Effects of Cervical Extension on the Deformation of Intervertebral Disc and the Migration of Nucleus Pulposus.

Sun G. Chung, MD, PhD (Seoul National University College of Medicine & Hospital, Seoul, Korea, Republic of); Yoon-Ho Kim, Bachelor; Seongjun Park, Bachelor; Sung-In Kim, Bachelor.

Disclosures: S. G. Chung, No Disclosures: I Have Nothing To Disclose.
Objective: To test whether the nucleus pulposus (NP) of the cervical intervertebral discs (IVD) migrates forward by cervical extension, so-called McKenzie, maneuver.
Design: In vivo anatomical measurement before and after intervention.
Setting: An MRI center in a university hospital.
Participants: 10 young and healthy males (22.4 ±1.6 years old).
Interventions: T2 midline sagittal MR images were obtained in supine position with the cervical spine in neutral and approximately 20 degree extended postures.
Main Outcome Measures: The anterior and posterior IVD heights and the horizontal position of the posterior margin of NP were measured and compared between the neutral and extended postures in each IVD of the C3-4, C4-5, C5-6, C6-7 levels.
Results or Clinical Course: Anterior IVD heights increased significantly in the C3-4 and C4-5 levels (5.77±0.71mm to 6.45±0.92mm and 6.30±0.85mm to 6.92±0.77mm, respectively, with $p<.01$) while slight increments were noticed in the lower levels. The posterior end of NP showed meaningful forwardly displacements in all of the levels (1.37±0.75mm, 1.41±1.45mm, 0.68±0.73mm, and 0.64±0.98 with $p < .05$).
Conclusions: Cervical extension maneuver increases the height of anterior IVDs and moves NP forward, which may help to prevent or treat posterior annular tear or herniation of NP.

A Systematic Review of Head-to-Head Evidence for Comparing Transforaminal Epidural Steroid Injections to Interlaminar Epidural Steroid Injections for the Treatment of Lumbosacral Radicular Pain.

Zack McCormick, MD (The Rehabilitation Institute of Chicago, Chicago, IL, United States); George C. Chang Chien, DO; Samuel K. Chu, MD; Kenneth D. Candido, MD.

Disclosures: Z. McCormick, No Disclosures: I Have Nothing To Disclose.
Objective: Controversy exists regarding superiority of TFESI or ILESI for the treatment of lumbosacral radicular pain (LSRP). We systematically reviewed studies directly comparing transforaminal epidural steroid injection (TFESI) to interlaminar epidural steroid injection (ILESI) for the treatment of LSRP. No such review currently exists.
Design: PubMed® and Google Scholar® were comprehensively searched to identify studies comparing TFESI to ILESI for LSRP, prior to 2013. Studies that met Cochrane Review criteria for randomized trials and Agency for Health Care Quality criteria for observational studies were included.
Setting: n/a
Main Outcome Measures: Evidence was graded according to the USPTF classification. Level 1, II-1, II-2, II-3, and III requires at least 1 randomized controlled trial (RCT) (1), non-randomized controlled trials (II-1), controlled retrospective studies (RS) (II-2), uncontrolled RSs (II-3), and descriptive studies (III). Clinical significance was defined by pain and functional score improvements greater than 20% and 10%, respectively, consistent with Cochrane review guidelines. 6 months was defined as "long-term."
Results or Clinical Course: 10 studies met the required criteria. For LSRP due to disc herniation (DH), level 1 evidence exists for clinically significant short (2 RCTs, 1 RS) and long-term (2 RCTs) improvement in pain scores with TFESI compared to ILESI. These findings are opposed by level 1 evidence for no difference between groups in the short (2 RCTs) and long-term (2 RCTs). Level 1 evidence exists for improvement in short (1 RCT) and long-term (2 RCTs) disability with TFESI compared to ILESI. These findings are opposed by level 1 evidence for no difference between groups in the short (2 RCTs) and long-term (1 RCT). In the treatment of LSRP due to spinal stenosis (SS), one RS comparing TFESI to ILESI showed no difference in short term pain or functional outcomes.
Conclusions: For the treatment of LSRP due to DH, Level 1 evidence exists ranging from no difference between TFESI and ILESI to clinically significant improvements in both short and long-term pain and functional outcomes. Therefore, this review suggests that TFESI is moderately superior to ILESI for short and long-term treatment of pain and disability. For the treatment of LSRP due to SS, no head-to-head evidence exists for superiority of either approach.

Implementing Changes in Opioid Prescribing: Applying REMS Principles to Clinical Practice.

James W. Atchison, DO (Rehabilitation Institute of Chicago/Northwestern University Feinberg School of Medicine, Chicago, IL, United States); Christine M. Gagnon, PhD; Linda Toelke, MSN; Sandra M. Aiello, RN; Sarah P. Gilbert, BSN; Dana Nelson, MSN, RN, CRRN; Randy L. Calisoff, MD; Steven P. Stanos, DO.

Disclosures: J. W. Atchison, No Disclosures: I Have Nothing To Disclose.
Objective: Following the release of the Risk Evaluation and Mitigation Strategies (REMS) from the FDA regarding Long Acting Opioids, an overall evaluation of the prescribing procedures of our pain management clinic was needed. An initial one week screening of clinic phone calls to the nursing staff revealed a large number of prescription refill requests for Schedule II and III medications without a face-to-face visit. This led to a change in the treatment pathways of the clinic. The goals were to: 1) limit phone/portal requests for Controlled Substance medications and 2) have all patients with continuous use of opioid medications return to clinic more regularly. This information would then be utilized to determine the frequency of future clinic visits.
Design: Prospective, behavioral intervention.
Setting: Urban academic pain management clinic.
Participants: Chronic pain patients, 1019 opioid requests.
Interventions: Baseline data of the ongoing practice was obtained over a four week period prior to implementing the changes requiring face-to-face visits. The patients were notified when calling in that they would need to be seen for their next prescription refill.
Main Outcome Measures: The nursing staff recorded each patient request for medication (phone and portal) and type of medications requested.

Effects of Cervical Extension on Deformation of Intervertebral Disc and Migration of Nucleus Pulposus

October-03-2013 7:30:AM
501. Best Pain and Spine Medicine Research Podium Presentations
AAPM&R Annual Assembly

Sun G. Chung[1], Yoon-Ho Kim[2], Sung-In Kim[2], Seongjun Park[2], Sung Hwan Hong[3]

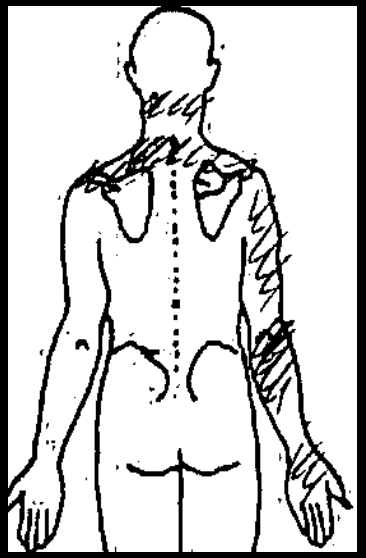
[1]Department of Rehabilitation Medicine, College of Medicine,
[2]School of Mechanical and Aerospace Engineering,
[3]Dept of Radiology, College of Medicine,
Seoul National University

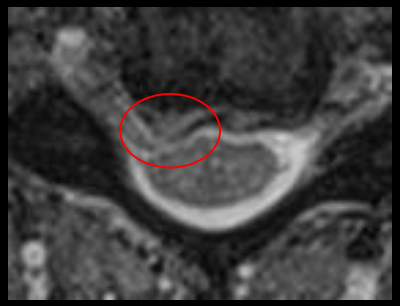
Disclosure

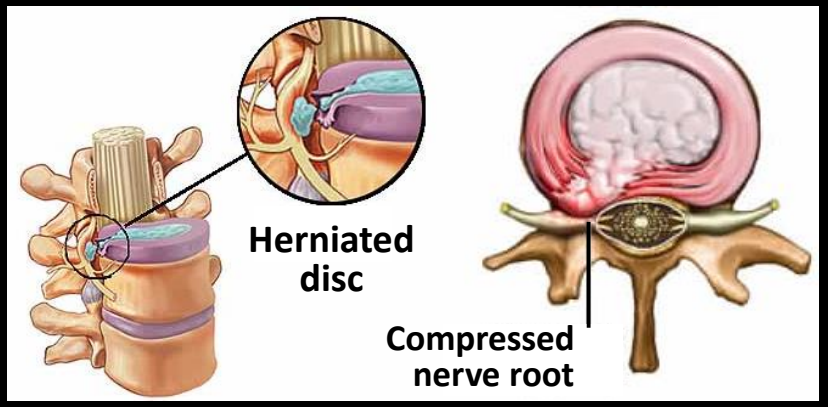
- Discussion of off-label uses of drugs or products: No
- Significant financial interests/relationships with manufactures of commercial products relevant to this presentation: None
- Conducted in the Seoul National University Hospital, supported by the Korean Foundation for the Advancement of Science & Creativity (KOFAC) grant funded by the Korean Government (MEST).
- Level of Evidence: 4

Pain from Cervical Spine

- Pain originated from the cervical spine is one of the major health problems in modern society.
  - 51% of people suffer from neck pain in a general population (Van der Donk, Schouten et al. 1991)
  - Main cause of the neck pain has been considered to be the structural abnormalities of intervertebral disc, e.g. disc herniation (Milette, Fontaine et al. 1999)

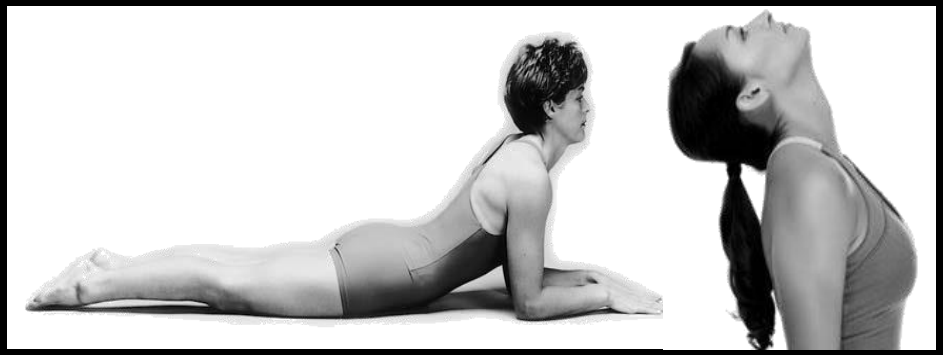






Extension Exercise

- The extension exercise so-called 'McKenzie maneuver' has been reported to have pain-relieving effect. (Smith and Mell 1987, Highland, Dreisinger et al. 1992, Kjellman and OBerg 2002, Dionne et al. 2006)



- **Therapeutic mechanism** underlying the cervical extension exercise?
- **Biomechanical aspects** of the cervical spine subjected to the extension?

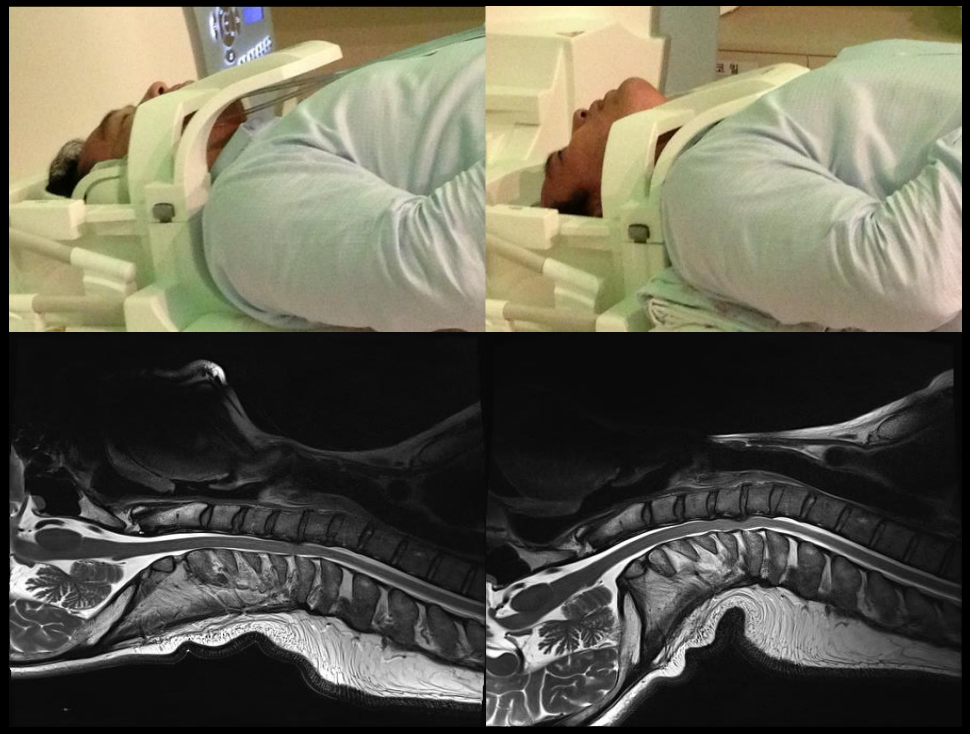
Objectives

- To investigate the effects of cervical extension maneuver on cross-sectional morphological changes:
  1) Deformation of IVD (Intervertebral Disc);
  2) Migration of NP (Nucleus Pulposus) in IVD;
  3) Posterior Bulge of AF (Annulus Fibrosus);
  4) Correlation between NP migration and Extension angle;
  5) Cross-sectional morphological change of NP

Method

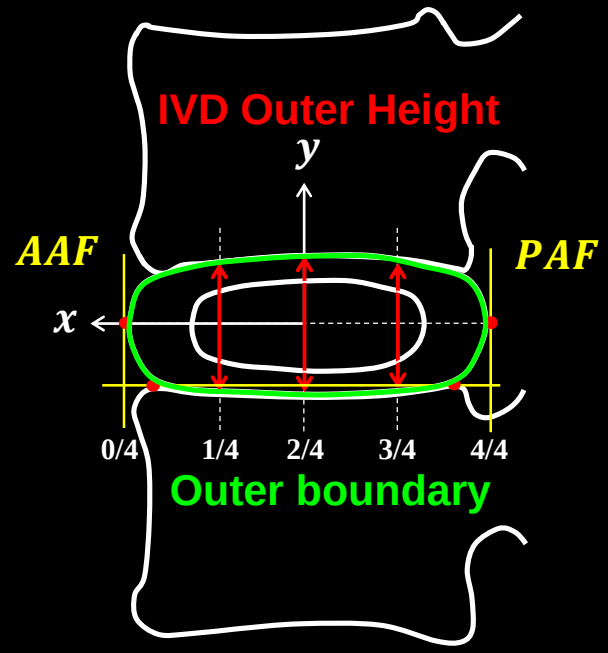
- 10 young, healthy male participants (22.4±1.6 years old)
- No history of
  - Trauma or inflammation
  - Pain for > 48 hrs. in post neck or shoulder girdle
- Can tolerate Cervical extension for > 5min

- Midline sagittal T2 MR in neutral and extended postures

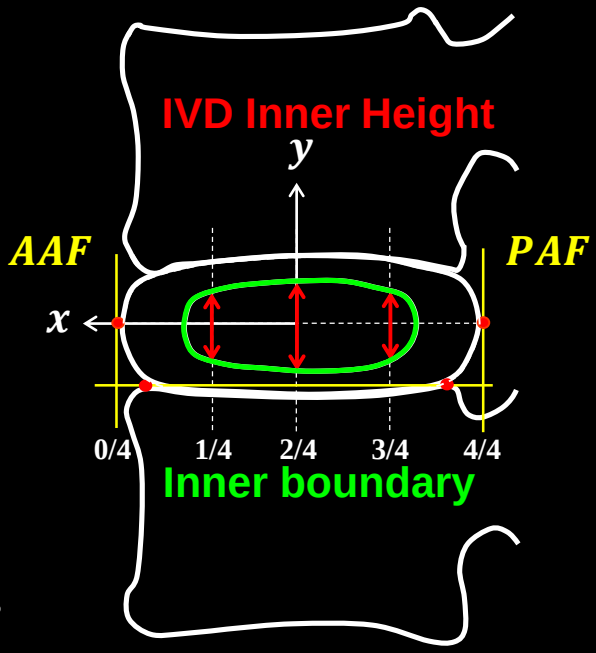


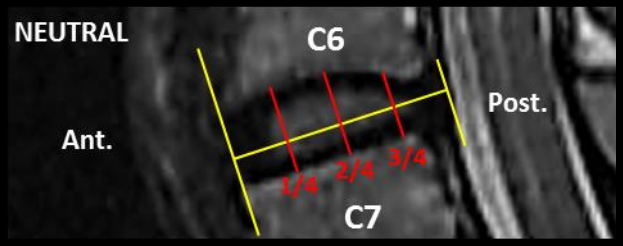
Neutral Extension

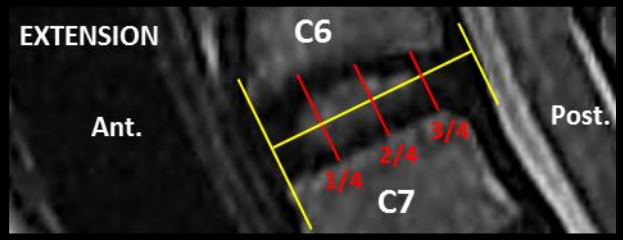
Data Analysis 1 : Deformation of IVD

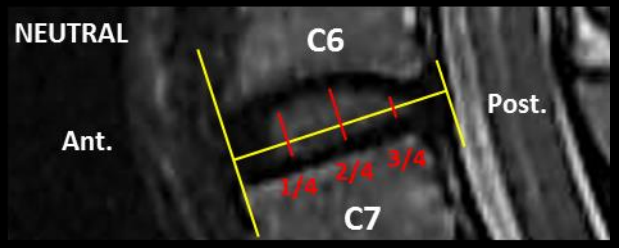


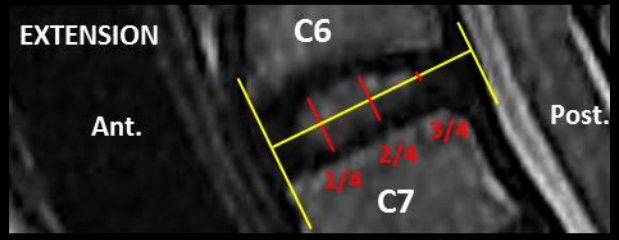
Heights of IVD's outer and inner boundaries were measured at same positions (1/4, 2/4, 3/4 of IVD length) for neutral / extension states.



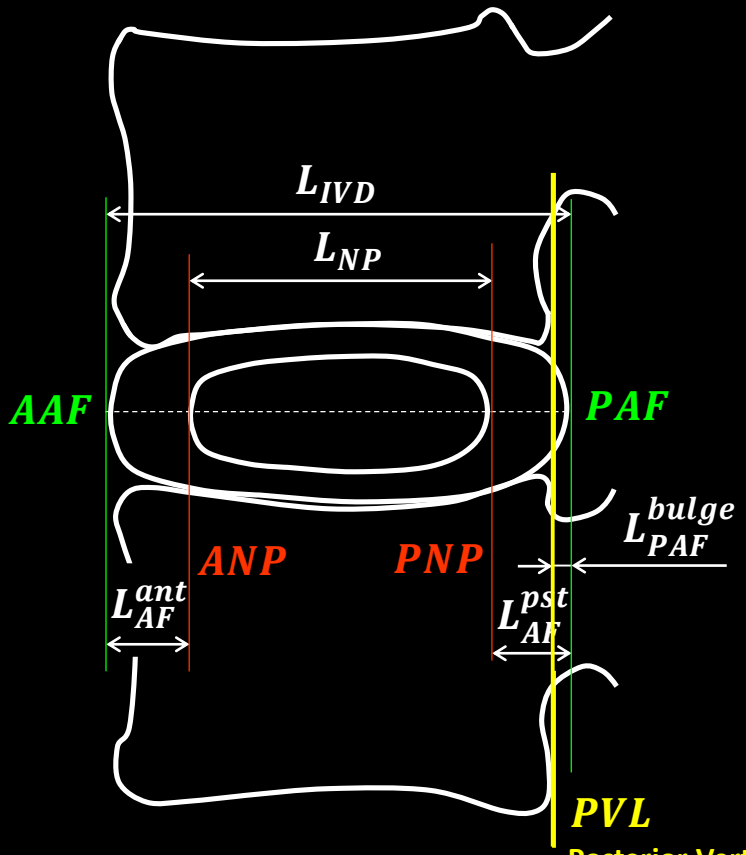


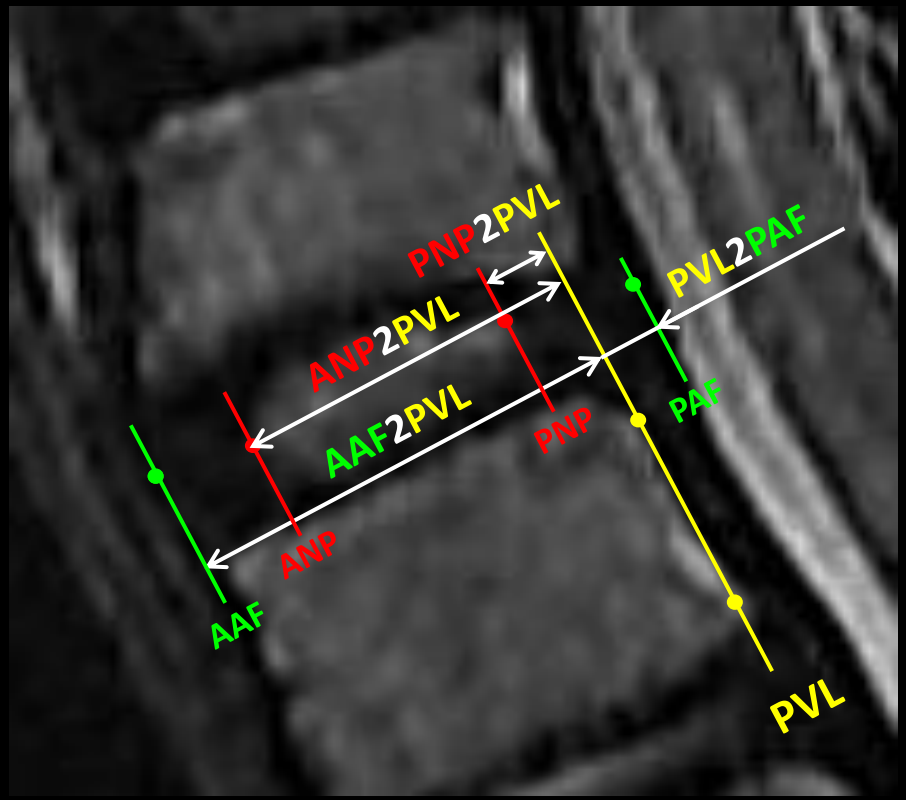






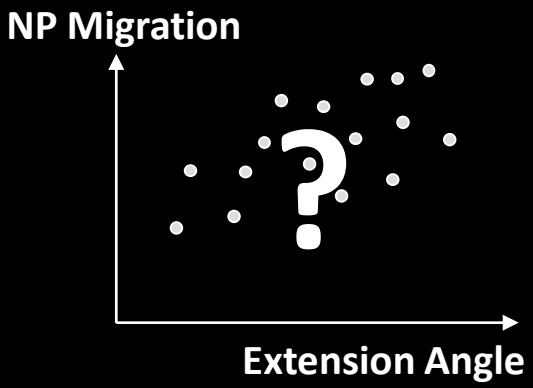
Data Analysis 2 : Migration of NP

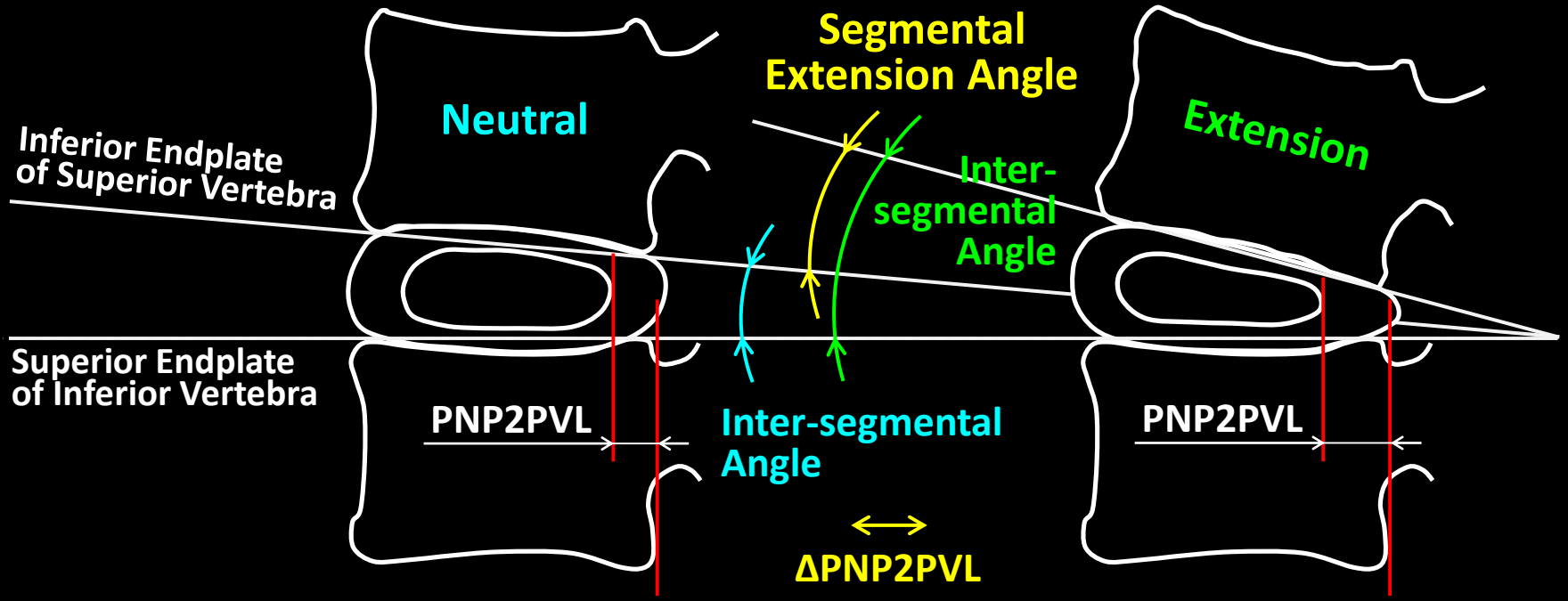




Data Analysis 3 :
Correlation between NP Migration and Extension Angle

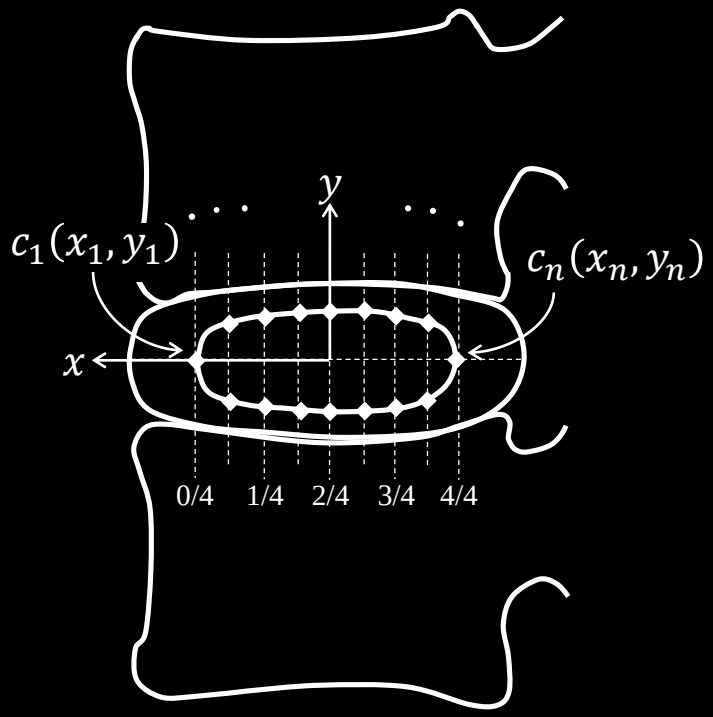
1) Definition of Inter-segmental Angle
2) Definition of Segmental Extension Angle
3) **NP migration VS. Segmental Extension Angle**

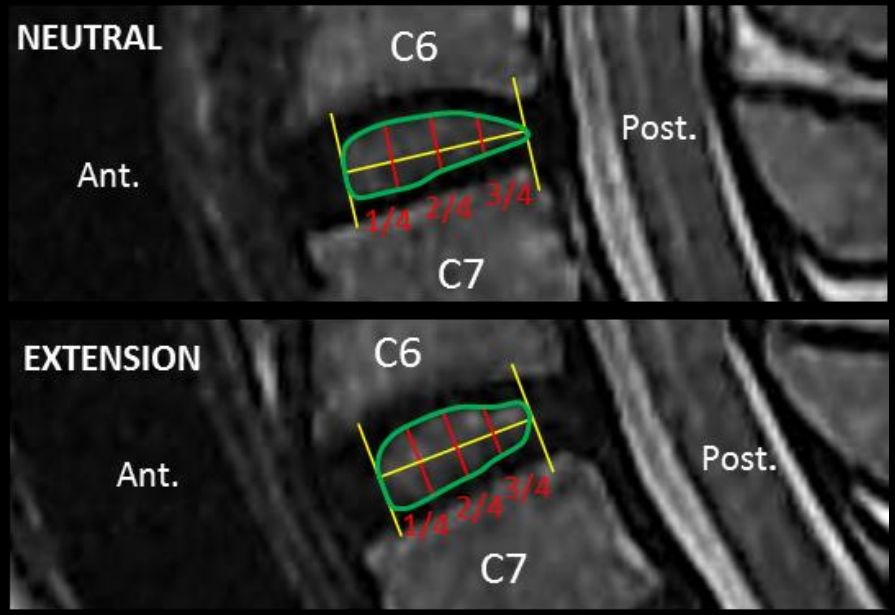




Data Anlaysis 4 : Morphological Change of NP

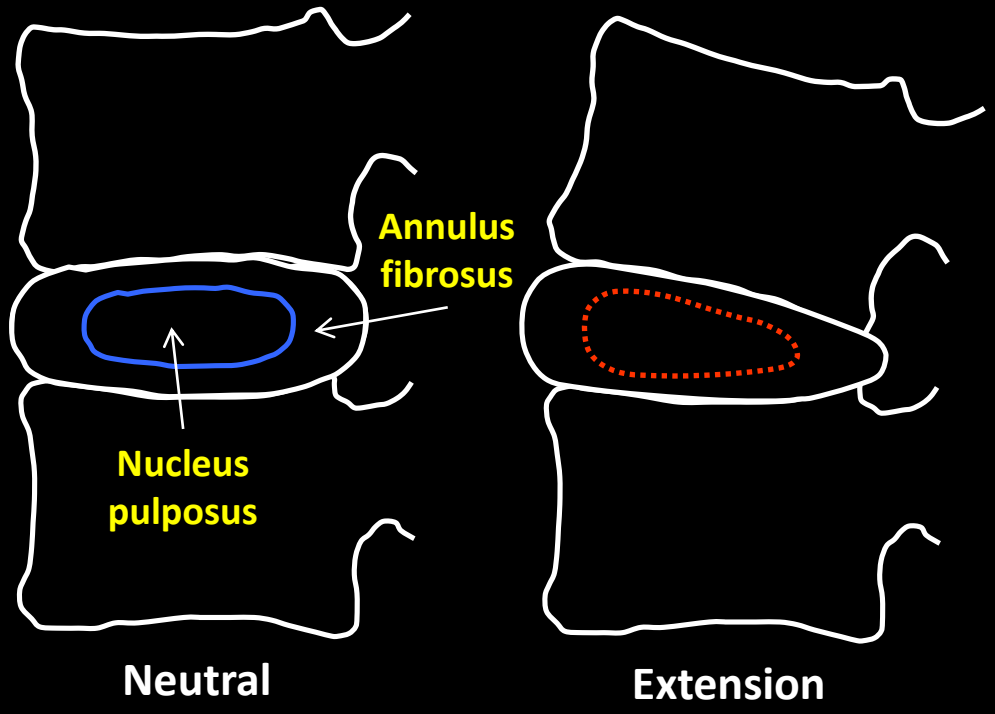
Method for Extracting NP Contours

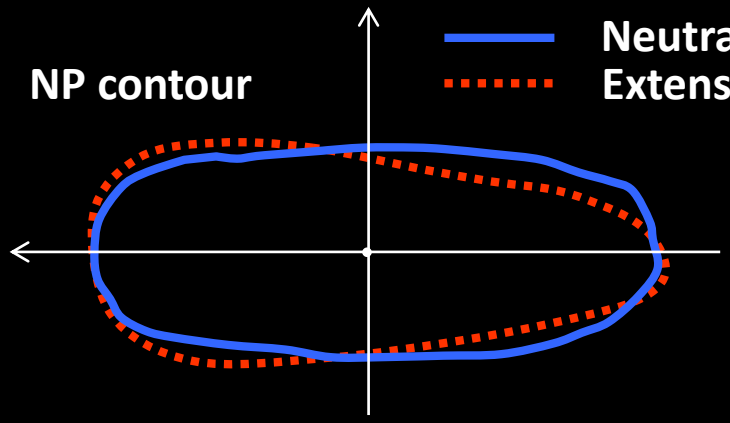




Data Anlaysis 4 : Morphological Change of NP

Comparing NP contours of each state for analysis of cross-sectional morphological change of NP.





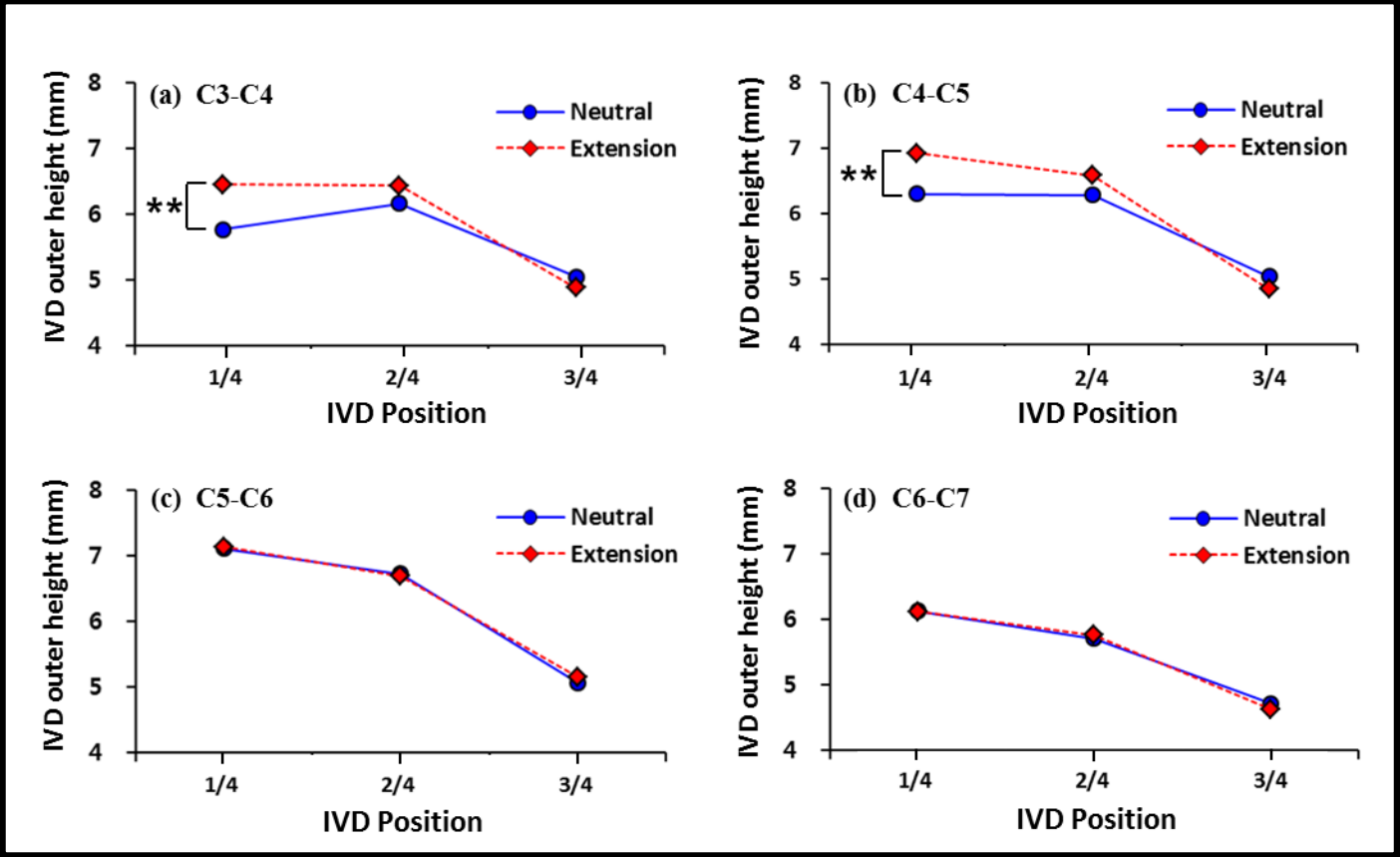
NP contours of Neutral / Extension were superimposed by their centres on the sagittal plane to be compared.

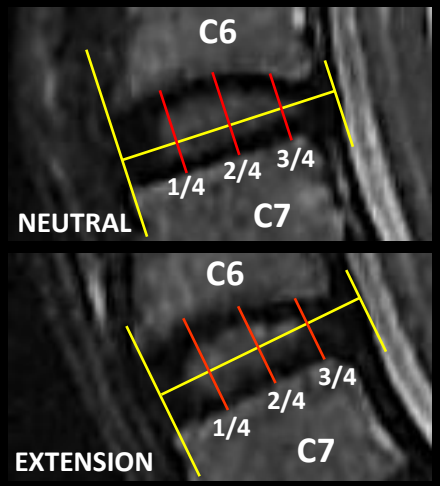
Statistical Analysis

- Statistical significance on deformation of IVD/NP and migration of NP was assessed by **Paired T-test**.
- **Pearson Correlation Analysis** was performed for the relationship between NP migration and inter-segmental extension angle.

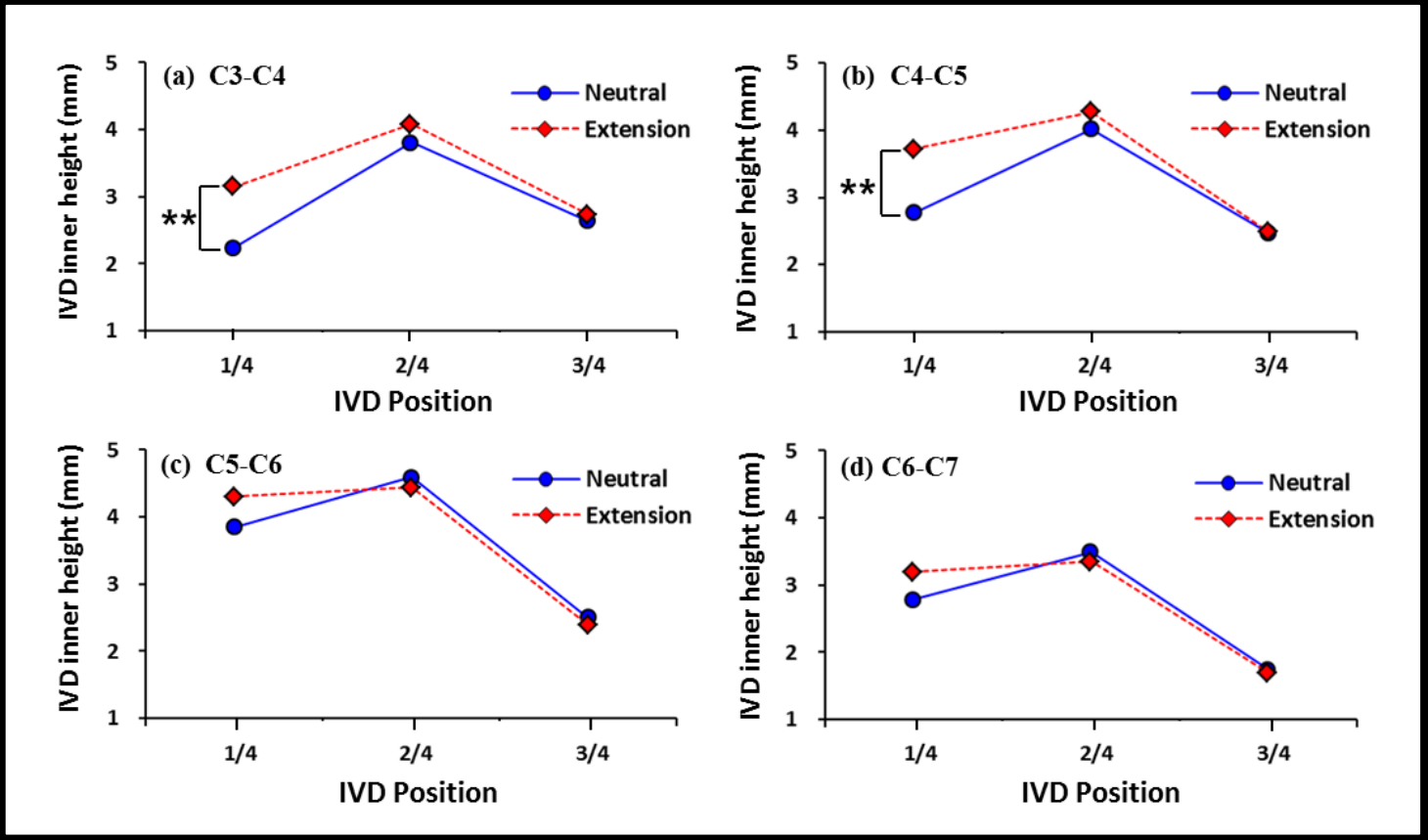
Results

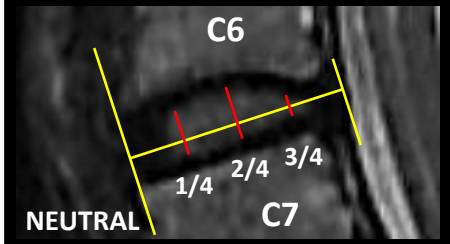
Result 1 :
Deformation of IVD's Outer Boundary

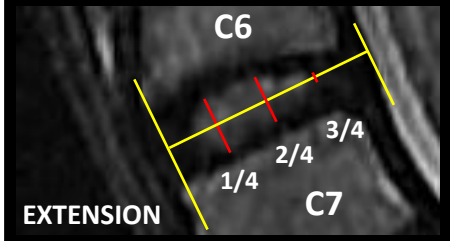




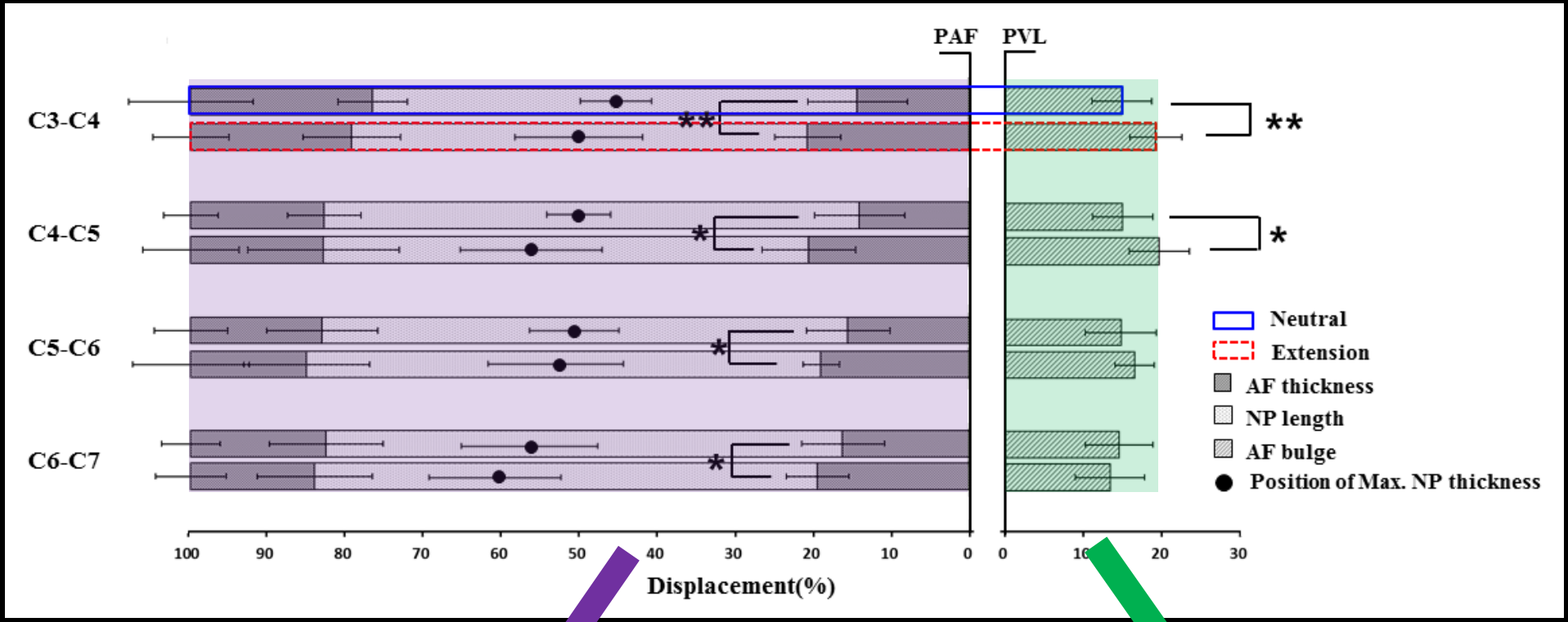
Result 1 :
Deformation of IVD's Inner Boundary

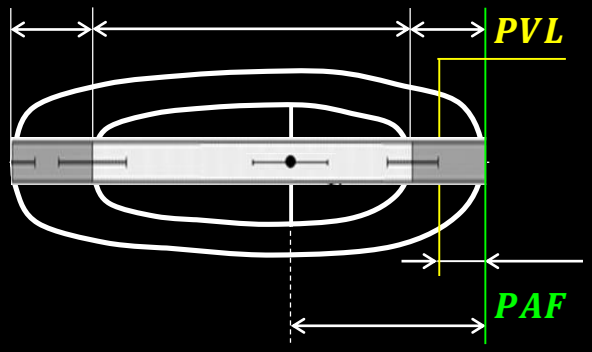


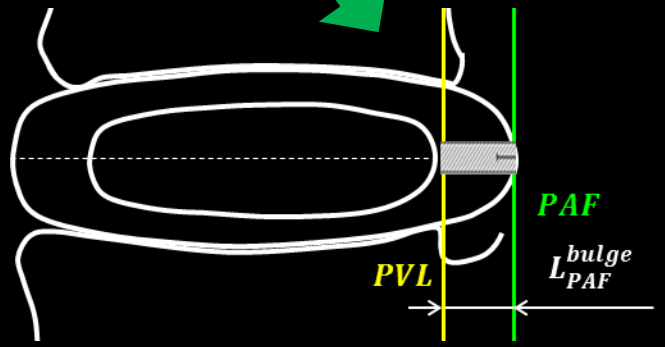




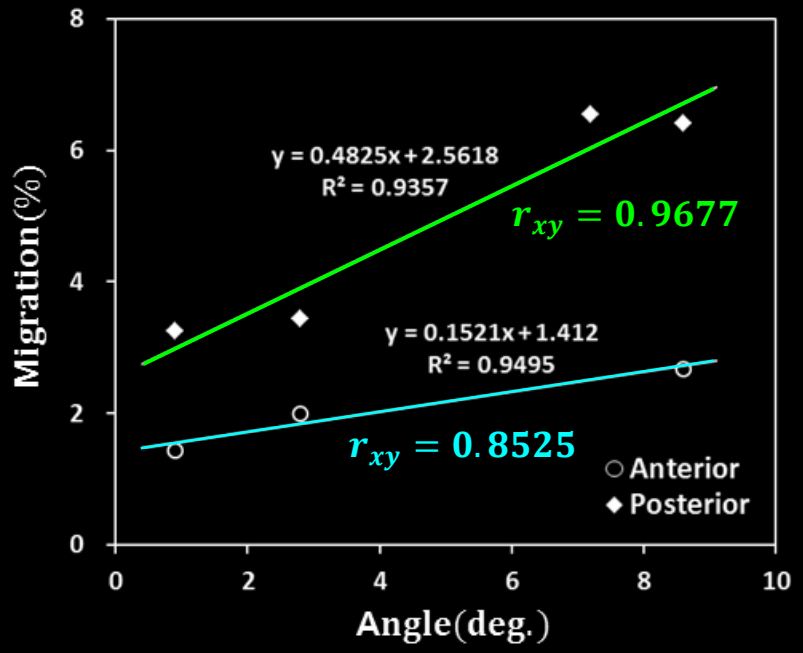
Result 2: Migration of NP



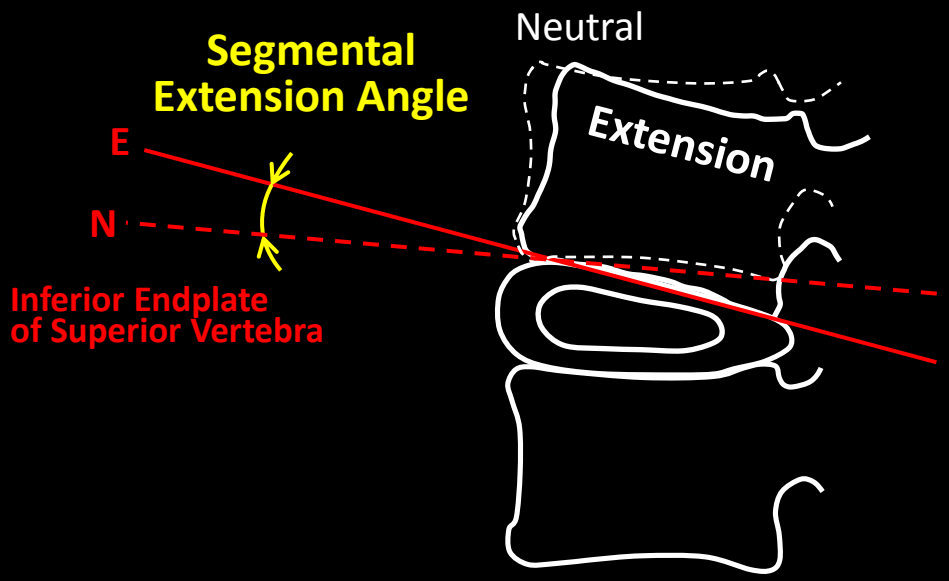


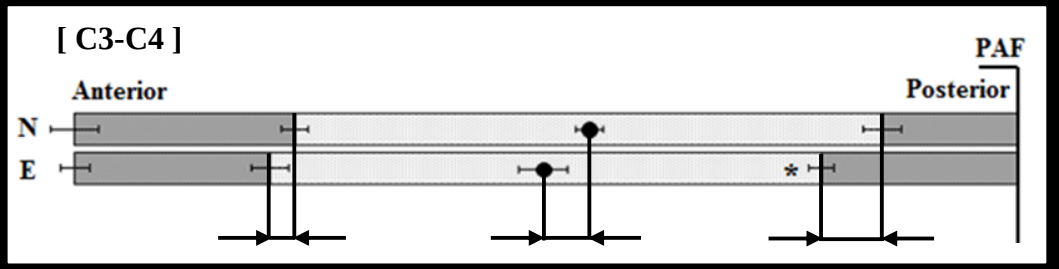


Result 3 :
Correlation between NP Migration and Segmental Extension Angle



r_{xy} : Pearson's Correlation Coefficient

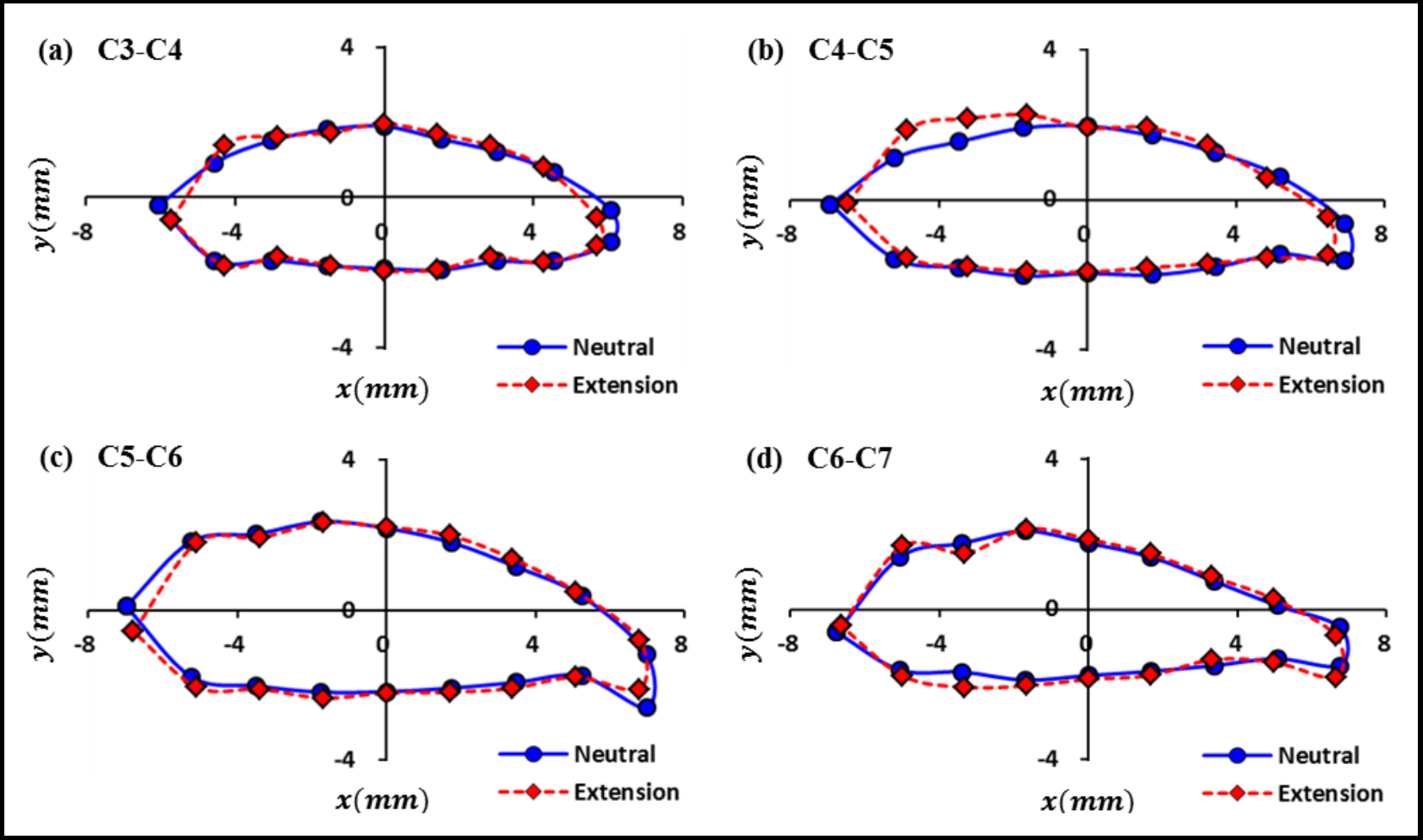




NP Anterior Migration | NP max. height Migration | NP Posterior Migration

Result 4 :
Morphological Change of NP

Cross-sectional morphology change of NP on the mid-sagittal plane



Conclusions

- At cervical extension,

1) Anterior height of IVD increases significantly at C3-C4 and C4-C5 for both outer and inner boundaries.
2) Posterior margin of NP migrates anteriorly in the IVD, where the amount of migration was greater at C3-C4, C4-C5 than C5-C6, C6-C7.
3) Posterior margin of AF protrudes posteriorly at C3-C4 and C4-C5, while the cross-sectional length of posterior AF increases at all levels.
4) Significant linear correlation exists between NP migration and extension angle.
5) Cross-sectional morphological change of NP occurs as well as the anterior migration:
   a) anterior height of NP increases, which was significant at C3-C4, C4-C5.
   b) cross-sectional length and posterior height of NP slightly decrease.

Thank You