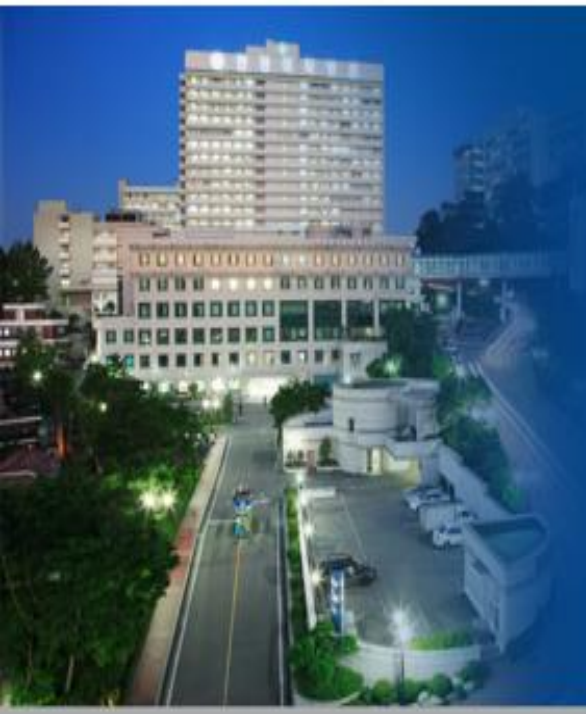


Outcomes of Use of Cement-augmented Cannulated Pedicle Screw in Lumbar Spinal Fusion

Sang Hoon Park, M.D., Incheol Kook, M.D.,
Sung Hoon Choi, M.D., PhD.,
Dong Ryul Heo, M.D., Chang-Nam Kang, M.D., PhD.

Department of Orthopedic Surgery, Hanyang University
College of Medicine, Seoul, Korea

Introduction

- **Purpose**

  Radiological and **clinical** outcomes between Cement-augmented CPS group **(Group C)** and Solid pedicle screw group **(Group S),** which executed **according to risk factors**

Materials and methods

- **Retrospective review**

  187 patients underwent surgery for degenerative spinal disease

  Single institution, one spine surgeon (CNK)

  Jan. 2014 ~ Jan. 2019

  Minimum 12 months f/u (6wk, 3mo, 6mo, 12mo, annual f/u)

- **Exclusion criteria**

  Spinal fusion d/t trauma, infection or tumor

  F/u less than 12 months

Materials and methods

- **Risk factors assessment**

Old age (>65yrs)

Osteoporosis (T<-2.5)

Autoimmune dz (RA, SLE, etc)

CKD Stage≥3

≥2 RFs: Cement-augmented CPS fixation

1 RF: Surgeon's choice & General condition

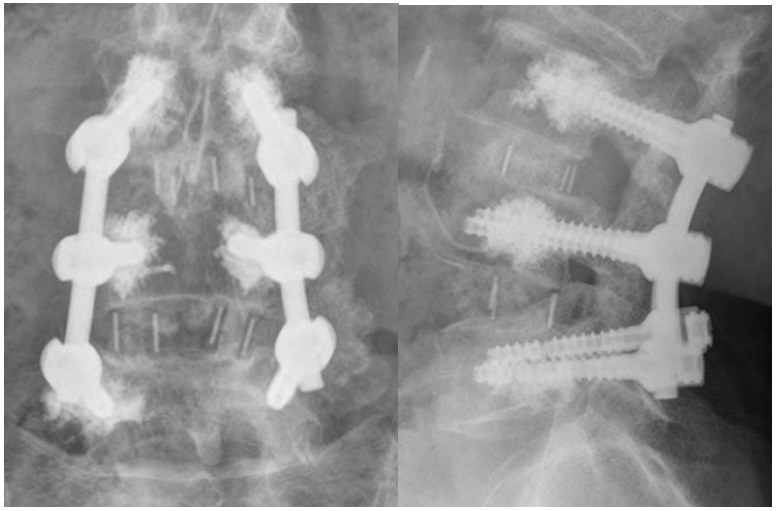
0 RF : Solid screw

Materials and methods

- **Surgical technique**

  - **Posterior** midline incision
  - **Laminectomy** + **Pedicle screw** fixation (**+cement** 1.5cc/screw)
  - **Interbody** fusion & **Posterolateral** fusion

Materials and methods



Results (1)

Variables	Group S (n=132)	Group C (n=55)	P-value
Age (yr)	67.2±9.8	71.3±7.0	0.002
Gender (M:F)	35:97	13:42	0.681
Osteoporosis (T-score)	-1.8±1.0	-2.2±1.0	0.005
Autoimmune disease	0%(0/132)	12.7%(7/55)	<0.001
Stage 3-5 CKD	0%(0/132)	16.4%(9/55)	<0.001
Fusion level	2.1±1.3	2.0±1.2	0.574
Number of screws	6.0±2.4	5.9±2.4	0.792
Follow-up period (month)	18.7±7..2	16.6±6.6	0.605

CKD, Chronic kidney disease
Values are given as mean±standard deviation
*Significant difference

Results (2)

Variables	Group S (n=132)	Group C (n=55)	P-value
VAS-BP(Preoperative)	5.2±2.4	5.6±2.3	**0.333**
VAS-BP(Final)	2.6±2.8	2.8±2.2	0.755
VAS-LP(Preoperative)	5.8±2.6	6.1±2.2	**0.382**
VAS-LP(Final)	2.8±2.6	3.3±2.6	**0.210**
K-ODI(Preoperative)	26.6±8.3	26.4±5.8	**0.866**
K-ODI(Final)	16.3±10.4	17.4±8.5	0.470

VAS-BP, visual analogue scale-back pain; VAS-LP, visual analogue scale-leg pain; K-ODI, Korean Oswestry Disability index
Values are given as mean±standard deviation

Results (3)

Variables	Group S (n=132)	Group C (n=55)	P-value
Preoperative segmental angle(°)	23.2±12.0	19.3±7.9	0.243
Postoperative segmental angle(°)	28.0±13.9	26.2±7.5	0.614
Final segmental angle(°)	22.4±13.7	23.9±7.8	0.666
Loss of correction(°)	5.6±4.9	2.2±3.6	0.019*
Clear zone	72/775 (9.3%)	12/324 (3.7%)	0.001*
Screw migration	44/775 (5.7%)	8/324 (2.5%)	0.022*
Screw pull-out	17/775 (2.2%)	6/324 (1.9%)	0.718
Screw breakage	0/775 (0%)	13/324 (4.0%)	0.000*
Location(mm)		16.6±2.9	
Time(month)		4.7±3.0	

Results (4)

Variables	Group S (n=132)	Group C (n=55)	P-value
Cage subsidence	10 (7.6%)	2 (3.6%)	0.514
Cage migration	6 (4.5%)	3 (5.5%)	0.724
Rod breakage	5 (3.8%)	1 (1.8%)	0.672
Fusion grade			
Interbody(BSF)_6mo	84 (63.6%)	40 (72.7%)	0.231
Interbody(BSF)_1yr	118 (89.4%)	50 (90.9%)	0.755
Posterolateral(Lenke)_6mo	81 (92.0%)	23 (88.5%)	0.570
Posterolateral(Lenke)_1yr	86 (97.7%)	25 (96.2%)	0.660

Discussion

- **Radiological assessment**

  - Group C: **Lower** loosening, screw migration, loss of correction
  - 13 screw breakage (16.4%), mean 4.7 months (2-12months)

❖ **All** breakage in **proximal** hole

  - ✓ **Pull-out strength** & **Toggling effect** **concentrated** to proximal hole

  → **Stress riser**, screw breakage

Discussion

- **Clinical assessment**

➢ **Osteoporotic** patients : **Higher** **non-union** rates after 1 level fusion

Cho et al. *J Orthop Sci.*, 2018

➢ **Non-union** after fusion: **Lower** social function (i.e. walking)

Makino et al. *J Orthop Sci.*, 2014

➢ **Osteoporosis** and **risk factors** : **High** possibility of **inferior** clinical results

→ **High risk group** with cement, **no** significant clinical difference

➢ Cement augmentation **enhances** stability, **solid union** achieved

Discussion

- **Complications**

  - **Previous** report: High frequency of PTE after cement augmentation

    Jenssen et al. *Spine J.*, 2017

  → No significant differences

  - 1 cement leakage **without sx**: Cement injection **with caution**

  1) Not injected when loss of **Inf. wall** of **pedicle**, **Post. cortex** of **body**

  Fransen et al. *J Neurosurg Spine.*, 2007

  2) Injected at dough phase, checking viscosity

  Burval et al. *Spine*, 2007

  3) Continuous C-arm image monitoring, Cement less than 2ml per screw

  Abousayed et al. *J Craniovertebr Junction Spine.*, 2018

  4) Screw first, Cement later via special tube

  Pare et al. *Spine.*, 2011

  → All methods above were used

  → Could be a safe surgical option

Conclusion

- Using **cement-augmented CPS** to **High risk groups** for screw failures showed **reduced** acute radiological complications & provided **compatible** clinical results

- Using cement-augmented CPS is a **good technical option**, especially **High risk groups** for screw failures

Thank you

Disclosure declaration

none of the authors has any potential conflict of interest

*Corresponding author.Department of Orthopaedic Surgery, HanyangUniversity College of Medicine, 222 Wangsimni-ro, Seongdong-gu, Seoul,04763, Republic of Korea, Tel: +82-2-2290-8485, fax: +82-2-2299-3774E-mail address:cnkang65@hanyang.ac.kr(C.-N. Kang)