Benefits of Minimally Invasive Spinal Surgery (MISS).

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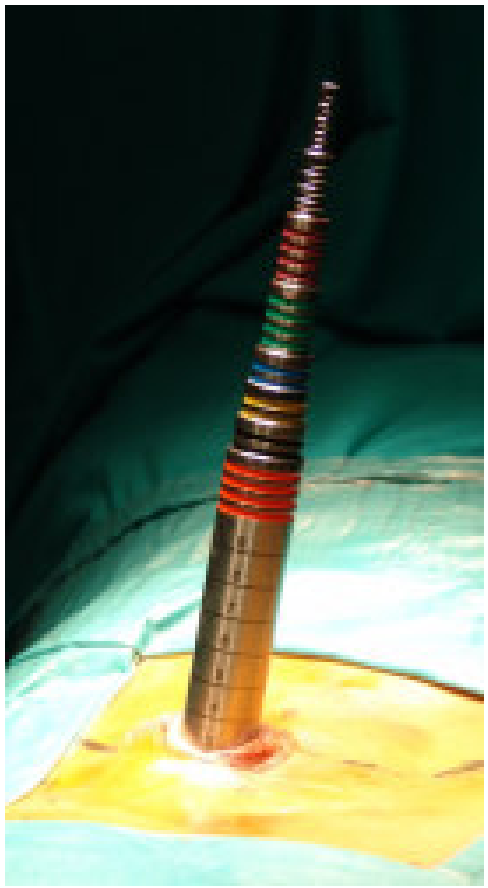
Introduction

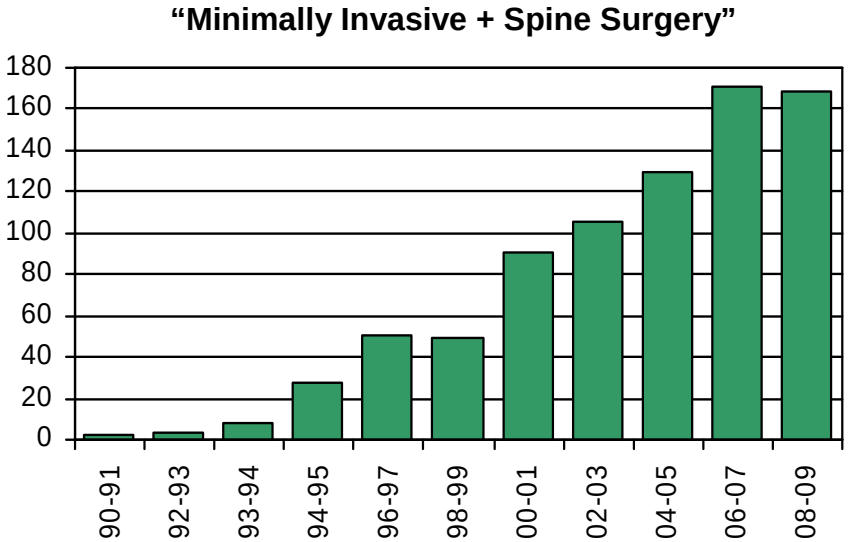
- MISS has become increasingly more popular.
- Same surgery through less invasive approaches.
- Same or better outcomes (?)
- Advantages
  - Less muscular aggression.
  - Minor bleeding.
  - Less postoperative pain.
  - Shorter postoperative recovery and hospital stay.
  - Lower morbidity.
  - Smaller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



Introduction

PubMed Search

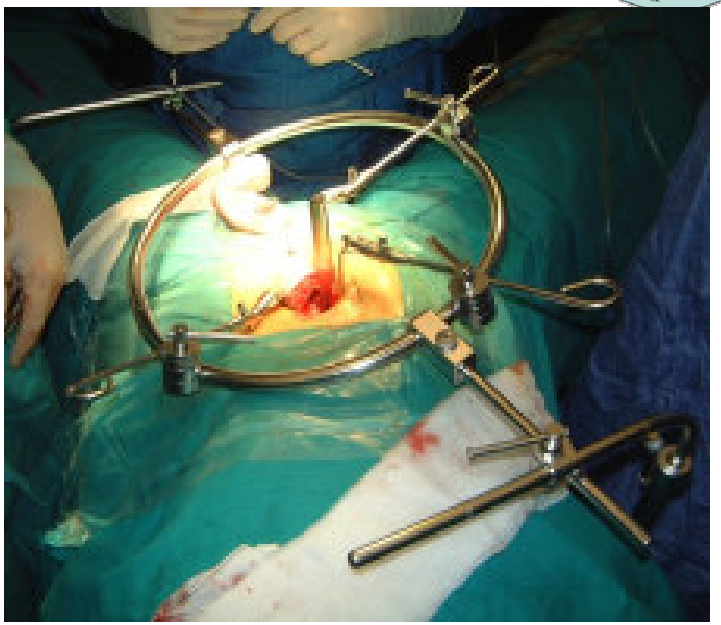
1. Minimally Invasive: 25,535 citations.
2. Minimally Invasive + Spine: 1,230 citations.
3. Limit to the clinical trials: 134 citations

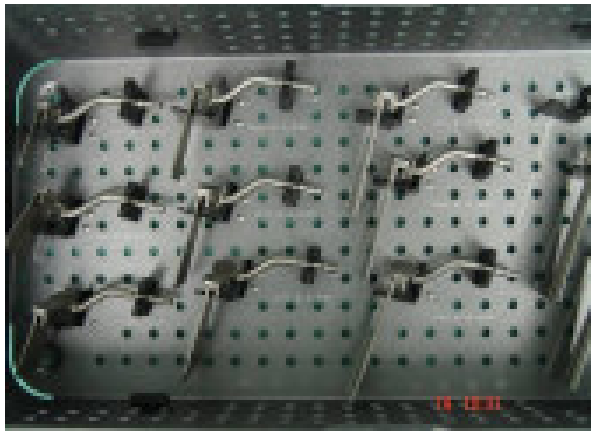


MISS Instruments.

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.





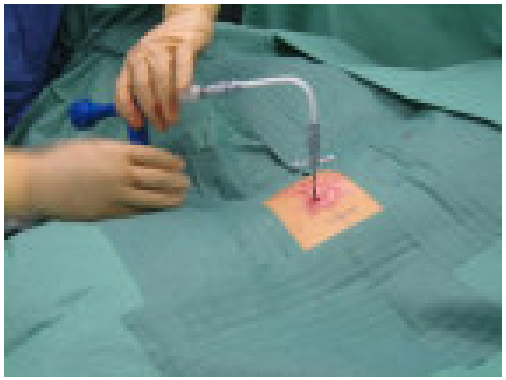
MISS Instruments.

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.

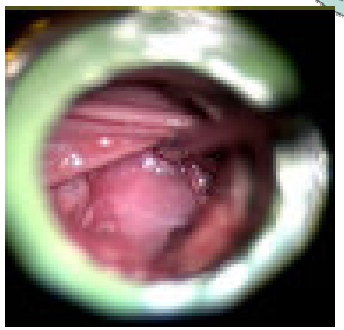
MISS Procedures

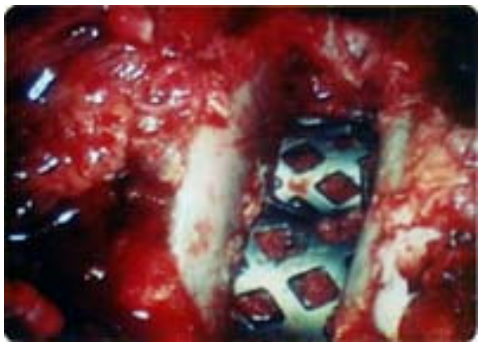
- Percutaneus procedures:
    1. Vertebroplasty.
    2. Kyphoplasty.
    3. Radiofrequency.
    4. IDET, Nucleoplasty.
    5. Facet blocks / epidural injections
- Endoscopic procedures.
    1. Video-Assisted thoracoscopy.
    2. Laparoscopy
- Minimally Open Procedures

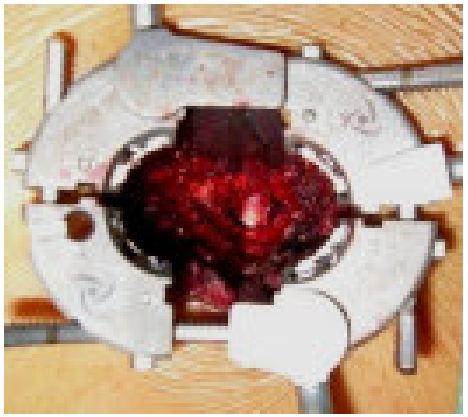


MISS Procedures

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

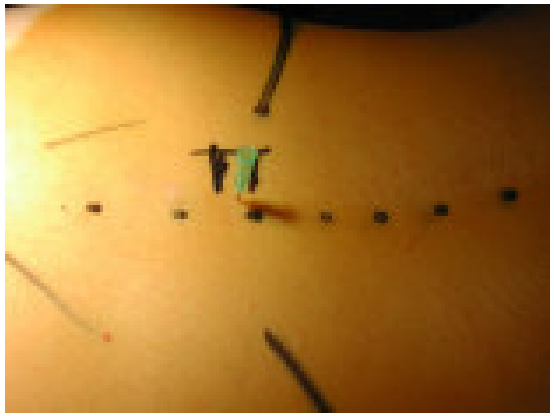


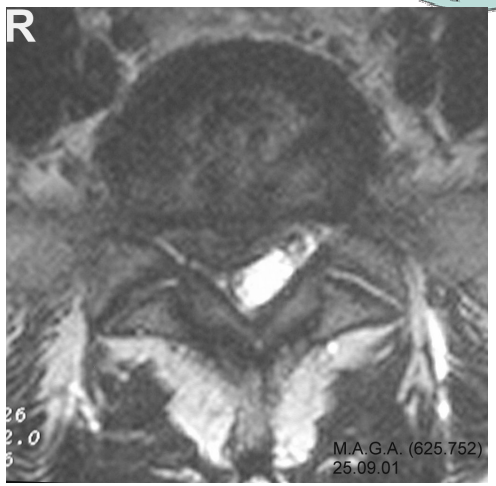


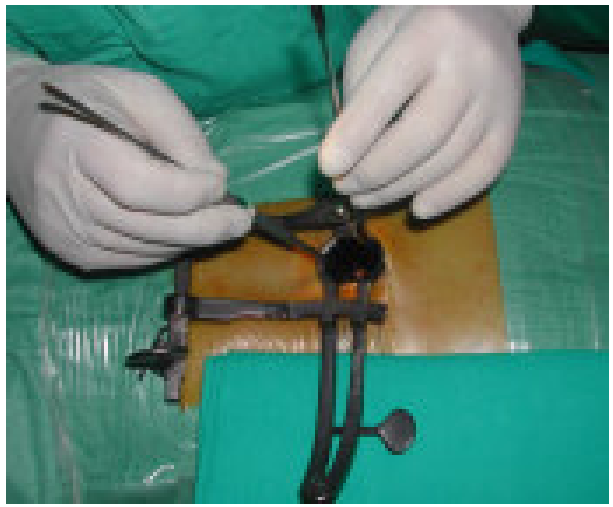


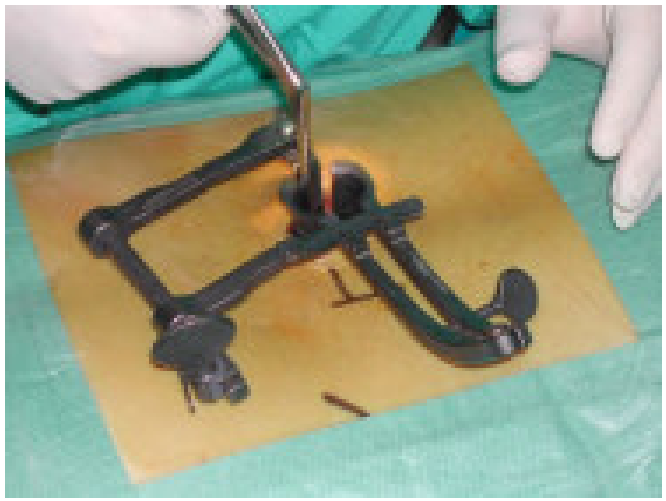
Lumbar MIS Discectomy

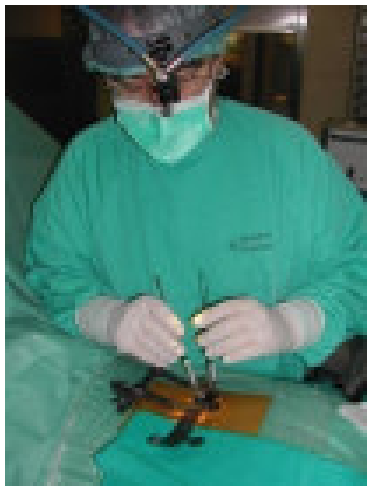
1. Microdiscectomy.
2. Endoscopic.
3. Minimally open.











Lumbar Discectomy

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

BY FRANK L. HERMANTIN, M.D.‡, TODD PETERS, M.D.§, LOUIS QUARTARARO, M.D.§, AND FARVIZ KAMBIN, M.D.**, PHILADELPHIA, PENNSYLVANIA

Journal of Bone and Joint Surgery, Jul 1999; 81, 7, pg. 958

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

TABLE II
POSTOPERATIVE FINDINGS

	Group 1: Laminotomy and Discectomy (N = 30)	Group 2: Arthroscopic Microdiscectomy (N = 30)
Mean age (yrs.)	40	39
Duration of disability (days)	49	27
Mean pain score* (points)	3.9	1.2
Mean score for frequency of postop. use of narcotics† (points)	2	1
No. of patients who were "very satisfied" with operative result	20 (67%)	22 (73%)

*On a scale of 0 to 10 points.
†On a scale of 1 to 5 points.

Analgesics (time): OPEN 25 days MIS 7 days

Time lost from wok: OPEN 6 wks MIS 4 wks

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

Lumbar Discectomy

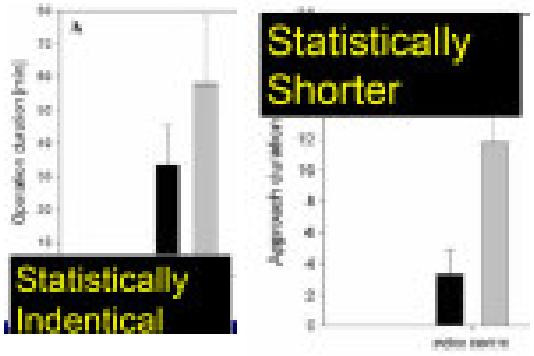
ORIGINAL ARTICLE

Comparison of a minimally invasive procedure versus standard microscopic discotomy: a prospective randomised controlled clinical trial

ORIGINAL ARTICLE

Microdiscectomy compared with standard discectomy: an old problem revisited with new outcome measures within the framework of a spine surgical registry

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



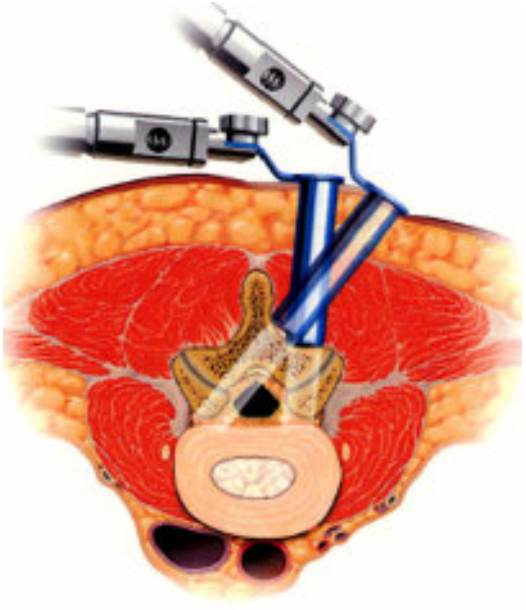
1. Prospective Non-randomised clinical Trial
2. 225 microdiscectomy Vs 36 standard discectomy

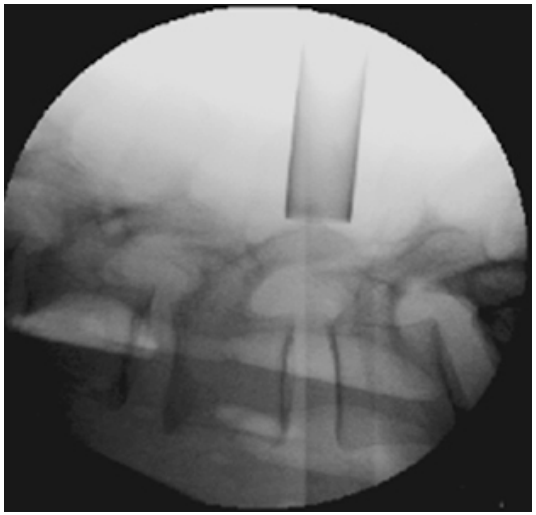
• Standard discectomy group: significantly greater blood-loss than the microdiscectomy (P>0.05).
• The use of the microscope did not lengthen the duration of the operation.

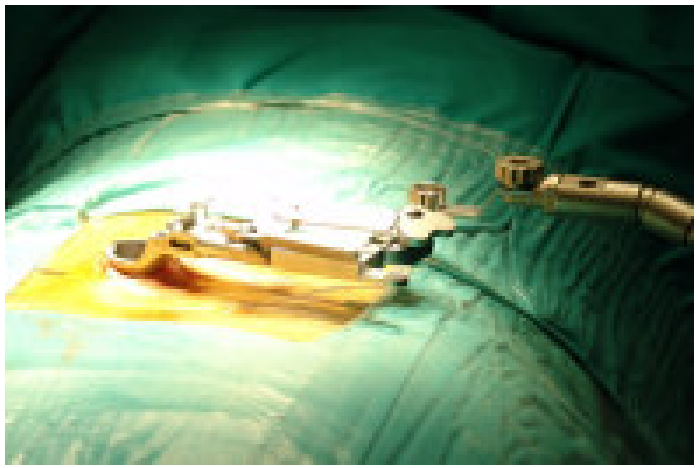
No differences in clinical outcomes

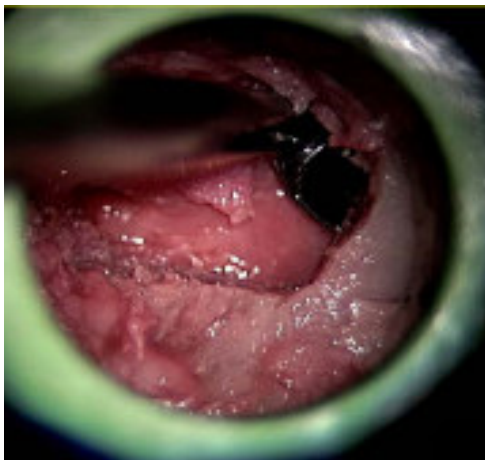
Lumbar Decompression

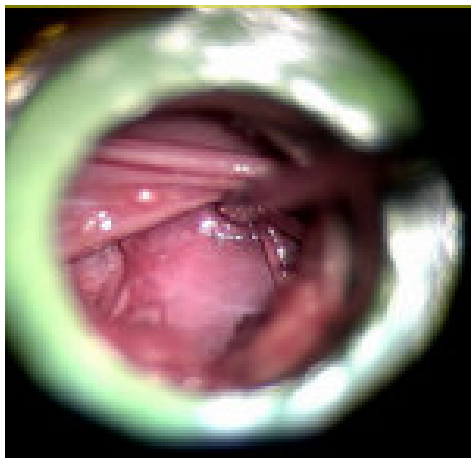
1. Midline decompression
2. Unilateral foraminal decompression
3. Bilateral foraminal decompression.











Lumbar Decompression

SPINE Volume 31, Number 19, pp E681–E691
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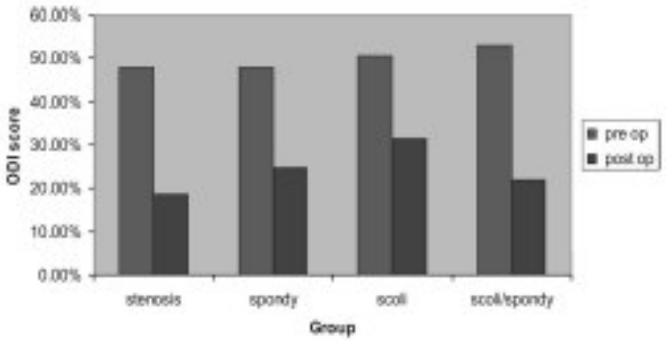
Success and Failure of Minimally Invasive Decompression for Focal Lumbar Spinal Stenosis in Patients With and Without Deformity

Michael O. Kelleher, FRCS(SN), MD, Marcus Timlin, MCh, FRCS (Tr&Orth), Orna Persaud, MSc, and Yoga Raja Rampersaud, MD, FRCS

- 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.

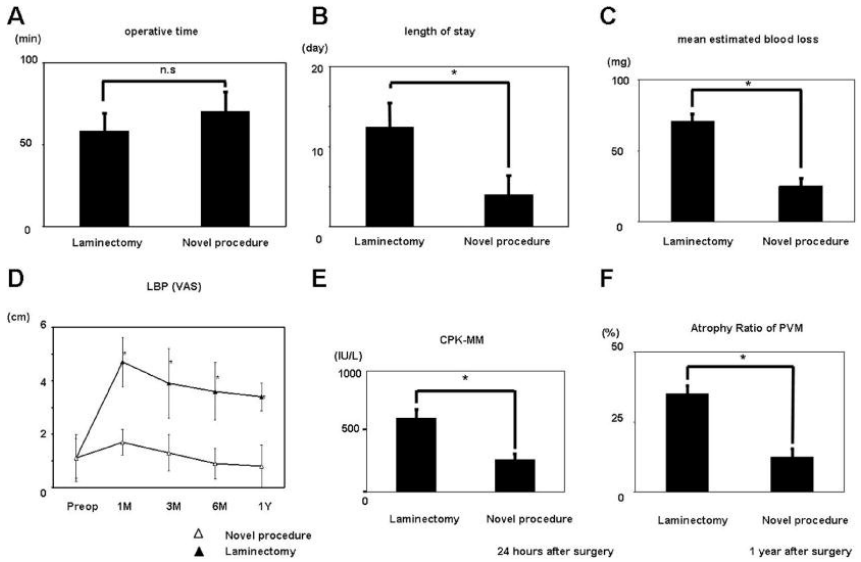
Lumbar Decompression

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.

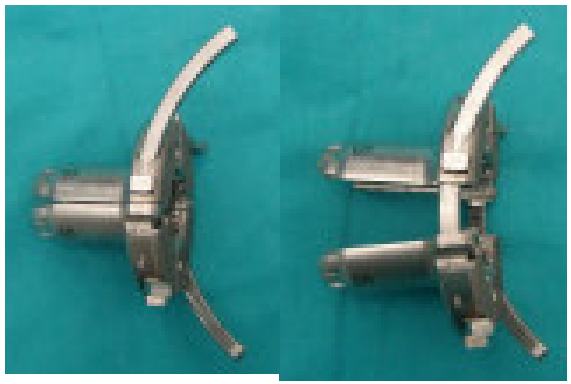
J Neurosurg Spine 2009, vol 10(4), 293-99

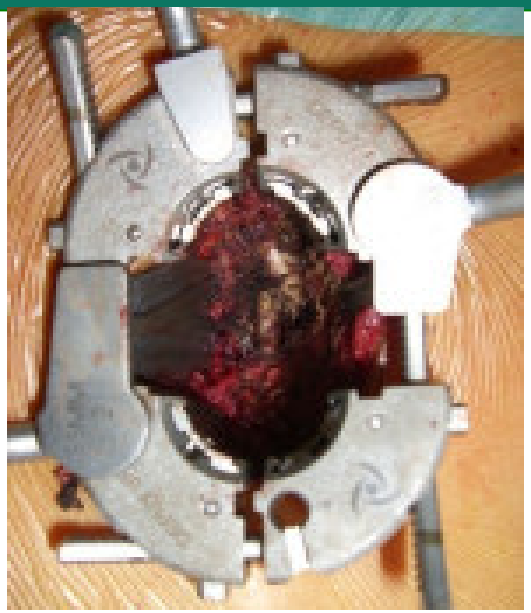
- Prospective. Level II evidence.
- 41 patients: comparing 20 MIS decompression vs 21 open laminectomy.
- Single level stenosis, single surgeon.

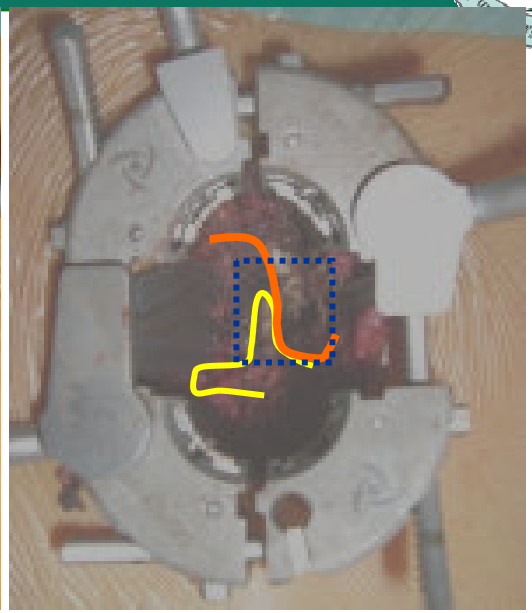


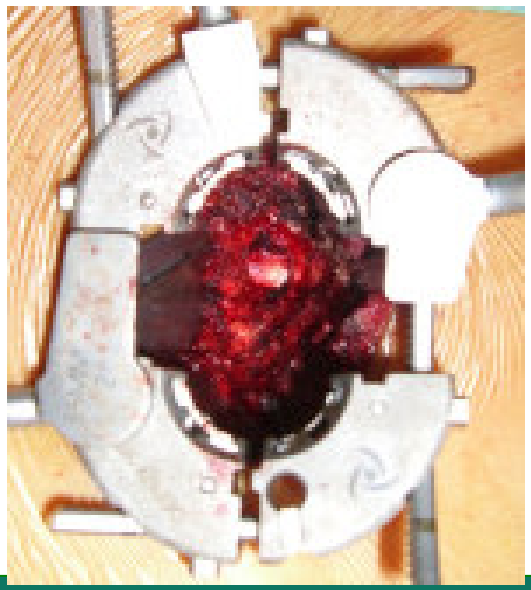
1. Conclusions: MIS superior in terms of VAS at 1 year, LOS, EBL and muscle damage
2. Limitations: small sample, single surgeon.

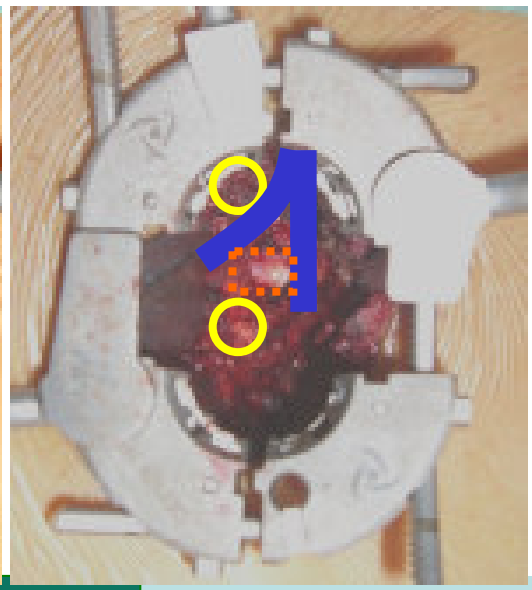
Lumbar Fusion: TLIF MIS



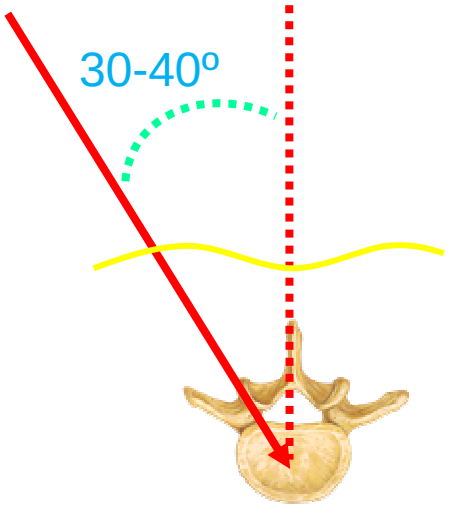


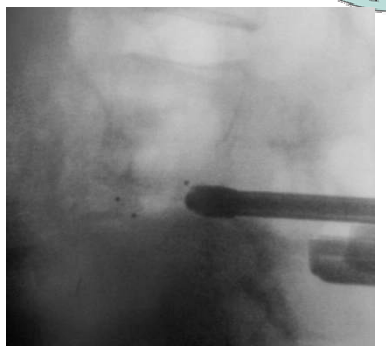


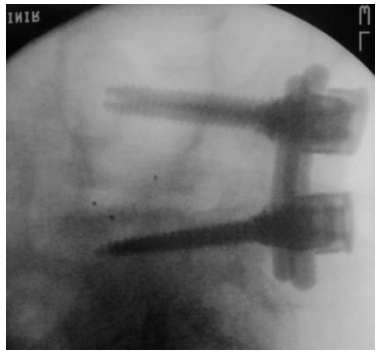




Lumbar Fusion: TLIF MIS







Lumbar Fusion: TLIF MIS

MISS vs OPEN TLIF

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

223 / 243

less blood loss

shorter hospitali-zation

longer operativ e time

NO clinical diferen

more technical complicatio ns.

Lumbar Fusion: TLIF MIS

SPINE Volume XX, Number XX, pp 000–000
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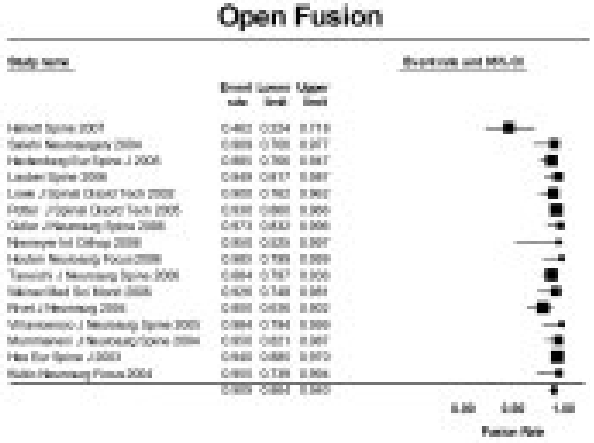
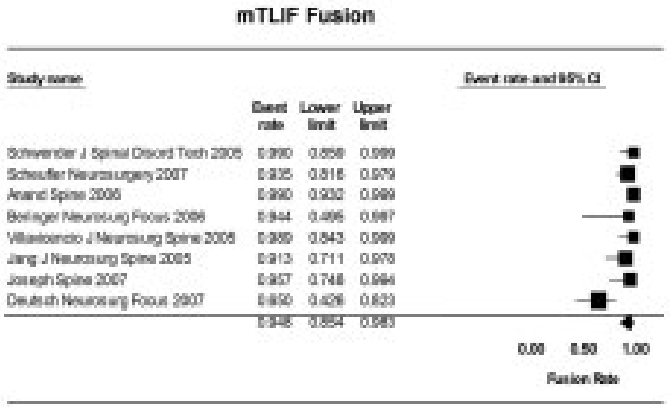
Minimal Access *Versus* Open Transforaminal Lumbar Interbody Fusion

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.

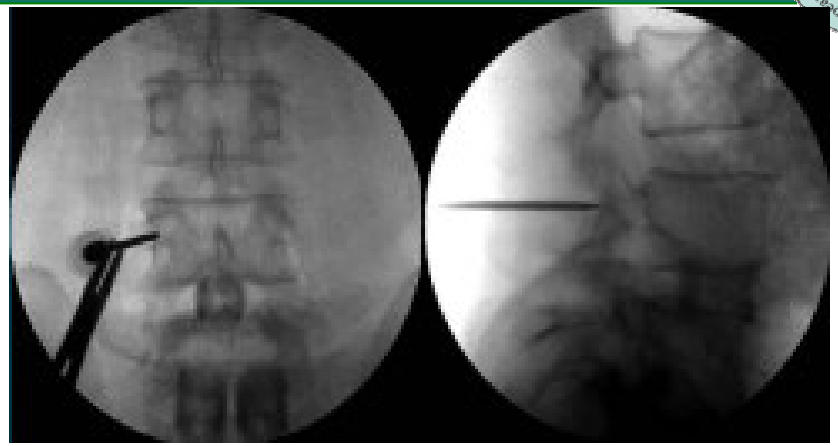


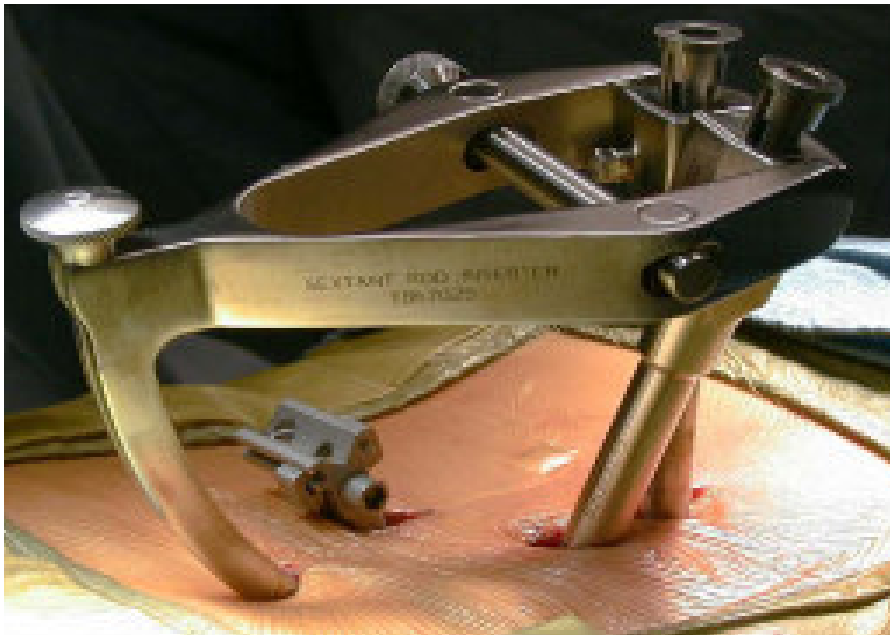


1. Concusions:
    1. Similar range of fusion in both groups.
    2. Similar complications rates.
2. Limitations: heterogeneus sample.

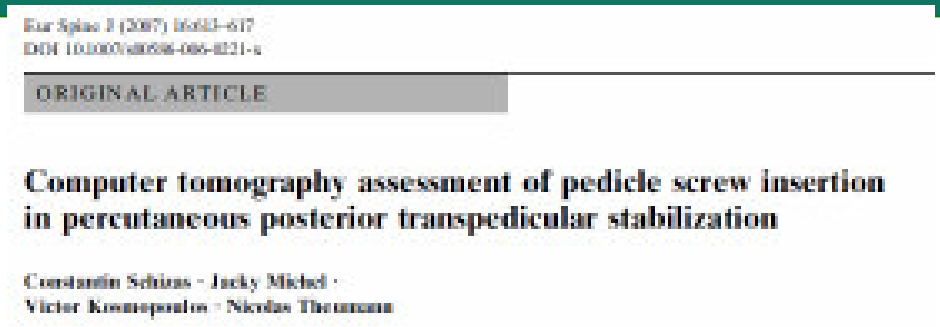
Lumbar Fusion: Pedicle Instrumentation.

1. Pedicle percutaneus instrumentation.
   - Fluoroscopy guidance.
   - C-Arm navigation
   - O-Arm navigation.





Lumbar Fusion: Pedicle Instrumentation.



Eur Spine J (2007) 16:613–617
DOI 10.1007/s00586-006-0221-x

ORIGINAL ARTICLE

Computer tomography assessment of pedicle screw insertion in percutaneous posterior transpedicular stabilization

Constantin Schizas · Jacky Michel · Victor Kosmopoulos · Nicolas Theumann

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

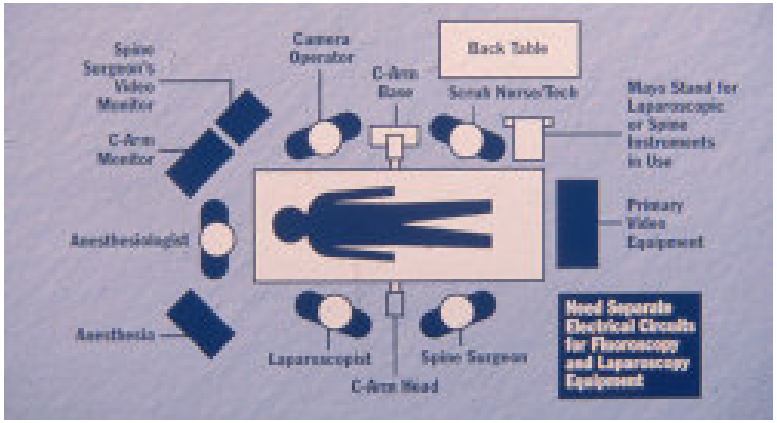
Perez-Cruet M et al. Early results of a prospective, multicenter, randomized clinical trial evaluating minimally invasive vs. open pedicle screw implantation outcomes. TSJ 2005; 5:S131

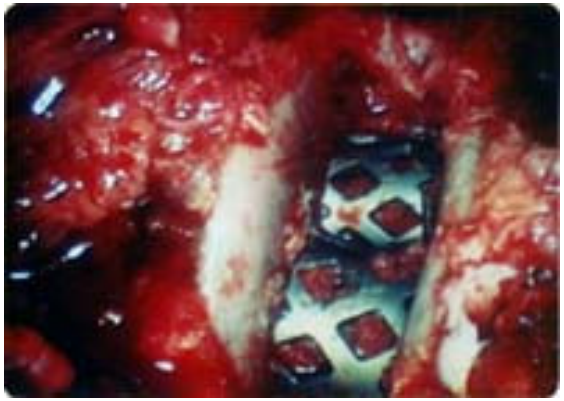
Conclusions:

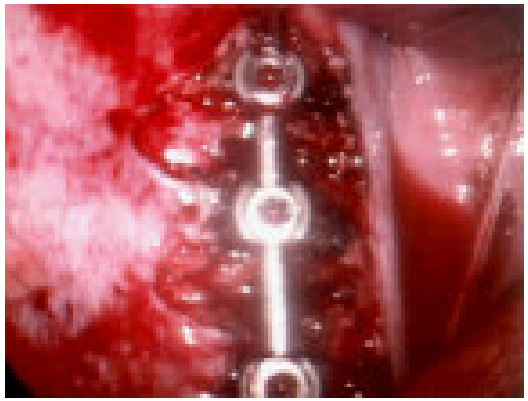
- Longer operative time (358 m vs 297m)
- Decreased blood loss (256 cc vs 519 cc)
- Shorter hospital stay (3 d vs. 4 d)
- Equal Clinical results

Lumbar fusion: Laparoscopy.

- Anterior Lumbar Interbody Fusion.
  - Extraperitoneal
  - Transperitoneal







Laparoscopy.

Laparoscopic Fusion of the Lumbar Spine: Minimally Invasive Spine Surgery: A Prospective Multicenter Study Evaluating Open and Laparoscopic Lumbar Fusion.
Regan, John; Yuan, Hansen; McAfee, Paul

Spine. 24(4):402-411, February 15, 1999.

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

	BAK Open		BAK Laparo-scopic		
	N	Mean	N	Mean	*P**
Blood loss L4–L5 (mL)	101	232.3	36	134.4	0.023
Blood loss L5–S1 (mL)	192	193.9	179	143.0	NS
Mean blood loss (mL)	305	207.2	215	141.7	0.005
Surgery time L4–L5 (min)	101	147.9	36	223.6	<0.001
Surgery time L5–S1 (min)	192	136.8	179	196.8	<0.001
Mean surgery time (min)	305	141.9	215	201.2	<0.001
Length of stay L4–L5 (days)	101	4.1	36	3.2	0.003
Length of stay L5–S1 (days)	192	3.8	179	3.4	NS
Mean length of stay (days)	305	4.0	215	3.3	0.005

* Levene's test for equality of variances.
NS = not significant.

Results:

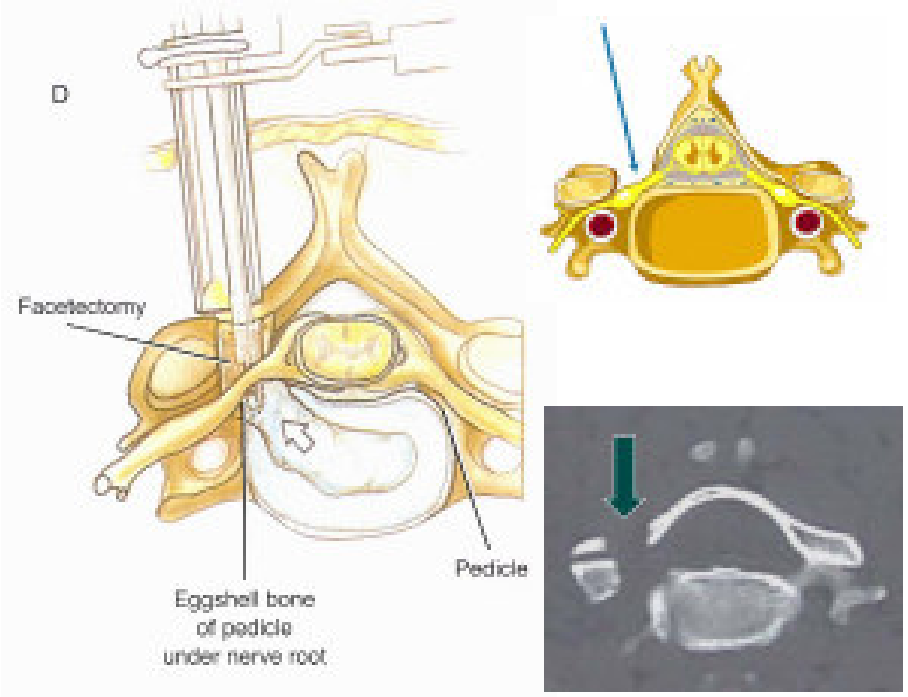
- No differences in results, revison and complication rate.
- Shorter stay and less blood loss.
- More operative time was spent.

	BAK Open (N = 305)	%	BAK LAP (N = 215)	%	*P**
Revision of implant	3	1.0	0	0.0	NS
Removal of implant	2	0.7	2	0.9	NS
Reoperation					
Bone graft Augmentation	1	0.3	0	0.0	NS
Early Decompression, discectomy, or laminectomy	0	0.0	7	3.2	0.002
Additional Stabilization	1	0.3	1	0.5	NS
Total	7	2.3	10	4.7	NS

* Fisher exact.
NS = not significant.

Cervical decompression.

1. Posterior cervical microforaminotomy.
2. Posterior Endoscopic foraminotomy.



Cervical decompression.

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Full-Endoscopic Cervical Posterior Foraminotomy for the Operation of Lateral Disc Herniations Using 5.9-mm Endoscopes

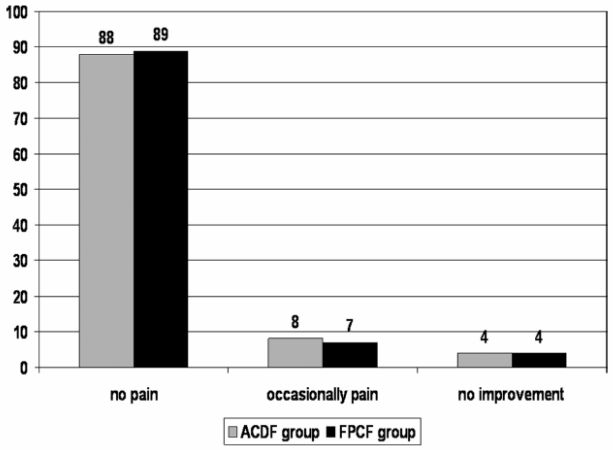
A Prospective, Randomized, Controlled Study

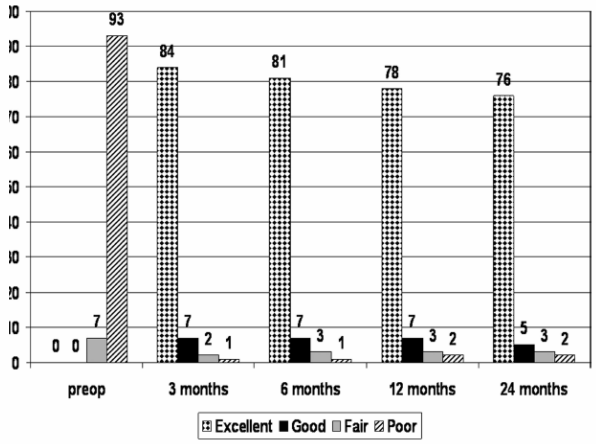
Sebastian Ruetten, MD, PhD,* Martin Komp, MD, PhD,* Harry Merk, MD,† and Georgios Godolias, MD‡

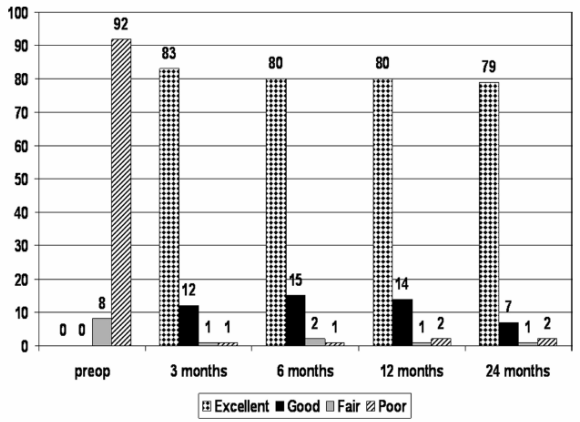
- 175 patients.
- Compared 86 anterior decompression vs 89 endoscopic posterior cervical foraminotomy.
- F-UP: 2 years.

Results:

- No differences in results, revison 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.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