

#### **Disc Degeneration**

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### Outline

- Introduction
- Anatomy and pathophysiology
- Clinical presentation
- Diagnostic studies
- Treatment options



- \$86 Billion spent on back and neck pain (2005)
- More U.S. health care dollars are spent treating back and neck pain than any other medical condition.

### Too much pain, Too little money

Company	acquirer	Price(million)
Spinecore	Stryker	360
Link spine	JNJ	325
Spine solution	Synthes	350
Spinal dynamc	Medtronic	270
Total		1.3 billion



# Why Disc?







#### PART 1 - NULEUS RESIST COMPRESSION TO 8X BODY WEIGHT





# NUCLEUS PULPOSUS





#### Proteoglycan = Super sponge





#### Part 2- ANULUS



LAMINATED CONSTRUCTION OF THE ANNULUS RESISTS MECHANICAL FORCES YET PRESERVES SEGMENTAL MOTION (THE AUTOMOBILE TIRE, WITH ITS HIGH INTERNAL PRESSURE IS QUITE SIMILAR.)





#### PART 3- ENDPLATE /VASCULAR: ENDPLATE FILTRATION SYSTEM For Transfer of Nutrients and Waste Removal

VERTEBRAL SPONGIOSA





#### HOW THE DISC DEGENERATES



# THE STRUCTURES OF THE ENDPLATE WORK WITH THE NUCLEUS AS A METABOLIC PUMP



### CHEMICAL CAUSES OF DISCOGENIC PART

Insoluble Portion of Cell MEMBRANE=

One of The Key Components



#### CHANGES IN EXTRACELL. MATRIX





#### **Collagen**

Inc Col 1:2 Cross link Col Proteolytic clevage

<u>Aggrecan</u>

Less cell – less PG CS to KS More Cross link Breakdown of aggrecan



#### **OUTER ANNULUS VESSEL & NERVE BELT**







#### A F DEGENERATED,

**FIBROTIC NUCLEUS** 

EDEMA OF GEL LAYERS

CIRCUMFERENTIAL EARS

OUTER ANNULUS TEARS



#### TYPES OF ANNULAR TEARS



#### COMBINED DEGENERATION, LEAKAGE AND GANGLIONIC ATROPHY





This Rare Case of Long-Standing Back and Leg Pain Shows Atrophy Of the Ganglion And Post-Ganglionic Nerve. An Old HNP is Also Seen At the Midline

#### MORE ADVANCED NUCLEUS DEGENERATION



#### **CIRCMFERENTIAL TEARS**

OLD HNP

FACET DEGEN

GANGLION



## MECHANICAL FAILURE





### MECHANICAL FAILURE









## **INTRADISCO PRESSURE**





## **Disc Degeneration**

- Controversial
- Young patients
- Mostly mechanical back pain worsen with any activities
- Sitting intolerance
- More pain with flexion than extension
- Abnormal psychological profile









#### **Disc Degeneration**

# Black discHIZ





### Treat patient not x-ray !

- 67Asymptomatic volunteers:
  - MRI + Herniated disc
    - <60 yo = 20%
    - >60 yo = 36%
    - >80 yo = 90%

(Boden JBJS 1990)

#### <u>98 Asymptomatic vol</u>.

- 36% had normal disc at all levels
- (Jensen NEJM 1994)





#### PROVOCATIVE DISCOGRAPHY









### DISCOGRAM

- Carragee, E
- Spine dec, 2000
- Randomized
- Symptomatic patients
  - **17/27** (63%) = +
- Asymptomatic patients
  - **8/20 (40%) = -**

- April, C
- Sine J 2005
- Control
- Asymptomatic, 55 disc, 58% Grade 3 tear, all had negative discogram result.



## **Non-Operative Treatment**

NSAID
Physical therapy
Epidural steroid injection
Activity modification





## Disc pressure & position

- Highest sitting with forwarded posture
- Lower with straight or relaxed with arm rest.
- Lowest with standing



### **OCCUPATIONAL PREVENTION**

- Inclination of backrest to 110 deg, lumbar support, arm rest.
- Decrease vibration input.
- Keep object center of mass close to the body

# Motion Preservation-Artificial Disc







Prodisc (synthes)



Flexicore (stryker)

Maverick (Medtronic)



### Artificial Disc and Fusion





>15 ∠15



# Cervical artificial disc





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### 2 Level cervical artificial disc





### **Posterior Dynamic Stabilization**







#### Progenitor Cells / BMP





# Thank You

