Image Findings of Intervertebral Invagination of the Intraabdominal Structures in Lumbar Spine

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Introduction and Materials & Methods

- Invagination of the peritoneal and/or retroperitoneal structures to the intervertebral disc space in lumbar spine is extremely rare. We will demonstrate the imaging features and clinical findings in four patients (three women and one man, with an age range of 65 - 84 years and a mean age of 76 years) with intervertebral invagination of the intraabdominal structures.
Results

- Plain radiographs, CT scans, and MR images showed disruption of the anterior longitudinal ligament (ALL) and variable structures were invaginated into the disc space including the vena cava, iliac vessels, intestine, and torn redundant ALL, retroperitoneal fat, and psoas muscle.
Results

- The level of invagination was L3-4 and L4-5 in one case, respectively, and L5-S1 in two cases. The underlying disease in three cases was chronic instability and chronic pyogenic infectious spondylitis in one case. Two cases of follow up images (one and five years) showed progression of the invagination.
Case 1

- 73/ F
- C.C.
  - Pain on low back area

Onset) 3 month ago
A 73-year-old female with infectious spondylitis at the level of L4-5. Acupuncture was performed at three months ago at the level of L4-5 and back pain was increased gradually.

L-spine plain radiographs show destruction of the endplates and sclerosis of the body of L4 and L5. Dynamic flexion and extension radiographs showed segmental instability with about 20 degrees angulation at the level of L4-L5 (not shown here).
L-spine MR images show bone destruction of the bodies of L4 and L5 and partially organizing abscess (black asterisk) in the intervertebral disc space. Adjacent IVC (white asterisk) abuts or is focally invaginated into the intervertebral disc space at the level of L4-L5.
Axial L-spine MR images show partially organizing abscess in the intervertebral disc space at the level of L4-5. Inferior vena cava (IVC) (white asterisk) abuts or is focally invaginated into the intervertebral disc space. Myositis is also noted in both psoas muscles.

- Note-. Posterior beaking of the IVC, probably indicating adhesion to the organizing abscess, comes with it.
Follow-up L-spine plain radiographs show more destruction and sclerotic change of the bodies of L₄ and L₅ after one year.

Note. - Retrolisthesis of the L₄ on L₅ is more accentuated.
Axial MR images at the level of L4-5 show folded IVC (white asterisk) with more invagination into the disc space.

- Note.- Fluid signal intensity (black asterisk) surrounding the invaginated IVC with signal void on the axial T2WI
Case 2

- 81/F
- C.C: claudication, both legs pain
L-spine plain radiographs including the dynamic flexion and extension view show degenerative spondylolisthesis of L4 on L5.

- Note-. Lordotic angle is marked increased on the extension view and narrowing of the disc space of L4-5.
Sagittal MR images show invaginated iliac vessels and retroperitoneal fat into the intervertebral disc space and fluid SI in the disc space at the level of L4-L5.

- **Note-.** Degenerative spondylolisthesis of L4 on L5, G1 with severe lordotic angulation. Wedge shaped deformity and collapse of the body of L4 and L5 indicating chronic erosion of the endplates.
Sagittal reformatted CT images show invaginated iliac vessels (white asterisk) and retroperitoneal fat (black asterisk) into the intervertebral disc space and fluid SI in the disc space at the level of L4-L5.

- Note-. Degenerative spondylolisthesis of L4 on L5, G1 with severe lordotic angulation. Wedge shaped deformity and collapse of the body of L4 and L5 indicating chronic erosion of the endplates.
Volume rendering 3D reconstruction CT images show invagination of the tortuous Lt. iliac vessels (circle) into the anterior aspect of the intervertebral disc at the level of L4-5.
Lateral plain radiograph, sagittal reformatted and axial CT images after posterolateral lumbar fusion at the level of L2-S1, show partially restoration of the intervertebral disc space at L4-L5.

- Note-. The invaginated iliac vessels are put back in those original location.
Case 3

- 84/ F
- C.C
  - Rt. buttock and low back pain

Onset) 2 month ago
AP and lateral L-spine plain radiographs show retrolisthesis of L5 on S1, G1 and narrowing of the intervertebral disc space.

- Note-. Dynamic flexion and extension study indicating focal sagittal segmental instability.
Coronal and sagittal reformatted CT images show invaginated small bowel (asterisk) into the intervertebral disc space at the level of L5-S1 including the mesenteric fat.

- Note-. There is no evidence of proximal bowel obstruction.
Sagittal MR images show invaginated small bowel (asterisk) into the intervertebral disc space at the level of L5-S1 including the mesenteric fat.

- Note-. There is high signal intensity bowel content (black asterisk) within the invaginated bowel on T2WI
Axial MR images show invaginated small bowel (white asterisk) occupying the almost intervertebral disc space at the level of L5-S1 including the mesenteric fat (black asterisk), peripherally.

- Note-. The continuity of the prevertebral bowel containing bowel gas and intervertebral invaginated bowel.
Axial and sagittal contrast enhancement MR images show invaginated small bowel (white asterisk) occupying the almost intervertebral disc space at the level of L5-S1 including the fat suppressed mesenteric fat (black asterisk), peripherally. Note-. The continuity of the prevertebral bowel containing bowel gas and intervertebral invaginated bowel, and contrast enhancement along the mucosal lining.
On retrospectively review, abdomen consecutive sagittal reformatted CT images underwent 5 years ago due to fever unknown origin show narrowing of the disc space at the level of L5-S1 and beak-like invagination of small bowel (black asterisk) into the intervertebral disc space.
Case 4

- 65/M
- C.C
  
  ; Pain on Rt. buttock and lower leg since 2 years ago
- He has trauma history of the lumbar spine on childhood.
L-spine lateral radiograph shows degenerative spondylolisthes of L3 on L4 and minimal focal sagittal segmental instability on the dynamic flexion and extension view (not shown here).

- Note-. There is interbody fusion of the body of L4 to S1, probably due to the sequela of infectious spondylitis or trauma.
Mid sagittal MR images show focal invagination of the torn redundant anterior ligament complex (arrows) into the intervertebral disc space at the level of L3-L4.

- Note-. Contrast enhancement of the invaginated contents (black asterisk) indicating inflammatory process
Rt. Parasagittal MR images show focal invagination of the retroperitoneal fat (arrow) into the intervertebral disc space at the level of L3-L4.

- Note-. Suppression of the fat on T2WI.
Axial MR images show focal invagination of the left psoas muscle (white asterisk) and retroperitoneal fat (black asterisk) into the intervertebral disc space at the level of L3-L4.

- Note-. There is focal tenting of the left psoas muscle.
Coronal and consecutive sagittal MR images show intervertebral invaginated contents (asterisk) and retroperitoneal fat (arrow) at the level of L3-4, those are showed continuity from the Lt. psoas muscle.

- Note-. There show focal invagination with tenting of the left psoas muscle into the intervertebral disc space at L3-L4.
Axial abdomen CT images for medical check-up since 8 years ago show tenting of the left psoas muscle (asterisk) at the level of L3-4. Focal invagination into the intervertebral disc space is suspicious, but is not definite.
Axial and coronal reformat CT images for medical check-up since two years ago show tenting of the left psoas muscle (asterisk) and suspicious focal invagination into the intervertebral disc space including the retroperitoneal fat at the level of L3-L4.
Discussion

Invagination of the peritoneal and/or retroperitoneal structures to the intervertebral disc space in lumbar spine is extremely rare. Variable structures may be invaginated into the disc space including the vena cava, iliac vessels, intestine, and psoas muscle including the mesenteric fatty tissue.
Discussion

Possible mechanism of the intervertebral invagination of the intraabdominal structures as follows.

- Defects of the anterior longitudinal ligament (ALL) and anterior annulus fibrous
- Severe laxity of the ALL caused by chronic segmental instability, anterior wedging of the vertebral body, anterolisthesis or retrolisthesis
- Trauma
- Operation such as disectomy
In patient with pyogenic spondylitis (case 1), a proteolytic enzyme resulting in lysis of the intervertebral disc including the ALL.

Common location of the intervertebral invagination is L4-5 and L5-S1 those sites are frequently noted instability such as degenerative and isthmic spondylolisthesis, respectively, esp. in older patients with degenerative lumbar spine.

The degree of the invagination may be progressed with increasing instability.
Conclusion

- Scrutinizing evaluation is needed in older patients with chronic sagittal segmental instability and disruption or redundancy of the ALL in lumbar spine imaging.
References

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Thank You

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