Benefits of Minimally Invasive Spinal Surgery (MISS).

G. Saló, PhD, MD.
Senior Consultant Spine Unit.
Hospital del Mar. Barcelona.
Ass. Prof. Universitat Autònoma de Barcelona.
Introduction

- MISS has become increasingly more popular.
- Same surgery through less invasive approaches.
- Same or better outcomes (?)
- Advantages
  - Less muscular aggression.
  - Minor bleeding.
  - Less postoperative pain.
  - Shorter postoperative recovery and hospital stay.
  - Lower morbidity.
  - Smaller scars.
- Disadvantages:
  - It is a technically demanding surgery: steep learning curve.
  - Requires recognition of anatomy with fewer landmarks.
  - Increases of Cost of procedures owing to tecnification.
Introduction

PubMed Search
3. Limit to the clinical trials: 134 citations
MISS Instruments.

1. Retractor Systems:
   - Retract surrounding structures on the 3–planes. Fixed or expandable diameter.
   - Avoid injuries to adjacent structures.
   - Fixed on the surgical table
   - Different sizes: Not stand higher than the skin level in order to avoid interference with surgeon’s activities.
   - Light incorporated in the retractor.
   - Surface coated in black.
MISS Instruments.

1. Instruments for working within the canal and the disc space:
   • Bayonet-shaped configuration.
   • Great length, with long handles and springs.
   • Surface coated in black matt.
MISS Procedures

• Percutaneous procedures:
  1. Vertebroplasty.
  2. Kyphoplasty.
  3. Radiofrequency.
  4. IDET, Nucleoplasty.
  5. Facet blocks / epidural injections

• Endoscopic procedures.
  1. Video-Assisted thoracoscopy.
  2. Laparoscopy

• Minimally Open Procedures
MISS Procedures

1. Lumbar microdiscectomy.
2. Lumbar microdecompression
3. MIS Lumbar fusion.  
   • Percutaneous instrumentation.
   • TLIF MIS.
4. Anterior thoraco-lumbar procedures.  
   • Video-Assisted thoracoscopy.
   • Laparoscopy
5. MIS Cervical fusion
Lumbar MIS Discectomy

1. Microdiscectomy.
2. Endoscopic.
3. Minimally open.
Lumbar Discectomy

A Prospective, Randomized Study Comparing the Results of Open Discectomy with Those of Video-Assisted Arthroscopic Microdiscectomy

- Prospective work
- Comparing 30 patients MISS vs. 30 patients OPEN.
- 1 level HNP with radiculopathy.
- At 2-year F/U

1. Conclusion:
   1. Equal clinical outcome.
   2. Less analgesic intake in MIS.
   3. Quicker return to work in MIS.

Analgesics (time): OPEN 25 days  MIS 7 days
Time lost from work: OPEN 6 wks  MIS 4 wks
Lumbar Discectomy

- **Randomised clinical Trial**
- 50 patients. compares 25 open vs 25 MIS

1. **Prospective Non-randomised clinical Trial**
2. **225 microdiscectomy Vs 36 standard discectomy**
   - Standard discectomy group: significantly greater blood-loss than the microdiscectomy (P>0.05).
   - The use of the microscope did not lengthen the duration of the operation.

No differences in clinical outcomes
Lumbar Decompression

1. Midline decompression
2. Unilateral foraminal decompression
Lumbar Decompression

- Observational cohort study. Retrospective. Level IV evidence.
- 74 patients MIS laminoplasty. 5 year follow-up.
- 1-2 level stenosis, single surgeon.

1. Conclusions: MIS decompression alone is an effective procedure.
2. Patients with scoliosis have a high revision rate.
3. Limitations: observational.
Lumbar Decompression

Postoperative outcome after modified unilateral-approach microendoscopic midline decompression for degenerative spinal stenosis
Clinical article

Mitsuru Yagi, M.D., Ph.D., Eijiro Okada, M.D., Ken Ninomiya, M.D., Ph.D., and Michiya Kihara, M.D., Ph.D.


- Prospective. Level II evidence.
- 41 patients: comparing 20 MIS decompression vs 21 open laminectomy.
- Single level stenosis, single surgeon.

1. Conclusions: MIS superior in terms of VAS at 1 year, LOS, EBL and muscle damage
2. Limitations: small sample, single surgeon.
Lumbar Fusion: TLIF MIS
Lumbar Fusion: TLIF MIS

30-40°
Lumbar Fusion: TLIF MIS

MISS vs OPEN TLIF

<table>
<thead>
<tr>
<th>Author / Year</th>
<th>Patients Op/MIS</th>
<th>Study design</th>
<th>Blood loss Open/MIS</th>
<th>Hospital stay Open/MIS</th>
<th>Operative duration Open /MIS</th>
<th>F-up Mon</th>
<th>Clinical Outcomes</th>
<th>Complications Open/MIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Villavicencio et al, 2010</td>
<td>63/76</td>
<td>Retrospective</td>
<td>366ml/163ml</td>
<td>4.2 d / 3 d</td>
<td>214 m / 222 m</td>
<td>37.5</td>
<td>No differences</td>
<td>1.6% / 10.5%</td>
</tr>
<tr>
<td>Peng et al, 2009</td>
<td>29/29</td>
<td>Prospective</td>
<td>681ml/150ml</td>
<td>6.7 d / 4d</td>
<td>170 m / 216 m</td>
<td>24</td>
<td>No differences</td>
<td>13.5% / 6.9%</td>
</tr>
<tr>
<td>Schizas et al, 2009</td>
<td>18/18</td>
<td>Prospective</td>
<td>961ml/456ml</td>
<td>8.2 d / 6.1 d</td>
<td>5.2 h / 5.8 h</td>
<td>24</td>
<td>No differences</td>
<td>2 cases / 6 cases</td>
</tr>
<tr>
<td>Wang et al, 2010</td>
<td>42/43</td>
<td>Prospective</td>
<td>673ml/264ml</td>
<td>14.6 d/10.6d</td>
<td>145 m / 156 m</td>
<td>26.3</td>
<td>No differences</td>
<td>4 cases / 5 cases</td>
</tr>
<tr>
<td>Shunwu et al 2010</td>
<td>30/32</td>
<td>Prospective</td>
<td>517ml/399ml</td>
<td>12.5d / 9.3d</td>
<td>142 m / 159 m</td>
<td>24 - 42</td>
<td>VAS&amp;ODI Beter MIS</td>
<td>5 cases / 6 cases</td>
</tr>
<tr>
<td>Dhall et al, 2008</td>
<td>21/21</td>
<td>Retrospective</td>
<td>505ml/194ml</td>
<td>5.5 d / 3 d</td>
<td>237 m / 199 m</td>
<td>24 - 34</td>
<td>No differences</td>
<td>2 cases / 5 cases</td>
</tr>
<tr>
<td>Isaacs et al, 2005</td>
<td>20/24</td>
<td>Retrospective</td>
<td>1147ml/226ml</td>
<td>5.1 d / 3.4 d</td>
<td>4.6 h / 5 h</td>
<td>--</td>
<td>Not studied</td>
<td>6 cases / 0 cases</td>
</tr>
</tbody>
</table>

223 / 243 less blood loss shorter hospitalization longer operative time NO clinical differences more technical complications.
Lumbar Fusion: TLIF MIS

Minimal Access Versus Open Transforaminal Lumbar Interbody Fusion
Meta-Analysis of Fusion Rates
Ray H. Wu, BS, Justin F. Fraser, MD, and Roger Härtl, MD

- Quantitative meta-analysis of fusion rates, Level I.
- 716 OPEN TLIF vs. 312 MIS TLIF. F-Up 2-3.5 years.

1. Conclusions:
   1. Similar range of fusion in both groups.
   2. Similar complications rates.

2. Limitations: heterogeneous sample.
Lumbar Fusion: Pedicle Instrumentation.

1. Pedicle percutaneus instrumentation.
   - Fluoroscopy guidance.
   - C-Arm navigation
   - O-Arm navigation.
60 percutaneous screws in 15 consecutive patients

Conclusions:
- The overall rate of screw perforation was 23%.
- Screw misplacement was comparable to average rates reported in open techniques

Perez-Cruet M et al. Early results of a prospective, multicenter, randomized clinical trial evaluating minimally invasive vs. open pedicle screw implantation outcomes. TSJ 2005; 5:S131

Conclusions:
- Longer operative time (358 m vs 297m)
- Decreased blood loss (256 cc vs 519 cc)
- Shorter hospital stay (3 d vs. 4 d)
- Equal Clinical results
Lumbar fusion: Laparoscopy.

- Anterior Lumbar Interbody Fusion.
  - Extraperitoneal
  - Transperitoneal

Regan, John; Yuan, Hansen; McAfee, Paul


- Prospective, comparative: Level III.
- 240 consecutive laparoscopic vs 591 open ALIF.

**Results:**
- No differences in results, revision and complication rate.
- Shorter stay and less blood loss.
- More operative time was spent.
Cervical decompression.

1. Posterior cervical microforaminotomy.
Cervical decompression.

- 175 patients.
- Compared 86 anterior decompression vs 89 endoscopic posterior cervical foraminotomy.
- F-UP: 2 years.

Results:
- No differences in results, revision and complication rate.
- Reduced soft tissue traumatization.
- Less operative time.
Conclusions.

1. Lumbar microdiscectomy:
   - Level I-IV evidence.
   - Less narcotic use.
   - More radiation exposure.
   - No long term difference.

2. Lumbar microdecompression:
   - Level II-IV evidence
   - Superior reported outcomes.
   - More research is necessary to define: adverse event profile, learning curve and optimal approach.
Conclusions.

3. Lumbar MISS fusion:
   - No Level I evidence.
   - Less blood loss, shorter hospital stay, less postoperative pain
   - Level II evidence reports of comparable outcomes for MIS TLIF vs ALIF + pedicular screws.
   - More research is necessary to define: optimal retractor, costs, graft substrate
   - More radiation exposure.

4. Cervical microdecompresion:
   - Level I-IV evidence
   - No difference between MIS vs OPEN
   - Both are reasonable.