DEGENERATIVE LUMBAR SPINE: PREOPERATIVE ASSESSMENT OF LUMBAR PAIN

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CONFLICT OF INTEREST: NONE

0 FUNDS RECEIVED TO SUPPORT THIS PAPER

PLEASE READ PP. 50-52 IN YOUR ABSTRACT BOOK

I'M NOT GOING TO PRESENT EXACTLY WHAT IS WRITTEN THERE!

DENIS L. KAECH
PREOPERATIVE ASSESSMENT OF LUMBAR PAIN

DIFFERENTIAL DIAGNOSIS:
- „BENIGN LOW BACK PAIN“
  = NOT SURGICAL ➔ NO IMAGING

- AS SYMPTOM OF A SERIOUS DISEASE?
  „RED FLAGS“! ➔ EARLY IMAGING

- RECURRENT, DISABLING, (+ NEUROL.?)
  OF MECHANICAL ORIGIN?
  = WE ARE INTERESTED! „BEST IMAGES“?
PREOPERATIVE ASSESSMENT OF "PROBLEMATIC" LUMBAR PAIN → MRI

IMAGING MODALITIES: + RADIOGRAPHS

- STRUCTURAL OVERVIEW:
  - TRANSITIONAL ANOMALY?
- CURVES
- ALIGNMENT
- ANGLES

INSTABILITY? = DYNAMIC IMAGING NEEDED!

+ LEG ASYMMETRY?
PREOPERATIVE ASSESSMENT OF LUMBAR PAIN

IMAGING BY DYNAMIC MYELOGRAM + CT

= WHEN MRI IS CONTRAINDICATED

FERROMAGNETIC IMPLANTS

= POSTOPERATIVE SPINE: „FAILED SPONDYLODESIS“?

INSTABILITY? = DYNAMIC IMAGING NEEDED!
THE RED FLAGS

• PROGRESSIVE NEUROLOGIC DEFICIT

  RISK OF IRREVERSIBLE DAMAGE!

• FEVER ➔ INFECTIOUS DISEASE, IMM.

• MALIGNANCY ➔ PATHOL. FACTURE ➔ METASTATIC COMPRESSION

= NOT A „BENIGN LOW BACK PAIN“

ANTICOAGULATION ➔ HEMATOMA !

CAREFUL HISTORY = „SHERLOCK HOLMES““WORK
WORSENING NEUROLOGY:

M, 1923, ANTICOAGULATION AFTER
PULMONARY EMBOLISM, VENOUS
THROMBOSIS, ATRIAL FIBRILLATION
5 DAYS HISTORY OF BACK PAIN
3 DAYS URINARY RETENTION
1 DAYS FULL INCONTINENCE AND
WEAKNESS OF BOTH LEGS (M3)
= UNABLE TO WALK
Thoracolumbar epidural hematoma, 1923, anticoagulated, back pain → paraparesis
Extradural hematoma at T 12 level
45 YEARS OLD LADY: INCREASING LUMBAR PAIN
= MUST GET UP AND WALK AROUND AT NIGHT!
SOME CLAUDICATION LIKE SYPTOMS IN BOTH LEGS
ACHILLEAN REFLEX -, NO FURTHER DEFICIT
CT: BULGING L5/S1 DISC, CONSERVATIVE TRTM: „0“
WHAT WOULD YOU DO?
„SHERLOCK HOLMES WORK“

= TAKE THE HISTORY:

„BACK PAIN IN RECUMBENCY“

= PATIENT HAS TO GET UP AT NIGHT
WALKS, TAKES A WARM BATH....

SPACE OCCUPYING LESION?
M. BECHTEREW ? (EARLY MORNING)
MAJOR SPINAL STENOSIS ?
MRI: "INTRADURAL, EXTRAMEDULLARY TUMOR
DD: NEURINOMA, MENINGIOMA: OP+HISTO = NEURINOMA
ANTICOAGULATED, KNOWN SPL L5S1, OLD T11 FRACTURE

3 YEARS BEFORE: L5 AND L5S1 SPL

NEW L5 FRACTURE!
NEW L5 FRACTURE

STENOSIS L5/S1 WORSENED BY OSTEOPOROTIC FRACTURE
LUMBAR PAIN, BUT NO CAUDA EQUINA COMPRESSION

NO MALIGNANCY FOUND ➔ OSTEOPOROTIC L4 FRACTURE
PREOPERATIVE ASSESSMENT OF LUMBAR PAIN

MECHANICALLY INDUCED?
WORSENED BY CHANGING POSITION?
DURING LOADING?

SUSPECTED INSTABILITY?
DYNAMIC STENOSIS?

DYNAMIC INVESTIGATION NEEDED!
“Upright, Multiposition”™ MRI

FUNCTIONAL MRI:  www.upright-mri.ch
DYNAMIC CHANGES OF FORAMINAL SIZE

~ NEUTRAL L5S1

STENOSIS L5/S1

STENOSIS L5/S1

DYNAMIC MRI

Upright extension

Upright flexion
RECUMBENT, AND FLEXION MRI:

- INTRATHECAL CSF VISIBLE
- INTRA-ARTICULAR FLUID AT L4/5

?BACK PAIN + NEUROGENIC CLAUDICATION
UPRIGHT - EXTENSION:
PROTRUDING LEFT L4L5 SYNOVIAL CYST
PLUS THICKENED FLAVUM
= DYNAMIC STENOSIS

BEST IMAGING = SHOWING POSITION AND MOTION DEPENDENT PATHOLOGIES
fmri shows: L4/5 instability, dynamic stenoses
L4/5 > L3/4 with neural compression
DIAGNOSTIC INFILTRATIONS:
ARE HELPFUL

FACET JOINTS
NERVE ROOTS
BUT...

ROGER ROBERT: L2 ➔ SYMPATHETIC BLOCK
SPINAL BALANCE ➔ OFTEN NEGLECTED!

Spatial relationship between L5S1 and the center of the femoral heads
lumbar lordosis
➔ spino-pelvi-femoral adaptation
and compensation potential:
E.g., **Flat Back** = Low curves, low incidence, limited pelvic tilt

Reduced compensation potential

Greater range of pelvi-femoral compensation if high incidence, high pelvic tilt („good curves“)
SACRAL SLOPE =
Angle between sacral endplate and horizontal plane
\( m = 41 \pm 8^\circ \)
(posture related parameter)

Duval-Beaupère G., Schmidt C., Cosson PH:
A barycentre-metric study of the sagittal shape of the spine and pelvis.
PELVIC TILT:
Angle between Vertical plane (at the center of the femoral heads) and a line linking the center of S1 endplate and the center of femoral heads $m = 12 \pm 8^\circ$

According to Duval Beaupère et al. 1992
INCIDENCE:
Angle between perpendicular axis to the middle of the sacral endplate inclination and the center of femoral heads
m = 53 +/- 11°

According to Duval Beaupère et al. 1992
PELVIC WIDTH:
A-P (horizontal)
distance between
center of femoral heads
and
vertical line
from the center of
S1-endplate
m = 23 +/- 14 mm

According to Duval Beaupère et al. 1992
ROUSSOULY P (2007):
4 TYPES OF LUMBAR LORDOSIS

ESTIMATES THE RISKS FOR, AND THE TYPES OF DEGENERATIVE PATHOLOGY BASED ON
- PELVIC INCIDENCE
- SPINAL CURVES
  TYPE 1 & 2: LOW INCIDENCE, FLAT BACKS
  TYPE 3: THE BEST ANATOMY
  TYPE 4: HIGH INCIDENCE, BIG CURVES
Roussouly's classification of spines (2007)
ROUSSOULY P (2007) :
4 TYPES OF LUMBAR LORDOSIS

EFFECT OF THE SAGITTAL SPINO-PELVIC ORGANIZATION ON DEGENERATIVE EVOLUTION OF THE SPINE, PP. 27-35, IN VITAL JM (ED):
ALTERNATIVES À L’ARTHRODÈSE LOMBAIRE ET LOMBO-SACRÉE, CAHIERS D’ENSEIGNEMENT DE LA SOFCOT 96, ELSEVIER, MASSON, 2007

ASPECTS BIOMÉCANIQUES DE LA LOMBALGIE:
INFLUENCE DE L’ORGANISATION MORPHOLOGIQUE SAGITTALE DE L’ENSEMBLE RACHIS-BASSIN SUR L’ÉVOLUTION DES PATHOLOGIES DÉGÉNÉRATIVES RACHIDIENNES.
LE RACHIS 3(4): 14-17, 2007
Normal (to high) incidence, harmonic curves = Type 3

Roussouly's classification of spines (2007)
LOW BACK PAIN: A NEW DIAGNOSTIC TOOL

Vital JM et al: Clinical applications of the EOS system in diseases of the locomotor apparatus
THORACO-LUMBAR KYPHOSIS

INCREDASED

L2:

RETROLISTHESIS

FLAT BACK

LOW INCIDENCE

FLAT SACRAL SLOPE

ROUSSOULY TYPE 1

INCREASED STRESS ON FACET JOINTS AND INTERSPINOUS PROCESSES
ROUSSOULY TYPE 2
= LOW INCIDENCE
= LOW SACRAL SLOPE
(S1 ENDPLATE TO HORIZONTAL)

FLAT BACK
EARLY L4/5, L5/S1
DISCOPATHY
RECENT CASE, FLAT BACK, „ROUSSOULY 2 ➔ 1“

HYPERPRESSURE DISCOPATHIES L4/5+L5S1 IN 2003
➔ RETROLISTHESIS L1/2 AND KYPHOSIS, L2/3 DISCOPATHY+ IN 2009

2003: Disc herniation L5S1R, stenosis/bulge L4/5 = Decompression+U

Scheduled for interspinous + facet block L2/3 and L5S1, later ➔ fmri?
Type 4 (Roussouly)
High incidence = initially good compensation
Risk = spondylolisthesis

Big curves
Stress on facets
Steep sacral slope
KAECH’S CONCLUSION: BEST IMAGING FOR PROBLEMATIC CASES = UPRIGHT MRI + EOS SYSTEM

FOR DYNAMIC IMAGING OF THE SPINE IN SYMPTOMATIC POSITIONS

FOR AP-LAT VIEWING OF THE WHOLE SPINE

ANGLES AND CURVES ➔ PELVIC PARAMETERS
Segmental lumbar kyphosis, or straight lumbar Fusion = Balance problem ➔ to be avoided!
➔ Compensatory Retrolisthesis above, leading to ➔ ➔ Adjacent level disease! (Brantigan, DCM 1997)

OPTIMIZED IMAGING ➔ „PROPHYLAXIS OF FBSS“
THANK YOU!

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