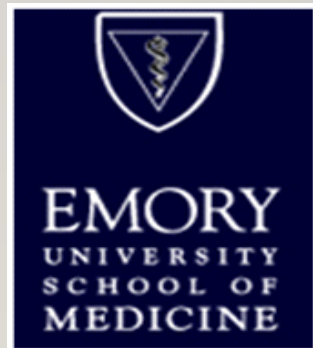


MRI OF THE PSOAS MAJOR MUSCLE: ORIGIN, ATTACHMENTS, ANATOMICAL VARIANTS AND CORRELATION WITH THE LUMBAR DISC EXTRUSION

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DISCLOSURE OF COMMERCIAL INTEREST

- Neither I nor the co-authors have a financial relationship with a commercial organization that may have a direct or indirect interest in the content of this presentation

INTRODUCTION: ANATOMY AND BIOMECHANICS

The Psoas Major muscle is a flexor and a stabilizer

It plays an important role in:

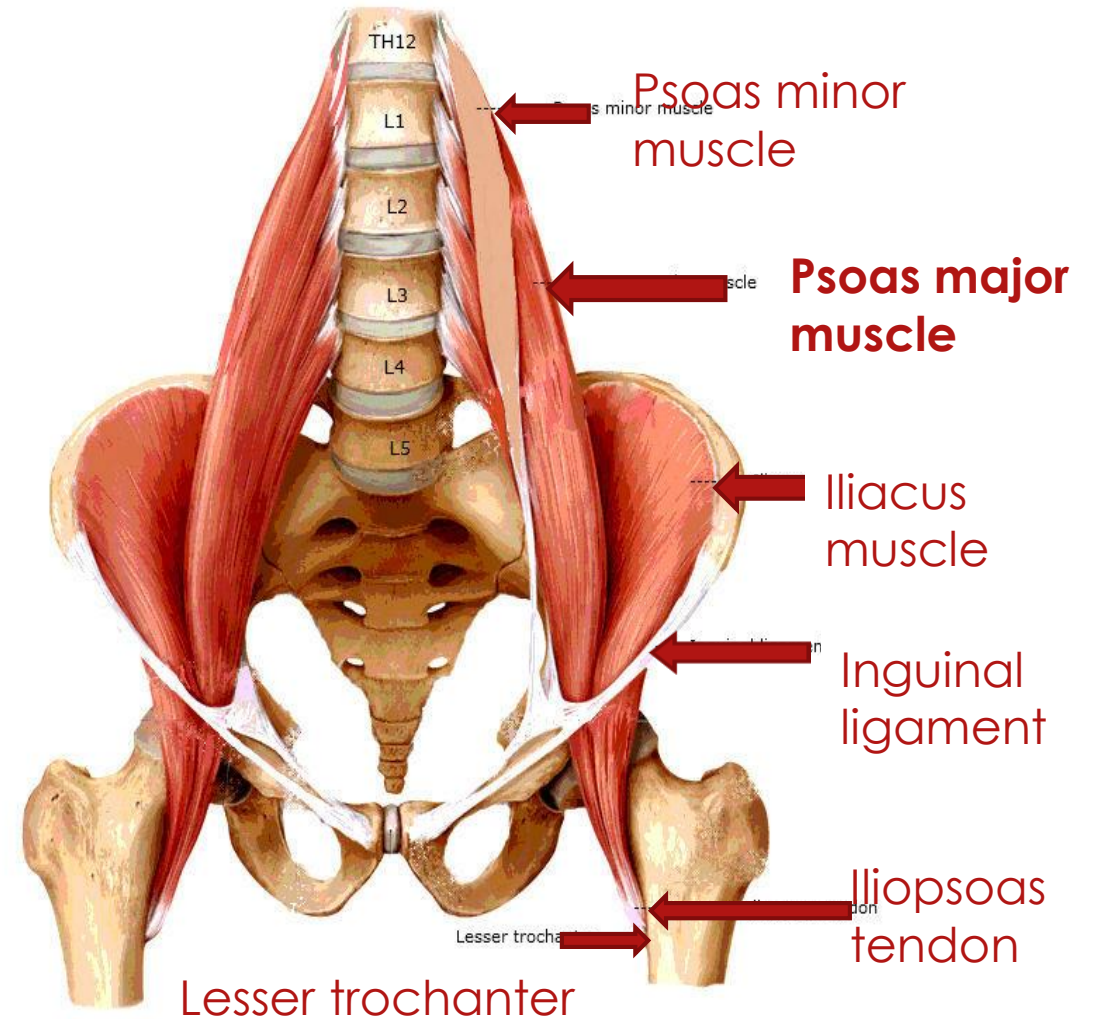
Motion and stabilization of the lumbar spine

Flexion of the Hip

INTRODUCTION: ANATOMY

The Psoas Major muscle is located on both sides of the lumbar spine, in a symmetrical fashion in most individuals.

In less than 50% of humans subjects, the Psoas Major is accompanied by the psoas minor



INTRODUCTION: ANATOMY

The infrastructure of the Psoas Major muscle is made of a series of overlapping segmental fascicles.

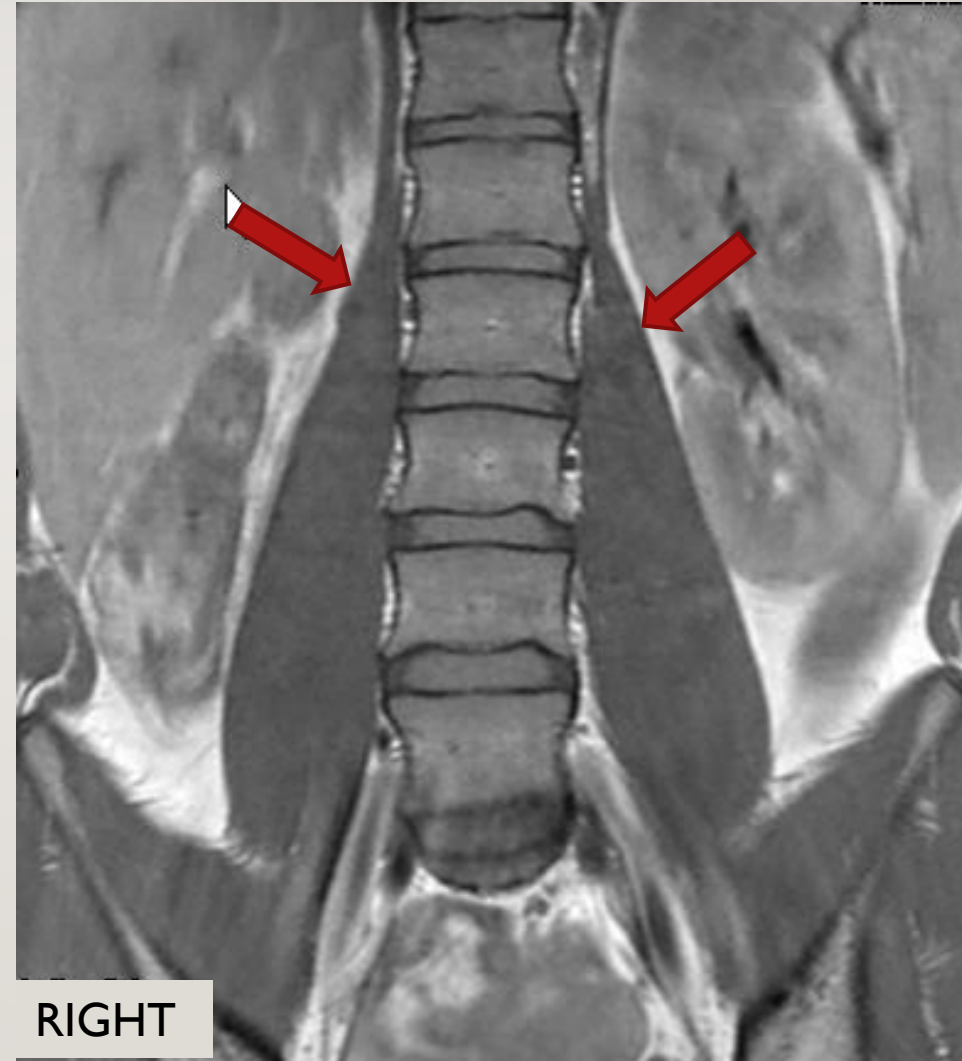
Each fascicle consists of bundles of fibers. These fascicles connect bilaterally with:

- the lumbar intervertebral discs
- the transverse processes
- and the vertebral bodies

INTRODUCTION: MORPHOLOGY

On MR coronal plan, the Psoas Major appears like a fusiform, symmetrical homogenous muscle

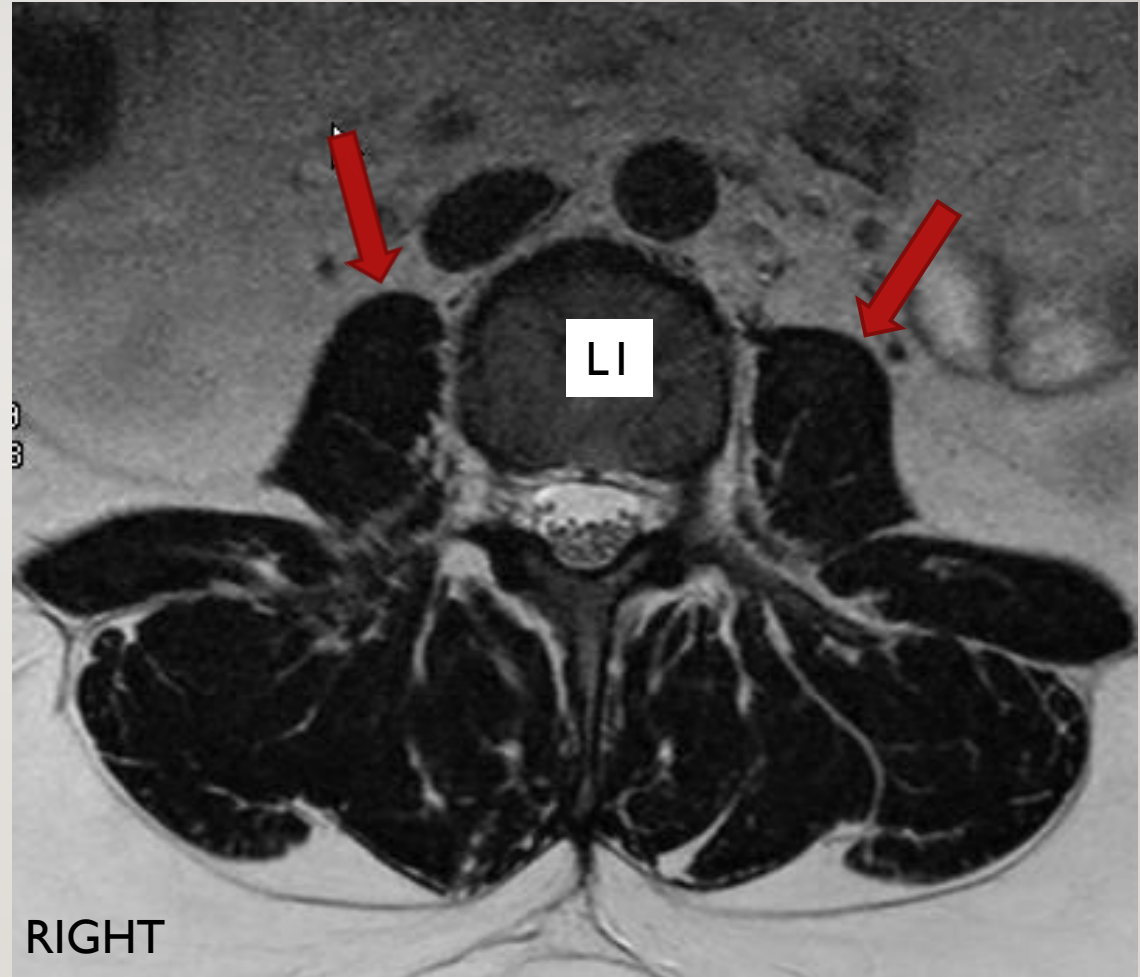
Distally, the Psoas Major reaches the brim of the lesser pelvis. It joins with the Iliacus muscle to form the iliopsoas muscle



MR AXIAL IMAGE:

PROXIMALLY AT ORIGIN (TH12-L1)

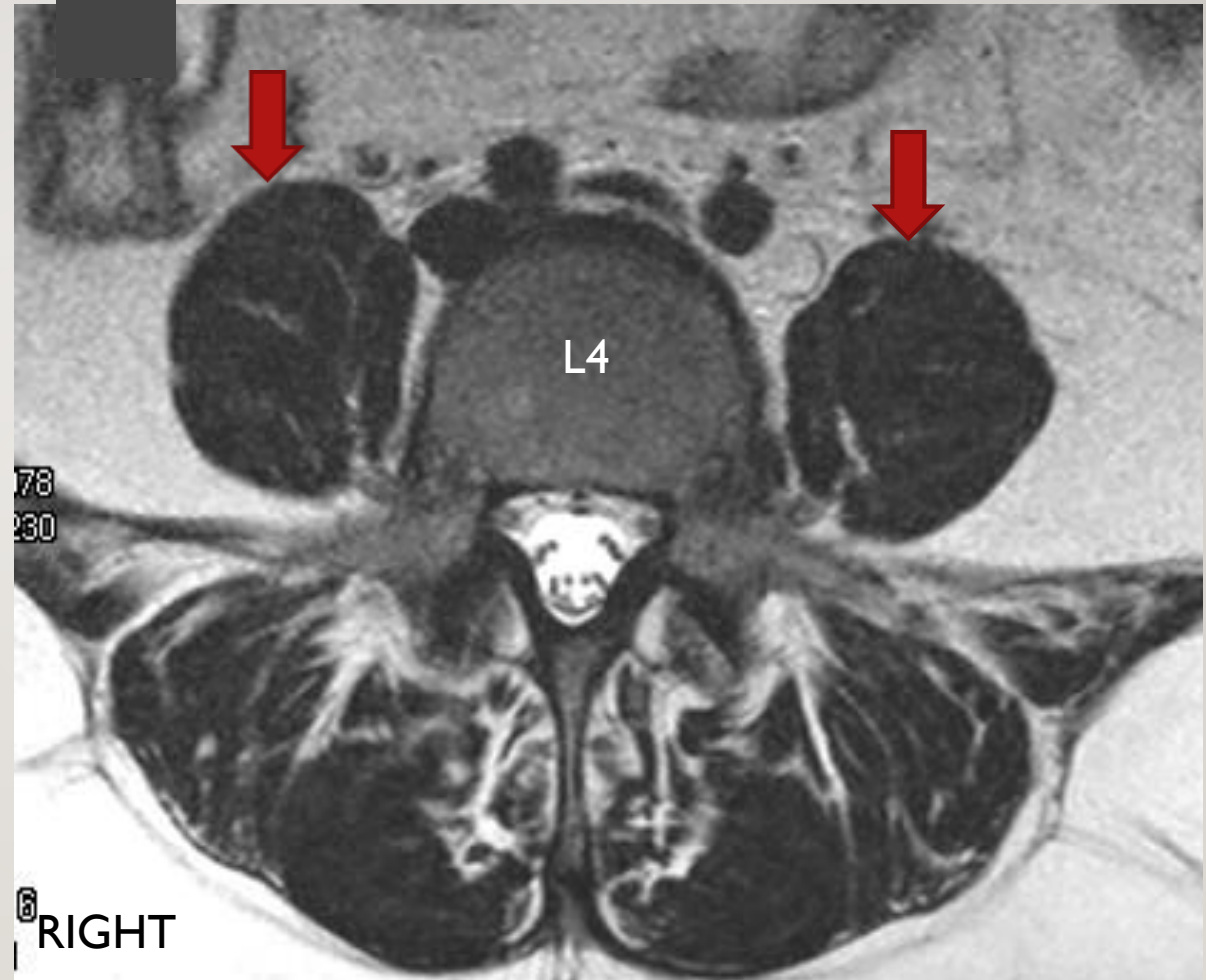
The Psoas Major appears like a bilateral quadrangular structure attached to the vertebral body



MR AXIAL IMAGE:

DISTALLY AT LEVELS L4 AND L5

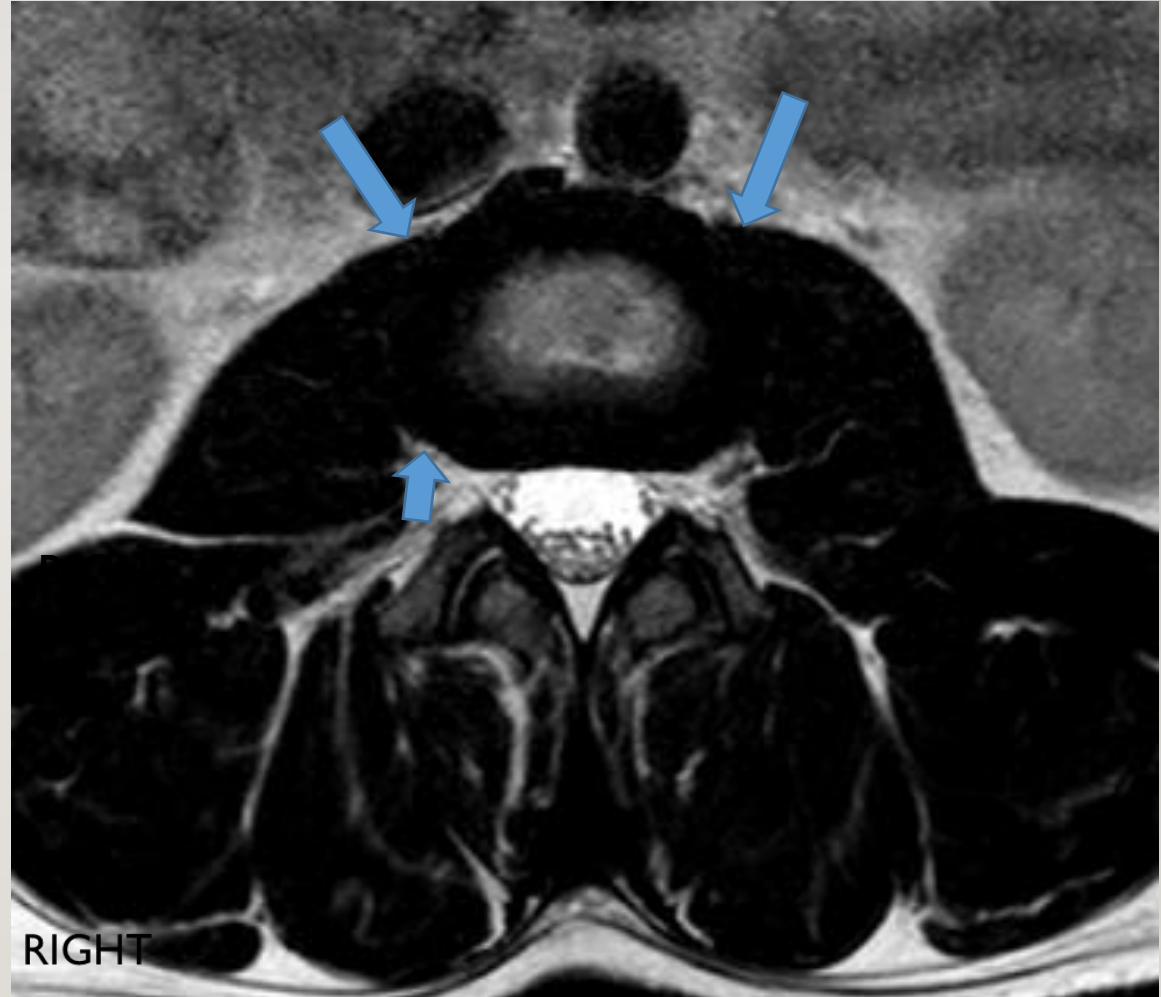
The Psoas Major has a bilateral circular shape on both sides of the vertebral body (arrows)



MR AXIAL IMAGE: ATTACHMENT

THE PSOAS MAJOR MUSCLE ATTACHES TO THE ANTERIOR AND LATERAL BORDER OF THE INTERVERTEBRAL DISC.

The attachment is usually bilateral and symmetrical. Occasionally, the psoas muscle may reach the posterior lateral border of the disc (small arrow).



PURPOSES OF THE STUDY

- 1) To verify the **anatomical origin** of the psoas major muscle and its anatomical variants
- 2) To evaluate the **attachments** to the lumbar discs and the variants
- 3) To assess the **prevalence of disc extrusion** in individuals with **absent of partial attachment of the psoas** to the lumbar discs.

MATERIALS

From two Institutions: Emory University Atlanta, GA – USA / Oslo University, Norway

MR images of the Lumbar spine from **the last 5 years** were retrieved

Exclusion criteria:

- acute trauma

- acute inflammatory diseases

- and neoplasia and metastases

- Incomplete examination of the spine

MATERIALS

Population (after exclusion): 383 subjects

Gender: 213 females / 170 males

Age: mean age 60,3 years (range 15 to 85 years)

All had MR examinations of the lumbar spine in sagittal, axial and coronal planes

METHODS - ANALYSIS OF IMAGES

1. The origin of the psoas major was assessed on the coronal and axial images
2. The attachments of the psoas major muscle to the:
 - vertebral bodies
 - transverse processes
 - and **intervertebral discs**were evaluated on both axial and coronal images

METHODS – ANALYSIS OF IMAGES

We searched for:

- a) The exact level of the origin of the psoas muscle
on both sides of the spine, above or below Th 12-L1 level.

- b) the symmetry of the origin of the muscle

METHODS – ANALYSIS OF IMAGES

c) Attachments of the psoas to the lumbar discs
at all levels until L5-S1

d) Symmetrical (bilateral) attachment of the Psoas
to the lumbar discs

METHODS – ANALYSIS OF IMAGES

- e) Search for the presence of lumbar disc herniation

- f) Co-existence of disc herniation and partial or total absence of psoas attachment to the disc at each level

METHODS – DEFINITION OF VARIANTS

Variant of origin:

We considered as anatomical variants of the psoas major muscle origin, when the muscle originated above or below the level of Th12-L1 disc

Variant of attachment:

When there is partial (unilateral) or total absent attachment of the psoas muscle to the intervertebral disc.

METHODS - ANALYSIS OF IMAGES

The analysis of images was done independently by four readers:

two readers in Atlanta

and two readers in Oslo

Agreement was reached by consensus

RESULTS: THE ORIGIN

The **most frequent site of origin** of the psoas muscle was found at:

Th12 - L1 disc  in 271 (70.8%) subjects

Variants of origin  in 112 (29.2%) subjects

RESULTS: ORIGIN VARIANTS

From 112 (29.2%) individuals with anatomical variant of the origin
the psoas muscle originated from:

Vertebral body Th12  in 9 (2.3%) subjects

Vertebral body L1  **in 88 (22.9%) subjects**

L1-L2 disc  in 12 (3.1%) subjects

Vertebral body L2  in 3 (0.7%) subjects

ASYMMETRICAL ORIGIN
OF THE PSOAS BELOW
TH12

On the right from the L1-L2 disc

On the left from body L1



RESULTS: ORIGIN VARIANTS

None of the studied subjects (n=112) had the psoas origin above the body of Th12 or below the body of L2.

There was no significant difference in both genders for the anatomical variants of the origin of the psoas.

females= 58 males=54

RESULTS: ATTACHMENT TO THE DISCS

We randomly selected 184 subjects to look at the attachment variant (absent attachment) to the disc and the prevalence of abnormal disc (herniation, bulging) in this subgroup at each level:

Absent attachment to the L1-L2 disc in 3 (1.63%) cases

to the L2-L3 disc in 5 (2.71%) cases

to the L3-L4 disc in 2 (1.08%) cases

to the L4-L5 disc in  40 (21.7%) cases

to the L5-S1 disc in  173 (94.0%) cases.

L5-S1 DISC HERNIATION
ON THE LEFT (A)

Complete absence of
Psoas attachment to
the L5-S1 disc



RESULTS: PREVALENCE OF ABNORMAL DISCS

The disc was abnormal (herniation/bulging) in more subjects in the two last discs:

at the L2-L3 disc in 4 (2.2%) subjects

at the L3-L4 disc in 29 (15.8%) subjects

at the L4-L5 disc in  62 (33.7%) cases

and at the L5-S1 disc in  65 (35.3%) subjects.

L3-L4 DISC HERNIATION ON THE LEFT

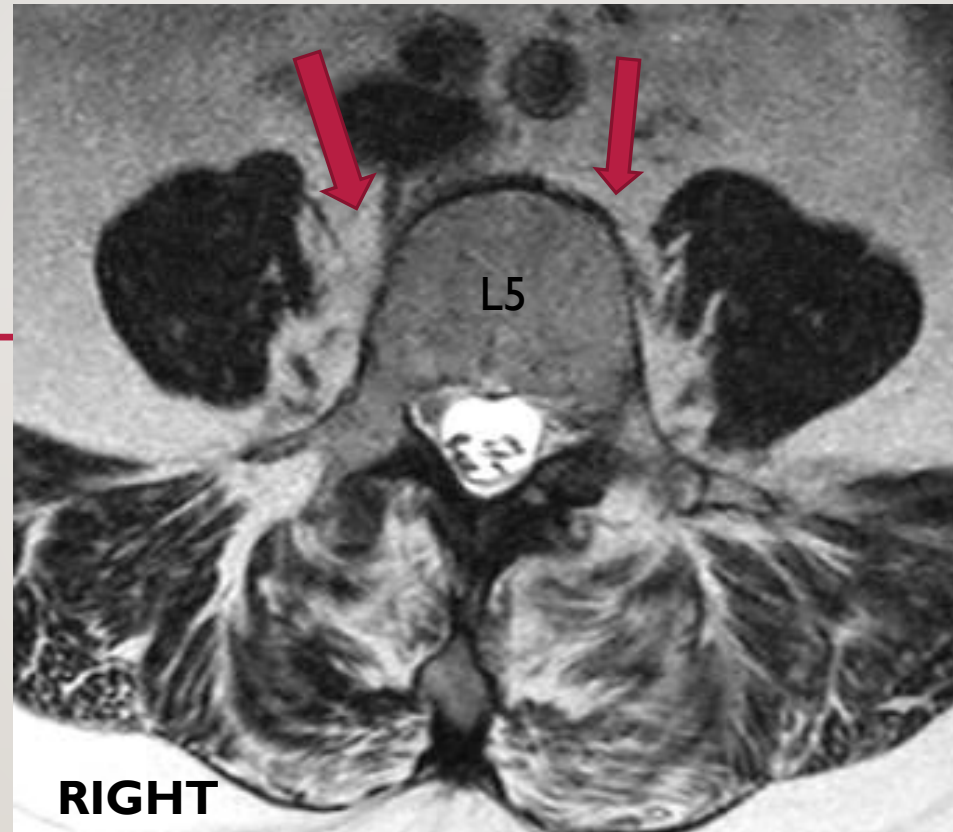
56 y.o. female with low back pain and right drop foot.

Bilateral partial attachment of the Psoas to the disc L3-L4 on the axial image



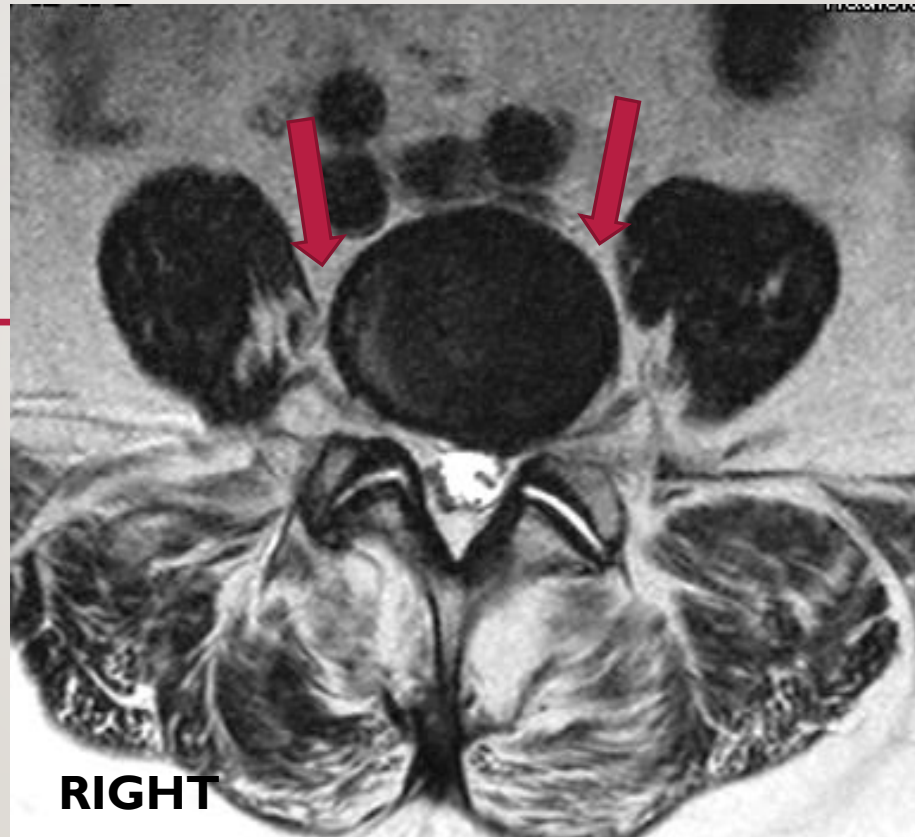
SAME PATIENT

Bilateral complete
absence of Psoas
attachment to the
vertebral body L5



SAME PATIENT
L4-L5 DISC HERNIATION
ON THE LEFT

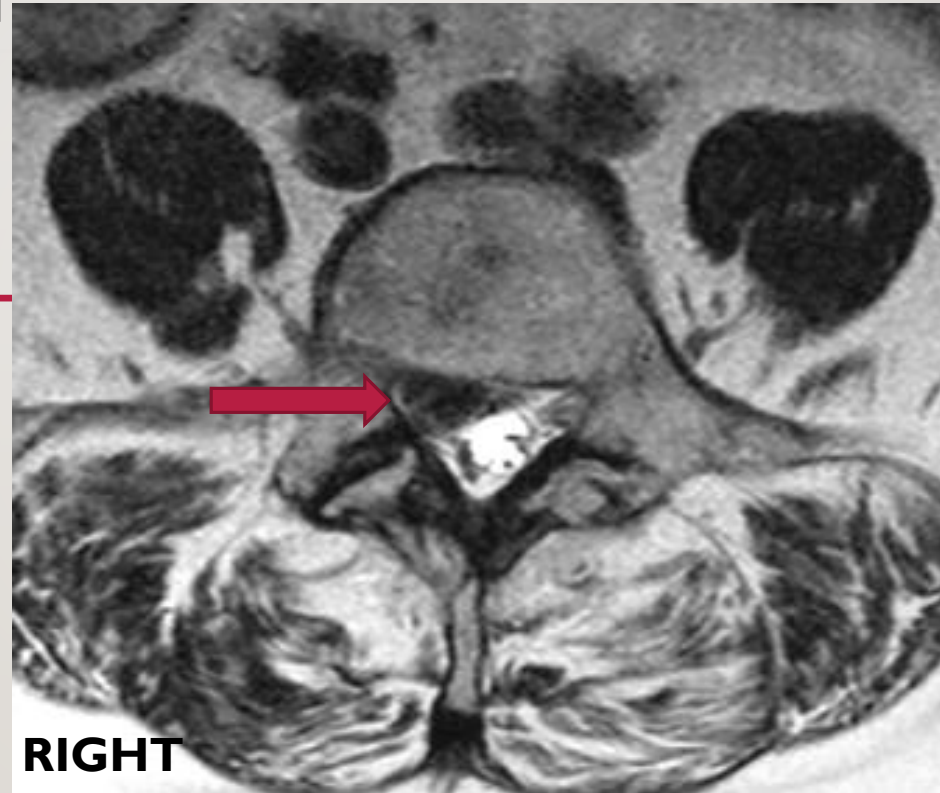
Complete bilateral absence
of psoas attachment to the
L4-L5 disc



SAME PATIENT
L4-L5 DISC HERNIATION ON
THE RIGHT

L4-L5 Disc herniation on the
right and caudal migration of
the herniated disc.

Compression of the L5 nerve
root on the right.



CONCLUSIONS

1. The psoas major muscle originates most frequently from the Th12-L1 disc

It does not originate from above the vertebral body Th12 or from below L2

2. The psoas major muscle rarely attaches to the L5-S1 disc

3. We found a higher prevalence of abnormal disc at L4-L5 and L5-S1 where partial or total absence of attachment of the psoas muscle to the disc occurred.

CONCLUSIONS

Weakness of the study:

1. This is a retrospective study
2. The results are preliminary. And the results from the subgroups based on age and genders and attachments to the vertebral body and transverse processes are not available
3. Further investigations needed:

Based on the results, further investigations are necessary to determine whether the absence of attachment of the psoas major muscle to the lower lumbar discs can relate to the higher occurrence of disc herniation at those two levels.

THANK YOU

