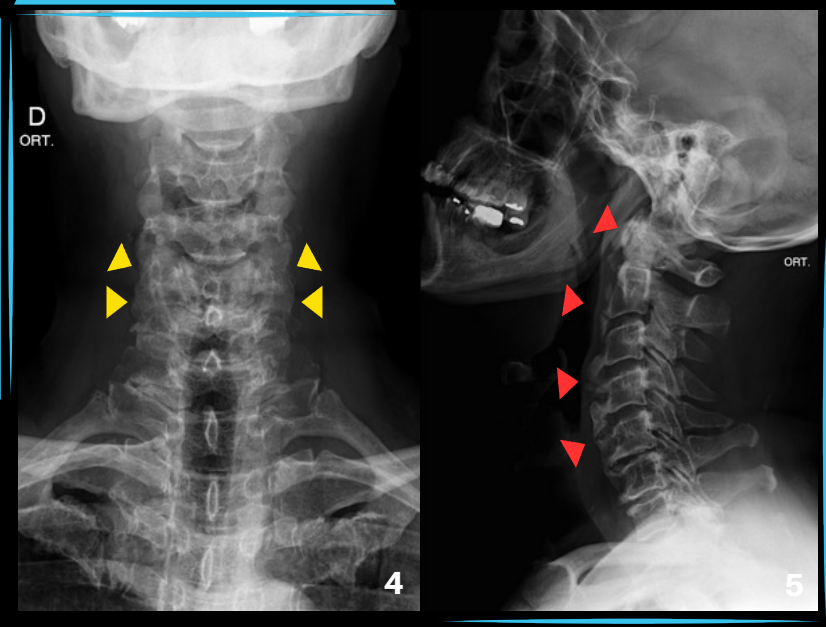
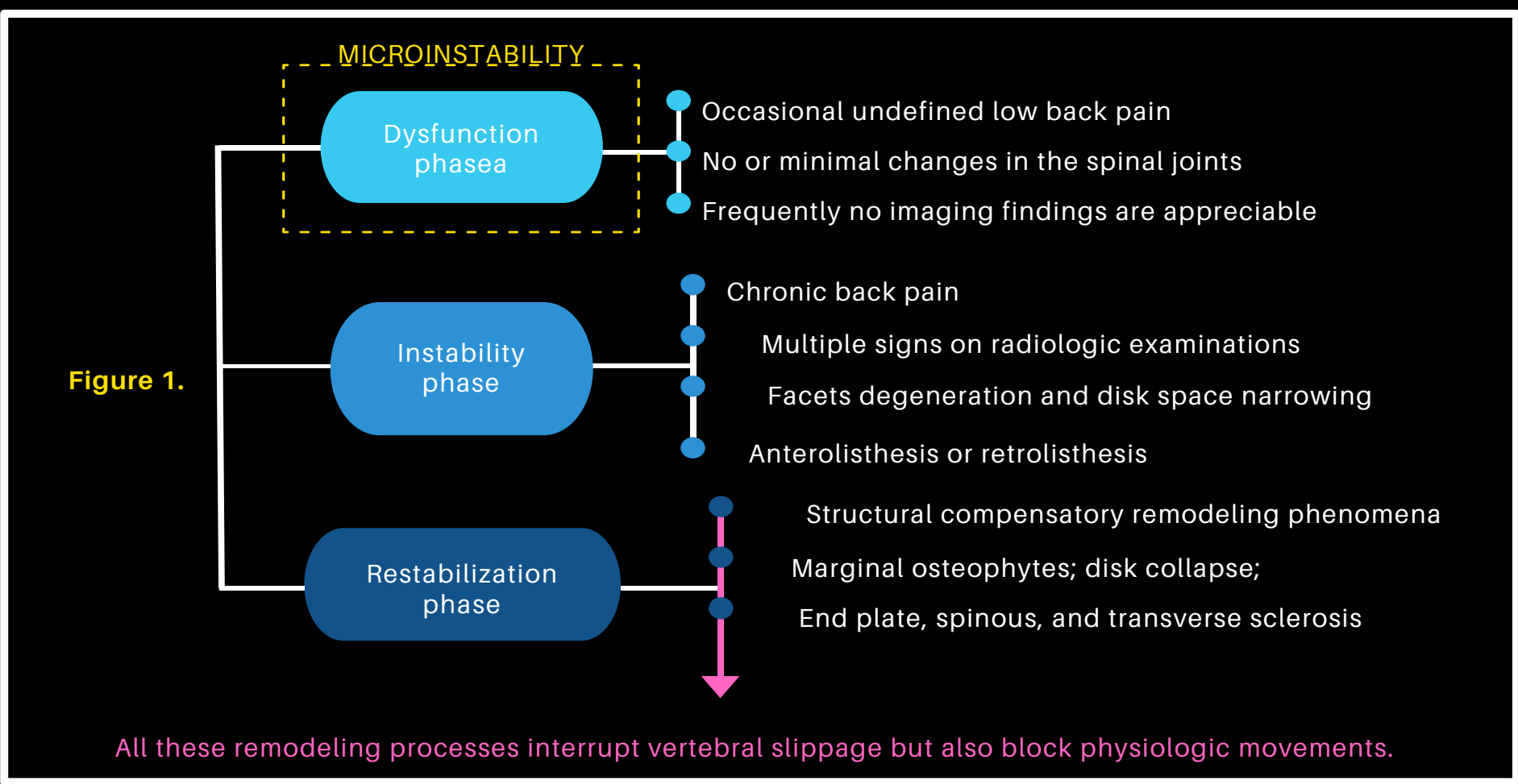
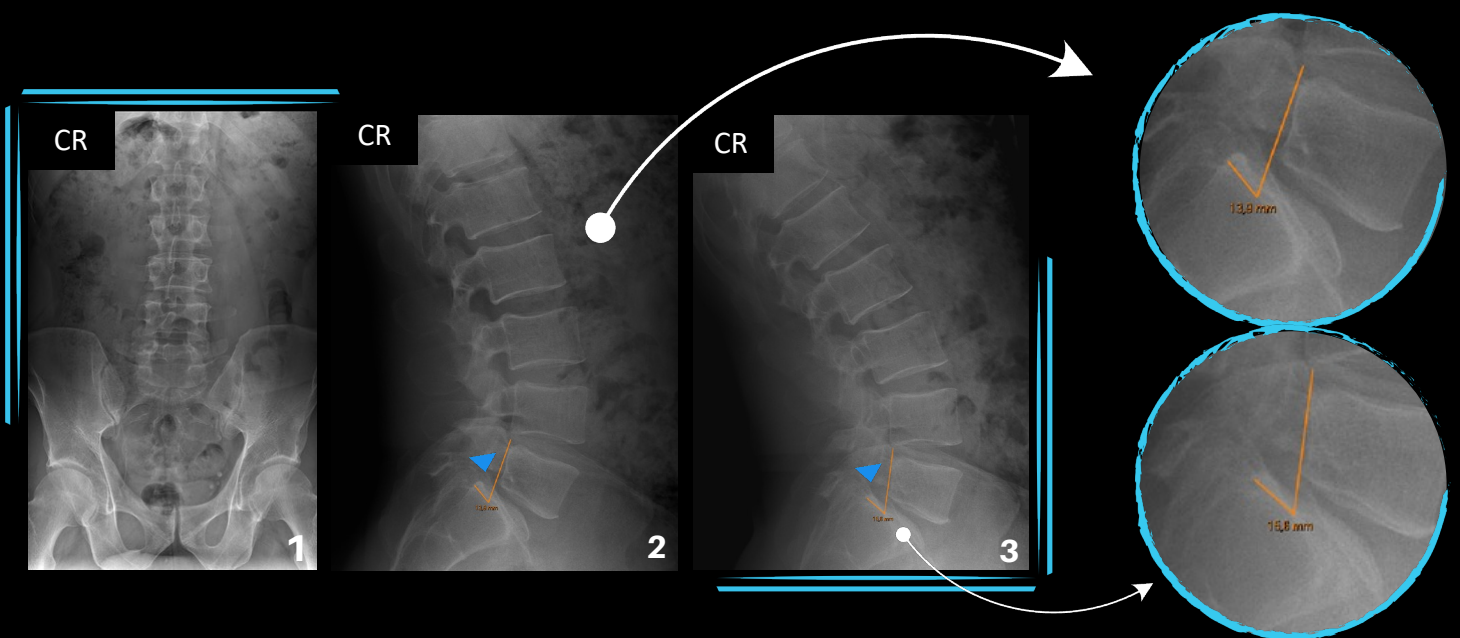


Unmasking Spinal Microinstability: a Imaging Exploration



Images 4-5. Male, 66 years old, CR with atlantodental arthrosis, exuberant osteophytes of the cervical spine (arrow head), in addition to reduced disc spaces at C5-C6 and C6-C7, associated with degenerative alterations of the interapophyseal and uncovertebral joints (arrow head).

Figure 1. Spinal degenerative instability process starts with the injury of a component of the column, leading to an inappropriate response of the muscles and consequently an erroneous positional feedback of the column. In this way, a vicious circle causes a chronic dysfunction and pain through 3 steps, the degenerative cascade: dysfunction, instability, and restabilization.



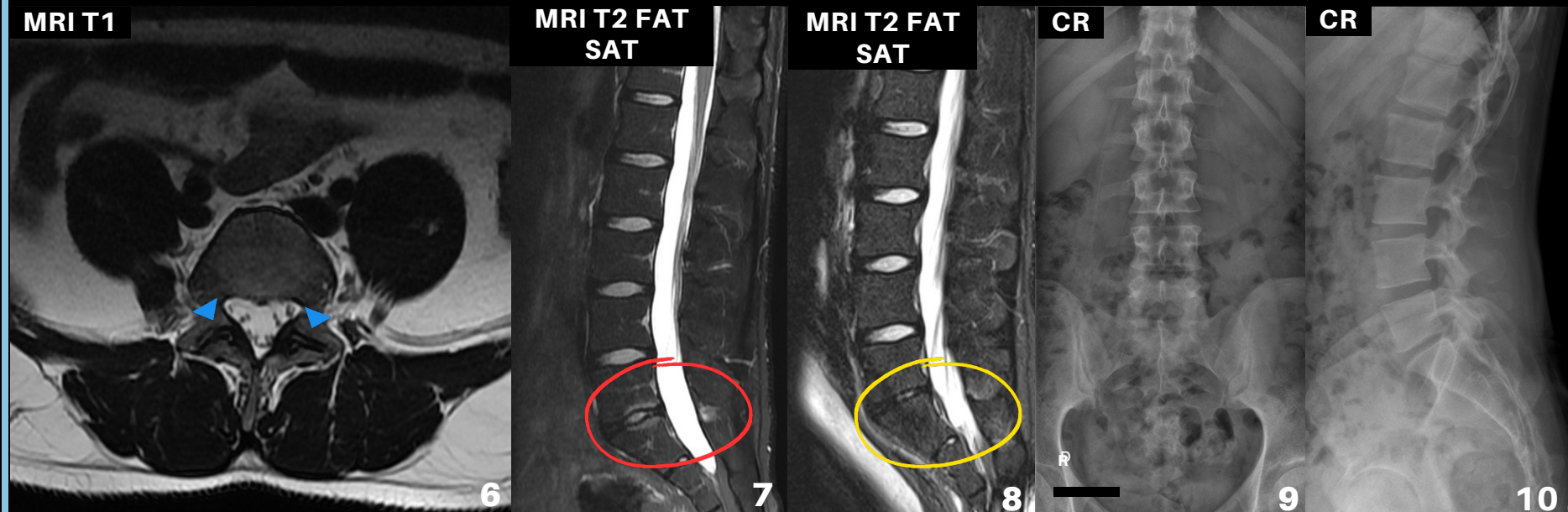
Images 1-3. Male, 35 years old, CR with L5 grade I retrolisthesis (arrow head), which is accentuated by hyperextension, inferring instability.

Aspect	Microinstability	Macroinstability
Definition	Subtle disruptions in spinal stability	Overt structural changes leading to instability
Clinical Presentation	Mild, intermittent symptoms	Pronounced, persistent symptoms
Radiological Findings	Often requires dynamic imaging for diagnosis	Evident on static imaging
Mechanism	Ligamentous laxity, minor facet changes	Fractures, severe ligamentous damage
Impact on Functionality	Inconsistent impact on daily activities	Often severely limits daily activities
Treatment	Conservative measures often effective	May require surgical intervention
Diagnostic Challenge	Overlapping symptoms with other conditions	Clear radiological evidence

Table 1. This table provides a clear visual comparison between microinstability and macroinstability in terms of their definitions, clinical presentations, radiological findings, mechanisms, impact on functionality, treatment approaches, and diagnostic challenges.

MICROINSTABILITY SPINE

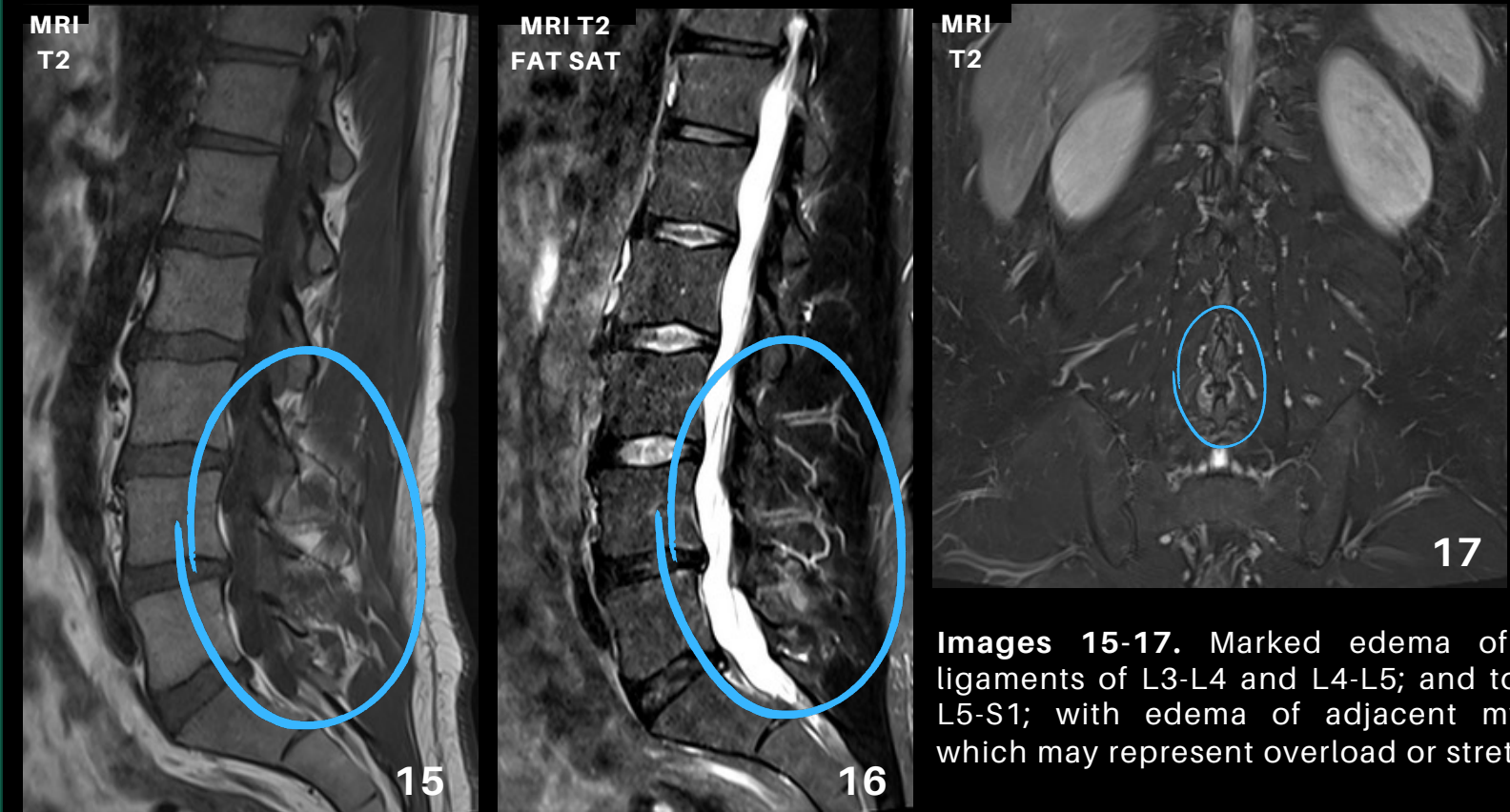
Male, 29 years old, with nonspecific recurrent low back pain that worsens physical activities, with no history of trauma.



Images 6. Level L4-L5: mild hypertrophy of interapophyseal joints (arrow head). 7. L5-S1 disc degeneration with Modic I type signal alteration (edema) in the apposed vertebral plateaus, and L5-S1 interspinous ligament edema, inferring mechanical overload (circle). 8. Reduction of degenerative edema in the L5-S1 vertebral plateaus ten months after treatment with neuromuscular therapy (circle). 9, 10. Static RX without significant changes.

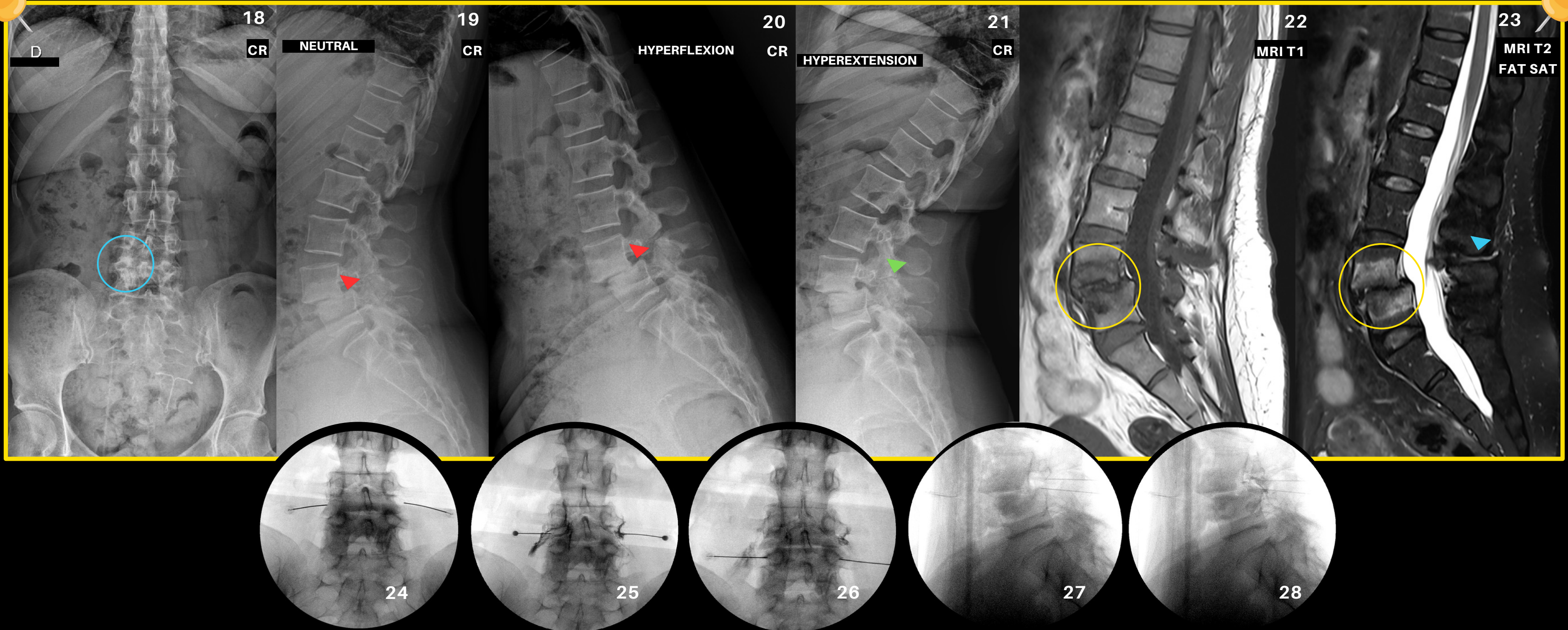


Images 11-14. Disc degeneration with minimal posterior bulging and fissuring of the annulus fibrosus, making a slight dural impression at L5-S1 (arrow head). Slight hypertrophy of the interapophyseal joints at L4-L5. There was also edema of the low lumbar interspinous ligaments, as well as a linear area of edema of the posterior paravertebral muscles on the right, suggesting overload (arrow head). These findings are compatible with microinstability of the spine.



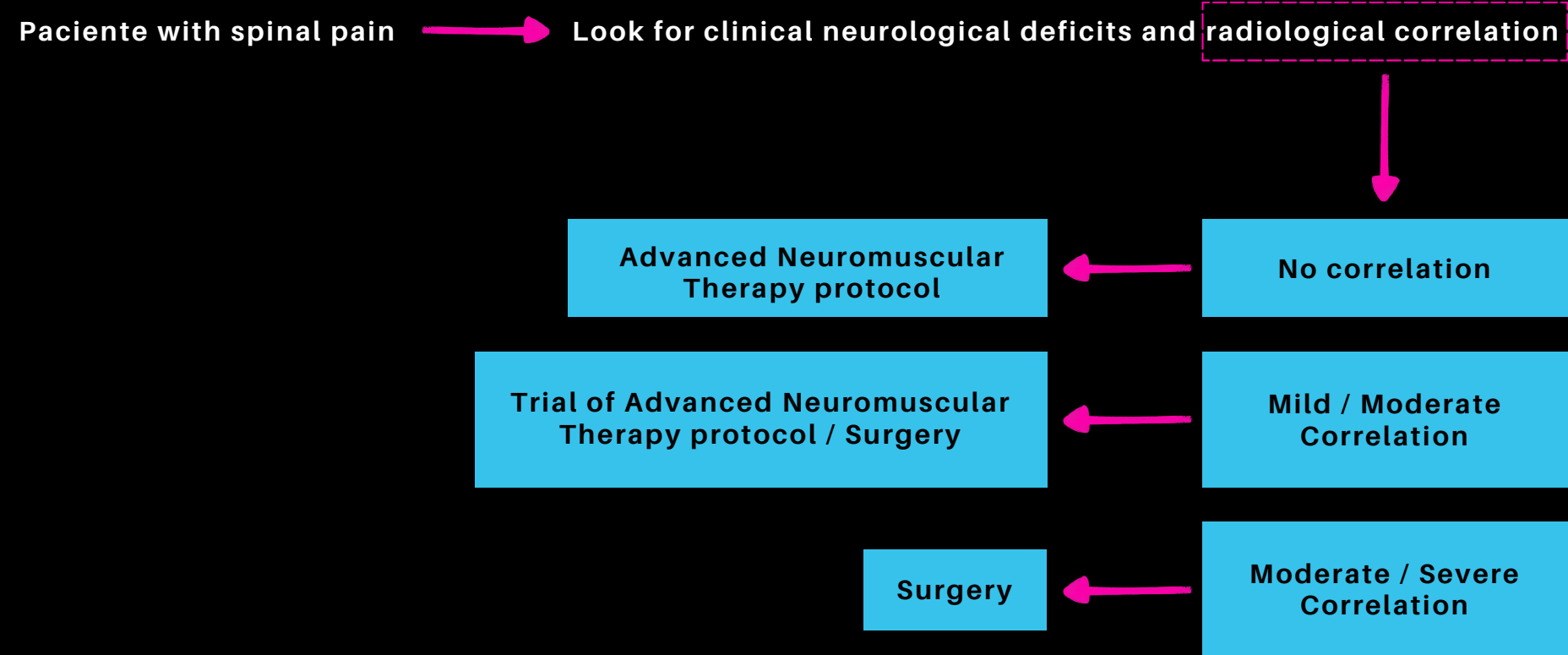
Images 15-17. Marked edema of the interspinous ligaments of L3-L4 and L4-L5; and to a lesser extent in L5-S1; with edema of adjacent myoadipose planes, which may represent overload or stretching (circle).

MICROINSTABILITY SPINE

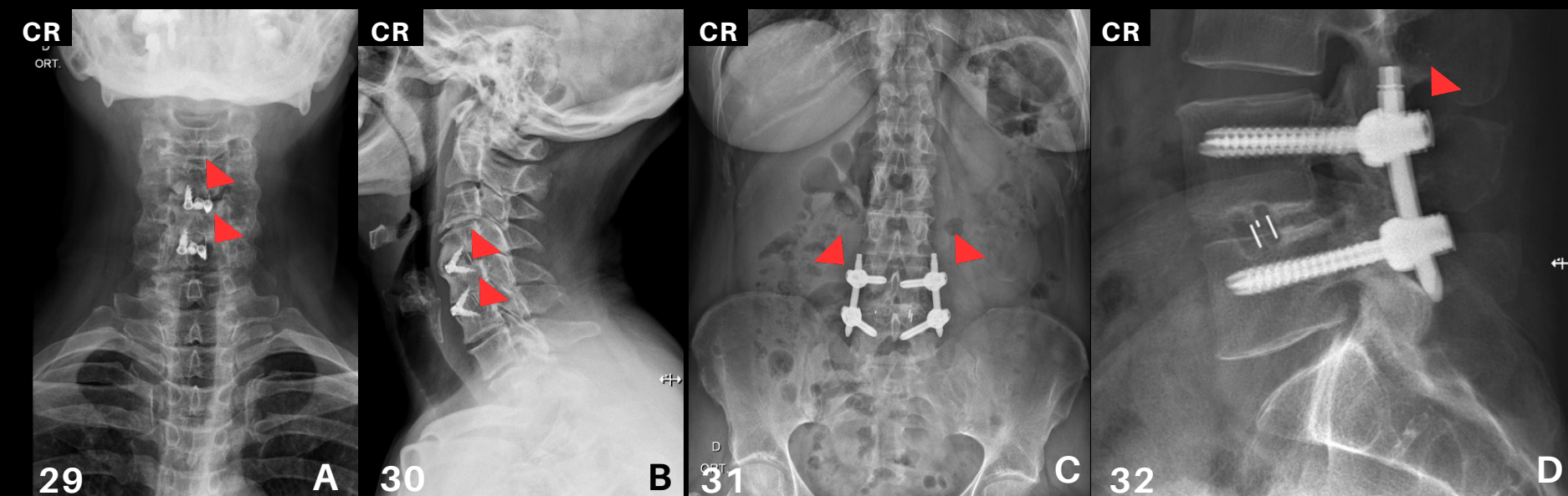


Images 18-23. Anterolisthesis of L4, grade II (arrow head), with chronic lysis of its isthmuses (arrow head) and marked reduction of the disc space of L4-L5 with sclerosis of the vertebral plateaus. Note the accentuation of the listhesis during a flexion maneuver. 21-22. Degenerative disc disease of L4-L5, with marked reduction in disc height, irregularities, Schmorl's nodules and Modic 1 and 2 alterations (edema and liposubstitution) in the vertebral plateaus, with emphasis on edema (circle). Edema and liquid layer in the topography of the interspinous ligament of L3-L4 (arrow head). **Images 24-28.** Radioscopic foraminal block for interventional treatment of chronic low back pain.

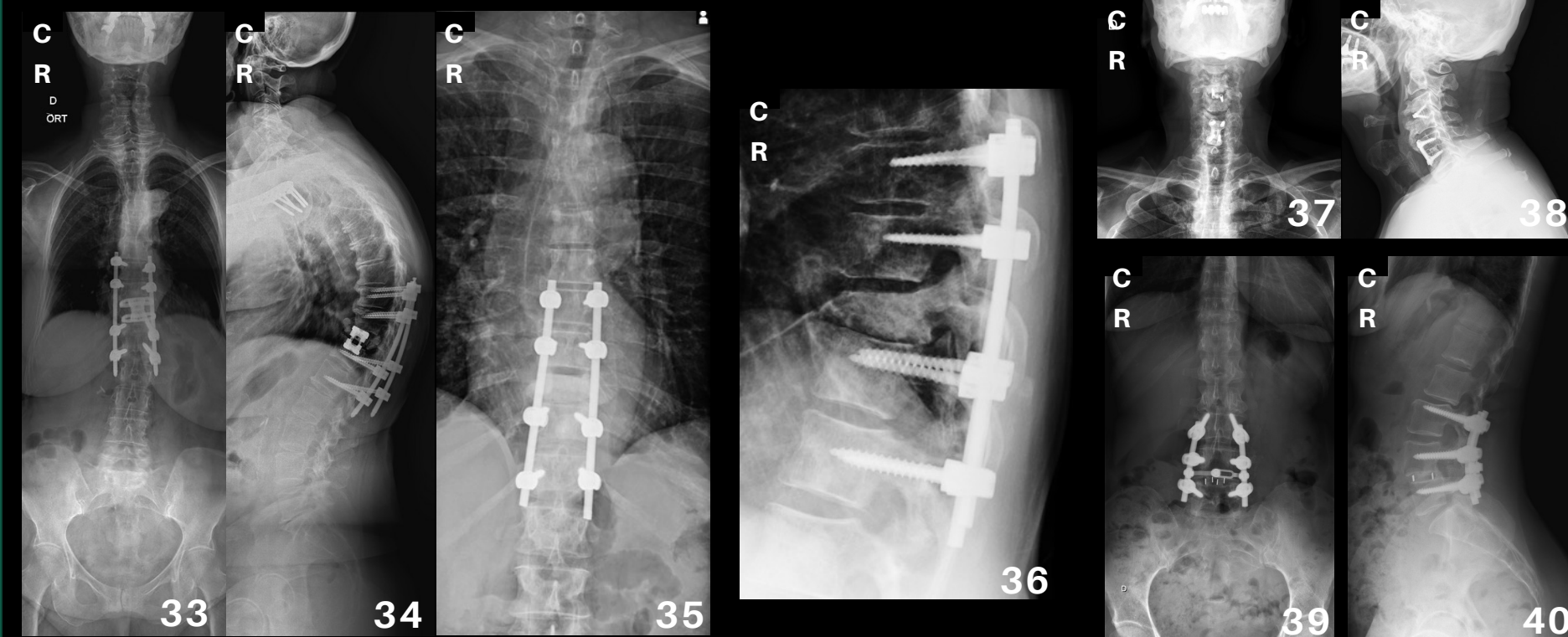
SPINAL PAIN AND THERAPY DECISION



Pictures A-D. Rehabilitation structure of our service, intended for the multidisciplinary care of patients, with human and technological material necessary for an adequate recovery and in the shortest possible time, to minimize the chances of eventual invasive surgical treatment resulting from late chronic alterations.

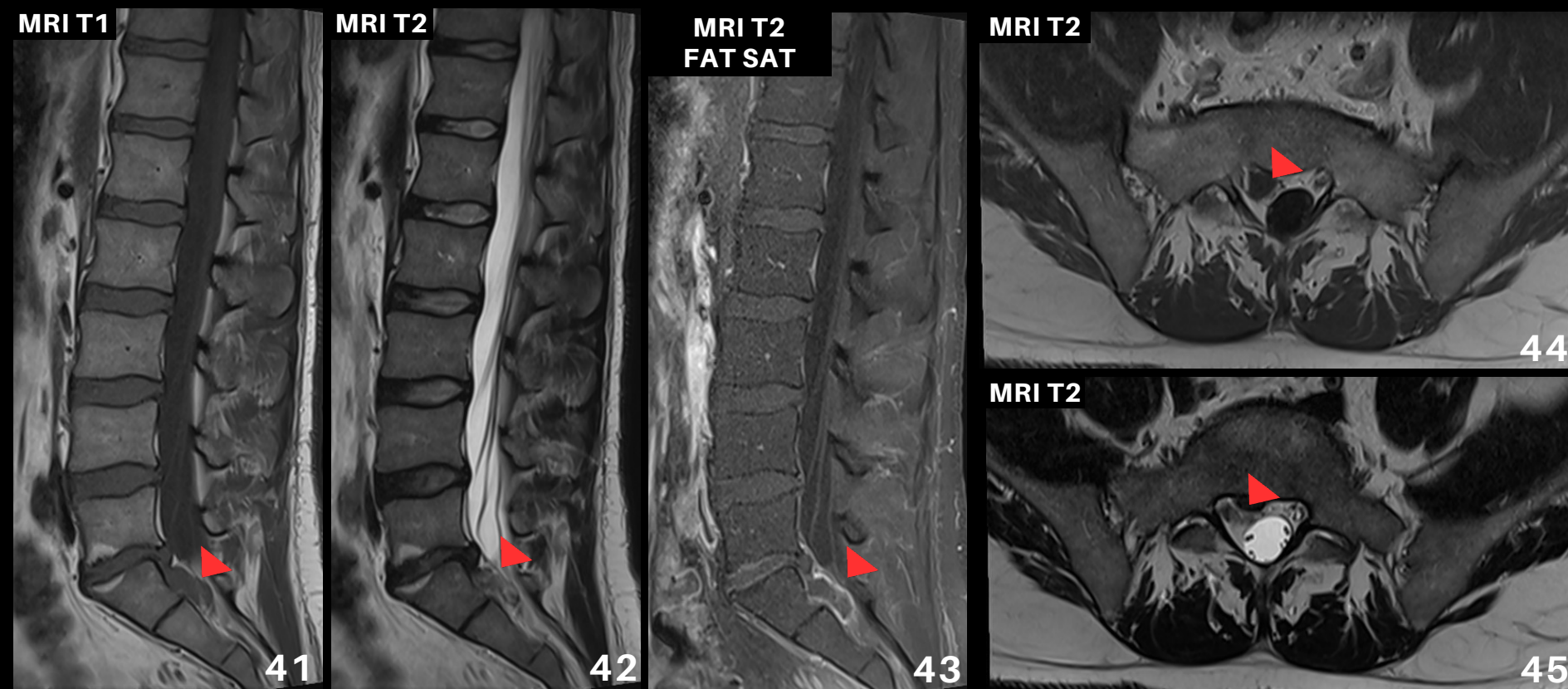


Images 29-32. Anterior arthrodesis from C4 to C6 consisting of disc spacers fixed by anterior screws (arrowhead). C-D. Posterior metal arthrodesis at L4-L5 with bilateral transpedicular screws connected by longitudinal rods. Presence of disc spacer and arthrosis of interapophyseal L4-L5 and L5-S1 (arrow head).



Images 39-40. Multiple cases of patients with spinal instability in the cervical, thoracic and lumbosacral segments, surgically treated with different stabilization-fusion procedures, characterized by arthrodesis and interbody cage spacers. The goal of these techniques is to maintain correct alignment and prevent abnormal motion of the spine. Stabilization is achieved by fusion of vertebral bodies and/or posterior elements through instrumentation and bone graft, which provide support until bone fusion (arthrodesis) occurs.

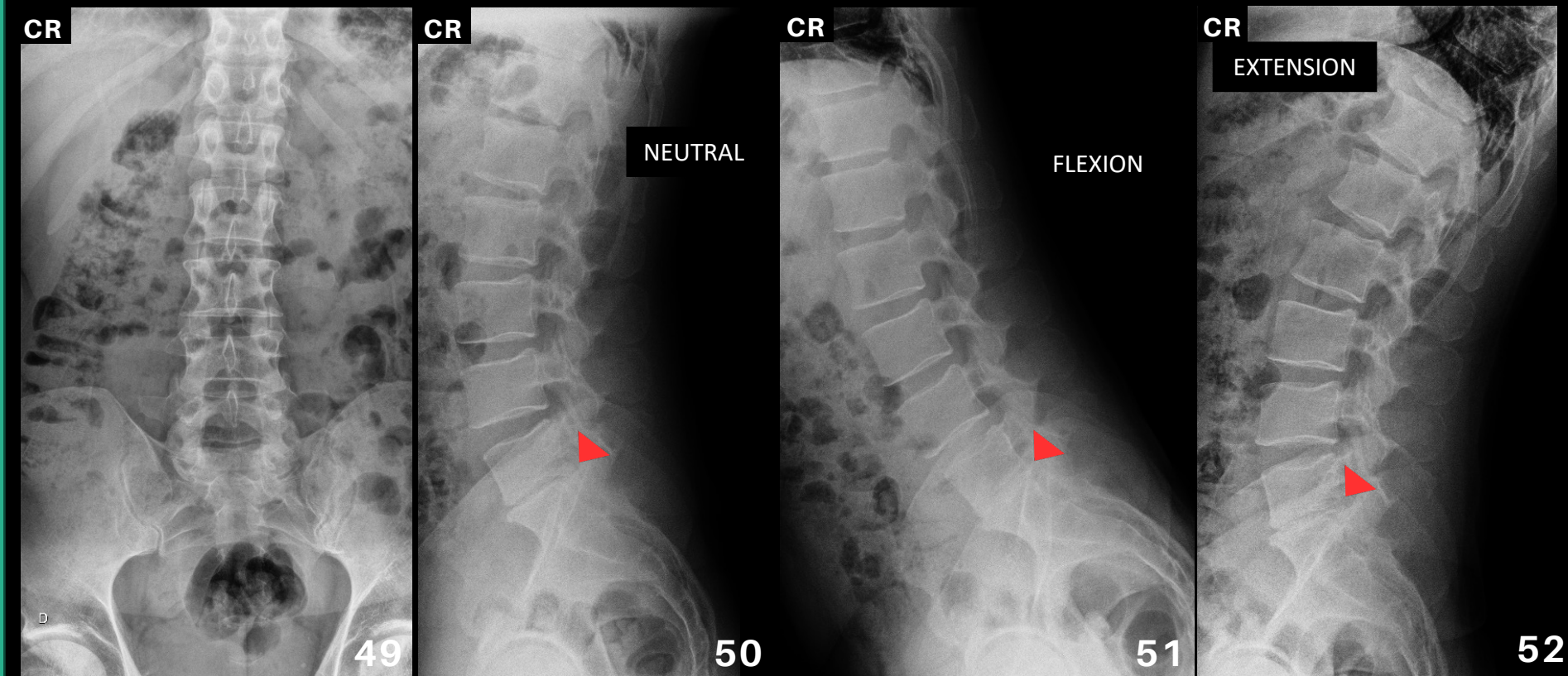
SPINAL PAIN AND THERAPY DECISION



Images 41-45. MRI Sagittal T1, T2 e T1GD and axial T1 and T2 images demonstrating right paramedian disc herniation with caudal migration and compressing the right S1 descending root (arrow head).



Images 46-48. Surgical treatment of lumbar spine instability with anterior arthrodesis, fixed with metal screws and a interbody cage spacer at the L5-S1 level.



Images 49-52. Radiography of the lumbar spine with dynamic maneuvers to investigate spinal instability. Note grade I retrolisthesis of L5, which reduces during flexion. There is also a reduction in the L5-S1 disc space with degenerative changes in the contiguous vertebral plateaus (arrow head).