Facetectomy is more effective than foraminotomy to prevent iatrogenic foraminal stenosis after pedicle screw fixation in the cervical spine

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Purpose

• The incidence of iatrogenic foraminal stenosis (IFS) after cervical pedicle screw (PS) fixation has been reported to be 0.6-50%.

• The use of posterior foraminotomy is recommended for preventing IFS. However, in some cases, IFS occurs even after foraminotomy. So we introduced facetectomy.

• To compare the effectiveness of foraminotomy with that of facetectomy in preventing IFS after PS fixation.
Materials and Methods

- 2007- 2012
- PS fixation C4/5- C7/T1 for instability and/ or kyphosis
- 43 patients, 95 disc levels
- 190 roots
  - no decompression 117
  - foraminotomy 48
  - facetectomy 25
- CSM 16, CSMR 13, OPLL 10, CP 7, trauma 3
- Age: avg 62 y.o. (36 - 81)
Levels

roots

C5  C6  C7  C8

p<0.01

- Green line: No decompression
- Blue line: Foraminotomy
- Red line: Facetectomy
RESULTS

• Incidence of IFS
  – 4.3 % (5/117 roots) without decompression
    • C5 in 2 roots, C6 in 1, C8 in 2
  – 8.3% (4/48 roots) with foraminotomy
    • C5 in 4 roots
  – 0% (0/25 roots) with facetectomy

(p=0.197)
No decompression

5/13 roots (38%) with diameter ≤1.7 mm: IFS

IFS
n=5
Avg. 1.3mm
( p< 0.001)

No IFS
n=112
Avg. 3.7mm

= cut-off value (sensitivity100%, specificity89%, ROC analysis)
Foraminotomy

4/22 roots (18%) with diameter ≤1.8 mm: IFS

Avg. 1.7mm

IFS
n=4

No IFS
n=44

Avg. 2.1mm

(p<0.05)

1.8 mm

= cut-off value (sensitivity 100%, specificity 65%, ROC analysis)
71 y.o. female CSMR

kyphosis 10 deg.

Canal stenosis C3/4/5/6/7

Foraminal stenosis C4/5 Lt., C5/6 Rt.
71 y.o. female CSMR

No IFS

Lordosis 20 deg.

Facetectomy C4/5 Blt.
Foraminotomy C5/6 Blt.
DISCUSSION

• In this study, even after foraminotomy, IFS occurred in 8.3% of roots. However, it did not occur after facetectomy. Therefore, foraminotomy is not sufficient to prevent IFS.

• Foraminotomy decompresses the inlet of the foramen and does not decompress the outlet. Therefore, it may cause IFS by rigid fixation with decreased kyphosis or increased posterior translation unexpectedly.
Facetectomy decompresses the entire foramen from the inlet to the outlet, allowing surgeons to observe the nerve roots fully even after instrumentation.
Prophylactic foraminotomy

• Hojo et al. (Eur Spine J 2011)
  – C4/5 foraminal diameter:
    • Avg 1.8 mm (1-4) with IFS
    • Avg 4.4 mm (2-8) without IFS

• Nakashima et al. (J Neurosurg. Spine 2012)
  – C4/5 foraminal diameter (cut-off value):
    • Preop. 2.2 mm
    • Postop. 2.3 mm

• This study
  – Facetectomy should be performed especially at C4/5.

None of the authors has any potential conflict of interest.