CT-guided percutaneous herniectomy and discectomy: Technique description and Early experience

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Authors: M. Cifrian Pérez1, N. Correas Alguacil2, J. H. Garcia Vila2, C. Cifrian3; 1EL GRAO/ES, 2Castellon/ES, 3Paterna, VALENCIA/ES
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Purpose

Technique description of CT-guided percutaneous herniectomy and discectomy.

To assess short-term efficacy of CT-guided herniectomy and discectomy in treatment of lumbar radicular syndrome refractory to conservative treatment.
Methods and Materials

CT-guided percutaneous herniectomy is a minimally invasive spinal procedure whose purpose is to extract the hernia or a portion of the hernia to reduce the pressure on the nerve roots. Fig. 1 on page 7
The removal of a small amount of tissue is sufficient to reduce hernial intradiscal pressure and remove the disco radicular conflict.

We perform a prospective study to evaluate the response to treatment by CT-guided percutaneous herniectomy in 30 patients with low back pain and radicular syndrome due to hernia source refractory to conservative treatment.

Inclusion criteria:
- Patients with radicular pain and disc-radicular conflict evidence on MRI.

- VAS greater than 6.

- Adequate Disc-hydration (hyperintense on T2)
  - Disc height preservation.

- Pain relief after performing an epidural injection and periradicular pulsed radiofrequency treatment to confirm the disc-radicular conflict as a cause of pain.

Exclusion criteria:

- Uncontained disc herniation

- Inability to tolerate the procedure with local anesthesia.

- Coagulation disorder

- Infection
-Pregnancy

-Absence of radicular pain syndrome

-Absence of good clinical-radiological correlation (MRI)

**CT guided procedures:**

CT provides precise control in both bone and soft tissue. We can achieve real time visualization of needle progression along the planned path using a combination of CT and C-arm fluoroscopy or CT-fluoroscopy.

Strict adherence to aseptic techniques is required in all bone interventional procedures.

**Patient preparation and positioning:**

-The patient is positioned in the prone position on the CT table.

-A pertinent slice is selected, where the target and the correct needle route are clearly visible.

-Vertical position is shown on the patient’s skin by the CT laser light beam.

-The entry point is located on the skin by placing a radio-opaque marker. The needle is introduced into the disc at the exact level of the hernia (intra-hernial approach)

-The skin surrounding the needle entry point is covered with sterile drapes. Then, local anesthethic is injected all along the needle pathway. Local anesthesia allows patient cooperation, which can be useful to indicate whether there is nerve impingement during the procedure and facilitate the correction of the needle position.

-Once the entry point is determined, the 22 G needle is introduced Fig. 2 on page 7 under CT guidance. Real time fluoroscopy is not usuually necessary andsequential, regular CT slices are, in most cases, sufficient to achieve correct needle placement.

**Technique:**

-The needle is introduced into the disc at the exact level of the hernia (intra-hernial approach). Fig. 3 on page 7 Fig. 4 on page 8
- A provocative discography test makes possible to confirm the disco-radicular conflict by reproducing the pain. Fig. 5 on page 9 Fig. 6 on page 10 Fig. 7 on page 11

- A 17 G needle is put in place using the same route up to the level of the disc herniation. The engine creates a worm that mechanically pushes the nucleous pulposus up the length of the probe and decompresses the disc.
- A progressive rotation of the probe allows the extraction and curettage of a large volume of the hernia. Fig. 8 on page 12

- The patient remains hospitalized 24 hours after the procedure.

**Evaluation:**

The parameters for evaluation were measurement of pain by the visual analog scale score (VAS), scale of quality of life EupoQol-5D and Oswestry disability index. The scales were evaluated previously and after treatment. Clinical evaluation was assessed previously to treatment, 1, 3 and 6 months after the procedure.

- European Index of Quality of Life (Euroqol-5D) is an instrument for assessing the quality of life. It comprises the following five dimensions: mobility, self-care, usual activities, pain/discomfort and anxiety/depression. Results obtained in the analysis of each dimension of this scale were analyzed according to three levels: no problems (1), some problems (2), and severe problems (3).

- The Self-Assessment Euroqol Health State expresses the patients perceived health status at the time. This scale ranges from 0 to 100, with 100 being the best possible state of health and 0 the worst according to the patient self-assessment.

- Oswesty test is an assessment tool that measures the functional status of patients. It values several items: pain intensity, standing, personal care, sleep, weight lifting, sexual activity, walking, socializing, sitting and traveling. The total score is expressed as a percentage (0 to 100%). Functional limitation categories are 5: low (0-19 points), moderate (20-39 points), severe (40-59 points), disability (60-79 points) and maximum (80-100 points).

- VAS: visual analog pain scale, in which the patient reports their pain perception from 0 (no pain) to 10 (maximum pain).
To evaluate the response to treatment defined variables: VAS difference (Vas before, 1 and 3 months after treatment prior month and three months after treatment), Euroqol difference (Euroqol before and after treatment), and Functional Assessment Oswestry test difference (before-after treatment).
Fig. 1: Herniated disc with nerve root involvement representation.

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Fig. 2: Percutaneous herniectomy and discectomy set: Herniotome ® Gallini.

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Fig. 3: Extruded disc herniation with nerve root compression

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**Fig. 4:** left posteromedial disc herniation

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Fig. 5: Percutaneous herniectomy. Inter-laminar intra-hernial approach.

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Fig. 6: Provocative discography previous to percutaneous herniectomy

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Fig. 7: Provocative discography provides both anatomical and functional information about a disc suspected to be diseased, reproducing the patients symptoms.

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Fig. 8: Portion of hernia extracted during the procedure

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Results

The analysis shows a significant decrease of the VAS mean score and improvement in the functional assessment Oswestry test scale and quality of life EuroQol-5D from the initial determination; which are persistent in the clinical follow up 1, 3 and 6 months after the procedure.

**VAS score**

VAS score improved significantly in all patients after percutaneous herniectomy. Fig. 9 on page 15

**EurQol 5**

There is a significant decrease in each of the dimensions of the EuroQol 5 in all patients, being most pronounced in the area of pain / discomfort, mobility and daily activities. Fig. 10 on page 15  Fig. 11 on page 16  Fig. 12 on page 16

**Functional Assessment Oswestry Test Scale**

There is a significant decrease in each of the dimensions of the functional assessment Oswestry test, being most pronounced in the area of pain intensity, standing, personal care, lifting, walking and socializing.

No major complications were observed either in the immediate postoperative period, or in the clinical follow up one month and three months after the procedure. Only 5 of the 30 patients reported residual paresthesia.
**Fig. 9:** Graphic depicting the initial VAS score, 1 month, 3 months and 6 months after treatment.

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**Fig. 10:** Euroqol5 scale representation previous to treatment

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**Fig. 11:** Euroqol scale: 3 months after treatment evaluation.

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**Fig. 12:** Euroqol: 6 months after treatment evaluation

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Conclusion

CT-guided percutaneous herniectomy is an effective treatment for lumbar radicular syndrome refractory to rehabilitation treatment.

With a careful selection of patients, percutaneous herniectomy is a minimally invasive alternative to spine surgery.
References


Personal Information

manuel.cifrian@gmail.com