**Introduction**

Outpatient anterior endoscopic microdecompressive cervical discectomy and foraminal decompression (foraminoplasty), by utilizing GPS (grid positional system), can treat herniated cervical discs and cervical foraminal stenosis efficaciously and successfully.

**Methods**

Since 1995, 2169 patients (3917 Discs), who failed at least 12 weeks of conservative care were treated. Levels were C2 to C7, inclusive. All patients demonstrated unilateral radicular pain of a specific dermatome, single level or multiple levels, confirmed with EMG/NCV. MRI or CT scans demonstrated the herniated cervical disc.

**Demographics of Endoscopic Anterior Cervical Discectomy (3917)**

<table>
<thead>
<tr>
<th>Cervical Levels</th>
<th>Discs</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2</td>
<td>316</td>
</tr>
<tr>
<td>C3</td>
<td>294</td>
</tr>
<tr>
<td>C4</td>
<td>376</td>
</tr>
<tr>
<td>C5</td>
<td>122</td>
</tr>
<tr>
<td>C6</td>
<td>354</td>
</tr>
<tr>
<td>C7</td>
<td>249</td>
</tr>
<tr>
<td>Total</td>
<td>3917</td>
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</tbody>
</table>

**Surgical Indications**

- Each side of neck and shoulder pain and radiculopathy
- Erobic neurological deficit
- Intermittent x-ray/CT myelography
- Discography pain
- At least 12 weeks of conservative therapy
- MRI or CT CT proved positive for disc herniation
- Positive EMG
- Multiple disc can be treated at one stage
- End plate/intervertebral disc arthritis/cyst
- Positive 2 tests of high short back pain syndrome
- Positive straight leg raising test
- Progressive neurological deficit

The surgical technique of anterior endoscopic microdecompressive cervical discectomy foraminoplasty (foraminoplasty) and laser thermodiskoplasty (non-ablative lower Holmium laser energy for disc shrinkage and tightening) are described. The surgical approach guided and facilitated with GPS is explained.

**ANESTHESIA and Intra-operative neurophysiological monitoring (IOM)**

- Local anesthesia combined with appropriate analgesics with additional BSO/leveling
- Tracheostomy is limited, if any, to the immediate environment
- Cervical retractor is removed and replaced when necessary
- Confirmation that the operative level is placed with the assistance of intraoperative neurophysiological monitoring (IOM)
- IOM at each level escapes/cervical root and ventral cervical root

**Mechanical decompression with GPS guidance for foraminoplasty for osteophyte/stenosis**

**Demographic of Endoscopic Cervical Microdiscectomy (3917)**

<table>
<thead>
<tr>
<th>Level</th>
<th>Stage</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervical</td>
<td>1</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Cervical</td>
<td>2</td>
<td>18</td>
<td>32</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>24</td>
<td>44</td>
</tr>
</tbody>
</table>

**Results**

For single level, 94% had good to excellent symptomatic relief and spinal motion preservation. 4.5% of patients had some persistent neck and upper extremity residual but diminished pain associated with paraesthesia, after surgery. Average time to return to work was ten to fourteen days. There were no intraoperative complications. Postoperatively, one with transient Horner’s syndrome and one transient hoarseness voice were noted.

**Conclusions**

Anterior endoscopic microdecompressive cervical discectomy and foraminal decompression with mechanical decompression and lower level non-ablative Holmium laser for disc shrinking and tightening effect (laser thermodiskoplasty) with GPS has proven to be safe, less traumatic, easier, and efficacious with significant economic savings. It preserves spinal motion. It is an effective alternative or replacement for conventional open cervical spinal surgery for discectomy.

**Case Illustration**

- 35 year old male professional musician with increasing intraspinar pain and upper extremity pain and numbness of fingers, unable to perform
- AICM and left C4-X cervical decompressive discectomy and foraminoplasty gave immediate relief of all symptoms

**References**


**Learning Objectives**

1. By the conclusion of this session, participants should be able to describe outpatient anterior endoscopic microdecompressive discectomy and foraminal decompression 2. To discuss the surgical technique and approach with GPS system (Grid positional system) 3. To identify the effective technique of anterior endoscopic cervical spinal surgery facilitated with GPS System.
Demographics of Endoscopic Anterior Cervical Discectomy (3917)

- C2: 0.01% (50)
- C3: 0.01% (44)
- C4: 0.08% (318)
- C5: 0.23% (890)
- C6: 0.40% (1576)
- C7-T1: 0.27% (1039)
Surgical Indications

- Neck with arm pain (radicular pain) associated with paresthesia, sensory loss, muscle weakness and/or decreased reflexes
- Intractable cervicogenic headache
- Discogenic pain
- At least 12 weeks of conservative therapy
- MRI or CT scan positive for disc herniation
- Positive provocative discogram
- Positive EMG
- Multiple discs can be treated at one sitting
- Post fusion junctional disc herniation syndrome
- Positive 3 legs of bar stool – symptoms, physical findings, EMG, imaging and provocative discogram
ANESTHESIA and Intra-operative neurophysiological monitoring (IOM)

- Local anesthesia combined with IV conscious sedation with surface EEG monitoring optimize anesthesia and reduce drug requirement.
- The obvious challenge of MISS is limited visualization and exposure of the relevant anatomy and direct visualization of the nerve.
- Continuous intra-operative EMG/neurophysiological monitoring in a digital operating room (DOR) prevents undue neural trauma.
- IOM of neural structure, direct visualization with fluoroscopy and endoscopy creates safer endoscopic MISS procedures.
IOM - Introduction

- Trend of spinal surgery is toward less or minimally invasive spine surgery (MISS).
- MISS aims at being less traumatic, with less morbidity and improved surgical outcome.
- The obvious challenge of MISS is limited visualization and exposure of the relevant anatomy in spite of fluoroscopy and endoscopy to work with, and potentially placing the relevant neural structures at increased risk of trauma.
- INTRAOPERATIVE NEUROPHYSIOLOGICAL MONITORING (IOM) of neural structure, direct visualization with fluoroscopy and endoscopy creates safer endoscopic MISS procedures.
- Spontaneous EMG monitoring, at times SSEP and MEP can provide the surgeon with useful feedback to avoid neural trauma during MISS.
- Intra-operative surface EEG/neurophysiological monitoring optimizes the anesthesia for MISS.
Patient Positioning - surgical portal of entry. Surgical Technique for needle and stylette placement into the disc with GPS

- Positioned in the supine position with mild hyperextension of neck
- Digital retraction of trachea/esophagus, and the carotid artery under the first two fingers (systolic arterial pressure maintained at 130+ ephedrine may be used to maintain BP)
- Needle and stylette inserted into the disc aided by GPS System, fluoroscopy and EMG
- N/G tube is placed in the esophagus to avoid injury
Endoscopic micro flexible forceps, bone ronguer and navigable dissecting probe
Mechanical decompression with GPS guidance for foraminoplasty for osteophytes/stenosis
Endoscopic/fluoroscopic views to provide safe and precise application of aggressive grasper forceps, drill, curette, discectome, and bony ronguer for microdecompression
Holmium YAG laser - photo thermal effect on the disc – shrinking and tightening

Protocols for laser thermodiskoplasty (LTD)

<table>
<thead>
<tr>
<th>Level</th>
<th>Stage</th>
<th>Watts</th>
<th>Joules</th>
</tr>
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<tbody>
<tr>
<td>Cervical</td>
<td>First Stage</td>
<td>8</td>
<td>300</td>
</tr>
<tr>
<td>Cervical</td>
<td>Second Stage</td>
<td>5</td>
<td>200</td>
</tr>
</tbody>
</table>

LTD

Fan sweep maneuver
Surgical Outcome: (symptomatic improvements)

Cervical disc patients (2169)

- Severe Neck Pain: 0 Pre-Op, 1549 Post-Op
- Mild Neck Pain: 64 Pre-Op, 620 Post-Op
- Required Analgesics: 85 Pre-Op, 2169 Post-Op
- Muscle Weakness: 88 Pre-Op, 714 Post-Op
- Muscle Spasm: 38 Pre-Op, 1002 Post-Op
- Persistent Numbness: 9 Pre-Op, 2169 Post-Op
Case Illustration

- 35 year old male professional musician with increasing intratable neck and upper extremity pain and numbness of fingers, unable to perform
- AEVM and left C5-6 foraminal decompressive discectomy and foraminoplasty gave immediate relief of all symptoms

Preoperative MRI scans - Large foraminal herniated C5-6 disc compressing C6 nerve root