Cervical Spondylotic Myelopathy treated by Unilateral Biportal Endoscopy

MAN KYU PARK

GOOD GANG AN HOSPITAL, BUSAN, SOUTH KOREA

Endoscopic surgery for cervical spondylotic myelopathy

Microendoscopic decompression

Eur Spine J (2010) 19:487–493
DOI 10.1007/s00586-009-1233-0

ORIGINAL ARTICLE

Clinical outcomes of microendoscopic decompression surgery for cervical myelopathy

Akihito Minamide · Munehito Yoshida · Hiroshi Yamada · Yukihiro Nakagawa · Kazuhiro Maio · Masaki Kawai · Hiroshi Iwasaki

Microendoscopic decompression for cervical spondylotic myelopathy

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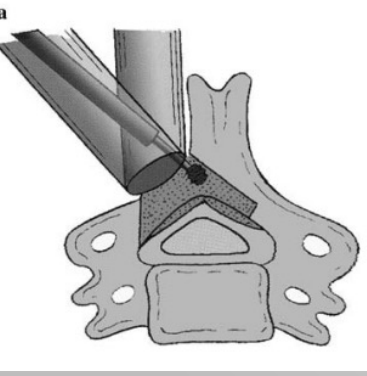
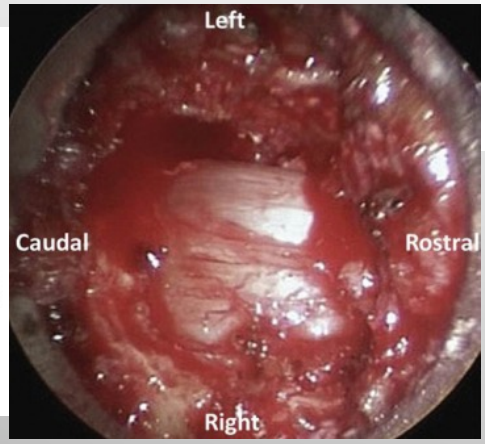
Clin Spine Surg. 2021 Dec 1;34(10):383-390. doi: 10.1097/BSD.0000000000001200.

Long-term Clinical Outcomes of Microendoscopic Laminotomy for Cervical Spondylotic Myelopathy: A 5-Year Follow-up Study Compared With Conventional Laminoplasty

Akihito Minamide [1 2], Munehito Yoshida [1], Yukihiro Nakagawa [1], Motohiro Okada [1], Masanari Takami [1], Hiroshi Iwasaki [1], Shunji Tsutsui [1], Takuhei Kozaki [1], Shizumasa Murata [1], Ryo Taiji [1], Kimihide Murakami [1], Hiroshi Hashizume [1], Yasutsugu Yukawa [1], Hiroshi Taneichi [2], Hiroshi Yamada [1], Andrew J Schoenfeld [3], Andrew K Simpson [3]





Conclusions: CMEL is a novel, less invasive, technique that allows for multilevel posterior cervical decompression for treatment of CSM. Our 5-year follow-up data demonstrates that patients after CMEL have similar neurological outcomes to conventional laminoplasty, with significantly less postoperative axial pain and improved subaxial cervical lordosis when compared with their traditional laminoplasty counterparts.

Endoscopic surgery for cervical spondylotic myelopathy

Microendoscopic decompression

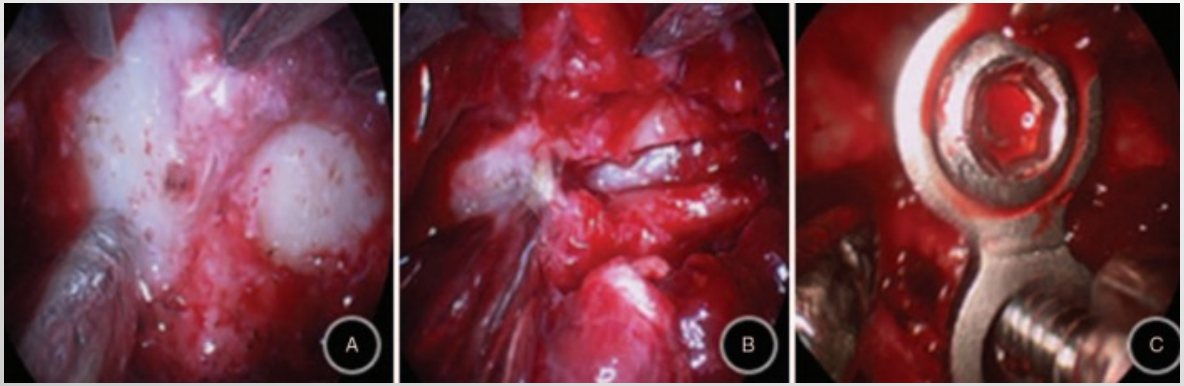
Spine

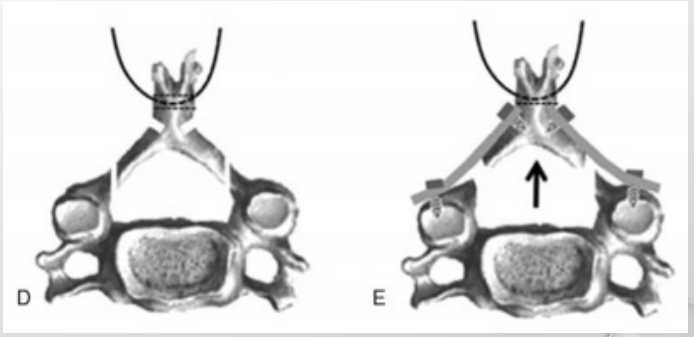
SPINE Volume 41, Number 19B, pp B44–B51

ORIGINAL PAPER

Cervical Endoscopic Laminoplasty for Cervical Myelopathy

Chunlin Zhang, MD, Dongzhe Li, MD, Chuangjian Wang, MD, and Xu Yan, MD





Endoscopic surgery for cervical spondylotic myelopathy

Full- endoscopic

Review > World Neurosurg. 2023 Jul:175:142-150. doi: 10.1016/j.wneu.2023.05.012. Epub 2023 May 9.

Full Endoscopic Spine Surgery for Cervical Spondylotic Myelopathy: A Systematic Review

Chao-Jui Chang [1], Yuan-Fu Liu [2], Yu-Meng Hsiao [3], Wei-Lun Chang [2], Che-Chia Hsu [4], Keng-Chang Liu [5], Yi-Hung Huang [6], Ming-Long Yeh [7], Cheng-Li Lin [8]

Results: The study included 183 patients and their age was 56.78 ± 7.87 years. The average surgical time calculated was 96.34 ± 33.58 minutes. Intraoperative blood loss ranged from a minimal amount to 51 mL. The average duration of hospital stay was 3.56 ± 1.6 days. The average span for follow-up was on an interval of 18.7 ± 6.76 months. Significant improvements were noted in all aspects of functional outcomes and image results after full endoscopic cervical spine surgery, with no major complications.

Conclusions: The current study found that both anterior transcorporeal and posterior surgical approaches could be used for the treatment of CSM with a full endoscopic technique. Indications of full endoscopic cervical spine surgery for CSM included cervical disc herniation, central canal stenosis, calcified ligamentum flavum, and ossification of the posterior longitudinal ligament. Improved postoperative outcomes with acceptable surgical complications were noted in this systematic review.

Endoscopic surgery for cervical spondylotic myelopathy

Lv *et al.*
Journal of Orthopaedic Surgery and Research (2022) 17:389
https://doi.org/10.1186/s13018-022-03274-3

Journal of Orthopaedic Surgery and Research

SYSTEMATIC REVIEW Open Access

Clinical efficacy and safety of posterior minimally invasive surgery in cervical spo

Junqiao

Results: We identified 14 observational studies of cervical spondylosis with 479 patients, mainly including 197 cases of myelopathy and 207 cases of radiculopathy. Channel and endoscopic techniques were used. This study was certified by PROSPERO: CRD42021290074. Significant improvements in the quantitative indicators (Neck-VAS in 9 studies, JOA in 7 studies, NDIs in 5 studies, Nurick, ARM-VAS, and EQ-5D in 2 studies each, and the SF12-PCS, SF12-MCS, and HF-36 in 1 study each) were observed between pre- and postoperation ($P < 0.05$), and satisfactory clinical significance was acquired in the descriptive indicators [average surgery time (94.56 ± 37.26 min), blood loss volume (68.78 ± 103.31 ml), average length of stay (2.39 ± 1.20 d), and cervical spine stability after surgery]. Additionally, we showed that there was a 4.9% postoperative complication rate and the types of complications that may occur.

Conclusion: Posterior minimally invasive surgery is an effective and safe method for the treatment of cervical spondylosis and is a recommended optional surgical procedure for single-segment myelopathy and radiculopathy.

Table 6 S

Subgroup					
Overall					
Population					
Cervical					
Cervical					
Other ty					
Surgical app					
Channel technique	3	93	YES	NO	YES
Endoscopic technique	11	386	YES	NO	YES

Table 7 Summary characteristics of included studies (cervical spondylotic myelopathy)

Characteristics	No. of trials (no. of participants)	Study (no. of participants)
Double-door laminoplasty	1 (46)	Oshima [20] (46)
Unilateral laminectomy	2 (40)	Dahdaleh [14] (10), Ross [22] (30)
Bilateral laminectomy	1 (50)	Yadav [25] (50)
Herniated nucleus removal	1 (16)	Yu [14] (16)
Bilateral laminoplasty with spinous process ligament complex and deep extensor muscle retroposition	1 (45)	Zhang [23] (45)
Bilateral partial laminectomy	1 (10)	Yabuki [26] (10)

Cervical laminectomy by UBE

Will It Help or Harm the patients

Cervical Spondylotic Myelopathy

- Surgical Technique
- Advantages
- Indication/ Contraindication
- Complications

제3차 UBE 세미나

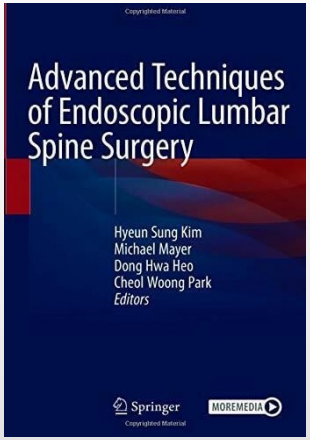
(UBE 연구회 발족식)

2016. 7.13 부산 강동병원

UBE™ Unilateral Biportal Endoscopy

UBE로 무슨 수술을 할 수 있나?

	UBE	microscope
Cervical, post. approach 1) discectomy, 2) foraminotomy, 3) hemilaminectomy	O	O
Cervical, ant. approach	X	O
Thoracic, post. App 1) discectomy, 2) foraminotomy, 3) hemilaminectomy	O	O
Lumbar, post. App 1) discectomy, 2) sublaminoplasty, 3) foraminotomy	O	O
Lumbar PLIF	O	O
Thoracolumbar trauma (bursting fx)	O	O
Infection	O	O
Tumor	?	O



Cervical laminectomy

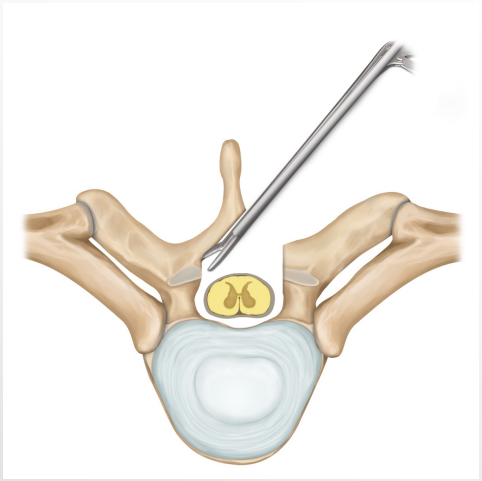
› Acta Neurochir (Wien). 2021 Sep;163(9):2537-2543. doi: 10.1007/s00701-021-04921-0. Epub 2021 Jul 2.

Biportal endoscopic unilateral laminotomy with bilateral decompression for the treatment of cervical spondylotic myelopathy

Jiyeon Kim [1], Dong Hwa Heo [2], Dong Chan Lee [1], Hung Tae Chung [3]

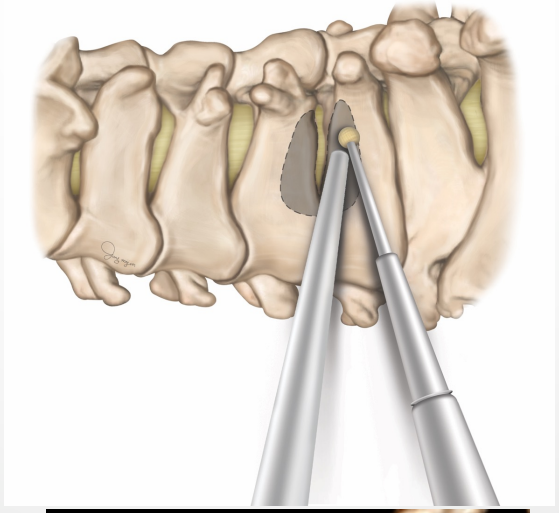
Cervical laminectomy by UBE

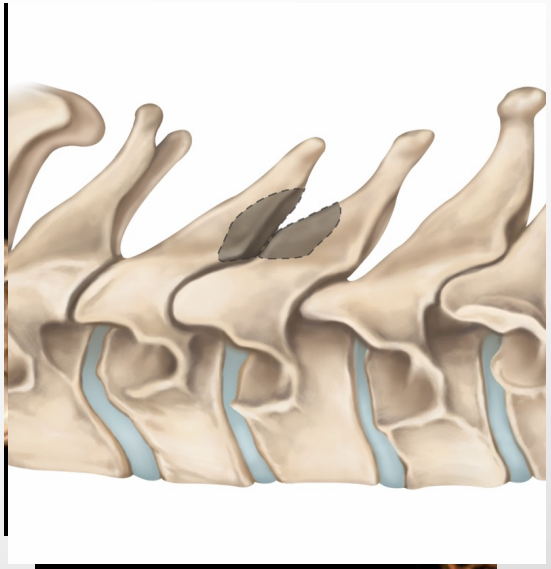
Lumbar, Thoracic ULBD

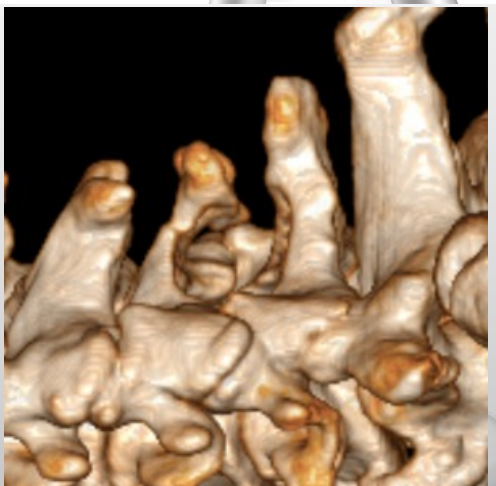


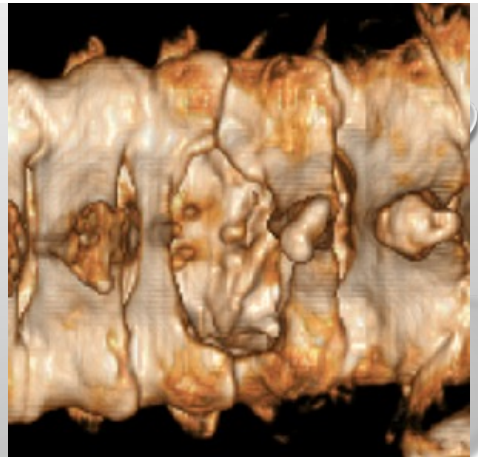
Contralateral decompression
- Sublaminar decompression

Cervical laminectomy via interspinous approach

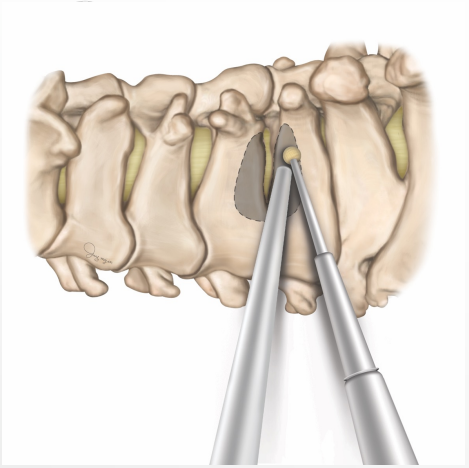


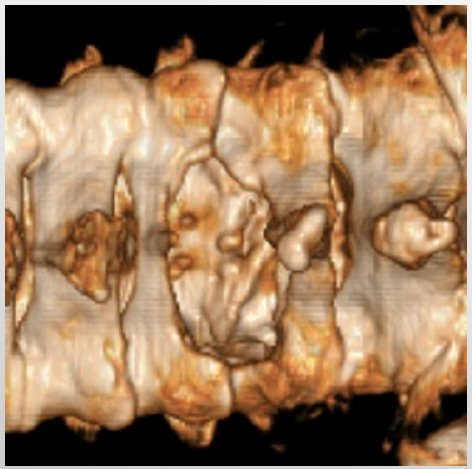






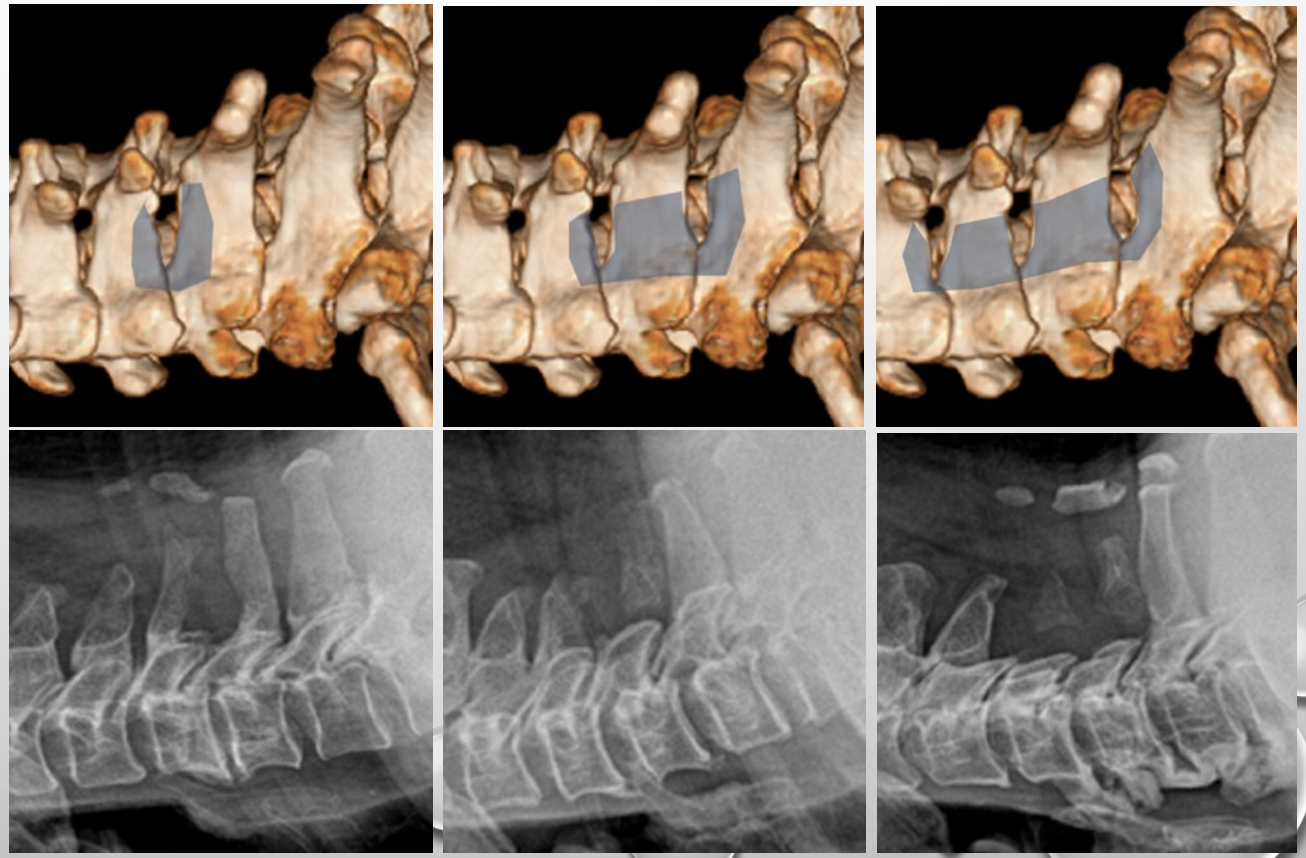
Cervical laminectomy by UBE





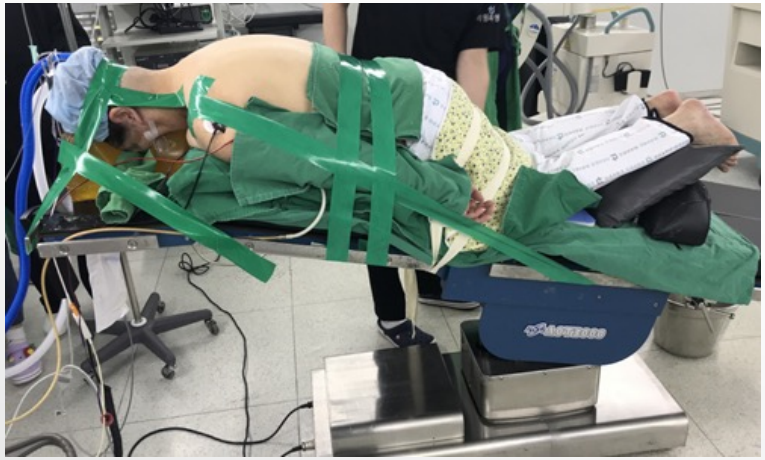
Contralateral decompression
-Modified subtotal laminectomy

Cervical laminectomy via interspinous approach



Cervical laminectomy by UBE

Position



Minimal neck flextion

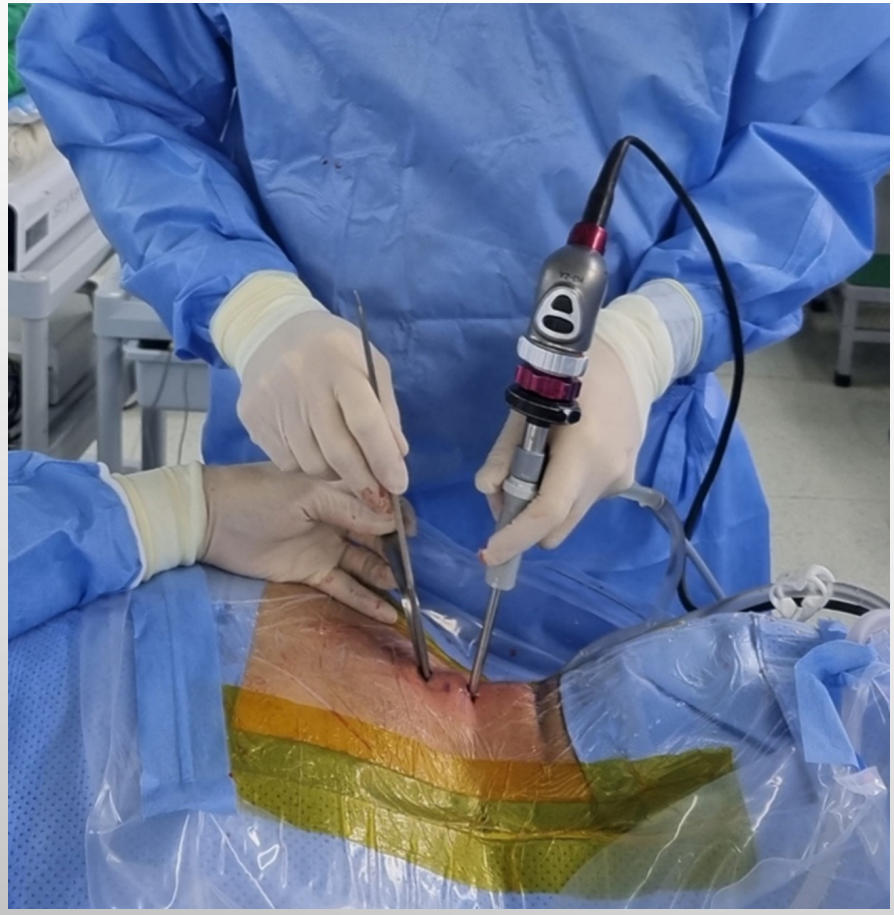
Minimal skin crease

Minimal pressure

Mayfield system X

Cervical laminectomy by UBE

Skin incision



Stiff nuchal ligament

Cord injury, laminar fracture d/t dilator

Tip)

1.Fascia incision

2.Laminar docking

Spinous process tip bifid

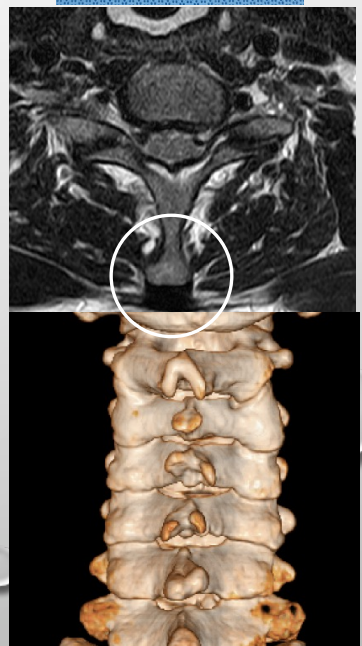
C2,C3,C4 always bifid

C5 almost bifid

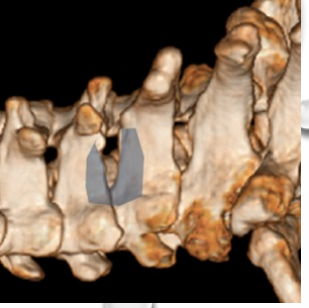
C6 is frequently bifid

Tip)

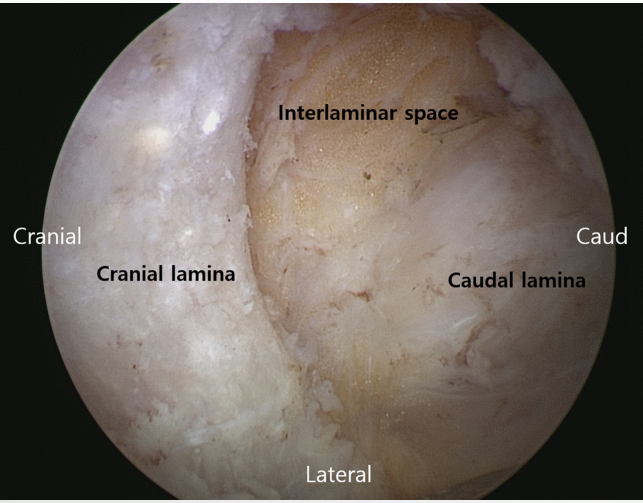
1. Pre op image, intra op C –arm (lateral)
2. Drilling of tip of spinous process

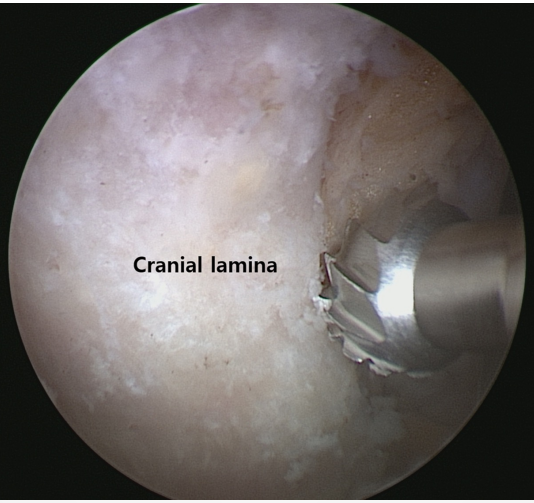


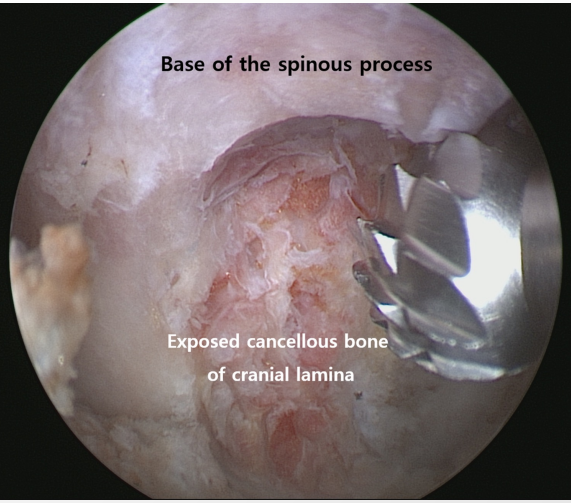
Cervical laminectomy by UBE

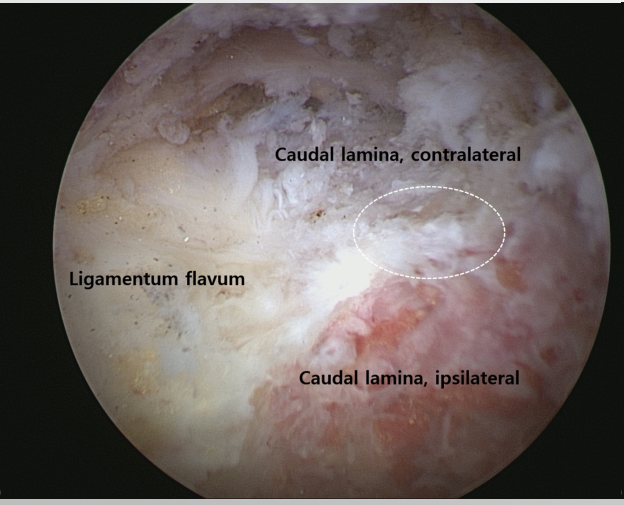


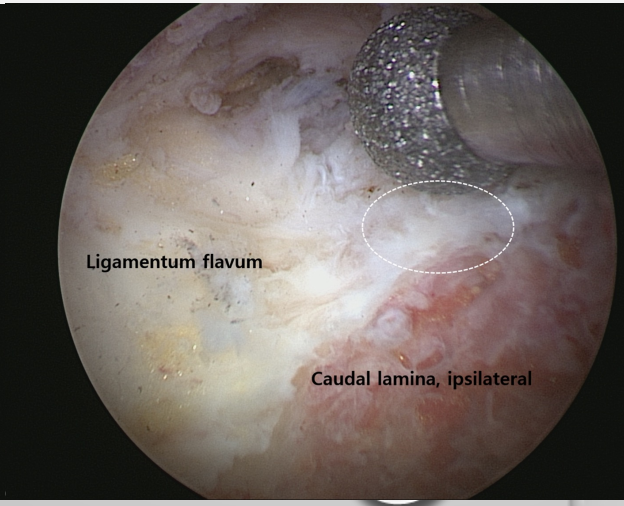
Bone working

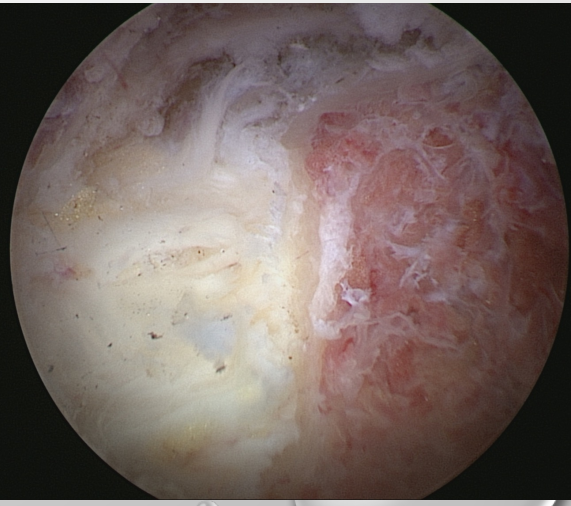






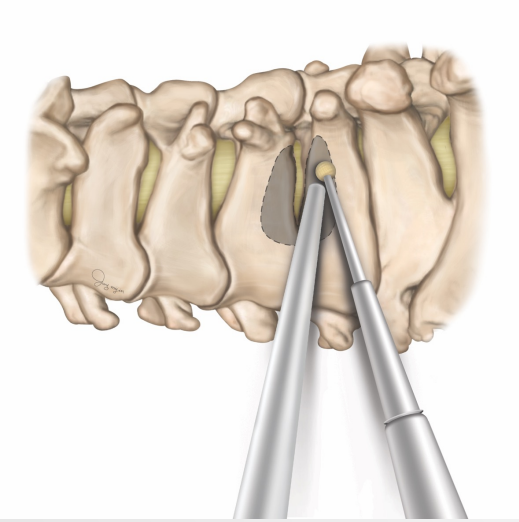


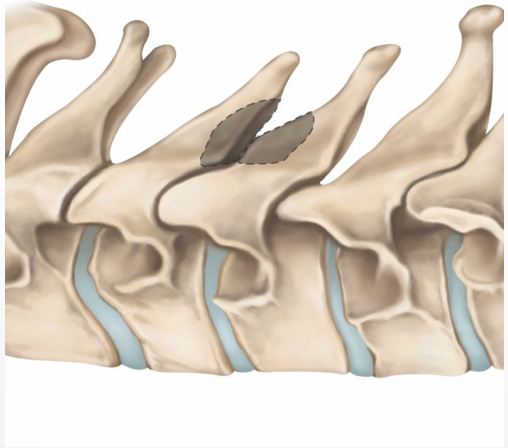


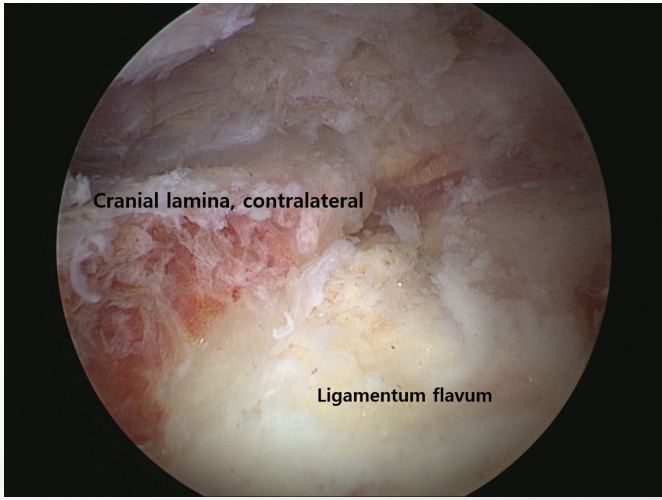


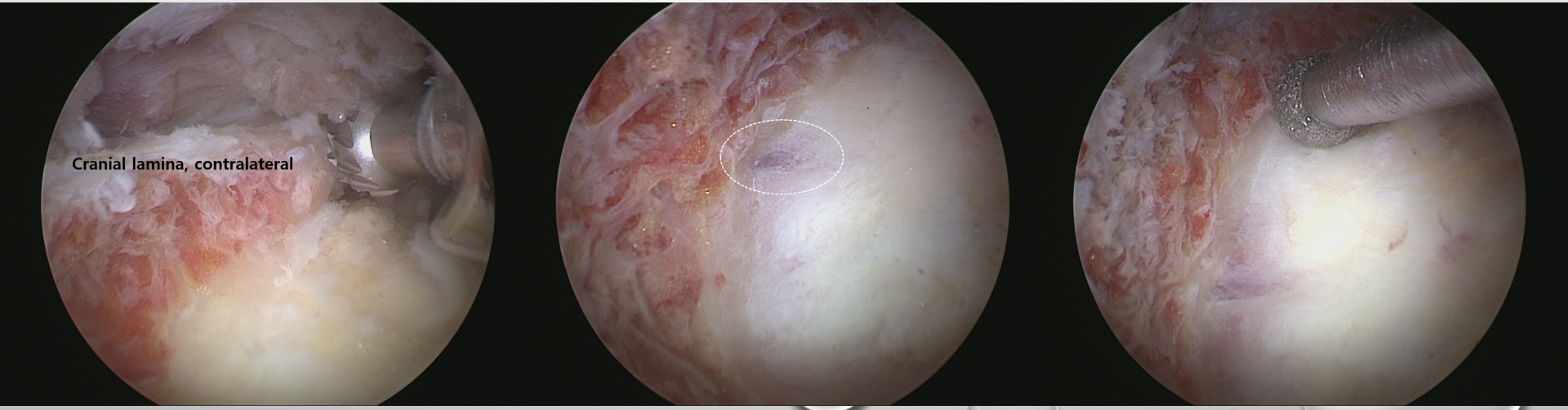
Cervical laminectomy by UBE

Bone working



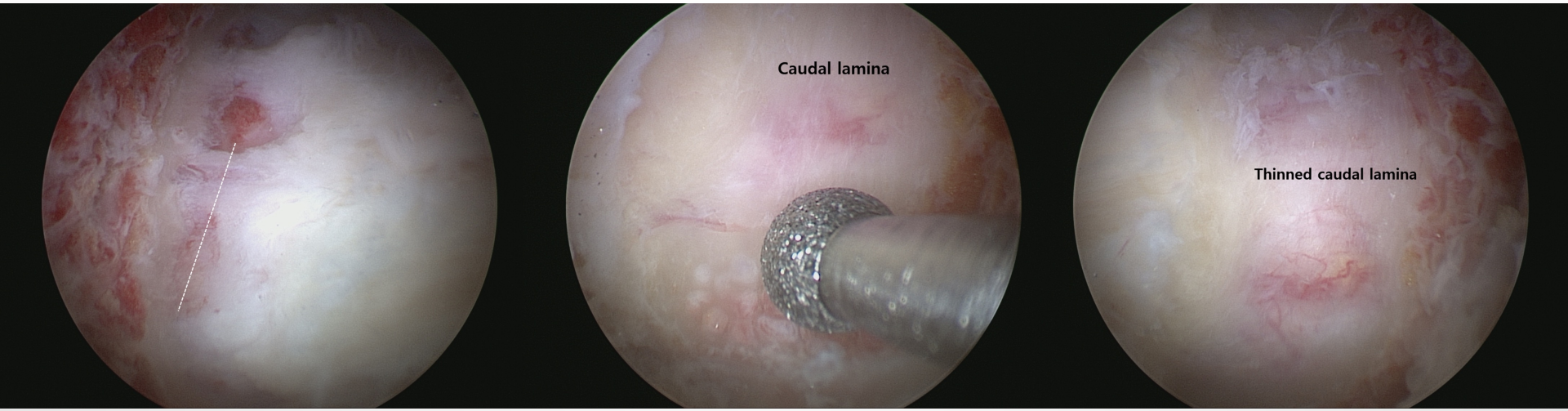


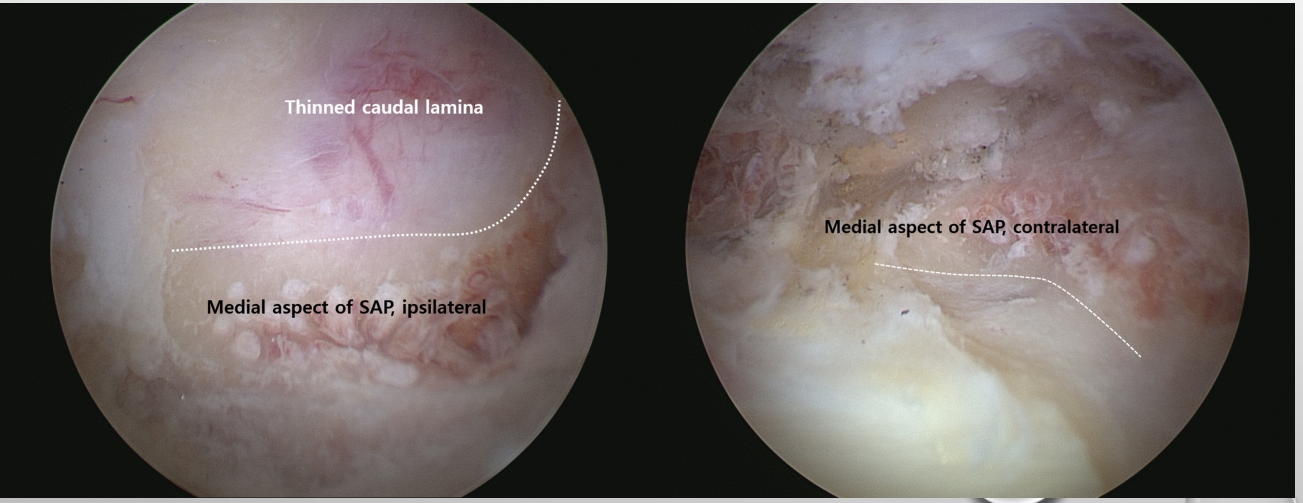




Cervical laminectomy by UBE

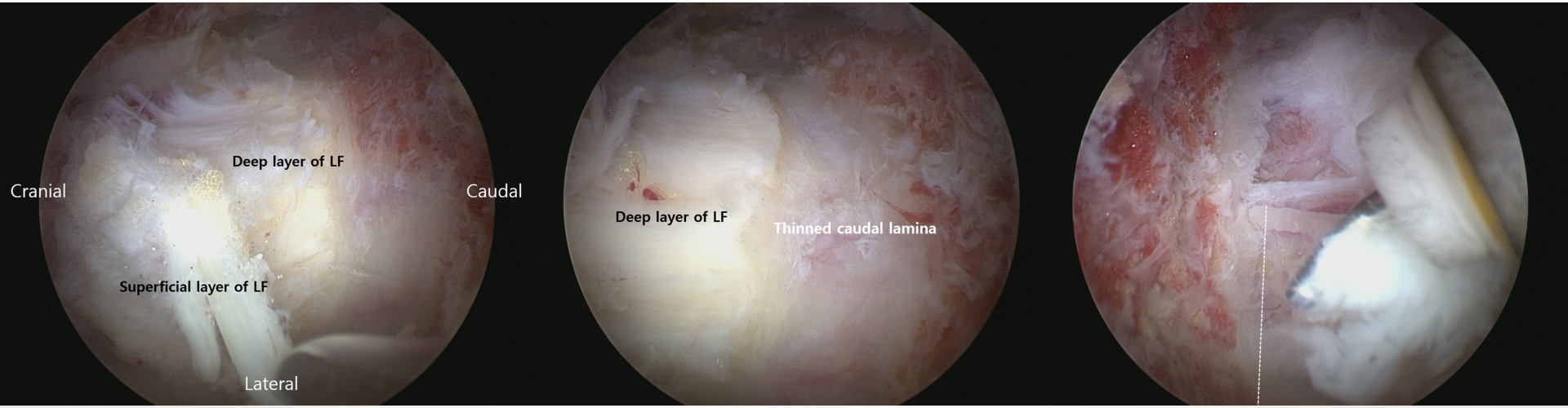
Bone working

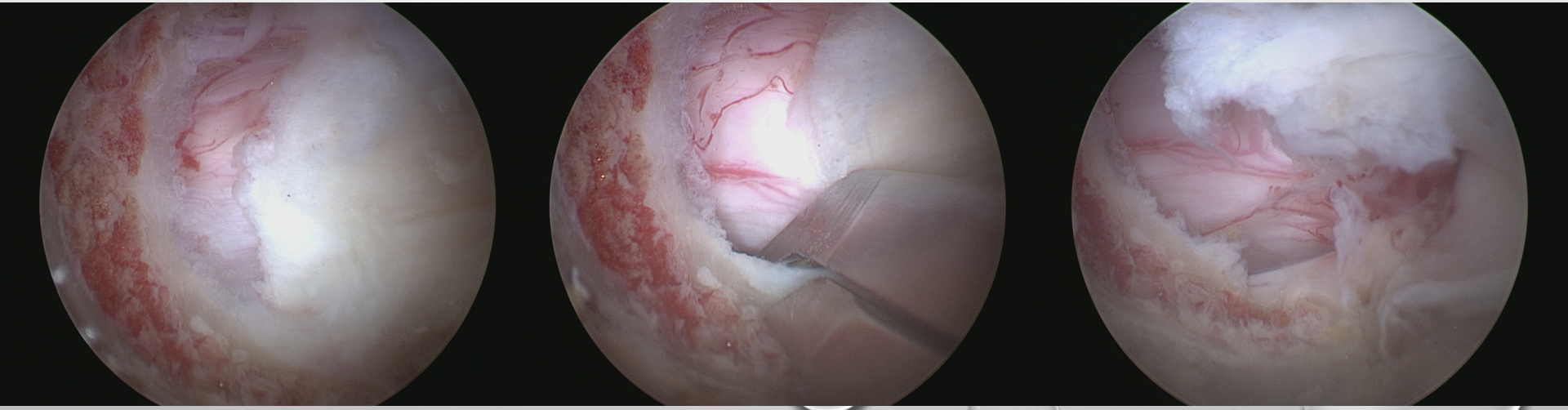




Cervical laminectomy by UBE

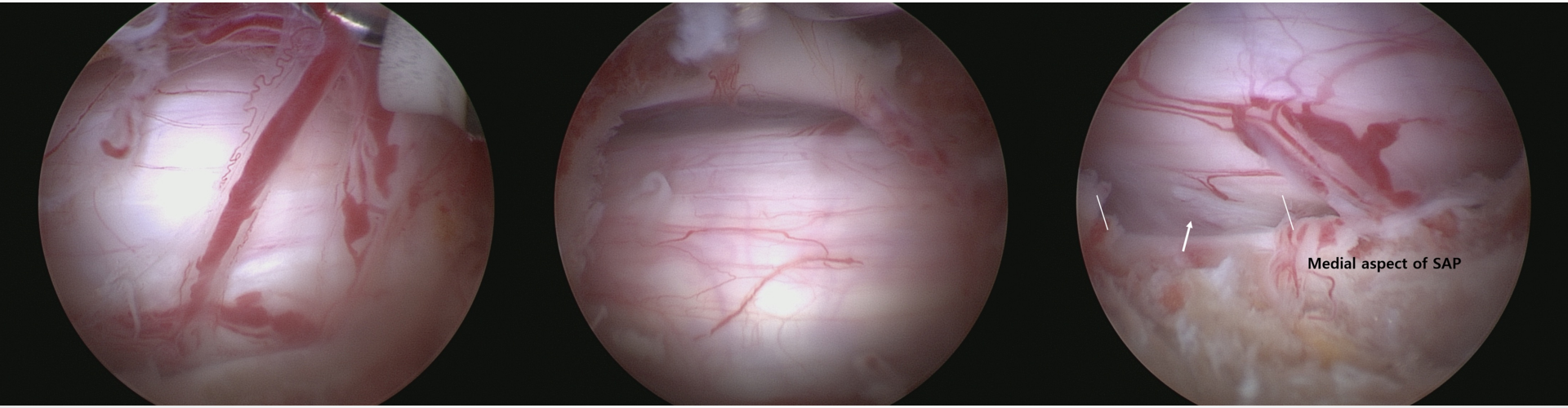
Flavectomy

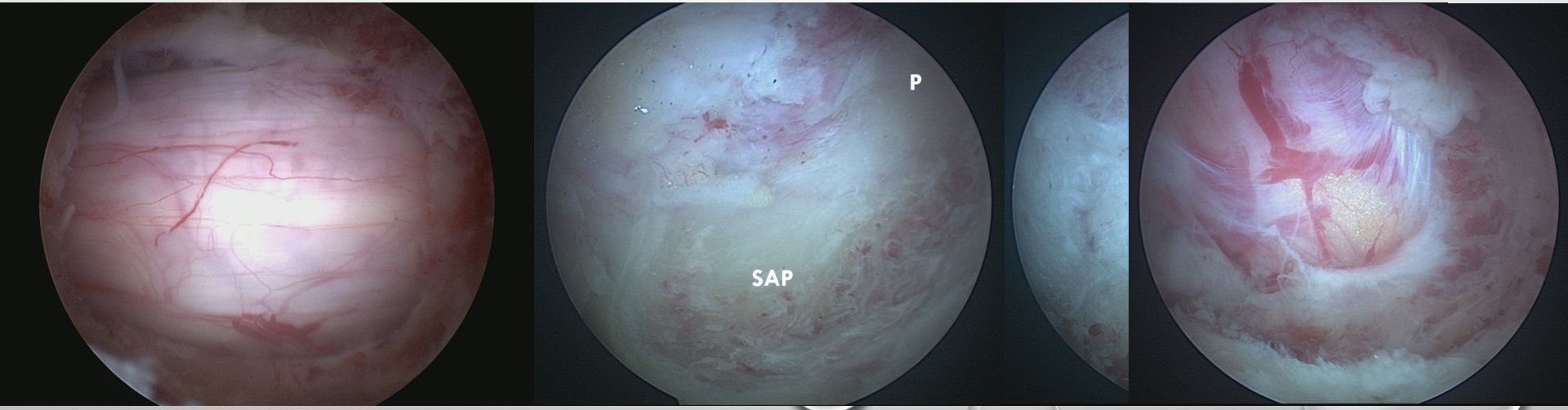




Cervical laminectomy by UBE

Flavectomy



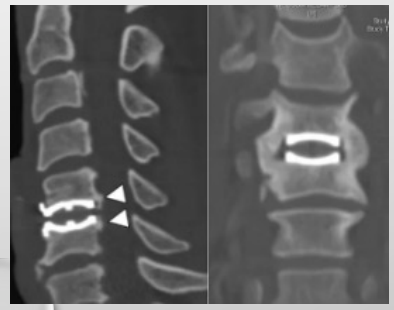


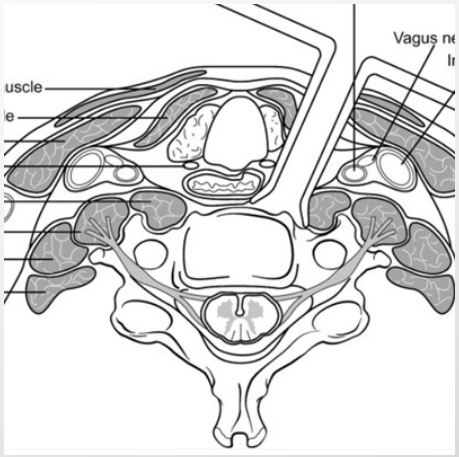
Anterior cervical fusion

Anterior approach

Stress in adjacent segment

ASD





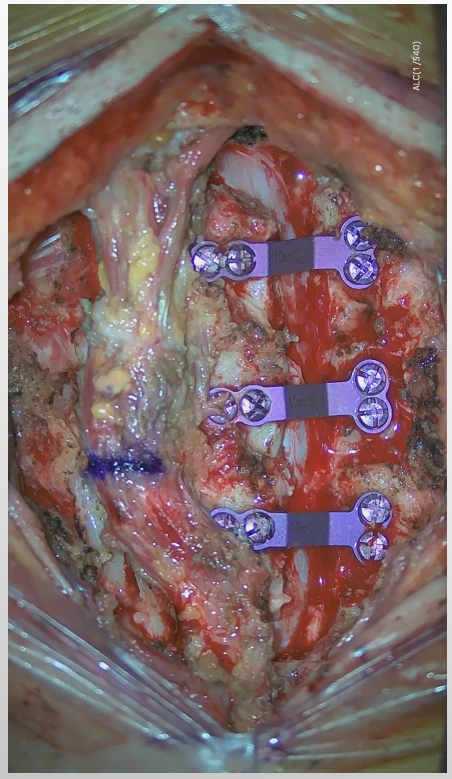
Approach-related Cx

G Choi et al. *Journal of Spine* 2015.

JC Chang et al. *J Korean neurosurgic Soc* 2011.

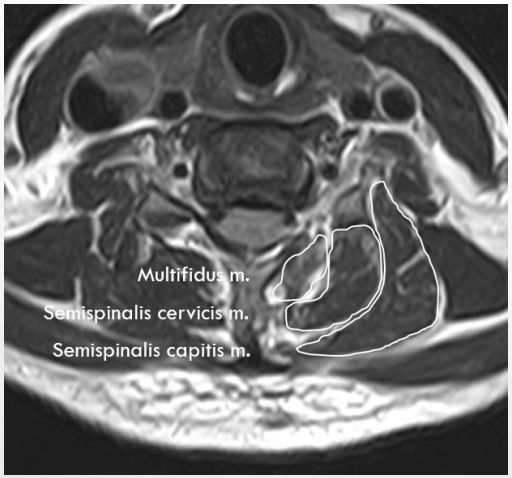
Cervical Laminoplasty

Lamina were reconstructed but muscle attachments was not achieved



Laminoplasty

Disruption of the muscle attachment



Spinous process – Semispinalis cervicis

Splenius capitis

Facet joint – Semisinalis capitis

Lamina - Multifidus

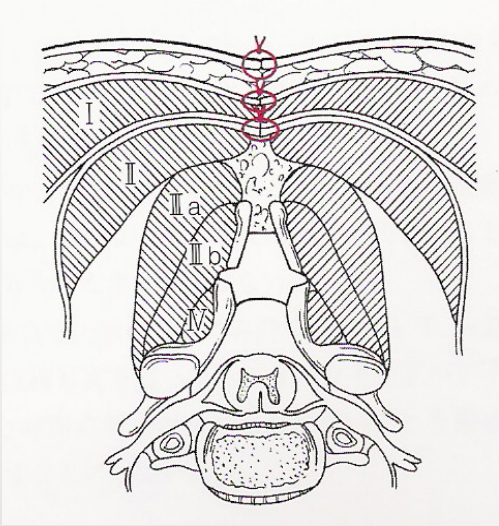
Posterior tension band

B. Nurboja et al. *Neurosurgery* 2012.

Cervical laminectomy by UBE

Minimal Invasiveness

Posterior cervical musculature



1st layer : Trapezius

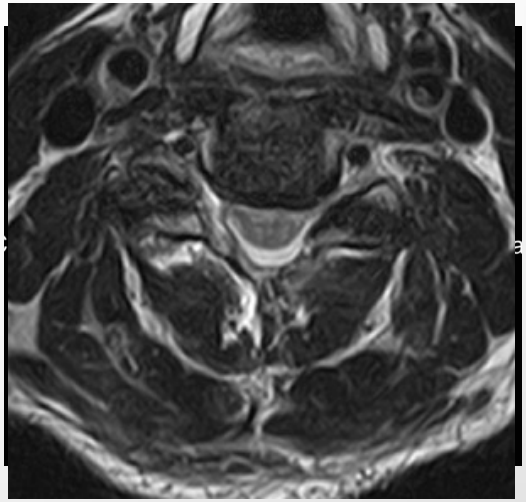
2nd layer : Splenius capitis

3rd layer : Semispinalis capitis

Semispinalis cervicis

Multifidus

VS



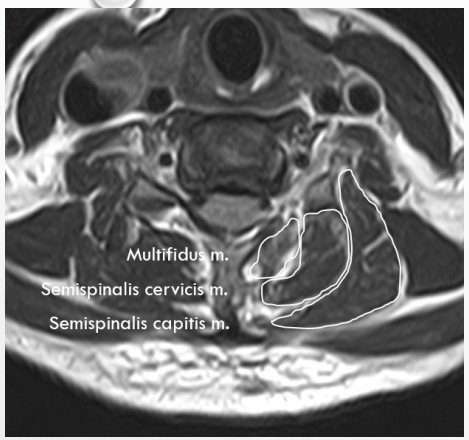
Weakness of extensor muscle and posterior tension band

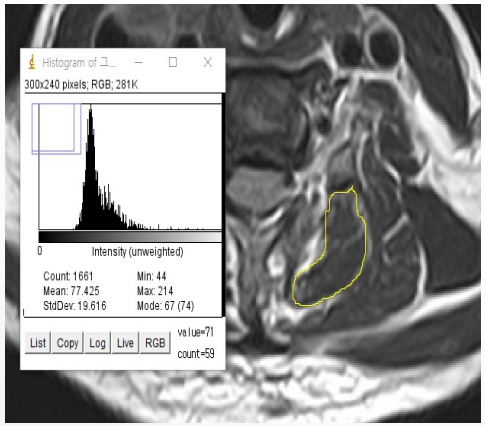
→Neck pain, shoulder strain

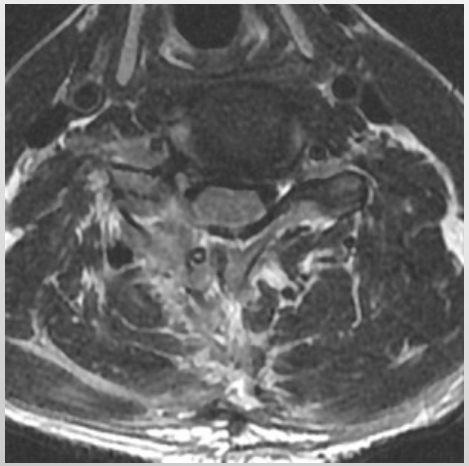
→Postoperative kyphosis

Cervical laminectomy by UBE

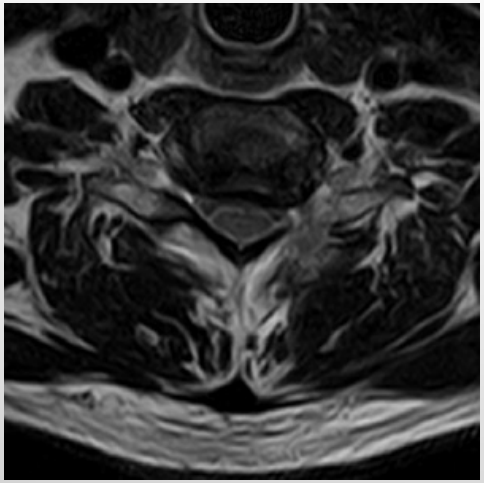
Minimal invasiveness







Microscopic-PCF



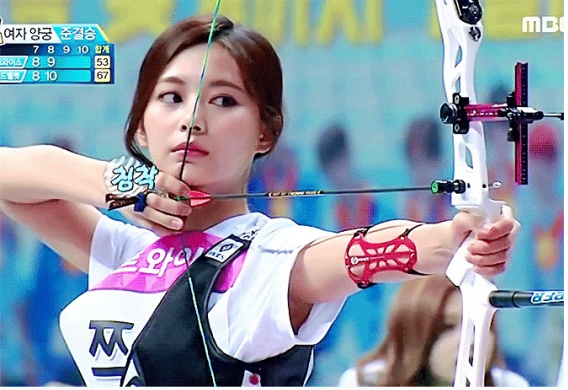
UBE-PCF

Characteristics	UBE-PCF (n=31)	M-PCF (n=34)	p value
Sex (M:F)	22:9	26:8	0.614
Age (years)	54.0 ± 8.2	51.8± 10.0	0.352
Symptom duration (months)	3.8 ± 2.5	4.9 ± 3.0	0.113
Diagnosis [n (%)]			0.394
Foraminal HNP	8	9	
Foraminal Stenosis	18	15	
Both	5	10	
Level [n (%)]			0.931
C4-5	3	2	
C5-6	13	15	
C6-7	13	14	
C7-T1	2	3	
Operation time (minutes)	63.9 ± 9.7	67.2 ± 10.5	0.197
Facet joint removal	30.7±6.4	34.3±8.3	0.054

Variable	UBE – T2-SIR	M - T2-SIR	p value
Preoperative			
Multifidus	1.21 ± 0.12	1.20 ± 0.13	0.693
Semispinalis cervicis	1.13 ± 0.22	1.14 ± 0.13	0.892
Semispinalis capitis	1.16 ± 0.21	1.16 ± 0.13	0.991
Deep extensor muscle	1.17 ± 0.13	1.16 ± 0.13	0.569
Postoperative			
Multifidus	1.57 ± 0.28	1.60 ± 0.22	0.608
Semispinalis cervicis	1.35 ± 0.16	1.47 ± 0.16	0.003*
Semispinalis capitis	1.26 ± 0.19	1.34 ± 0.17	0.071
Deep extensor muscle	1.45 ± 0.21	1.57 ± 0.18	0.013*

Cervical laminectomy by UBE

Minimal Invasiveness



SPINE Volume 32, Number 26, pp 2985–2988
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The Source of Axial Pain After Cervical Laminoplasty-C7 Is More Crucial Than Deep Extensor Muscles

Noboru Hosono, MD, PhD,* Hironobu Sakaura, MD, PhD,† Yoshihiro Mukai, MD, PhD,* and Hideki Yoshikawa, MD, PhD†

SPINE Volume 26, Number 20, pp 2220–2226
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Extensor Musculature of the Cervical Spine After Laminoplasty

Morphologic Evaluation by Coronal View of the Magnetic Resonance Image

Haku Iizuka,* Takachika Shimizu,† Katsuhiko Tateno,† Naohumi Toda,* Hideo Edakuni,† Haruhiko Shimada,† and Kenji Takagishi*

J Neurosurg Spine 7:610–614, 2007

Cervical malalignment after laminoplasty: relationship to deep extensor musculature of the cervical spine and neurological outcome

HAKU IIZUKA, M.D., TAKASHI NAKAJIMA, M.D., YOICHI IIZUKA, M.D., YASUNORI SORIMACHI, M.D., TSUYOSHI ARA, M.D., MASAHIRO NISHINOME, M.D., AND KENJI TAKAGISHI, M.D.

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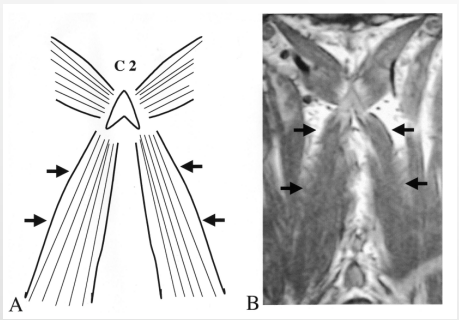
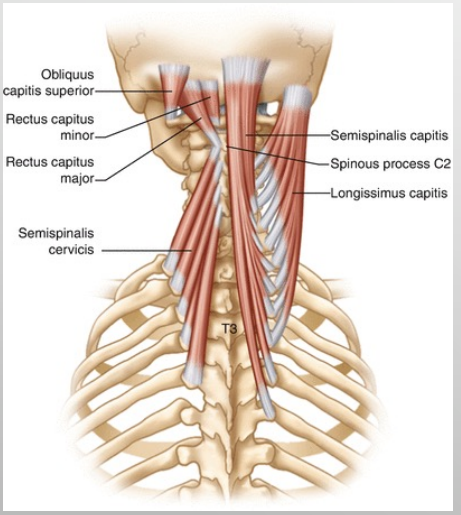
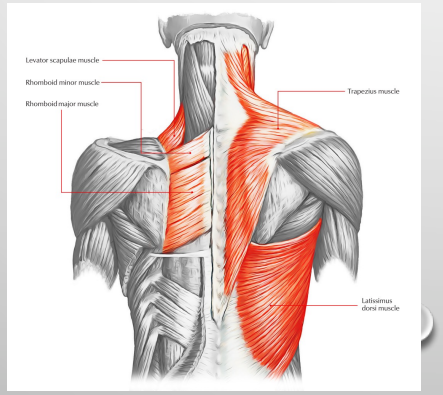






C2, C7 spinous process tip preserve

C2- Semispinalis cervicis

C7- Trapezius, Splenious capitis

→ **Kyphosis, axial neck pain ↓**

Flextion/Extension C-MRI

Long-term radiological outcome

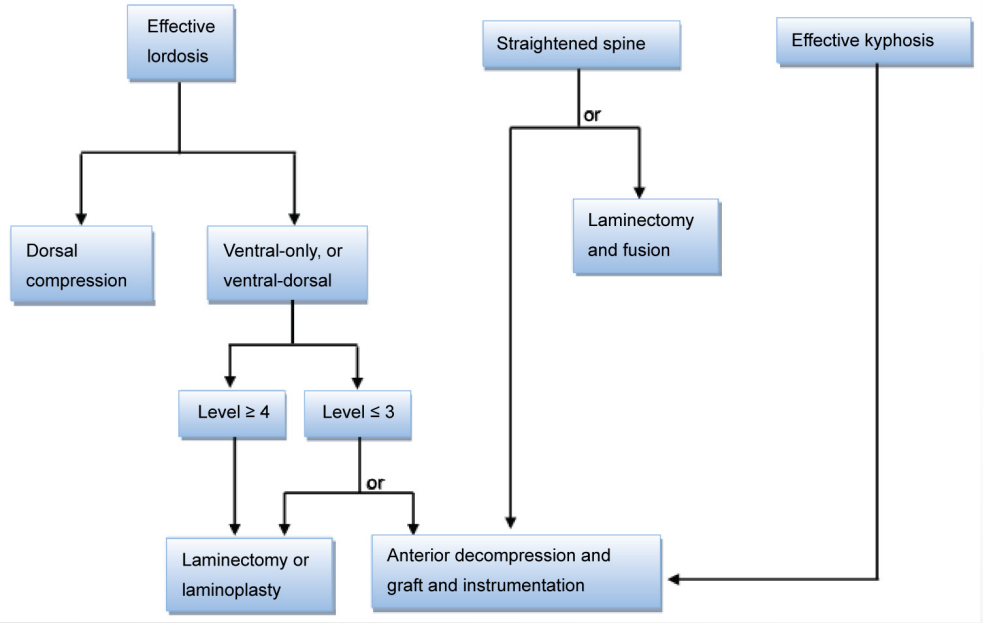
Floating of spinous process

Pre-op

POD 2D

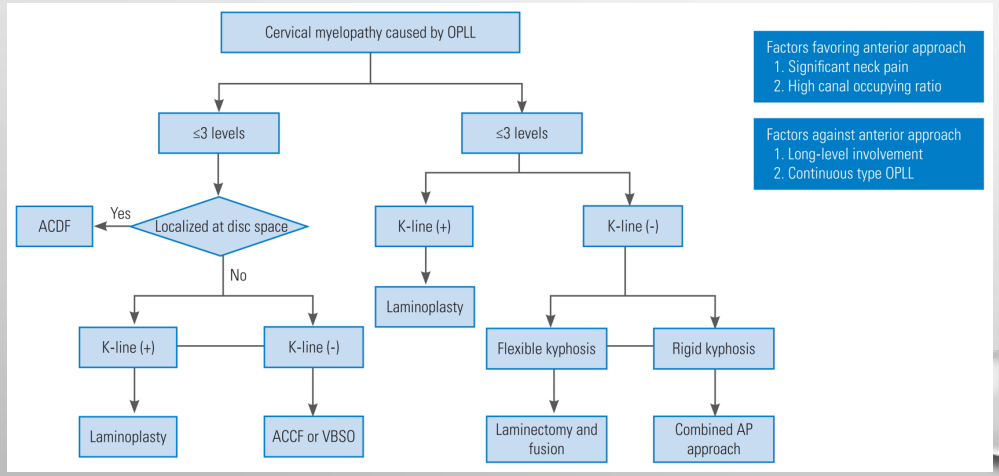
POD 1Y

Decision making of cervical spondylotic myelopathy



Consideration

- Dosal compression vs Ventral compression
- Canal compromise rate
- How many levels
- Lordosis vs Kyphosis , K line



Indication

One to three levels Cervical spondylosis

One to three levels OPLL

Neutral or lordotic cervical spine

Need in combination with the anterior approach

Contraindication

Multiple segmental CSM (>4 level)

Severe OPLL with continuous type

Centrally located disc herniation

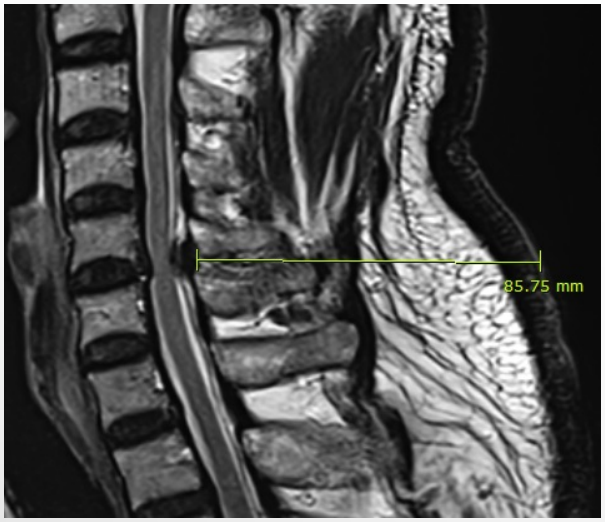
Cervical spine instability

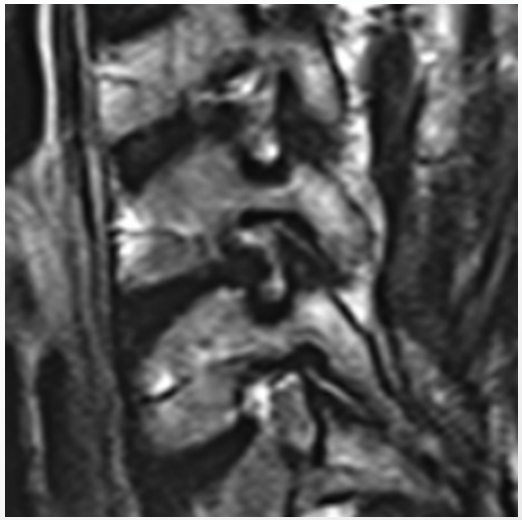
Significant kyphotic deformity

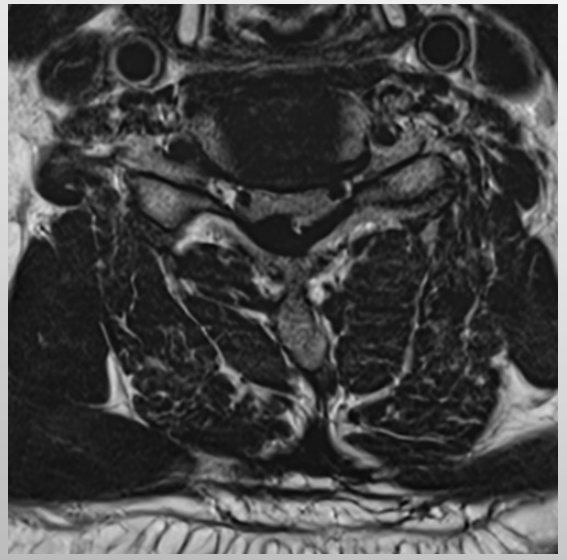
Cervical laminectomy by UBE

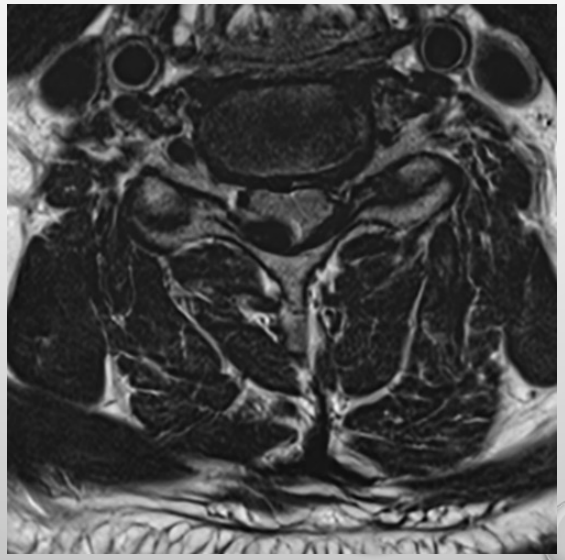
Cases

Calcium pyrophosphate dehydrate deposition with myelopathy/ Foraminal stenosis







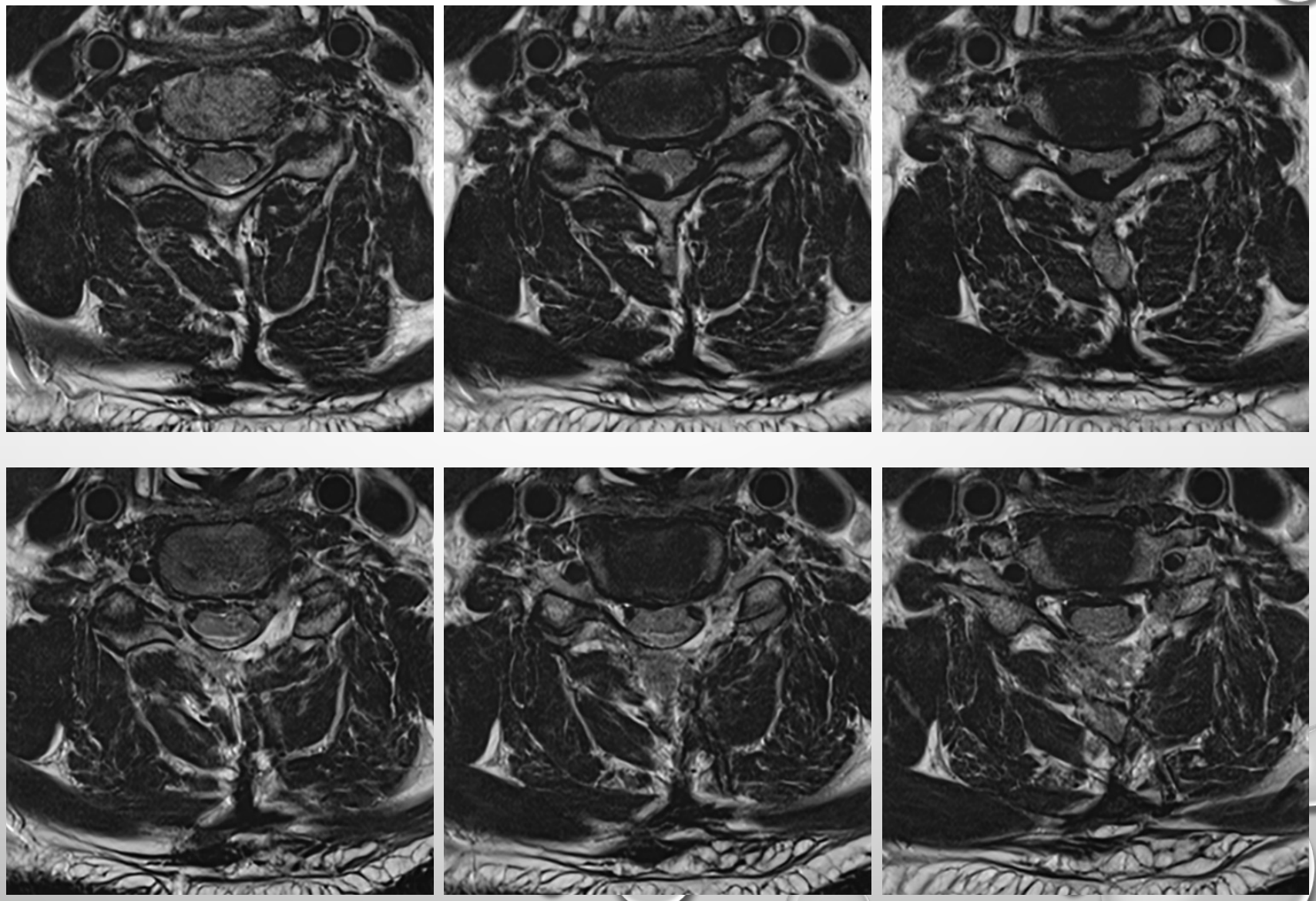


Cervical laminectomy by UBE

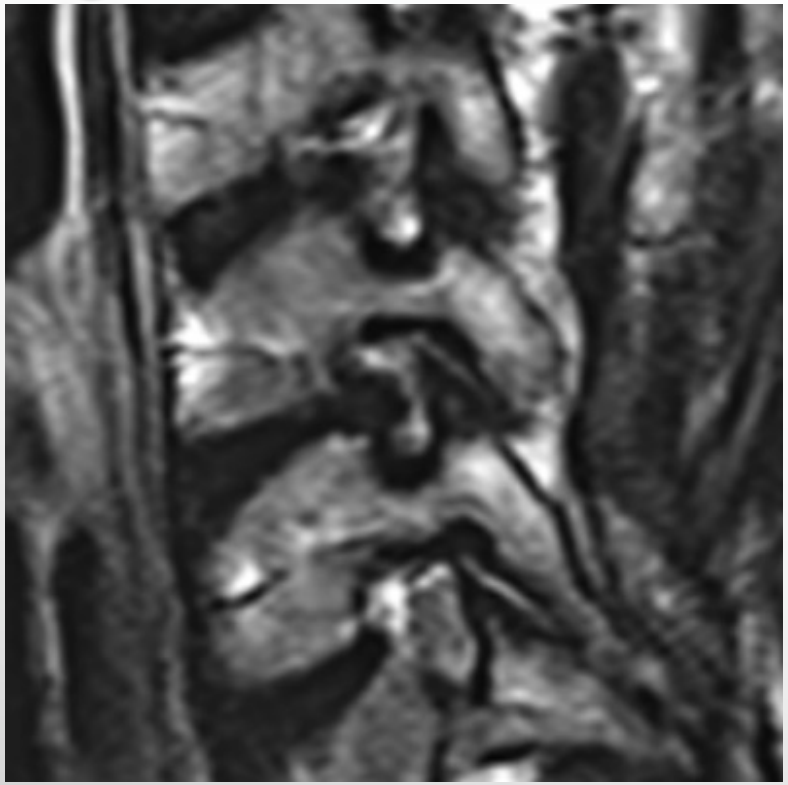
Cases

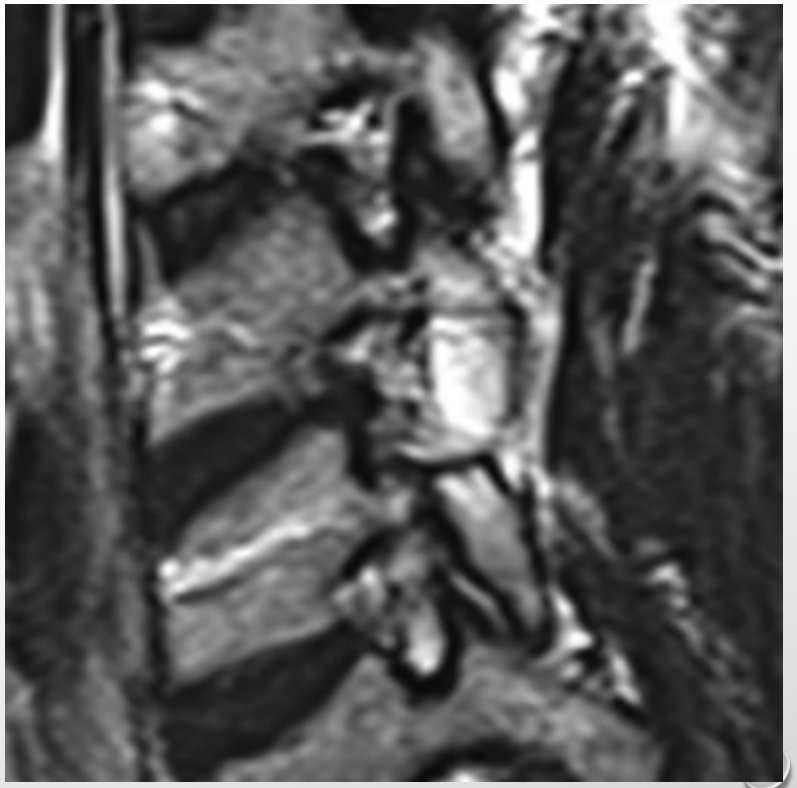
Cervical laminectomy by UBE

Cases



Cervical laminectomy by UBE

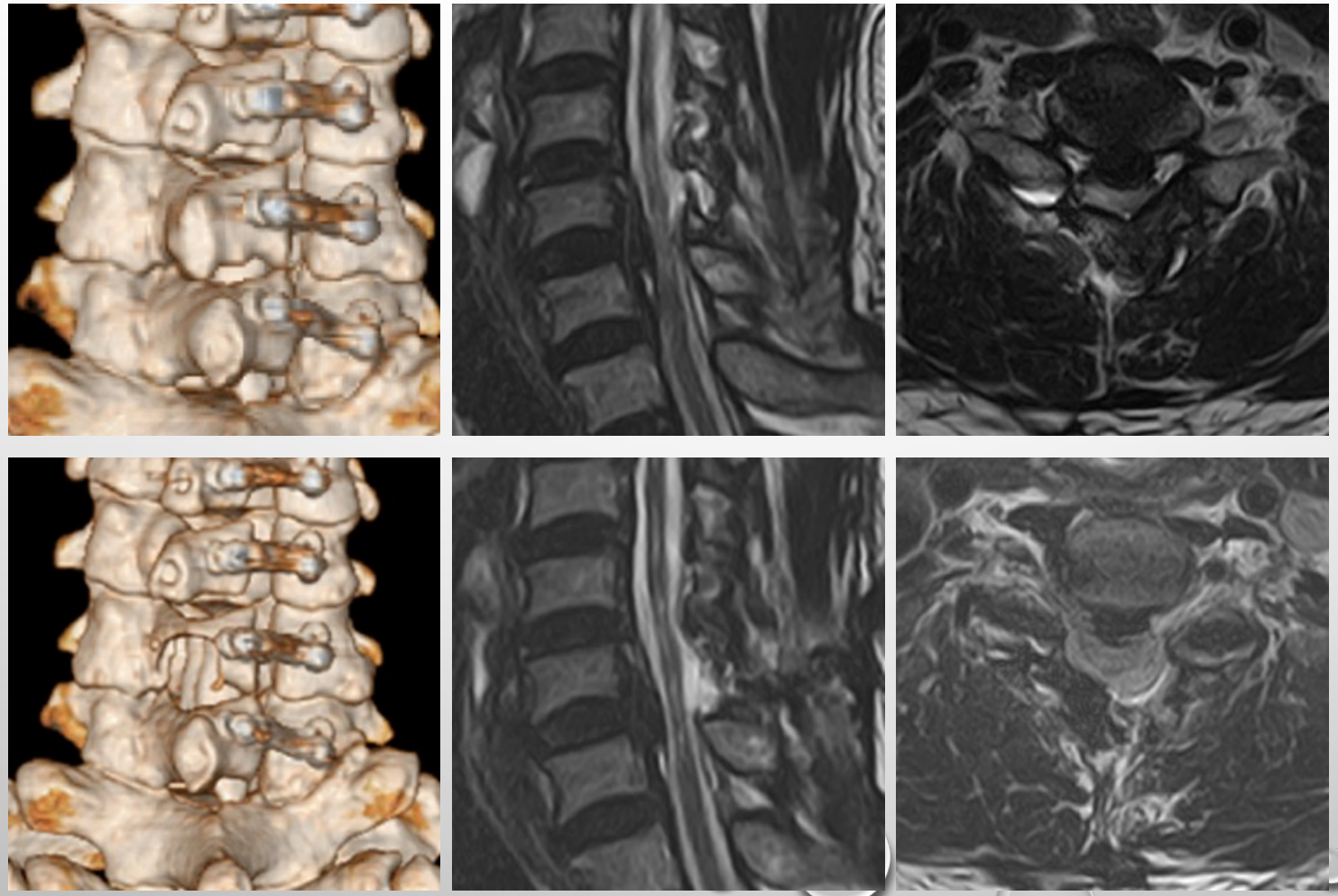




Cervical laminectomy by UBE

Cases

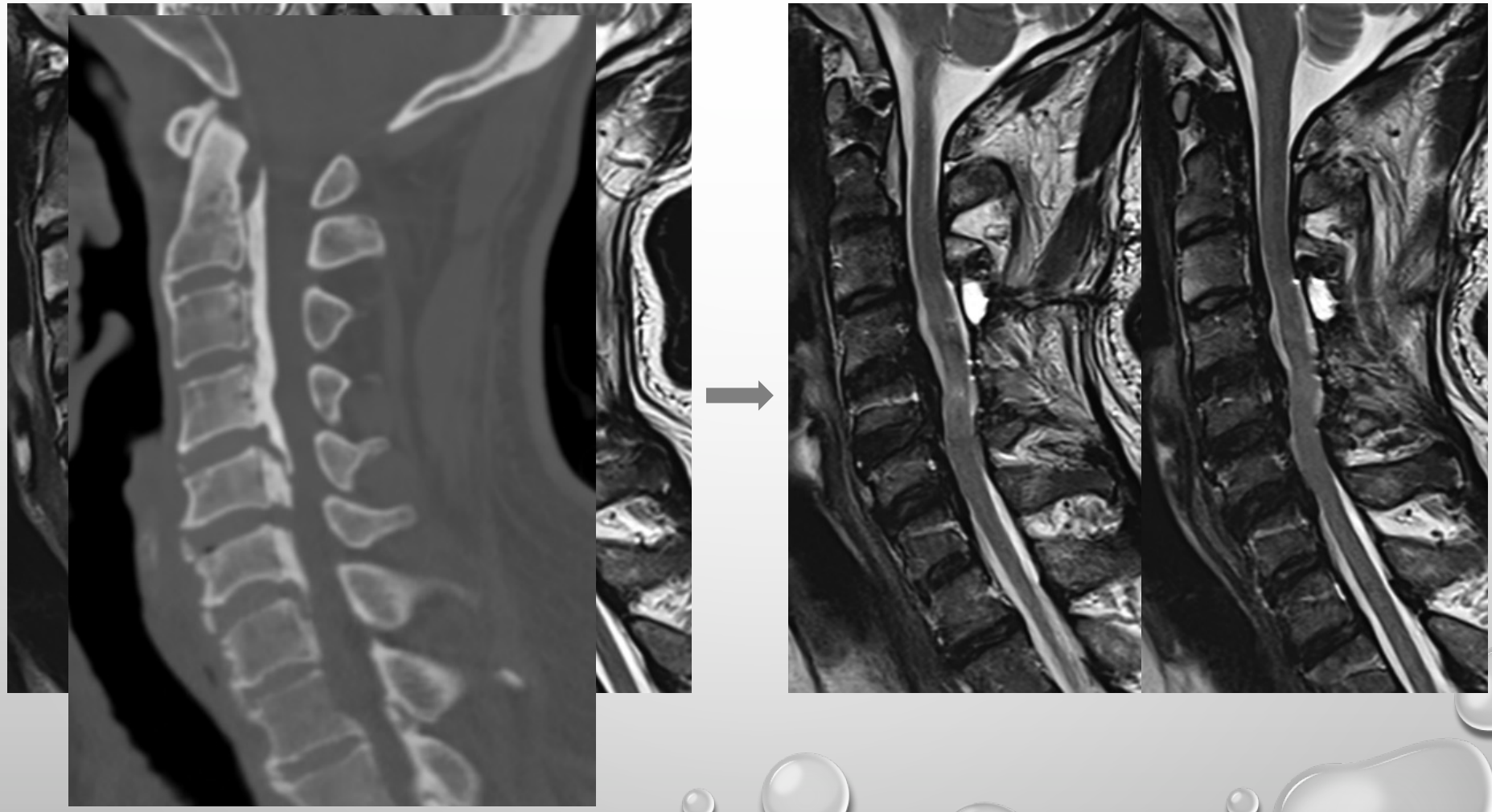
Calcified HNP on C6-7 (Laminoplasty state)



Cervical laminectomy by UBE

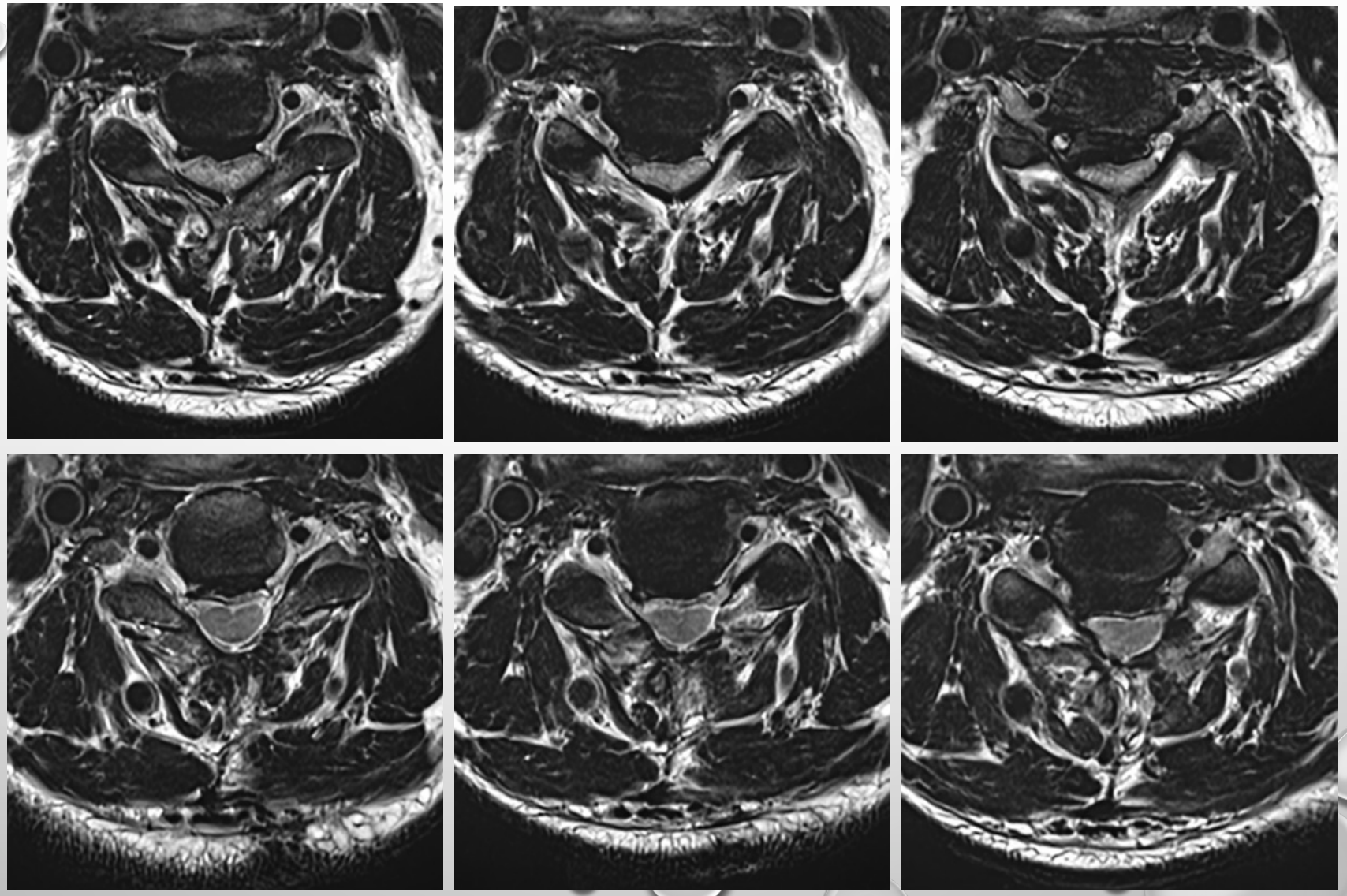
Cases

Incomplete cord injury associated OPLL on C3-4-5-6



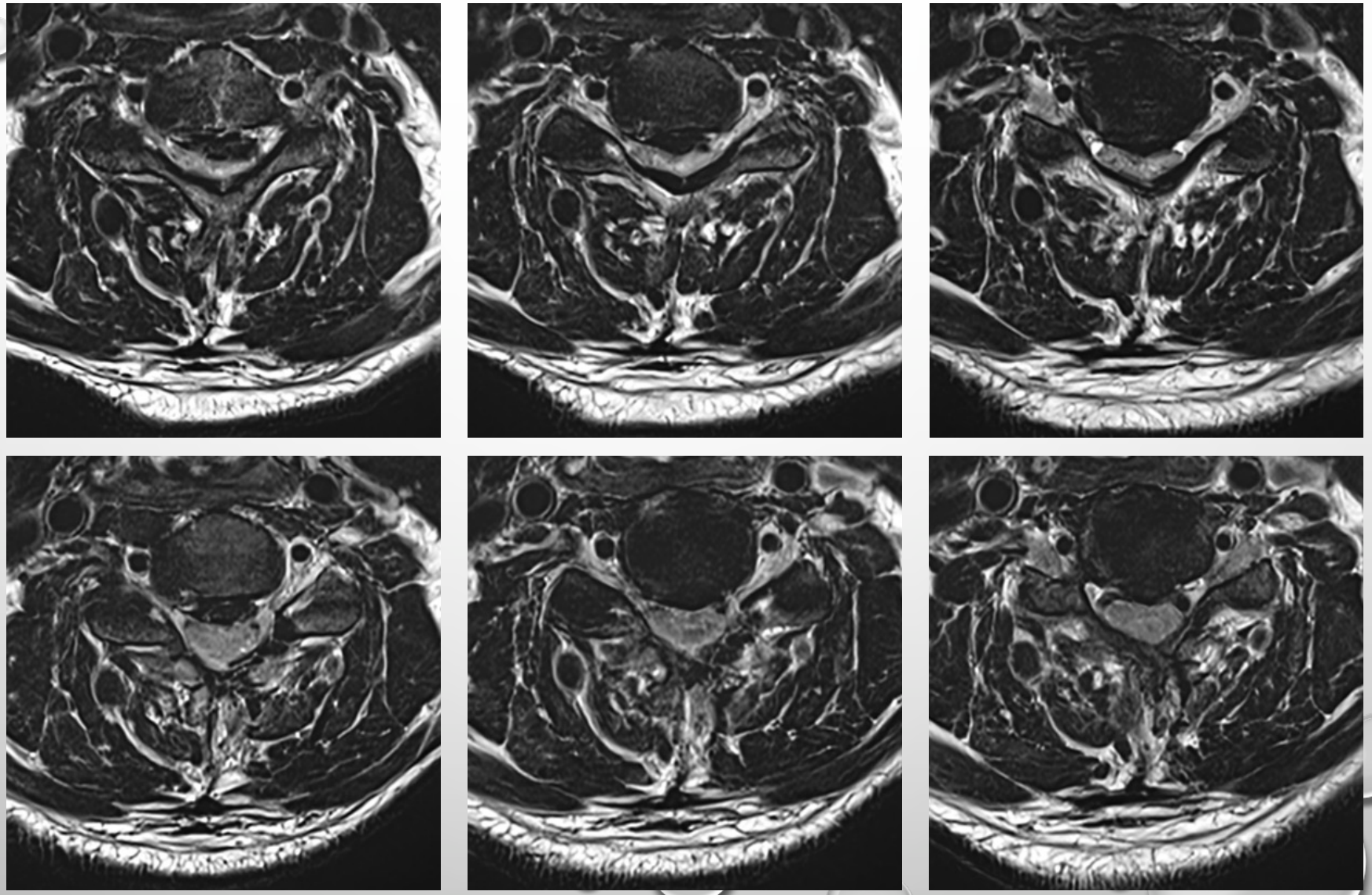
Cervical laminectomy by UBE

Cases



Cervical laminectomy by UBE

Cases



Cervical laminectomy by UBE

Cases

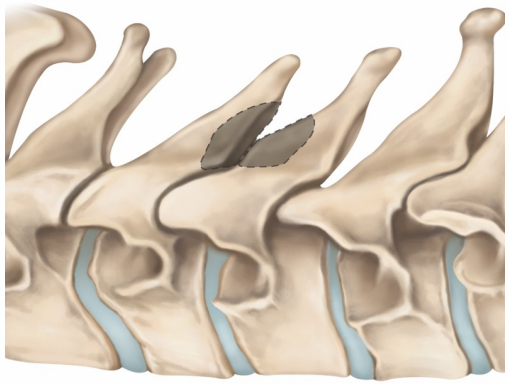
Cervical laminectomy by UBE

Complications

Cord injury

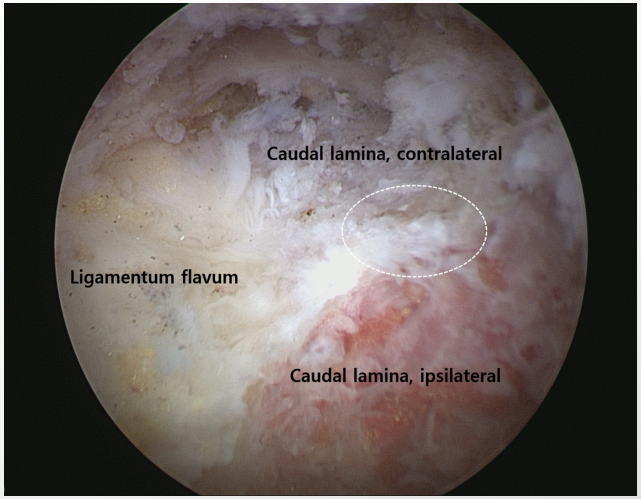
Fluid output

One hand surgery



Space

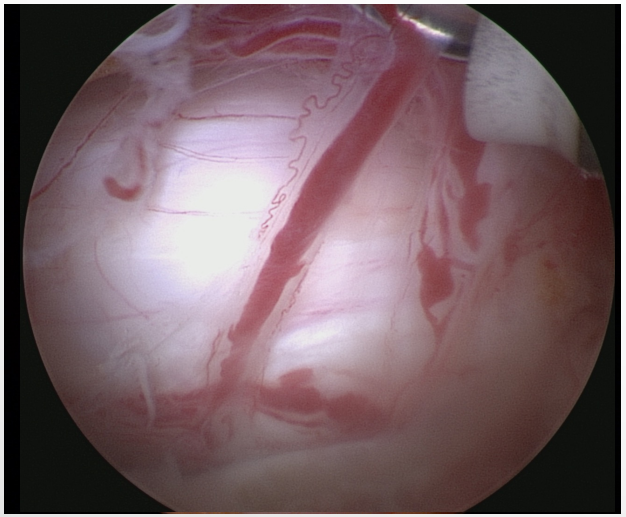
Interspinous approach



Cervical laminectomy by UBE

Complications

Cord injury

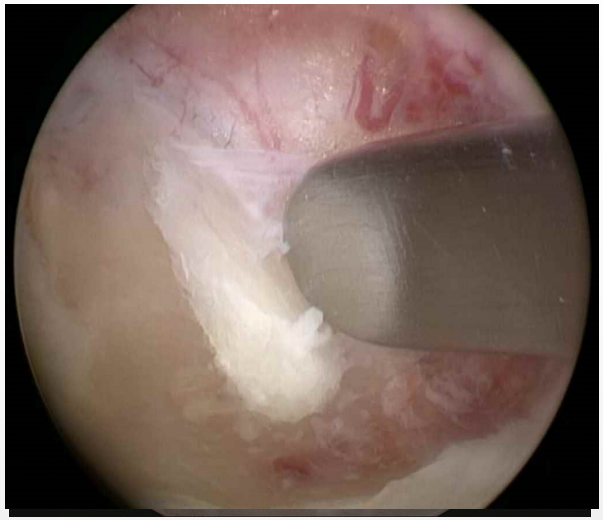


Radiofrequency probe

Coagulation/ Ablation

Against neural structures

Hook type RF probe



Thin out using diamond drill

Floating method

Intraoperative cord monitoring

Cervical laminectomy by UBE

Microscopic surgery / Mentor / Indication / Evidence

Comparative cohort studies

Randomized clinical trials with long-term follow-up

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