Segmental stability following minimally invasive decompressive surgery with tubular retractor for lumbar spinal stenosis

Department of Spinal surgery,
Research Institute for Brain and Blood Vessels-Akita

Naoki Higashiyama, Taku Sugawara

The authors have declared no conflicts of interest.

Introduction

- Minimally invasive decompressive surgery using microscope with tubular retractor (MISMT) has been widely performed for the treatment of lumbar spinal stenosis (LSS).

- Postoperative spinal instability affects the clinical outcomes after decompressive surgery, however, there were few reports regarding the segmental stability following this surgery. In this study, clinical and radiological outcomes were evaluated.

Clinical Characteristics of 144 patients with lumbar spinal stenosis

No. of patients	144 (1 Level 121, 2 Level 23)
Sex (M/F)	89 ; 55
Age (range)	68.0±10.9 34-85
Neurological injury	None
Dural tear	4 (2.8%)

May. 2008 — Feb. 2013

(The mean follow-up period : 42 months)

Tubular retractor system

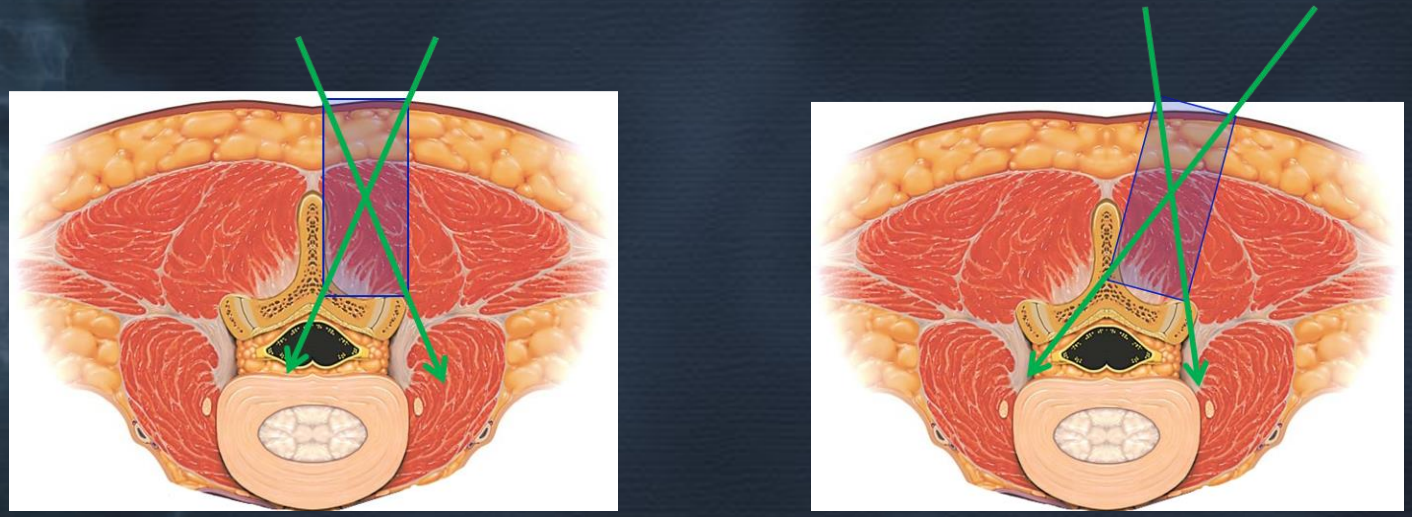
Benefits

- Smaller incision
- Less muscle trauma
- Less post-operative pain
- Shorter hospital stay
- Similar results as standard open surgery

Disadvantages

- There is a learning curve.
- Orientation is considerably reduced.
- This technique is more difficult with severe obesity.
- Direct repair of inadvertent dural tears is not possible.

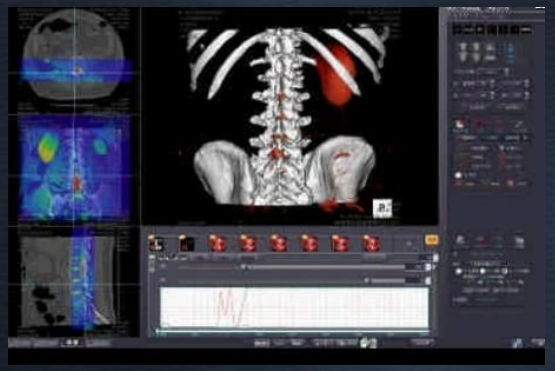
Unilateral approach for bilateral stenosis decompression



3T MRI
(MAGNETOM® Verio 3T,SIEMENS AG)

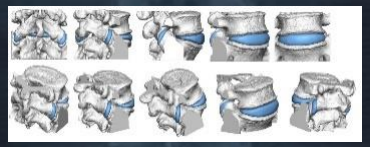
320列Area Detector CT
(Aquilion ONE™,Toshiba medical systems)

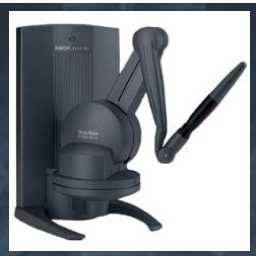
Surgical simulation ①



3D Dicom workstation（Ziostation, Ziostation2,Ziosoft, Inc.）

Surgical simulation ②





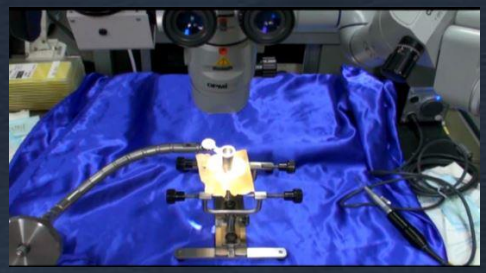
FreeForm®
（SensAble Technologies, Inc.）

Surgical simulation ③

Objet Connex500™
（Stratasys Ltd.)

uprinter SE™
（ Stratasys Ltd)

Surgical simulation ④



Assessment of outcomes

- Clinical outcomes

  VAS (Visual analogue scale)

  PVS (Pain vision scale)

  JOA score

- Radiographic measurements

  %slip

  Dynamic %slip between flexion & extension

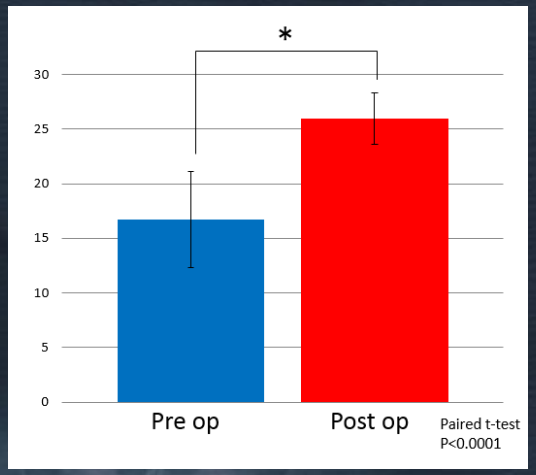
  ROM of the intervertebral disc space

  Posterior Intervertebral angle on flexion

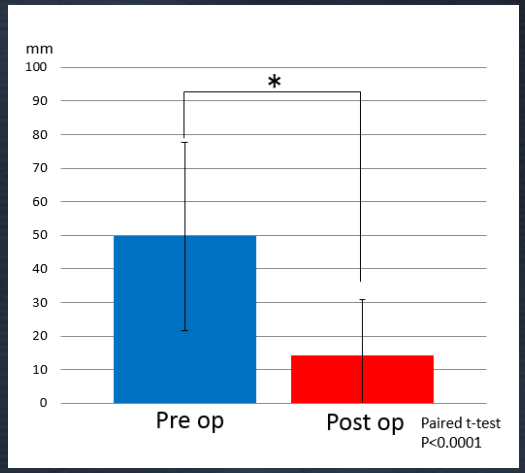
Results

Clinical outcomes

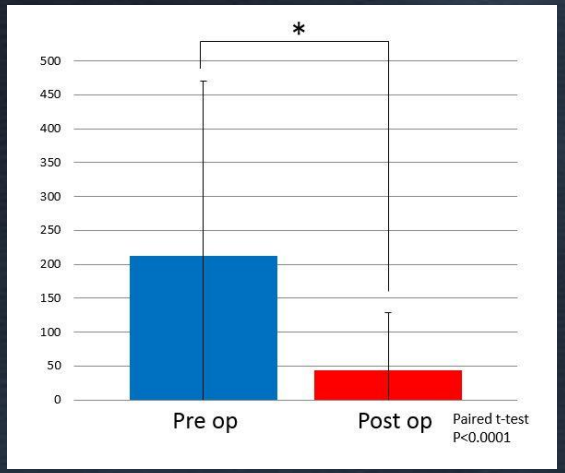
JOA score



VAS



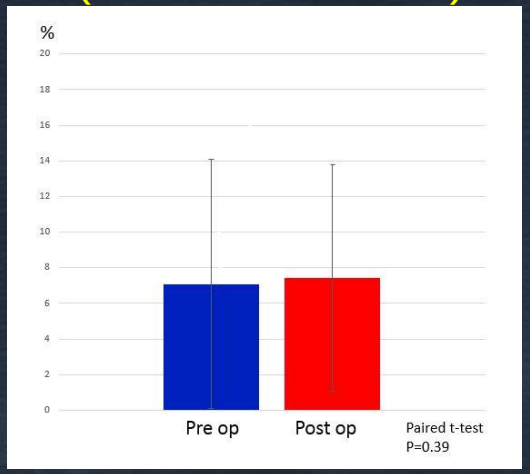
Pain vision scale



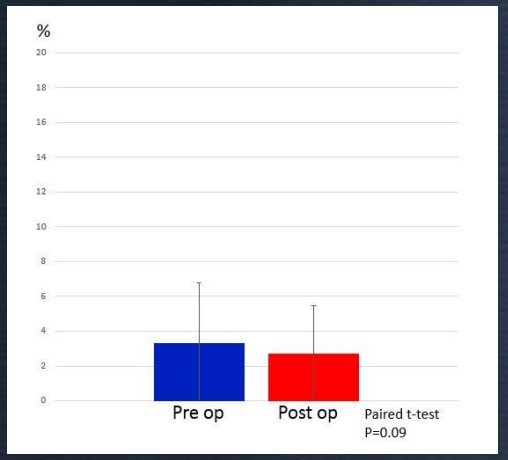
Results

Radiographic measurements

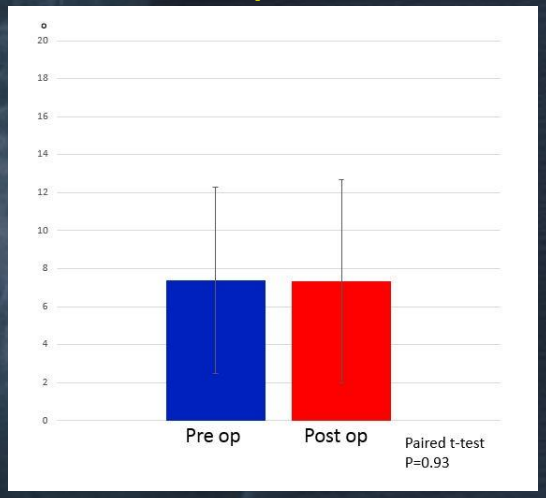
%slip (Taillard method[1])



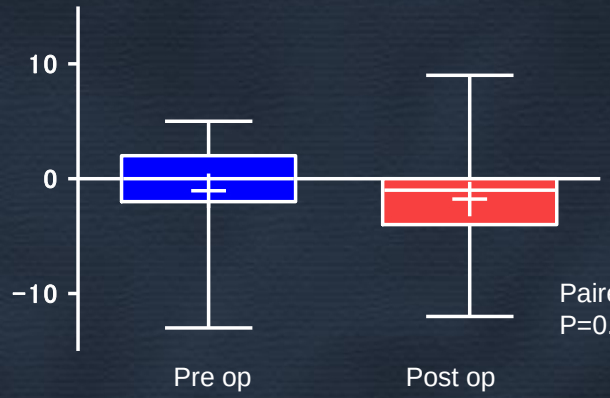
Dynamic %slip between flexion & extension



ROM of the intervertebral disc space[2]



Posterior Intervertebral angle on flexion



1) Taillard W. Acta Orthop Scand. 24:115–144.1954
2) Bible Je, et al. Spine 15;33:1793-9.2008

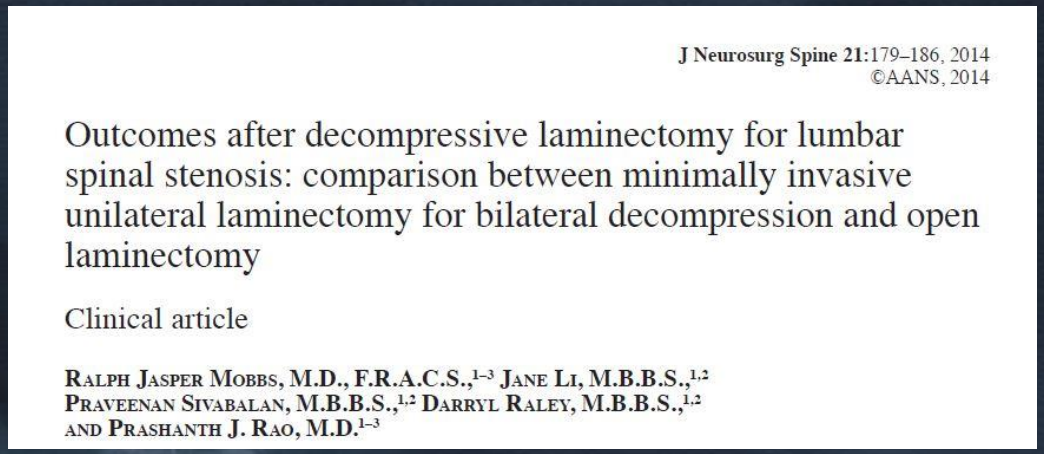
Discussion

- Minimal access spinal technique was first adapted to this approach using tubular retractor(METRx tube), and this was first reported independently by Fessler's group[1,2] and by Palmer et al[3].

1) Guiot BH, et al: Spine 27 : 432-438, 2002

2) Khoo LT, et al: Neurosurgery 51 : S146-S154, 2002

3) Palmer S, et al: J Neurosurg 97 : 213-217, 2002



J Neurosurg Spine 21:179–186, 2014

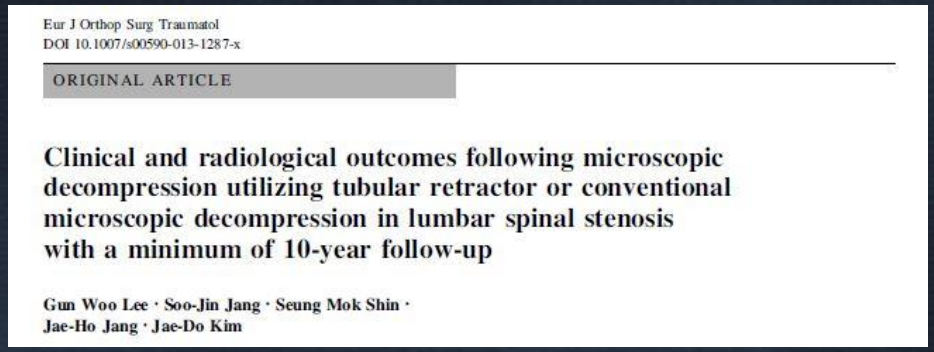
Outcomes after decompressive laminectomy for lumbar spinal stenosis: comparison between minimally invasive unilateral laminectomy for bilateral decompression and open laminectomy

Clinical article

Ralph Jasper Mobbs, M.D., F.R.A.C.S.,[1–3] Jane Li, M.B.B.S.,[1,2] Praveenan Sivabalan, M.B.B.S.,[1,2] Darryl Raley, M.B.B.S.,[1,2] and Prashanth J. Rao, M.D.[1–3]

- A randomized trial comparing minimally invasive unilateral laminectomy for bilateral decompression to standard laminectomy.
- MIULBD is as effective as open decompression in improving function (ODI score), with the additional benefits of a significantly greater decrease in pain (VAS score),postoperative recovery time, time to mobilization, and opioid use.

Discussion



Eur J Orthop Surg Traumatol
DOI 10.1007/s00590-013-1287-x

ORIGINAL ARTICLE

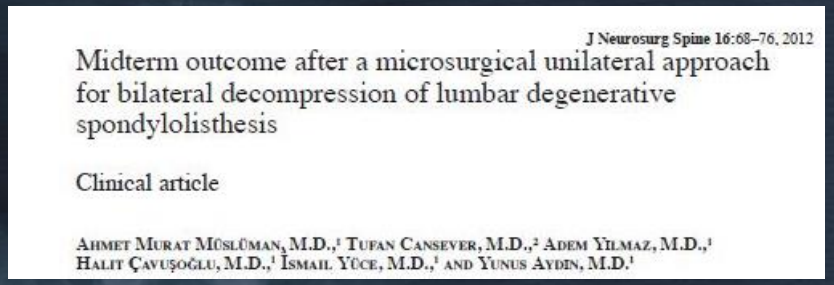
Clinical and radiological outcomes following microscopic decompression utilizing tubular retractor or conventional microscopic decompression in lumbar spinal stenosis with a minimum of 10-year follow-up

Gun Woo Lee · Soo-Jin Jang · Seung Mok Shin · Jae-Ho Jang · Jae-Do Kim

- MDT appears to result in less postoperative pain and better clinical outcomes in the acute postoperative period of <3 months
- Both MDT and CMD were no significant differences in clinical and radiological outcome after that time.

MDT : microscopic decompression with tubular retractor

CMD: conventional microscopic decompression



J Neurosurg Spine 16:68–76, 2012

Midterm outcome after a microsurgical unilateral approach for bilateral decompression of lumbar degenerative spondylolisthesis

Clinical article

Ahmet Murat Müslüman, M.D.,[1] Tufan Cansever, M.D.,[2] Adem Yilmaz, M.D.,[1] Halit Çavuşoğlu, M.D.,[1] İsmail Yüce, M.D.,[1] and Yunus Aydin, M.D.[1]

- Postoperative clinical improvement and radiological findings clearly demonstrated that the unilateral approach for treating 1-level and multilevel lumbar spinal stenosis with DS is a safe, effective, and less invasive method of reducing the need for stabilization.

Discussion

JNS SPINE

CLINICAL ARTICLE

J Neurosurg Spine 22:339–352, 2015

Minimally invasive laminectomy for lumbar spinal stenosis in patients with and without preoperative spondylolisthesis: clinical outcome and reoperation rates

Marjan Alimi, MD, Christoph P. Hofstetter, MD, PhD, Se Young Pyo, MD, PhD, Danika Paulo, BS, and Roger Härtl, MD

- The reoperation rate requiring fusion at the same level was 3.5%.
- Reoperation rates for instability are lower than those reported after open laminectomy.
- Patients with and without preoperative spondylolisthesis had no significant differences in their clinical outcome or reoperation rate.

Conclusion

- In this study, MISMT showed excellent clinical outcomes and preservation of spinal segmental stability.
- The use of tubular retractor for microsurgical decompression for LSS is a safe and effective treatment modality, but long-term observation is necessary.