Least Invasive Lumbar Decompression, Interbody Fusion & Pedicle Screw Implantation (LINDIF)

A Case Series Report

Disclosures

Royalties from Zimmer Spine
Least Invasive Lumbar Decompression, Interbody Fusion & Pedicle Screw Implantation (LINDIF)
A Case Series Report

To our Japanese colleagues who are here and back home:

- Kokoro yori okuyami moushiagemasu
- (From the heart I give you my condolences)
Least Invasive Lumbar Decompression, Interbody Fusion & Pedicle Screw Implantation (LINDIF)
A Case Series Report

Said G Osman, M.D.
Background

- List of Desirables
  - Desire to reduce:
    - * Surgical trauma
    - * Blood loss and the need for transfusion
    - * Anesthetic time
    - * Hospital stay
    - Post-op pain medicines
    - Down time to normal activities early
    - * Risk of complications in the elderly
    - * Escalating health care cost
  - * Desire by elderly patients to maintain high level of physical activities
Purpose of the study

- To determine if LINDIF can realize those desirable outcomes
**Patient Sample:** Case series by one surgeon at two centers

**Outcome Measures:** Operating time; intra-operative blood loss; hospital stay; VAS scores for back and leg pain; Roland-Morris Disability Questionnaire; and post-operative imaging studies.
Materials and Methods

- Total # of Patients = 60
  - Male = 30
  - Female = 30
Materials and Methods

Deg Disc Disease = 5
Deg. Motion Seg. = 49
Spondylolisthesis = 6
Operative Routine

- Prophylactic Antibiotics
- * Endotracheal Anesthesia
- Foley catheterization
- * Neuro-monitor
- * DVT prophylaxis
- Open frame operating table
- * Prone position
- * Transparent drapes
- Fluoroscopy/Navigation system
Procedure

- Percutaneous Pedicle Screw Instrumentation
- Interbody fusion
Percutaneous pedicle screw implantation
INTRADISCAL PROCEDURES

- **Establish Access channel to posterolateral disc**


ARTHROSCOPIC DISCECTOMY

- Postero-lateral approach
ARTHROSCOPIC DISCECTOMY

- Foraminal Space
- Posterolateral view of Kambin’s Triangle
ARTHROSCOPIC MICRODISCECTOMY

- Mid-Interpedicular placement
- Lateral placement
Arthroscopic discectomy & end-plate preparation
Endplate Preparation
Expandable Reamer System
Endplate Preparation

Expandable Reamer System
Endplate Preparation

Expandable Reamer System
Endplate Preparation
Interbody Grafting

- **Interbody Graft Material:**
  - Rh-BMP-2
  - Allograft Bone Chips
Interbody Grafting
Results
Results
# of cases = 60

Mean age = 52.7 years

- Age range = 26 – 85 years.
- Age Groups:
  - 20-30y = 3
  - 31-50y = 25
  - 51-70y = 20
  - 71-90y = 12
- **Duration of illness:**
  - Mean = 5 years
  - Range = 2m – 32 years
Follow-up:

- Mean: 12 months
- Range: 6 – 25 months
Results

**Complaints:**
- Back pain = 60
- Leg pain = 60
Fusion Levels

- L1-S1: 2
- L2-3: 1
- L2-4: 3
- L2-5: 1
- L2-S1: 1
- L3-5: 9
- L3-S1: 6
- L4-5: 8
- * L4-S1: 16
- * L5-S1: 13
**Fixation Device**

- **Implants used:**
  - * Denali (K2M) 19
  - SpheRx (Nuv) 6
  - Pathfinder (AS) 18
  - Sextant (Sofam) 17
Total OR Time

28 patients
Mean = 174 min
Range = 117 – 250.8 min
Total OR Time

1 level (7) = 2.5 hr.
2 levels (13) = 2.8 hrs.
3 levels (5) = 3.3 hrs.
4 levels (2) = 3.05 hrs
5 levels (1) = 4.1 hrs.
Estimated Blood Loss

Mean  57.6 cc
- Range  30 – 100 cc
Blood Loss vs # of Fused segments

- 1 Level (20) 47.8 cc
- 2 levels (31) 64.4 cc
- 3 levels (7) 61.4 cc
- 4 levels (1) 75.0 cc
- 5 levels (2) 62.5 cc
Length of Hospital Stay

- Mean: 2.6 days
- Range: 1-12 days
Hospital Stay vs # Fused Seg

- 1 level (20) 1.7 days
- 2 levels (21) 3.0 days
- 3 levels (8) 3.6 days
- 4 levels (1) 4.0 days
- * 5 levels (12) 12.0 days
Back Pain

Pre-op on VAS:
Mean: 7.5
Range: 0 – 10

At Last Follow-up:
Mean: 2
Range: 0 – 8
Leg Pain

Pre-op on VAS:
Mean: 7.0
Range: 0 – 10

At Follow-up:
Mean: 1.7
Range: 0 - 5
Prior Back Surgery

- Decompressions = 10
  - One Level = 5
  - Two Levels = 5
Prior Back Surgery

Back Pain /Leg Pain
All:
Preop: 7.5/7.0
Postop: 2.0/1.7

Failed Back:
Preop: 7.0/8.0
Postop: 0.8/0.6
Prior Back Surgery

Hospital stay
All: 2.0 days
Failed Bk: 1.8 days
Post-op Images

- 45 sets reviewed
  - 28 solid fusion
  - 15 stable constructs
  - 2 cases of osteolysis around pedicle screws
Post-operative Imaging Studies

3 months post-op

6 months post-op
Complications:

- 1 medial penetration of S1 pedicle with irritation of S1 nerve root - revised
- 1 case of painful loose pedicle screws – Removal.
# Comparative Data

<table>
<thead>
<tr>
<th>Procedure</th>
<th>OR Time (min)</th>
<th>EBL (ml)</th>
<th>LOS (Days)</th>
<th>Complication Rates (%)</th>
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</thead>
<tbody>
<tr>
<td>LINDIF</td>
<td>174*</td>
<td>57.6</td>
<td>2.6</td>
<td>1.8</td>
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<tr>
<td>X-LIF +/- Post. ins</td>
<td>165</td>
<td>119</td>
<td>3.4</td>
<td>13.3</td>
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<tr>
<td>MIS TLIF</td>
<td>230.2</td>
<td>264.7</td>
<td>5.6</td>
<td>5.6</td>
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<tr>
<td>OPEN PLIF/TLIF</td>
<td>213.9</td>
<td>693</td>
<td>8.1</td>
<td>4.9</td>
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</tbody>
</table>
CONCLUSION

LINDIF minimizes surgical trauma:
- Avoids violation of natural cavities – spinal, peritoneal, thoracic
- Avoids excision of the facet joint
- Avoids the Psoas Space
- Avoids retroperitoneal space

Reduced Surgery time
Reduced Blood loss
Short Hospital stay
Minimal rate of complications
Good symptomatic relief

Walking 3 hrs post-op
CONCLUSION

- VERY WELL TOLERATED BY ELDERLY PATIENTS
- LEAST STRESSFUL FOR THE SURGICAL TEAM
CONCLUSION

- Randomized Controlled Trial (RCT) is needed to determine:
  - Accuracy of above findings
  - Cost-Effectiveness Analysis
  - Reduction in rehab duration
  - Earlier return to prior occupation/recreation
  - Complication compared with open & other MIS procedures.
Bibliography

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Thanks