Nucleoplasty

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Nucleoplasty

Is a minimally invasive technique for disc decompression that utilizes Coblation technology for ablating soft tissue by means of a low temperature (52°C) molecular dissociation process to create small channels within the disc.
Nucleoplasty

Is a process derived from radiofrequency energy producing a plasma field of highly ionized particles which causes a breaking of organic molecular bonds within tissue. Tissue is broken down into elementary molecules and low molecular weight gases.
Decompression

The physical principle at the base of the root decompression is that small reduction of volume in a closed hydraulic space, like an intact disc, results in a disproportionately large fall of pressure and the outcome of disc excision is independent of the quantity of disc material removed.
Intradiscal Pressure

In an experimental study concerning the disc pressure after nucleoplasty the intradiscal pressure was markedly reduced in the younger, healthy cadaver with nucleoplasty. In the degenerative discs of the elderly cadavers the intradiscal pressure reduction after nucleoplasty was statistically significant. However this reduction was very small.

Intradiscal pressure was markedly reduced in non-severe degenerate discs.

Intradiscal Pressure study of percutaneous disc decompression with Nucleoplasty in human cadavers.
Indications

1. Symptomatic patients with contained herniated disc
2. Leg pain with or without back pain
3. MRI evidence of contained herniated disc protrusion
4. Discography positive for concordant pain
5. Failure of six weeks of conservative treatment
Pfirrmann Classification of disc degeneration with MRI

Nucleoplasty is indicated in disc protrusion or contained hernia in not totally degenerated discs.
Contraindications

Nucleoplasty is contraindicated in patients with associated spinal or foraminal stenosis, spinal instability and >50% loss of disc height.
Contraindications

Is also contraindicated in disc protrusion more than 1/3 of the sagittal diameter of the spinal canal or in extruded hernia or with a free fragment

Does not substitute conventional open procedures required for extruded disc
Disc Degeneration

Degeneration of the intervertebral disc is the main pathophysiological process implicated in low back pain and is a prerequisite to disc herniation. Mechanical forces are important modulators of the degeneration but the initial process occurs at the molecular level.

Glutamate

The proteoglycan degeneration facilitates the production of glutamate and because of the acidity of the environment are blocked glutamate reuptake systems. Glutamate would be free to diffuse to the dorsal root ganglion to affect glutamate receptors.

Harrington JF et al: Herniated lumbar disc material as a source of free glutamate available to affect pain signals through the dorsal root ganglion. Spine 2000 Apr 15;25(8):929-36
Complications

• Nerve puncture
• Vascular puncture
• Discitis
Complications

The percentage of secondary discitis detected is the same for a normal discography (0.25% per patient or 0.14% per disc). Usually a temporary local pain in the side of the skin entry point is referred. At present no other complications are reported.


Lumbar Technique
Nucleoplasty

Biochemical effects

- Significant decrease in Interleukin-1 (IL-1) associated with tissue degeneration
- Significant increase in Interleukin-8 (IL-8) associated with tissue angiogenesis

The short-term effects of electrosurgical ablation on proinflammatory mediator production by intervertebral disc cells in tissue culture
Kee-Won Rhyu, MDa, et al

RESULTS: For normal nucleus cells, ablation produced significantly greater levels of IL-8 at 3 days and 6 days, Hsp70 at 3 days but not 6 days, and NO at 6 days. PGE2 was also increased at 3 days and 6 days but not significantly. For IL-1–stimulated annulus cells, IL-6 and NO in the ablation group were decreased at 3 days relative to the control group. However, IL-6, IL-8, PGE2, and Hsp70 significantly increased in the 6-day ablation group.

CONCLUSIONS: The results show that electrosurgical ablation has an acute direct effect on proinflammatory mediator production by disc cells. The effect produced depends on disc cell phenotype, the mediator, and time. These direct biologic effects may be a mechanism of pain relief after percutaneous discectomy using electrosurgical ablation.

Percutaneous Nucleoplasty for discoradicular conflict.  

Retrospective study of 1390 patients, follow up at 15 days, 1 month, 6 months and 1 year. Post Op MRI or CT showed disc bulging eliminated in 34%, significantly reduced in 48% and unvaried in 18%.

<table>
<thead>
<tr>
<th>Results</th>
<th>15 Days</th>
<th>1 Month</th>
<th>6 Month</th>
<th>1 Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>50.8%</td>
<td>53.3%</td>
<td>51.5%</td>
<td>55.8%</td>
</tr>
<tr>
<td>Good</td>
<td>23%</td>
<td>26.6%</td>
<td>31.5%</td>
<td>24.9%</td>
</tr>
<tr>
<td>Fair</td>
<td>13.9%</td>
<td>10%</td>
<td>8.5%</td>
<td>12.4%</td>
</tr>
<tr>
<td>None 1</td>
<td>2.3%</td>
<td>10%</td>
<td>8.5%</td>
<td>6.9%</td>
</tr>
</tbody>
</table>
### Table 3: Grading Recommendations

<table>
<thead>
<tr>
<th>Grade of Recommendation/ Description</th>
<th>Benefit vs Risk and Burdens</th>
<th>Methodological Quality of Supporting Evidence</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1C/strong recommendation, low-quality or very low-quality Evidence</td>
<td>Benefits clearly outweigh risk and burdens, or vice versa</td>
<td>Observational studies or case series</td>
<td>Strong recommendation, but may change when higher quality evidence becomes available</td>
</tr>
</tbody>
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The recommendation is a level 1C, strongly supporting the therapeutic efficacy of this procedure.

Frederic J. Gerges, Stuart R. Lipsitz, and Srdjan S. Nedeljkovic,

**A Systematic Review on the Effectiveness of the Nucleoplasty Procedure for Discogenic Pain**

Pain Physician 2010;13: 117-132 • ISSN 1533-3159
Patients have been divided into the following groups: Group 1 – patients with a disc protrusion treated with nucleoplasty (n = 46), which has been divided into Subgroup 1A, those with a disc protrusion size \( \leq 5 \) mm (n = 24), and Subgroup 1B, those with a disc protrusion size 6 – 9 mm (n = 22);

Subgroups 1A and 1B showed no clinically significant differences in outcome.

Conclusion: The size of the disc protrusion does not significantly affect the outcome of nucleoplasty. The rational guideline for choosing between the 2 types of surgery is the integrity of the annulus.
OBJECTIVE: To document the comparative changes in magnetic resonance imaging (MRI) the appearance of disk morphology as reflected by Pfirrmann classification scores before and after the nucleoplasty treatment in patients with continued symptoms.

METHODS: Twenty-eight consecutive patients with persistent symptoms after nucleoplasty within 1 year of treatment were evaluated. Prenucleoplasty and postnucleoplasty MRIs were evaluated and Pfirrmann scores of the symptomatic level were determined.

CONCLUSION: This study failed to detect any morphologic improvement of disk abnormalities by MRI evaluation in patients with persistent pain, who then underwent nucleoplasty. Thirty-two percent showed progressive degeneration in less than 1 year after nucleoplasty, a rate greater than expected by natural progression during the interval of examination.

Accelerated degeneration after failed cervical and lumbar nucleoplasty.
Cuellar VG, Cuellar JM, Vaccaro AR, Carragee EJ, Scuderi GJ. J Spinal Disord Tech. 2010 Dec;23(8):521-4
METHODS: This was a multicenter randomized controlled clinical study. Ninety patients (18-66 years old) who had sciatica (visual analog scale score ≥ 50) associated with a single-level lumbar contained disc herniation were enrolled.

RESULTS: The patients in the PDD Group had significantly greater reduction in leg pain scores and significantly improved Oswestry Disability Index and 36-Item Short Form Health Survey ([SF-36], physical function, bodily pain, social function, and physical components summary) scores than those in the TFESI Group. During the 2-year follow-up, 25 (56%) of the patients in the PDD Group and 11 (28%) of those in the TFESI Group remained free from having a secondary procedure.

CONCLUSIONS: In study patients who had radicular pain associated with a contained lumbar disc herniation, those patients treated with PDD had significantly reduced pain and better quality of life scores than those treated using repeated TFESI. In addition, significantly more PDD patients than TFESI patients avoided having to undergo a secondary procedure during the 2-year study follow-up.
BACKGROUND: Nucleoplasty appears a successful minimally-invasive treatment for symptomatic contained disc herniation (protrusion). The purpose of this prospective study was to assess the effectiveness of nucleoplasty for alleviating pain and dysfunction in our patients. Eighty-three patients, aged between 20 and 65 years who were treated with nucleoplasty were included in the study. No complications were noted. At the 12-month-follow-up, the median VAS and RMDQ scores were significantly reduced.


Percutaneous coblation nucleoplasty in patients with contained lumbar disc prolapse: 1 year follow-up in a prospective case series.

BACKGROUND: Over the last several decades there has been a general trend toward reduction and minimalization in surgical treatment of chronic back pain, since open surgery brings complications in small and contained disc herniations instead of achieving expected success. Attention has been focused on percutaneous nucleoplasty due to the limited success of other minimally invasive methods, as well due to their associated complications. However, there have been few studies in the English literature with a follow-up period of more than 1 year. The percent of those stating "good" and "excellent" satisfaction was 66% (23 persons) on the last follow-up.

CONCLUSIONS: While it is once more shown that nucleoplasty is a safe method, it is also shown that its effectiveness continues at the end of 2 years.


Effectiveness of nucleoplasty applied for chronic radicular pain.
THANK YOU