Postoperative foraminal diameter should be more than 1.9 mm to prevent iatrogenic foraminal stenosis after cervical pedicle screw fixation

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INTRODUCTION

- The incidence of iatrogenic foraminal stenosis (IFS), which is not directly attributable to cervical pedicle screw (PS) insertion: 0.6-50%.

- Foraminotomy is recommended for preventing IFS.
  - Hojo Y et al. Eur Spine J 2011

- In 8.3% of the nerve roots IFS occurred even after foraminotomy. Therefore we introduced facetectomy, which can visualize the entire nerve root. (J. Spine Res.)
PURPOSE

• The preop. foraminal diameter causing IFS has been investigated. However, the postop. foraminal diameter for preventing IFS has not been discussed.

• This study aimed to determine the optimal postop. foraminal diameter to prevent IFS.
MATERIALS and METHODS

- March 2007- March 2013
- PS fixation C4/5- C7/T1 for instability or kyphosis
- 43 pts, 102 levels
- 204 roots (C5: 72, C6: 58, C7: 48, C8: 26)
  - No decompression 125 roots
  - Foraminotomy 52 roots
  - Facetectomy 27 roots
- CSM 20 pts, CSMR 13 pts, OPLL 10 pts, CP 9 pts
- Age: avg. 62 y. o. (36- 81y. o.)
- Investigated factors
  - Incidence of IFS (worsening of MMT score by 1 grade or more)
  - Foraminal diameter (postop. axial CT)
RESULTS

Overall

4.9% (10/204 roots) C5: 7, C6: 1, C8: 2 (p<0.05)

45% (10/22 roots) with diameter of 1.8 mm or more: IFS

- IFS: n=10, avg. 1.3mm
- no IFS: n=194, avg. 4.1mm (p<0.001)

1.8 mm = cut off value (sensitivity 100%, specificity 86%, ROC analysis)
No decompression

4.0% (5/125 roots) C5: 2, C6: 1, C8: 2

38% (5/13 roots) with diameter of 1.6 mm or less: IFS

nof decompression

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38% (5/13 roots) with diameter of 1.6 mm or less: IFS

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38% (5/13 roots) with diameter of 1.6 mm or less: IFS
Foraminotomy

7.7% (4/52 roots) C5: 4

67% (4/6 roots) with diameter of 1.7 mm or less: IFS

△ IFS
n=4

○ no IFS
n=44
Facetectomy

3.7% (1/27 roots) C5: 1

- IFS
  - n=1
- no IFS
  - n=26

Roots

- 2.9 mm

Diameter (mm)

- 1.8 mm
58 y.o. male
CSMR

kyphosis 9 deg.

CS C4/5/6/7
FS C4/5 Blt.
58 y.o. male
CSMR

no IFS

lordosis 1 deg. (10 deg. ↓)
ant. slip 1.3mm (3.2mm ↓)

PSF C4/5, facetectomy C4/5 Blt.
DISCUSSION and CONCLUSIONS

- Degenerative cervical diseases have foraminal stenosis in many cases. Therefore, IFS may be caused unpredictably by rigid fixation, decreased kyphosis, or unexpected posterior translation.

- Foraminotomy: decompresses only the inlet of the foramen.

- Facetectomy: decompresses the entire foramen from the inlet to the outlet, allowing clinicians to fully observe the nerve roots.
• IFS occurred in 45% of nerve roots, especially when the diameter was 1.8 mm or less, even after foraminotomy or facetectomy.
• Therefore, facetectomy is preferred to secure a foraminal diameter of 1.9 mm or more.

**COI DISCLOSURE**

- **Akiyoshi Yamazaki**
  - Medtronic Sofamor Danek
  - Alfatec Spine
- **Tomohiro Izumi, Yu Sato, Tatsuki Mizouchi, Ryuta Fujikawa**
  - Nothing