Cervical Plasma disc decompression (Nucleoplasty): Indications Results and Limits

Alessandro Cesaroni
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.

By the tissue removal (from 10 to 20 %) we obtain a disc reduction and the decompression of the root.
“Intradiscal pressure was markedly reduced in non severe degenerate discs”

“Nucleoplasty treatment for herniated discs immediately (within two channels) and dramatically reduced intradiscal pressure”

“Nucleoplasty has the potential to be a viable, effective and safe treatment for lower back pain resulting from disc disease”.

Intradiscal pressure study of Nucleoplasty in 60 live patients. Dr A. Cesaroni, Rome, Italy, *Unpublished results.*
Nucleoplasty

Università degli studi di Roma “Tor Vergata”:
Facoltà di ingegneria
Radiofrequenza ablativa nel trattamento mininvasivo del dolore discogenico:
Modellazione e simulazione
Indications

• Symptomatic patients with contained herniated disc
• Integrity of the annulus
• Failure of 6 weeks of conservative therapy
• MRI evidence of contained herniated disc protrusion (degree 2 and 3 Pfirrmann’s classification)

Contraindications

• Extruded hernia or with a free fragment
• Reduction more than 1/3 diameter of the spinal canal
• Spinal or foraminal stenosis, Osteophytosis
• Spinal instability and >50% loss of disc height
Pfirrmann Classification of disc degeneration with MRI

Indications
Disc Pain

Herniated Disc
- Conservative Care (Medications, PT, Steroid injection)
  - Contained
    - Nucleoplasty
  - Non contained

Degenerative Disc Disease
- Conservative Care (Medication, PT)
- Other Surgical Technique
  - Disc/Nucleus Replacement
    - Fusion
Surgical Technique

Patient in supine position with head slightly hyper extended, under fluoroscopic LL vision

The needle is inserted by an anterior lateral approach, medially to the SCM and vessels

Introduced the wand, the ablation starts for 3 cycles in withdrawal, rotating the wand for 360° in each cycle
The Safety Zone of Percutaneous Cervical Approach
A Dynamic Computed Tomographic Study
Sang-Hun Lee, MD,* Ki-Tack Kim, MD,* Bi-O Jeong, MD,* Eun-Min Seo, MD,* Kyung-Soo Suk, MD,* Jung-Hee Lee, MD,* and Gyeong-Kyu Lee, MD†

Conclusion
The safety zone was wider at the distal level (C5–C6, C6–C7) than at the proximal level (C3–C4, C4–C5). The safest needle entry point should be between the pushing point of the airway and the pulsating point of the carotid artery. In addition, the needle should be approached toward the center of the disc. A percutaneous cervical approach allows a low risk of pharyngoesophageal structure injury and is considered a safe diagnostic technique in dynamic imaging studies.
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.


Results

The results in over 1 year follow up shows a significative improvement in pain between 85 and 91% in cervical


Results

Prospective longitudinal cohort study Retrospective study of 67 patients with primary radicular pain due to contained disc herniations. Evaluation at 3 and 6 months using SF36, VAS, and EuroQol 5D (EQ5D).

No infections, nerve root injuries or complications associated with the procedure. Statistically significant improvement in all outcome measures.

Results

Case study of 55 patients with cervical soft disc protrusion and associated radicular pain. Clinical outcomes were graded by using the Macnab criteria, at 6 months, 44 (85%) patients (n = 52/55) had good or excellent outcomes. Entire procedure took no longer than 10-12 minutes to complete from administration of local anesthetic to withdrawal of SpineWand device.

Comparitive study of cervical nucleoplasty (n=50) vs conservative care (n=20) with three month follow up.
Nucleoplasty group - 80% complete resolution of symptoms (VAS) at 3 months. CC group – 25% resolution of symptoms, 75% persistent symptoms.
Average return to work for Nucleoplasty = 21 days, Conservative care = 46 days (with no amelioration of symptoms)

Results

Plasma disc decompression for contained cervical disc herniation: a randomized, controlled trial

Alessandro Cesaroni · Pier Vittorio Nardi

<table>
<thead>
<tr>
<th>Pain VAS Score Reduction from Baseline</th>
<th>NPL (n=43)</th>
<th>CCC (n=32)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 Weeks post-op</td>
<td>46 ± 21 (39, 52)</td>
<td>17 ± 13 (11, 22)</td>
<td>&lt;0.001</td>
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<tr>
<td>3 Months</td>
<td>53 ± 21 (47, 60)</td>
<td>33 ± 18 (27, 39)</td>
<td>&lt;0.001</td>
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<tr>
<td>6 Months</td>
<td>54 ± 22 (48, 61)</td>
<td>41 ± 19 (34, 48)</td>
<td>0.004</td>
</tr>
<tr>
<td>1 Year</td>
<td>63 ± 3 (57, 69)</td>
<td>35 ± 22 (28, 43)</td>
<td>&lt;0.001</td>
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Quality Of Life – NPL Group

Quality Of Life – CCC Group

# Plasma-Mediated Disc Decompression for Contained Cervical Disc Herniation: Results Through 5 Years

Alessandro Cesaroni and Pier Vittorio Nardi

<table>
<thead>
<tr>
<th></th>
<th>1 year</th>
<th>2 year</th>
<th>3 years</th>
<th>4 years</th>
<th>5 years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Good</strong> (mean VAS &lt;2.5)</td>
<td>59.9%</td>
<td>56.9%</td>
<td>56.7%</td>
<td>62.1%</td>
<td>60.8%</td>
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<tr>
<td><strong>Satisfactory</strong> (mean VAS &gt;2.5&lt;4.5)</td>
<td>35.5%</td>
<td>38.4%</td>
<td>38.6%</td>
<td>31.4%</td>
<td>30.6%</td>
</tr>
<tr>
<td><strong>No results</strong></td>
<td>4.6%</td>
<td>4.7%</td>
<td>4.7%</td>
<td>6.5%</td>
<td>8.6%</td>
</tr>
</tbody>
</table>
Biological Effects

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

“Our results suggest that Nucleoplasty may be capable of initiating a repair response in the disc”.

Biological Effects

Graph illustrating percentage change in inflammatory mediators for normal nucleus cells at 3 and 6 days post ablation (Corrected against sham)

“These results support the hypothesis that Nucleoplasty can relieve pain by direct biologic effects”

Conclusions

Nucleoplasty is a minimally invasive technique for disc decompression in contained hernia with radicular pain. The integrity of the annulus is the basis for success.

Nucleoplasty does not substitute conventional open procedures required for extruded disc.

The limits of this technique are related to the level of the disc degeneration.
Thank You For Your Attention