried out in an intervention room with computed tomography (CT) under strict aseptic conditions and well-trained interventional radiologist. The patient is placed prone, is given sedation and local anesthesia in the level to treat and depending on the approach. Then, using fluoroscopic guidance (2) a sagittal plane diskography is performed to check the positioning of the needle and the hernia ensuring the best approach. The diskography not only is useful to analyze the consistency and elasticity of the disc but to cause the usual clinical findings that could influence the results of percutaneous treatment (3). The morphologically normal vertebral discs
in asymptomatic patients are rarely painful after performing a discography. However, those patients with low back pain and normal disc structure may have pain after contrast injection. Furthermore, those with an abnormal contour disc or nucleus pulposus herniation into the epidural space are often painful (4). You can complete the study with TC to ensure placement of the trocar and complete the morphological assessment of the disc, although not routinely performed.

Then, a small cut is made in the skin for insertion of the trocar, which is usually curved and has a lateral small window to achieve more difficult locations (L5-S1) and obtain more quantity of disc material. Subsequently, herniatome is inserted through the trocar and activated by rotational movements to extract herniated component and nucleus pulposus. Simultaneously, the radiologist performs movements back and forth to remove more material at different angles. The procedure is performed several times, with an average of 5 extractions, ending when sufficient material has been obtained, and the radiologist experiences a decrease in pressure disc. Finally it is administered 1cc of an intradiscal corticosteroid. Procedure takes approximately 20-30 minutes. The patients usually stay in our institution over 24 and 48 hours.

**Statistical analysis**

1.1. A statistical analysis was then performed relating the variable gender (male / female) for overall clinical improvement experienced by patients after surgery (yes / no), using a contingency table $X^2$.

1.2. The relationship between the number of operated levels (levels 1/2) versus the presence of clinical global improvement (yes / no) was assessed with $X^2$.

1.3. The statistical relationship between the approach used in each of the operated levels (paramedian interlaminar/oblique lateral approach) and clinical global improvement experienced by patients after surgery (yes / no) were evaluated with $X^2$ test.

1.4. Finally, the relationship between those patients who had severe back pain before surgery (severe pain / no severe pain) to the overall clinical improvement (yes / no) was analyzed by $X^2$. The same analysis with severe sciatic pain versus no severe pain was performed.

**Statistical power**

The calculations were performed with G-Stat 2.0.1 program.

The value was considered significant $p <0.05$. 
Fig. 1: VAS is evaluated by two rectangles, one for the assessment of low back pain and one for the sciatic radicular pain, 10cm in length each, undergraduate, where 0 is no pain and 10 is the worst pain imaginable.

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Results

Descriptive analysis
Patients had lumbar pain and mostly persistent radicular pain, being right more often (26 patients, 52%) left sciatica (22 patients, 44%) or, except for a patient with left sciatica and right crural pain (2%) and the remaining patient with left cruralgia (2%).

In most patients, the dairy pain usually reproduced after administration of contrast test (48 patients, 96%). In one of the patients with negative diskography for reproduction of pain, showed no significant clinical improvement after the procedure (2%) while the remaining patient improved significantly (2%).

The most frequently operated lumbar levels were L4-L5 (27, 43%) and L5-S1 (26, 41%). In 9 cases was operated the L3-L4 (14%) level and in the remaining case, the level L2-L3 (2%).

In the same surgical procedure involved two lumbar levels in 13 patients (26%), being L4-L5 and L5-S1 the most prevalent.

The most common types of hernia depending on the location were paramedian disc protrusions, on the right side in 21 (33%) and 15 patients (24%) on the left. The second group of hernias were right foraminal protrusions in 5 patients (8%) and left in 4 patients (6%).

Regarding the surgical approaches for different types of hernia, the most used was oblique lateral approach in 30 (48%) and paramedian interlaminar puncture in 33 (52%).

The most common complication was post-puncture headache, present in the first hours after surgery (3 patients, 6%). Among the major complications, only one patient (2%) needed to be reopened by open surgery due to a detachment of a small piece from the herniotome. The other two patients who underwent surgery (3 patients in total, 6%) was due to the persistence of radicular pain in the short term, performing at one discectomy with subsequent placement of an interspinous spacer (IS) and in the second case discectomy and foraminectomy with subsequent placement of a IS.

Regarding the clinical assessment, 4 patients could not be interviewed (8%). Of the remaining 46 patients, before surgery 28 (61%) had severe back pain, moderate pain, 17 patients (37%) and the remaining patient a slight (2%) pain. After the intervention 7 (15%) had severe pain, moderate pain, 13 (28%) and 26 mild pain (57%). The results are represented in Figure 2.

Severe sciatic pain was present in 38 patients (83%) was moderate in 7 (15%) and mild in the remaining patient (2%). However, after the intervention sciatic pain was severe in
7 patients (15%), moderate in 6 (13%) and severe in 34 patients (72%), shown in Figure 3 is important to note that in 15 patients (33%) had completely disappeared sciatic pain.

The arithmetic mean of back pain (assessed with VAS) preoperatively was 6.67 and postoperatively 3.47 while the average sciatic pain before and after surgery was 7.7 and 2.67, respectively (Figure 4), which determine an improvement in the radicular pain mainly regarding LBP.

Most patients (41 patients, 82%) showed a global improvement after performing the procedure (Figure 5), 8 patients reported significant improvement (16%), unaware of the clinical status of the remaining patient (2%).

**Statistical Analysis**

1.1. The statistical relationship between gender (male / female) and clinical improvement showed no statistically significant results (p = 0.1322).

1.2. Regarding the relationship between intervention lumbar levels (1 or 2) and clinical global improvement (yes / no) without obtaining statistically significant results (p = 0.0783).

1.3. The proportion of patients undergoing interlaminar paramedian and oblique lateral approaches had a very similar distribution with global clinical improvement in both groups being also very homogeneous, determining no statistically significant results (p = 0.6469).

1.4. Finally in the statistical analysis assessing the relationship between clinical global improvement in patients with prior severe back or sciatic pain, we did not demonstrate statistically significant results (p = 0.5342 lumbar pain and sciatic pain p = 0.2235).

**Figure 6** represents an example of one of the cases treated in our department.
Fig. 2

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Fig. 5

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Fig. 6: Is a 53 year-old woman with chronic right sciatic pain, unable to return to work for 3 months. She had VAS of 6 and 7 in low back pain and sciatic pain respectively. Study of MR with T1-weighted sequences (a) and T2-weighted in sagittal (b-c) and axial (d and e): The signal and height of L4-L5 disc space is normal although a right paramedian disc protrusion is demonstrated (yellow arrows in c and d). The L5-S1 disc space has lost height and degenerative signal characteristics, type I Modic changes and incipient diffuse disc bulge (orange arrows b and e). Diskography is performed (f-h images), accessing the L4-L5 and L5-S1 levels by right paramedian interlaminar approach, confirming the presence of hernias described above and reproduction of an intense pain on both levels. The study was completed by CT (i and j images). Next, 4 and 3 extractions were performed from herniated component and nucleus pulposus in L4-L5 and L5-S1 levels, respectively. 4 months later, the patient claimed to feel better, with significant improvement of low back pain (VAS 2) and fundamentally sciatic pain (VAS 0), allowing her to return to work normally.

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Fig. 7: Is a 53 year-old woman with chronic right sciatic pain, unable to return to work for 3 months. She had VAS of 6 and 7 in low back pain and sciatic pain respectively. Study of MR with T1-weighted sequences (a) and T2-weighted in sagittal (b-c) and axial (d and e): The signal and height of L4-L5 disc space is normal although a right paramedian disc protrusion is demonstrated (yellow arrows in c and d). The L5-S1 disc space has lost height and degenerative signal characteristics, type I Modic changes and incipient diffuse disc bulge (orange arrows b and e). Diskography is performed (f-h images), accessing the L4-L5 and L5-S1 levels by right paramedian interlaminar approach, confirming the presence of hernias described above and reproduction of an intense pain on both levels. The study was completed by CT (i and j images). Next, 4 and 3 extractions were performed from herniated component and nucleus pulposus in L4-L5 and L5-S1 levels, respectively. 4 months later, the patient claimed to feel better, with significant improvement of low back pain (VAS 2) and fundamentally sciatic pain (VAS 0), allowing her to return to work normally.

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Low back pain is extremely common, three-quarters of adults have had at least one episode of back pain during their lifetime (4, 5). It is one of the main causes of work leave and the main etiology of functional limitation in persons under 45 years (4 and 6). Initially, the treatment of low back pain should be conservative for 2-6 months, including nonsteroidal anti-inflammatory drugs and corticosteroids, rest and postural therapy (6, 7) because in 60% of cases patients recover. In situations of persistent symptomatology, the most appropriate imaging technique to assess whether clinical correlates with a herniated disc and nerve root compression, is magnetic resonance (MR) (6-8).

Percutaneous discectomy may be a good alternative to surgical treatment in symptomatic herniated discs resistant to conservative treatment. It is a rapid technique, easy to perform and with few complications. The success of the intervention depends crucially on the establishment of appropriate indications, being very beneficial short-term clinical results, with improvement mainly sciatic pain in most patients. Although, it is important to determine that their use does not exclude the possibility of percutaneous or surgical reintervention in the long term.