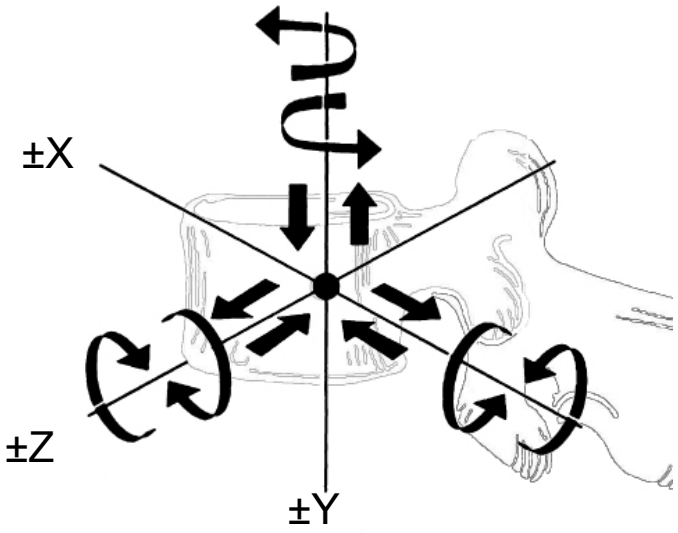
OMURGA YÜK DAĞILIMI

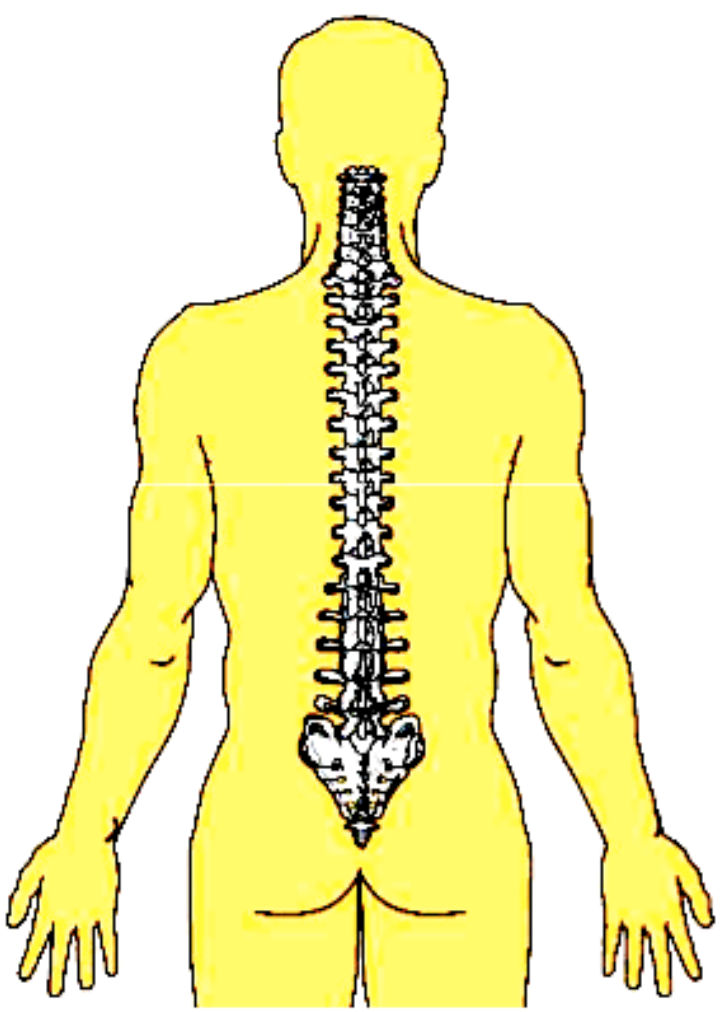
Dr.Hakan BOZKUŞ

Omurganın Eksen ve Planları

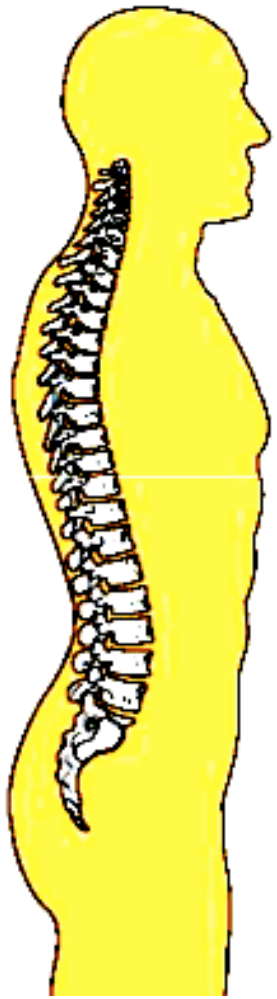


6 serbestlik derecesi

Koronal plan (± YX)
Sagittal plan (± YZ)
Aksiyal plan (± XZ)

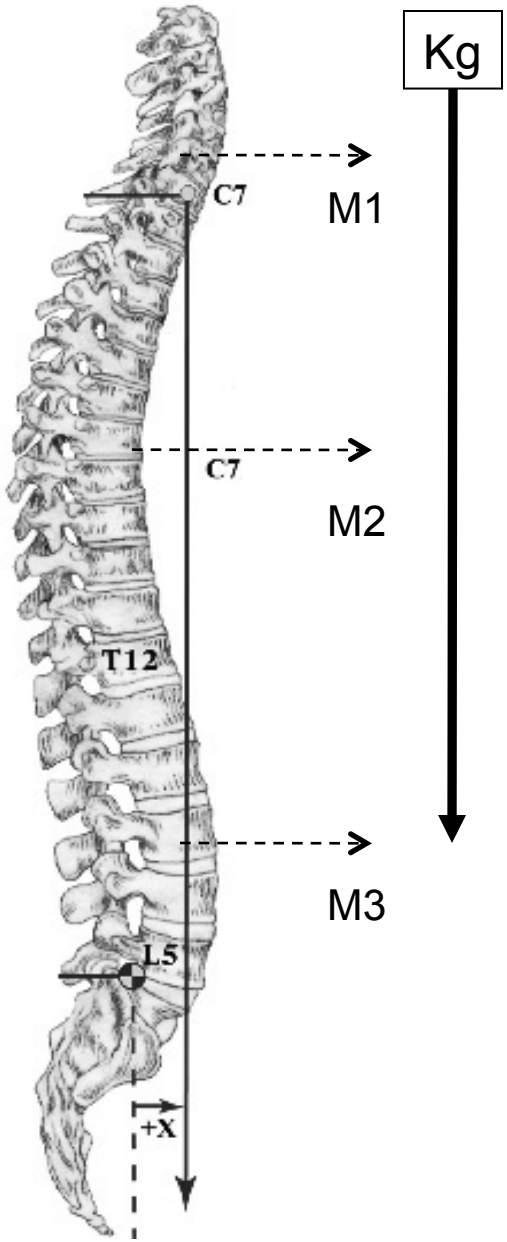


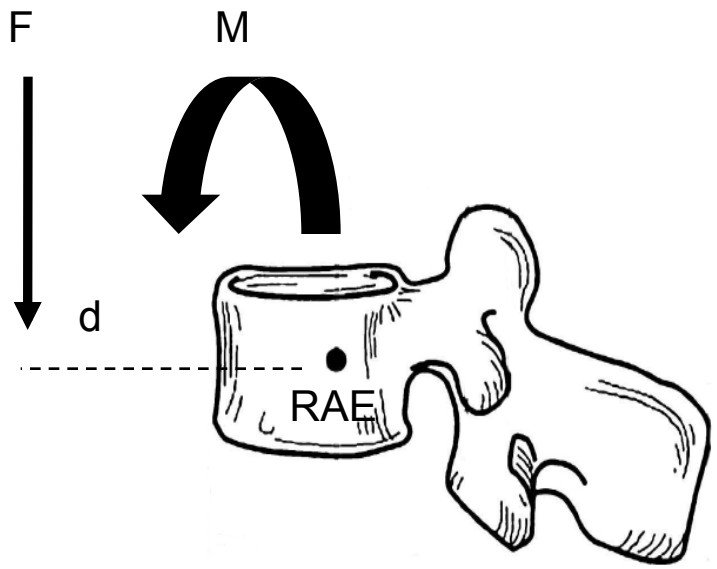
Koronal plan



Sagittal plan

Moment= Yük x Uzaklık





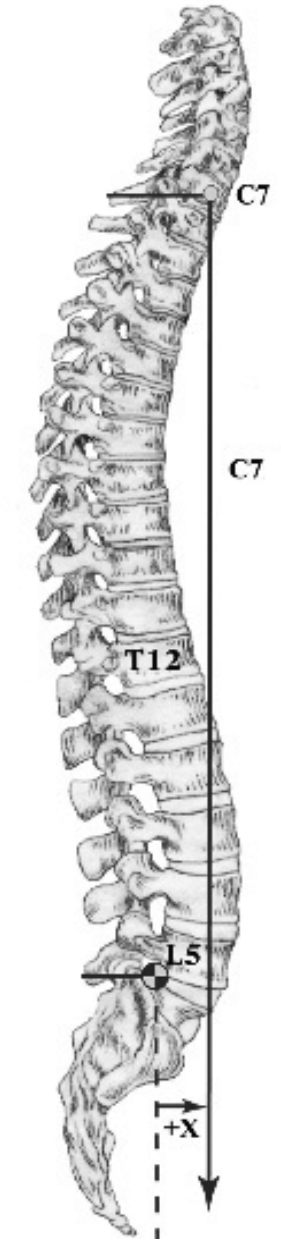
M= F. d

Sagittal Denge

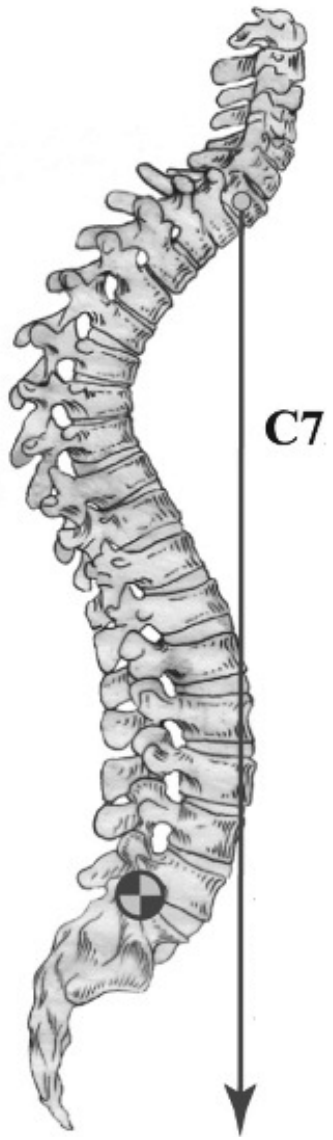
Lordoz

Kifoz

Lordoz



C7 plumb çizgisi !

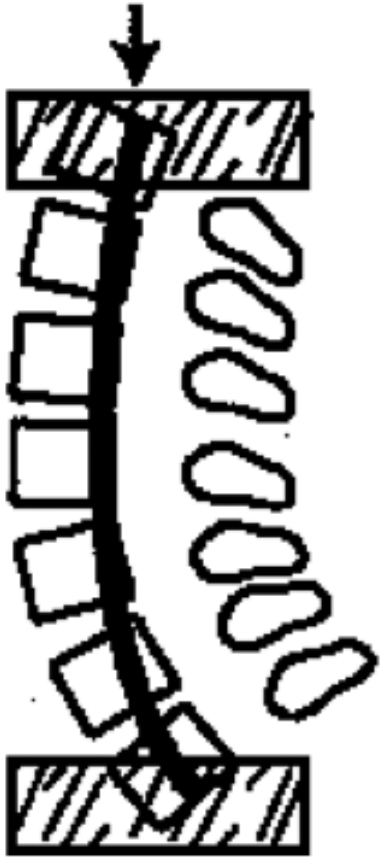


Servikal Bölge Gerilme Dağılımı

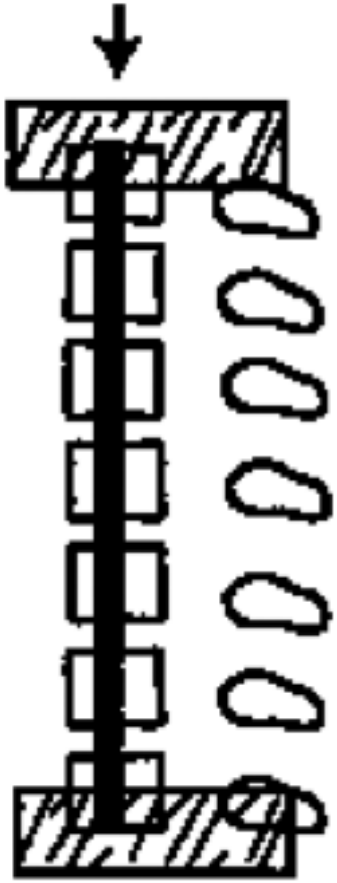
- Omur cisminde;
  - Flexion ve aksiyal yüklemeler ile basma gerilmesi
  - Ekstansiyon yükleme ile çekme gerilmesi
- Laminalarda
  - Aksiyal yükleme ile çekme gerilmesi
  - Fleksiyon/ ekstansiyon yüklemeler ile oluşan basma ve çekme gerilmeleri eşit miktarda

Bozkus et al., Turkish Neurosurgery, 2004

Servikal Bölge Yük Dağılımı



Normal lordoz



Lordoz kaybı

• Azalmış servikal lordozda; aksiyal basma yüklemesi ile hasar daha kolay olur.

Oktenoglu et al., J Neurosurg, 2001

Torakal Bölge Yük Dağılımı

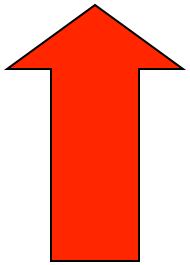
- Aksiyal yüklerden (basma/ çekme) daha fazla etkilenir

- Fleksiyon hareketinde ekstansiyona göre daha fleksibl

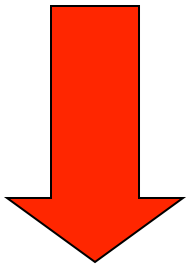
Panjabi et al.JBJS, 1976

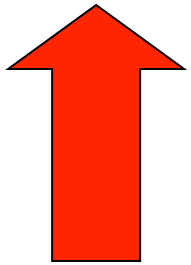
İntervertebral Disk Davranışı

Bifazik Davranış

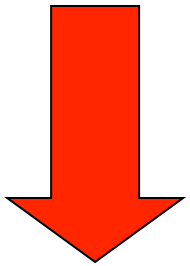


YÜK



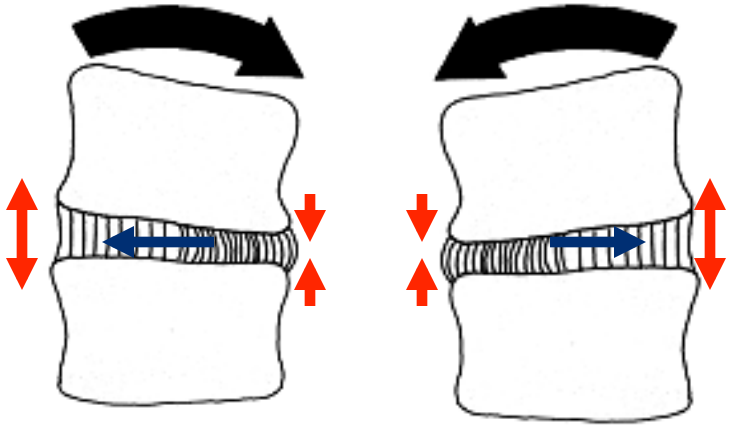


DİSK SERTLİĞİ



Lomber Bölge Yük Dağılımı

Fleksiyon/ Ekstansiyon/ Lateral Bending



Fleksiyon

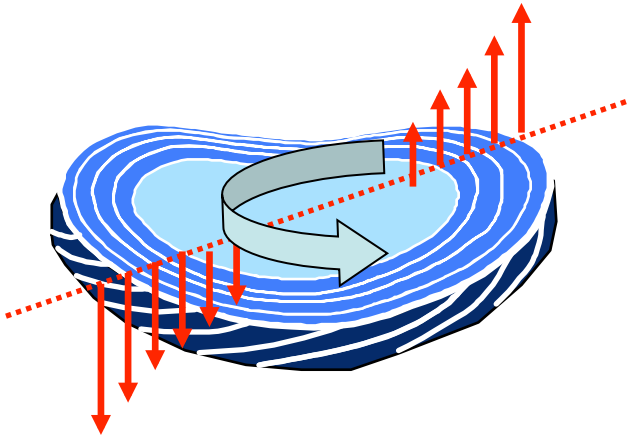
Ekstansiyon

- Momentin olduğu tarafta anulus liflerinde basma gerilmesi, karşı tarafta çekme gerilmesi oluşur

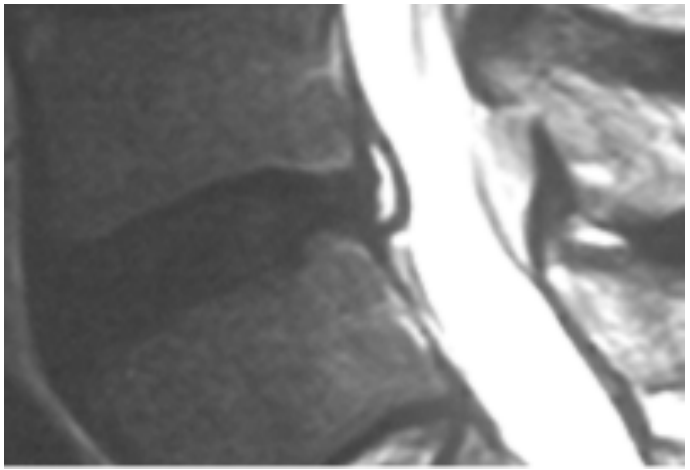
- Disk içeriği momentin olduğu tarafın tersine yer değiştirir

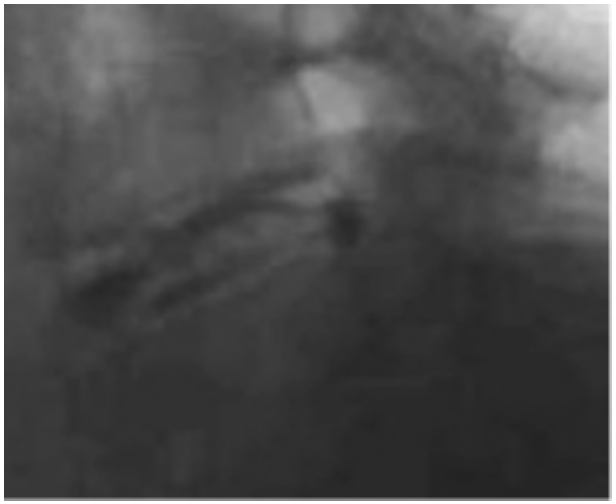
Lomber Bölge Yük Dağılımı

Aksiyal rotasyon



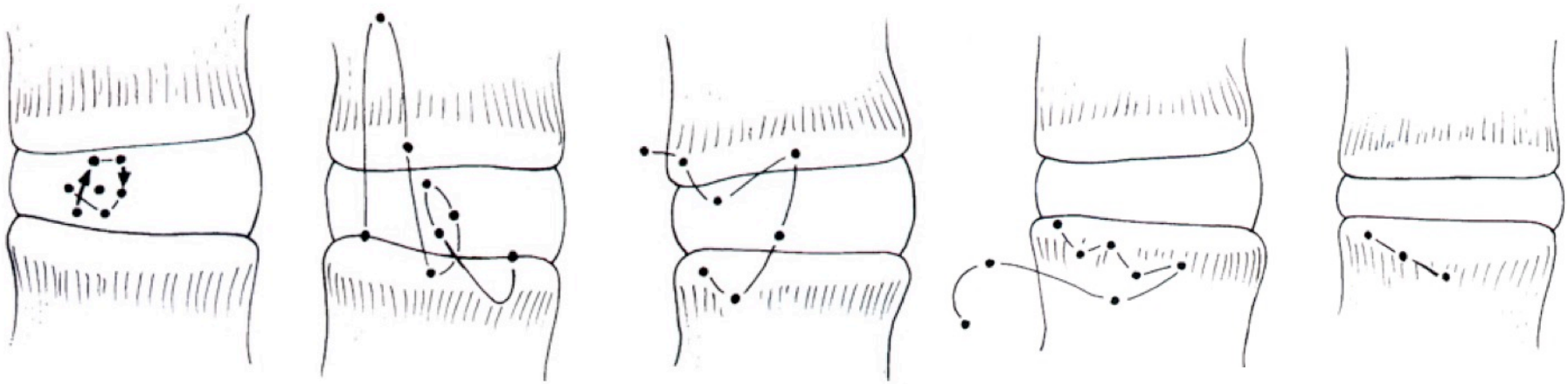
- Disk içi ve anulus kayma gerilmeleri dış yan bölgelerde daha fazladır

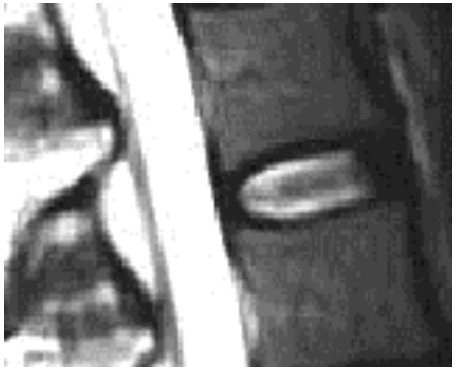


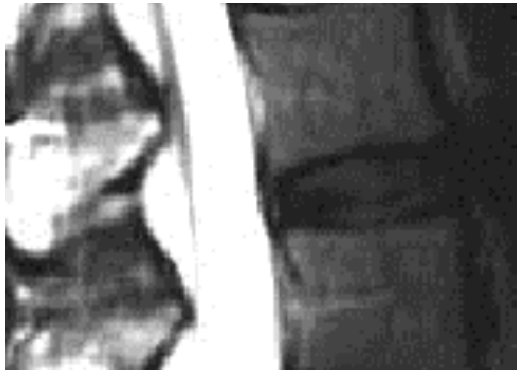


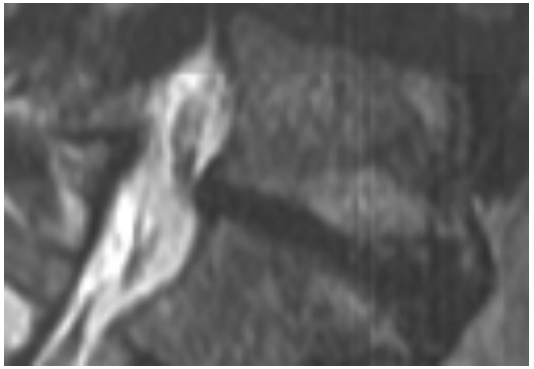
Lomber Sagittal Plan Yük Dağılımı

Normal ve Dejenere Diskte Rotasyonun Anlık Ekseninin Değişmesi









Michael T. Modic, MD • Peter M. Steinberg, MD • Jeffrey S. Ross, MD
• Thomas J. Masaryk, MD • John R. Carter, MD

Degenerative Disk Disease: Assessment of Changes in Vertebral Body Marrow with MR Imaging[1]

- 474 dejenere disk olgusunun MR değerlendirmesi

	T1	T2
• Tip 1:	hipo	hiper
• Tip 2:	hiper	hiper
• Tip 3:	hipo	hipo

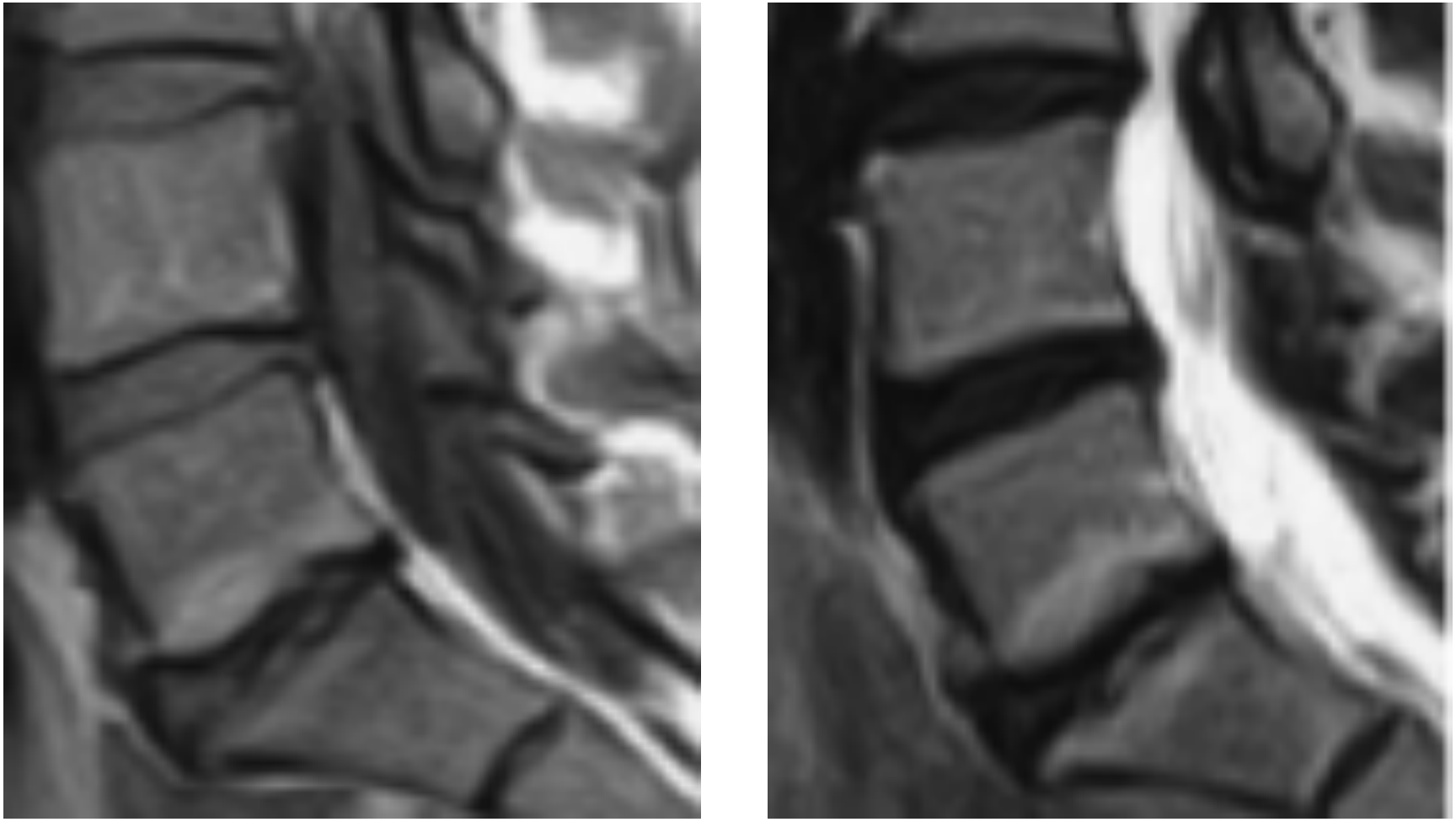
- Tip 1 Tip 2'ye dönebiliyor (14 ay-3 yıl)
- Tip 2 aynı kalabiliyor (2-3 yıl)

Radiology 1988

Modic 1

Subkondral kemik iliğinde artmış vaskularite

Modic 2



Subkondral kemik iliğinde yağ dejenerasyonu

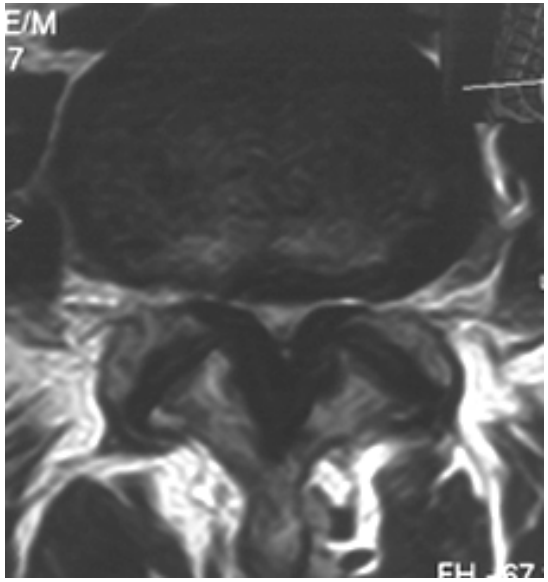
Modic 3

Subkondral kemik iliğinde skleroz

Hangi Yapı Önce Dejenere Oluyor ?

Disk dejenerasyonu genellikle faset eklem osteoartritinden önce oluşmaktadır.

FASET EKLEMİ ve PEDİKÜL



Butler ve ark., Spine 1990

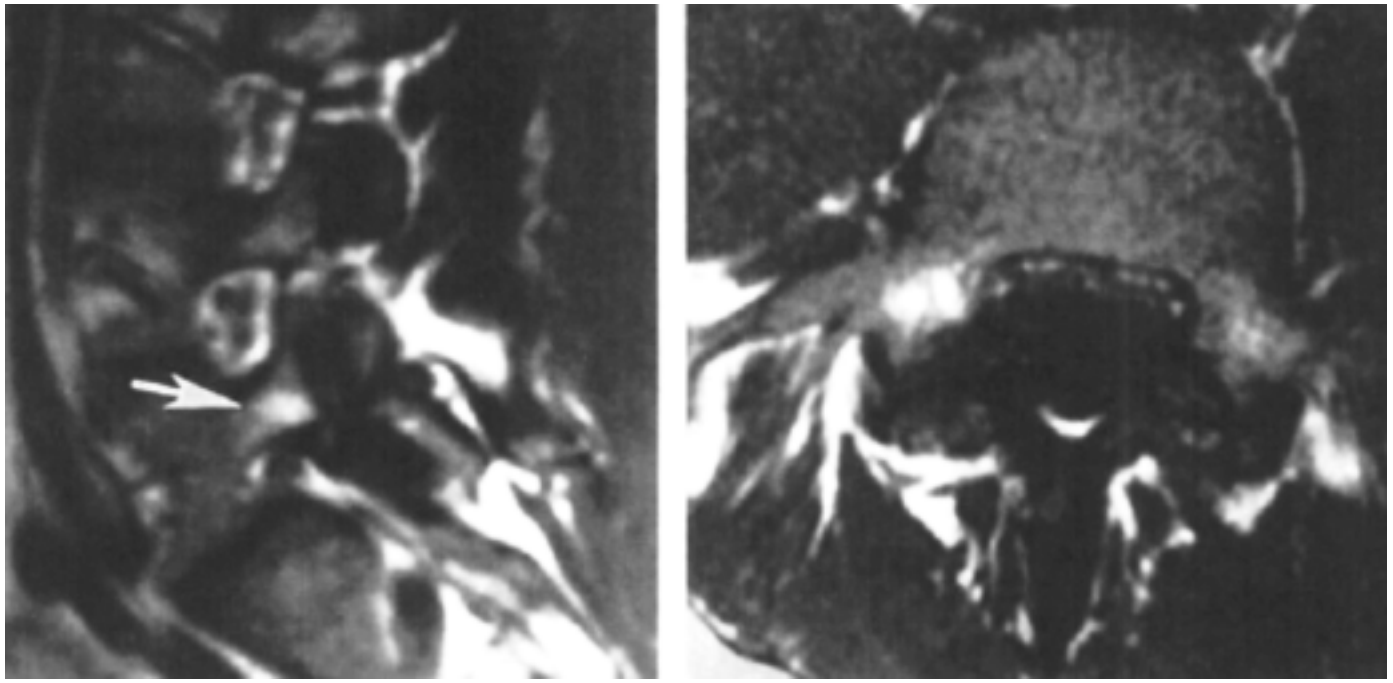
Lumbar Spondylolysis: Reactive Marrow Changes Seen in Adjacent Pedicles on MR Images

AJR 1995;164:429–433

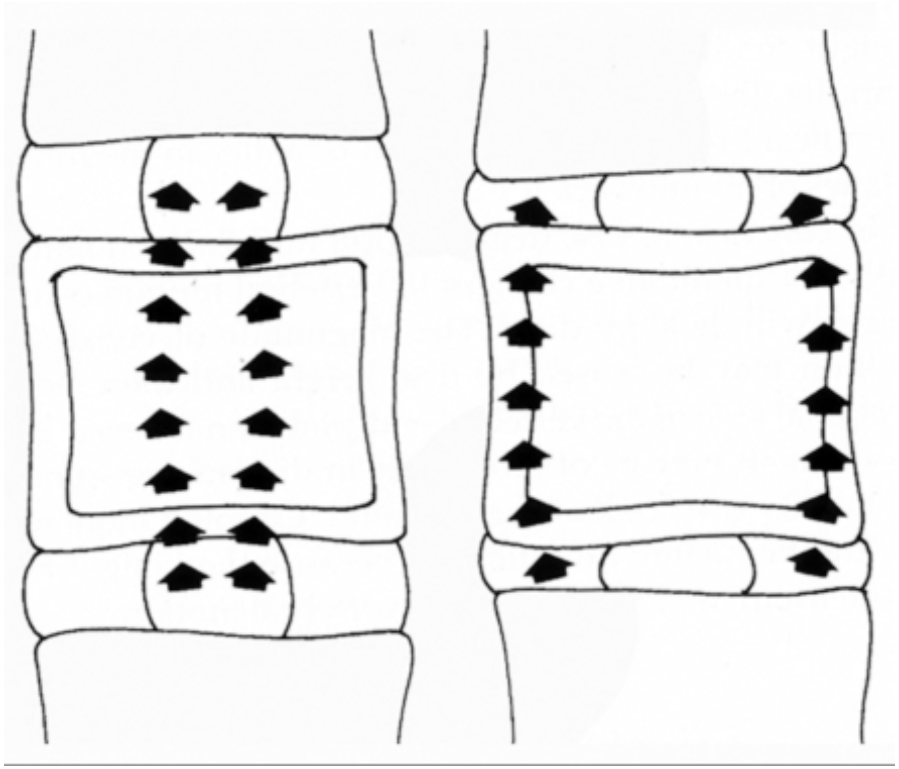
John L. Ulmer[1]
Allen D. Elster[1]
Vincent P. Mathews[1]
Anton M. Allen[1,2]

OBJECTIVE. In a search for ancillary MR findings for the diagnosis of spondylolysis, we performed a retrospective study to characterize changes in MR signal intensity of marrow within lumbar pedicles at the level of a spondylolytic defect. These reactive marrow changes were classified according to the anatomic-pathologic scheme developed for degenerative disk disease by Modic et al.

Lomber spondilozda pedikül Modic değişiklikleri %40 hastada görülüyor



Disk Dejenerasyonu



Normal Dejenere

Dejenerasyonda annulus nukleusdan daha fazla yük taşır !

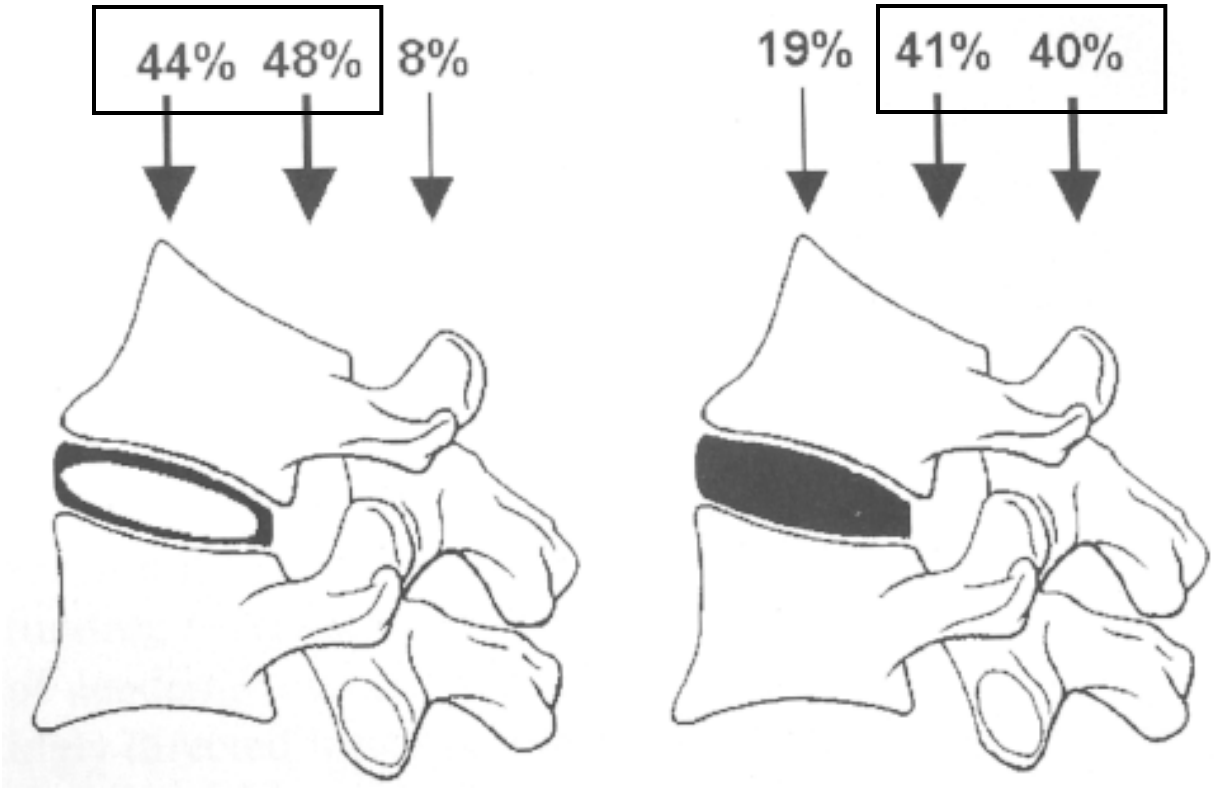
Yük Dağılımı

Journal of Biomechanics 38 (2005) 1972–1983

Perspective

Spine biomechanics ☆

Michael A. Adams*, Patricia Dolan



Normal

Dejenere

JOURNAL
OF
BIOMECHANICS

Journal of Biomechanics 37 (2004) 197–204

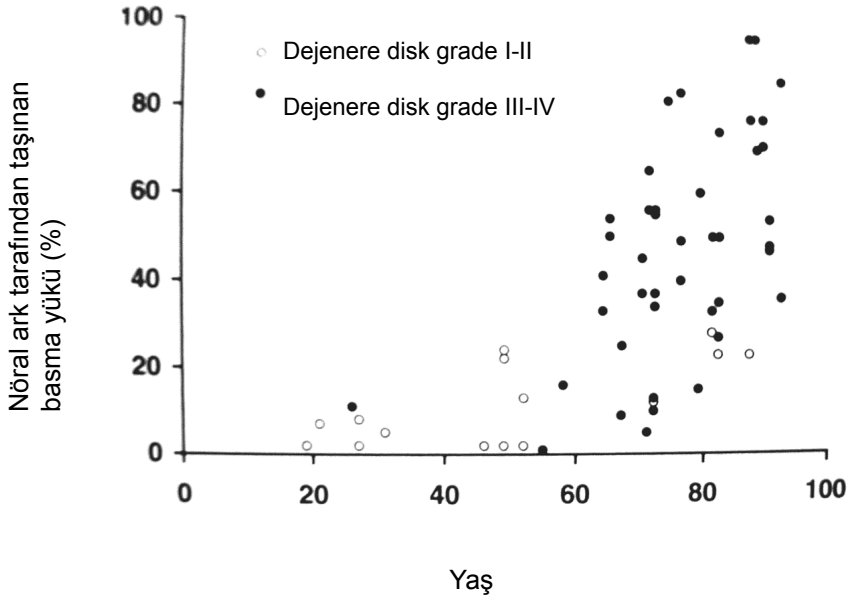
www.elsevier.com/locate/jbiomech
www.JBiomech.com

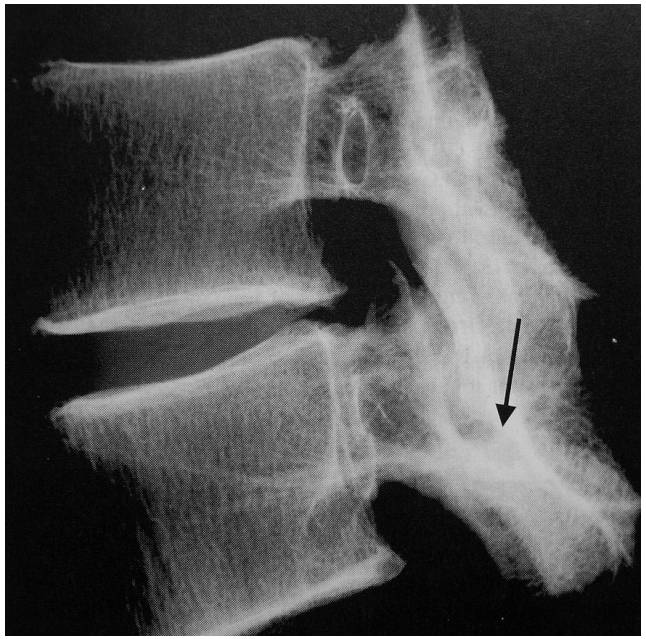
Neural arch load-bearing in old and degenerated spines

P. Pollintine, A.S. Przybyla, P. Dolan, M.A. Adams*

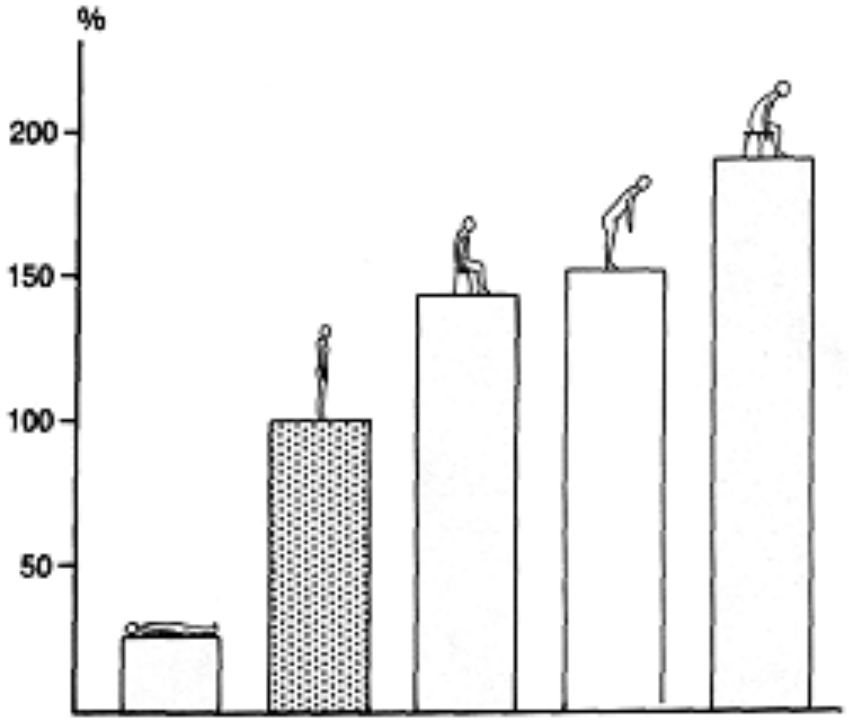
Comparative Orthopaedic Res Unit, Department of Anatomy, University of Bristol, Bristol BS2 8EJ, UK

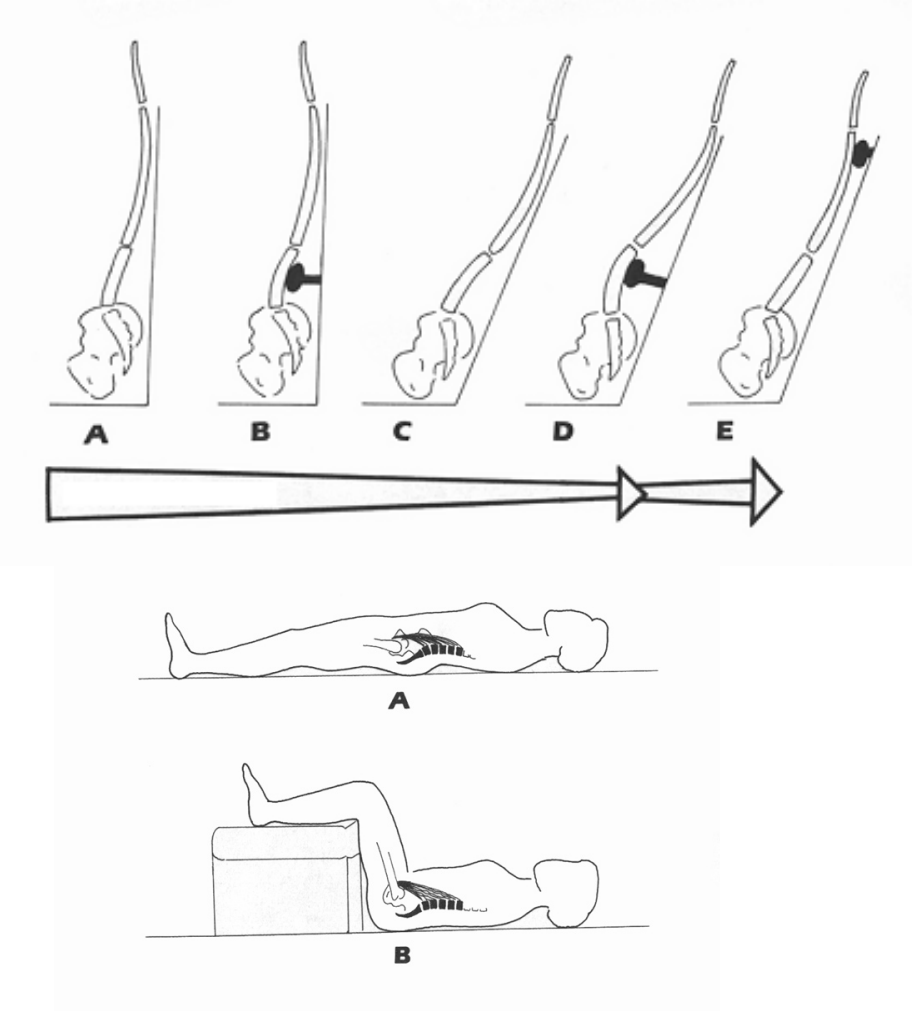
70 yaş sonrası nöral ark %50 yük taşıyor





Lomber Disk İçi Basınç

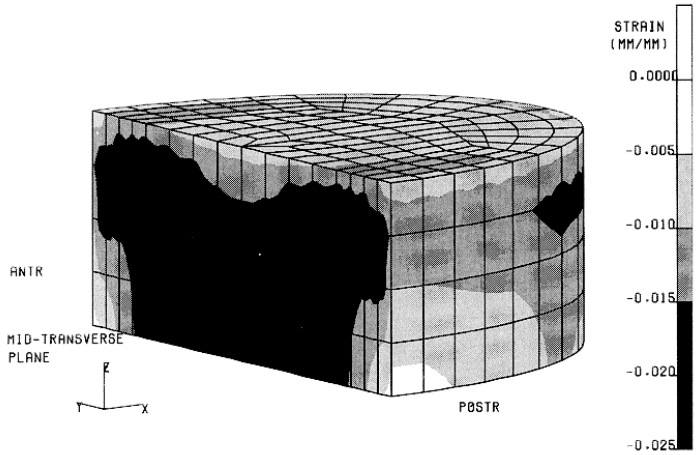




Nachemson., 1966

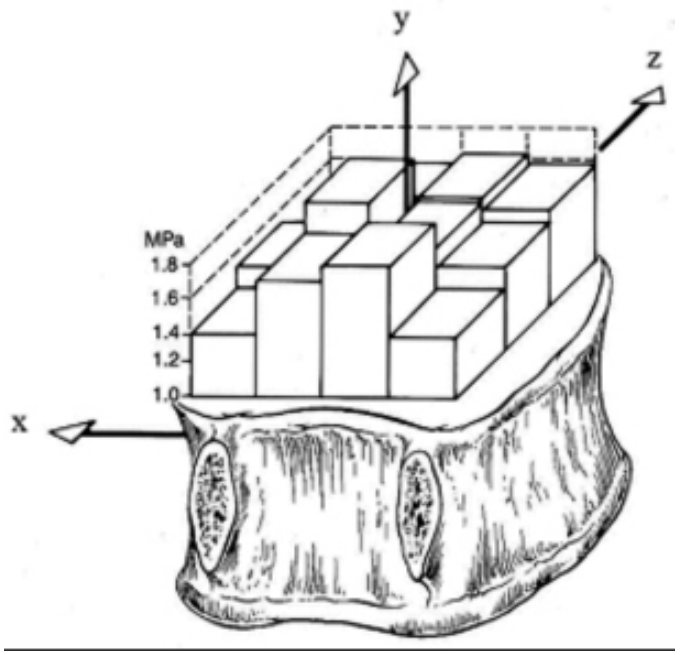
Korteksden Yük Geçişi

Rockoff (1969)	%45-75
McBroom (1985)	%10
Yoganandan (1988)	%40
Faulkner (1991)	%12 (osteoporozda %56)
Burr (1994)	%50 (osteoporozda %90)



Trabeküler Kemik Dayanımı

Basma yüklemesi



Basma yüklemesine dayanım;

En fazla → ORTA

En az → ARKA YAN

1 MPa= 10 kg/cm^2

Kazarian, 1977

Son-plak (end-plate)

- En sağlam yer posterolateral son-plak
- En zayıf üst son-plak ortası
- Üst son-plak, alt son-plaktan daha zayıf

Grant JP ve ark., Spine 2001

Son-plak (end-plate)

- Tekrarlayan yükleme ile yorulma testi
- İlk kırılan yer üst son-plak ve komşu trabeküler yapı
- Disk dejenerasyonu ile direk korelasyonu yok

Schmorl’s Nod

Son Söz

- Fizyolojik lordoz ve kifozlar önemli!

- Omurgayı etkileyen yükler genel olarak moment ile hesaplanır.

- İntervertebral disk ve anulus arka dış yanda daha fazla gerilmeye maruz kalır.

- İntervertebral disk dejenerasyonu ile yük anulus ve posterior kolondan taşınır

- Osteoporozda, omurga korteksinden yük daha fazla taşınır

Konuşmanın slaytları

www.hakanbozkus.com

adresinden alınabilir

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