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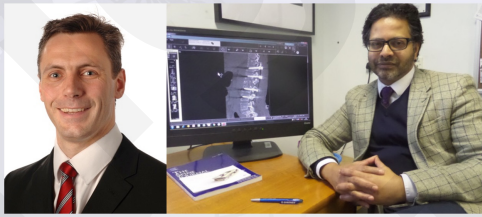
Osteotomy vs ALL Release

Mr M J H McCarthy
Consultant Spinal Surgeon

Fusion Portfolio Minimally Invasive Surgery Biomaterials Motion Preservation

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- ALIF – Burns 1933
- Smith-Petersen Osteotomy – 1945
- Anterior approaches – Hodgson 1964
- Anterior Scoliosis – Dwyer 1969
- PSO – Thomasen 1985
- XLIF – Pimenta 1997
- ACR – 1st paper Akbarnia 2014

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Roles of Osteotomies

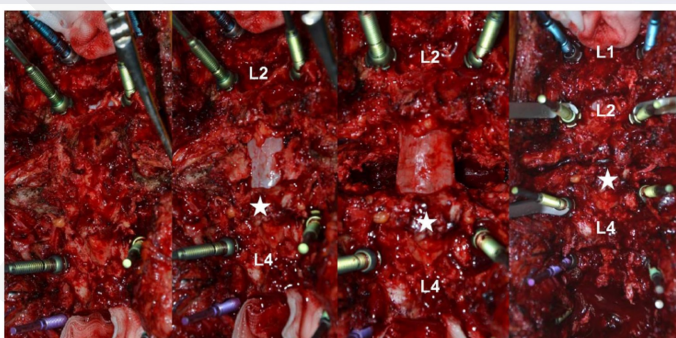
- Loosen stiff curves
- Address fixed deformity
- Reduce strain on instrumentation/bone interface during deformity correction
- Permit shortening or lengthening of portions of the spinal column

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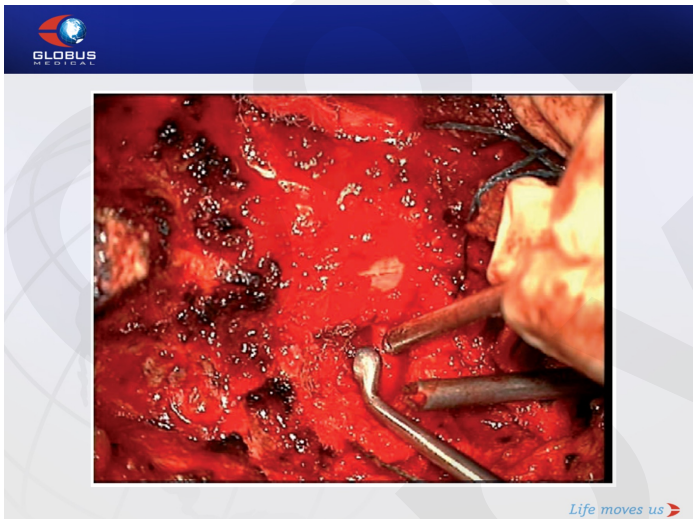
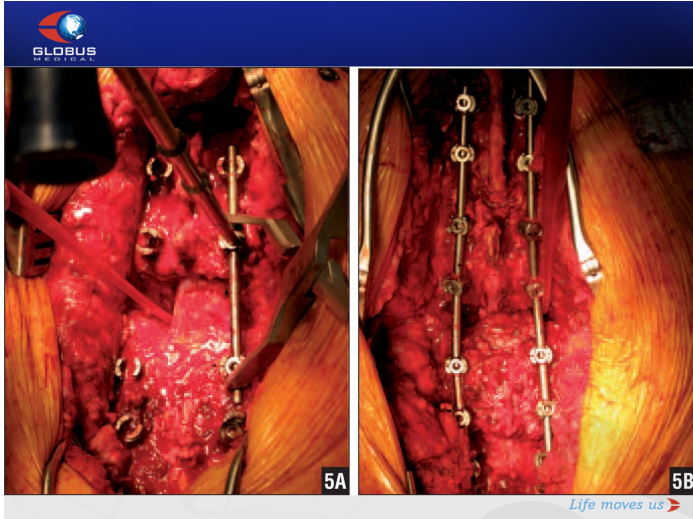
Type	Description	Diagram	Reference
1	Resection of posterior elements from mid pars above to pedicle below with realignment of the spine through hinging through a mobile disc anteriorly		Ponte
2	Resection of posterior elements from mid pars above to pedicle below with realignment of the spine through hinging through a mobile disc anteriorly		Smith-Petersen
3	Posterior-based transpedicular decancellation of the vertebral body with realignment through controlled fracture of the anterior column		Heinig
4	Posterior-based intraosseous wedge resection of the vertebral body with realignment through osteoclasis of the proximal third of the anterior vertebral body		Thomasen (PSO)
5	Posterior-based wedge resection with extension of the osteotomy into the supra-adjacent disc and realignment hinging on the anterior column at the intervertebral space		Mod Thomasen (Ext PSO)
6	Posterior-based vertebral column resection including one or more vertebra with adjacent discs		Suk (VCR)

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What it's supposed to look like...



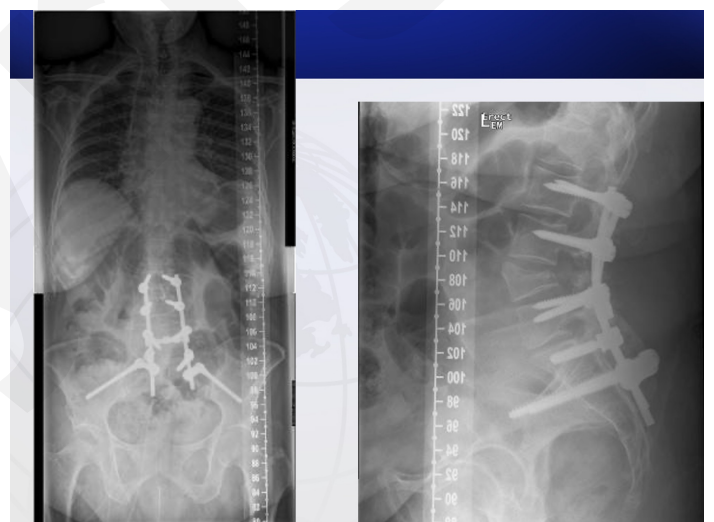
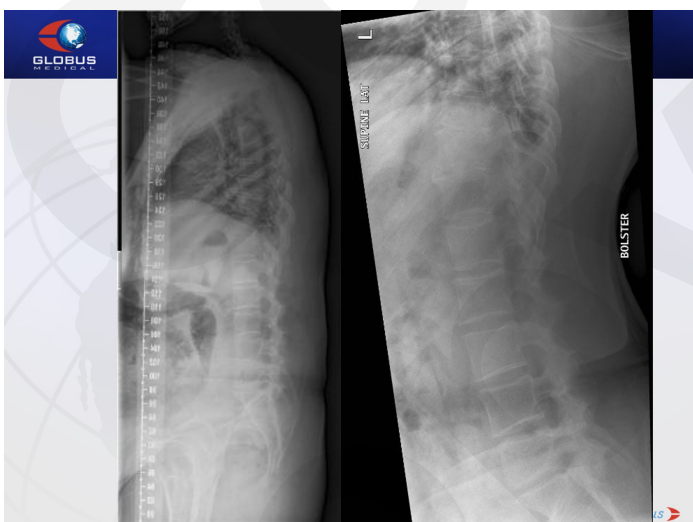
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Osteotomy vs ALL Release

- Osteotomy - PSO
 - Direct canal decompression
 - Direct foraminal decompression (but no height restoration)
 - Shortening procedure
 - “Bone on bone” fusion if performed correctly
 - Correction = per level
 - Typically up to 30 degrees
- ALL release + Cage
 - Indirect canal decompression
 - Indirect foraminal decompression
 - “Lengthening” procedure
 - Fusion through a cage
 - Requires additional posterior procedure
 - Correction = per level
 - Depends on cage lordosis and facets at back

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Problems with Osteotomy (PSO)

- Can't see the XRs
- Can't see because its bleeding
- Inadequate / too much correction
- Translation at osteotomy
- Collapse not wedge
- Dural tear – often revision case
- Nerve compression
- Non union - disc levels posterior elements
- PJK / DJK / Screw loosening
- Osteoporosis

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Problems with ALL Release

- Not enough cases done yet...
- “Neither be the first nor the last to embrace a new technology”
- ¼ XLIFs penetrate endplate and subside
 - VB fracture
 - Implant extrusion
 - Vessel, Renal, Bowel even Cauda Injury

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Anterior Column Realignment (ACR) in Adult Sagittal Deformity Correction

Technique and Review of the Literature

Rajiv Saigal, MD, PhD,* Gregory M. Munds Jr., MD,* Robert Eastlack, MD,* Juan S. Uribe, MD,[†] Frank M. Phillips, MD,[‡] and Behrooz A. Akbarnia, MD*

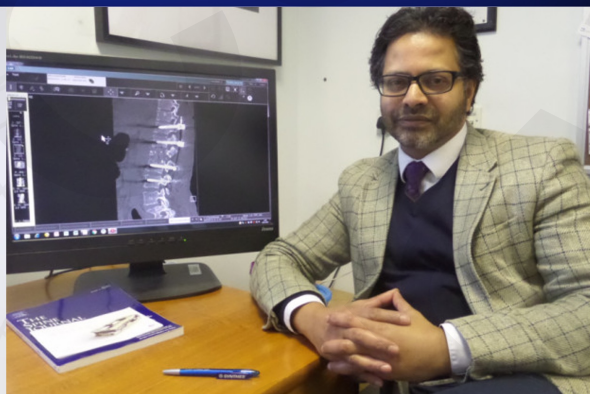
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Year	Authors	Title	Radiographic Results	Study Type
2015	Pimenta L, Forti F, Oliveira L, Marchi L, Jensen R, Coutinho E, Amara E	Anterior column realignment after lateral interbody fusion for sagittal deformity correction	26° mean improvement in LL in authors' recent cases	Retrospective review
2015	Berjano P, Damilano M, Ismael M, Longo A, Bruno A, Lanturina C	Anterior column realignment (ACR) technique for correction of sagittal imbalance	26° improvement in LL	Single-center, retrospective case report
2015	Berjano P, Cecchinato R, Sinigaglia A, Damilano M, Ismael M, Martini C, Villafrae JH, Lanturina C	Anterior column realignment from a lateral approach for the treatment of severe sagittal imbalance: a retrospective radiographic study	31° mean improvement in LL with 27° segmental lordosis at ACR level	Single-center, retrospective case series
2015	Turner JD, Akbarnia BA, Eastlack RK, Bagheri R, Nguyen S, Pimenta L, Marco R, Deviren V, Uribe J, Murelis GM Jr.	Radiographic outcomes of anterior column realignment for adult sagittal plane deformity: a multicenter analysis	24.1° mean improvement in LL	Multicenter, retrospective, radiographic
2015	Berjano P	Lateral access surgery for adult deformity: video lecture	37° LL correction	Single-center, retrospective case reports
2015	Murray G, Beckman J, Bach K, Smith DA, Dukwar E, Uribe JS	Complications and neurological deficits after minimally invasive anterior column release for adult spinal deformity: a retrospective study	17.6° mean improvement in LL	Single-center, retrospective case series
2014	Akbarnia BA, Munds GM Jr, Moazzaz P, Kabirian N, Bagheri R, Eastlack RK, Pawelek JB	Anterior column realignment (ACR) for local hypokyphotic spinal deformity using a lateral transpos approach and ALL release	22° mean improvement in LL	Single-center, retrospective case series
2014	Manwaring JC, Bach K, Ahmadian AA, Deukmedjian AR, Smith DA, Uribe JS	Management of sagittal balance in adult spinal deformity with minimally invasive antrolateral lumbar interbody fusion: a preliminary radiographic study	16.5° mean improvement in LL with 12° per segmental level	Single-center, retrospective case series
2012	Uribe JS, Smith DA, Dukwar E, Bai AA, Munds GM, Turner AW, Cornwell GB, Akbarnia BA	Lordosis restoration after anterior longitudinal ligament release and placement of lateral hyperlordotic interbody cages during the minimally invasive lateral transpos approach: a radiographic study in cadavers	11.6° segmental lordosis correction	Cadaveric
2012	Deukmedjian AR, Le TV, Baaj AA, Dukwar E, Smith DA, Uribe JS	Anterior longitudinal ligament release using the minimally invasive lateral transpos approach: a cadaveric feasibility study and report of 4 clinical cases	25° mean improvement in LL and 10° segmental lordosis correction	Cadaveric, retrospective case series
2012	Deukmedjian AR, Dukwar E, Ahmadian A, Smith DA, Uribe JS	Early outcomes of minimally invasive anterior longitudinal ligament release for correction of sagittal imbalance in patients with adult spinal deformity	24° mean improvement in LL with 17° improvement per ACR level	Single institution, retrospective case series
2012	Marchi L, Oliveira L, Amara E, Castro C, Coutinho T, Coutinho E, Pimenta L	Anterior elongation as a minimally invasive alternative for sagittal imbalance—a case series	24.8° mean improvement in LL	Single institution, retrospective case series

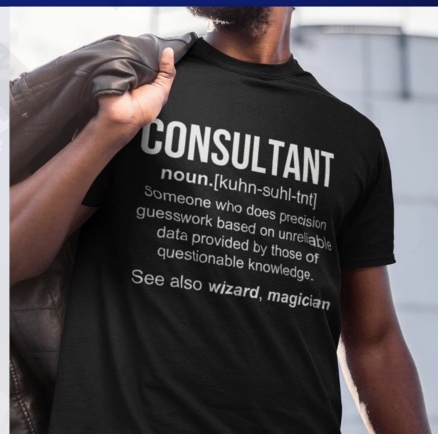
ACR indicates anterior column realignment.

Only 12 papers since 2012
2 in cadavers

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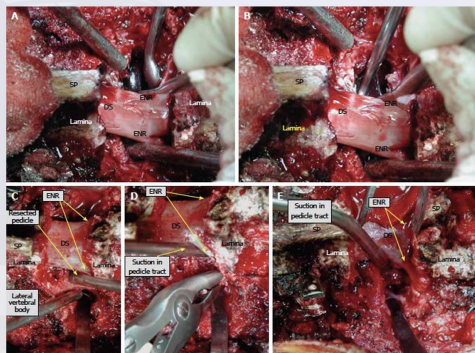
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Case for ALL release / Vertebrectomy

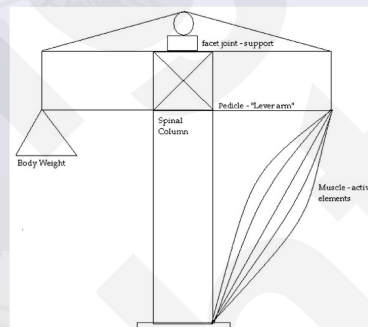
- Complexity of resection of bone posteriorly is eliminated



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Anterior column support

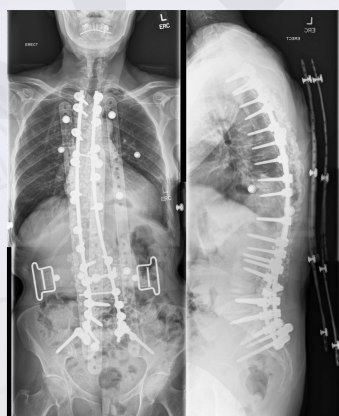
- Constant lectures by orthopaedic surgeons about the biomechanics!



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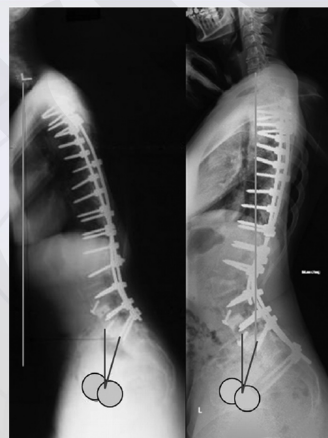
Increase posterior metalwork needed

- Often need to fix much higher than kyphus
- Sometimes need to fix to pelvis



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Acute angle of posterior metalwork?



- Does this acute angle cause an increase in metalwork failure?

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Case using LLIF



Case for using vertebrectomy



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Smoother curve



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Summary

- Lateral ALL release is not that difficult!
- Use of expandable cages allows for in built lordosis
- Smoother curve achieved compared to PSO
- Better anterior support



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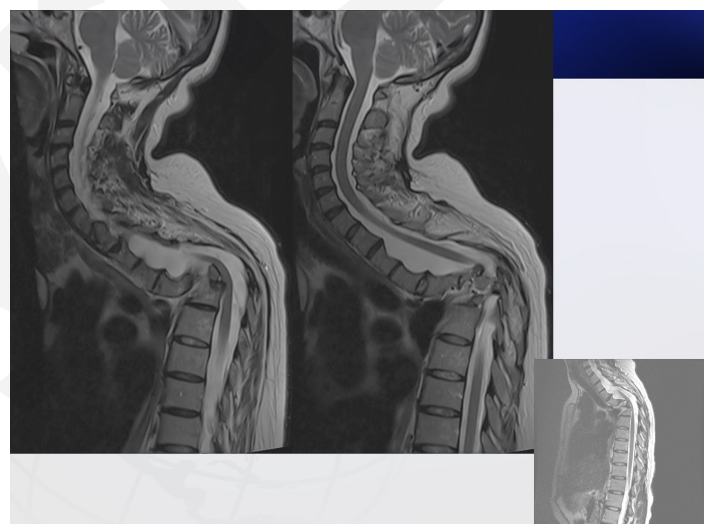
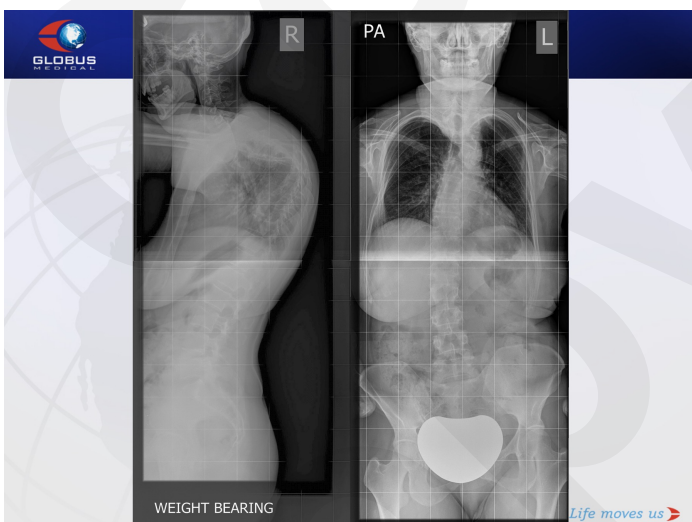
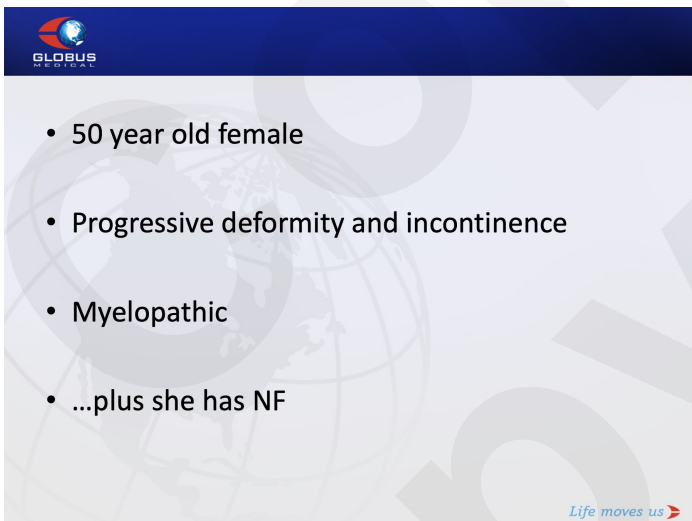
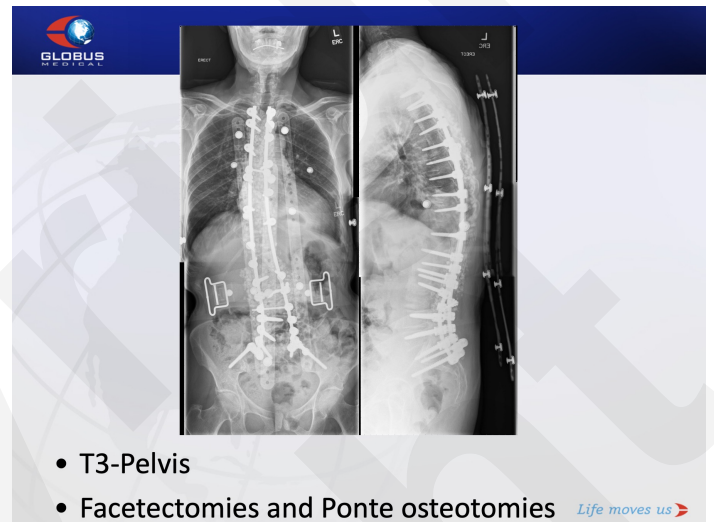
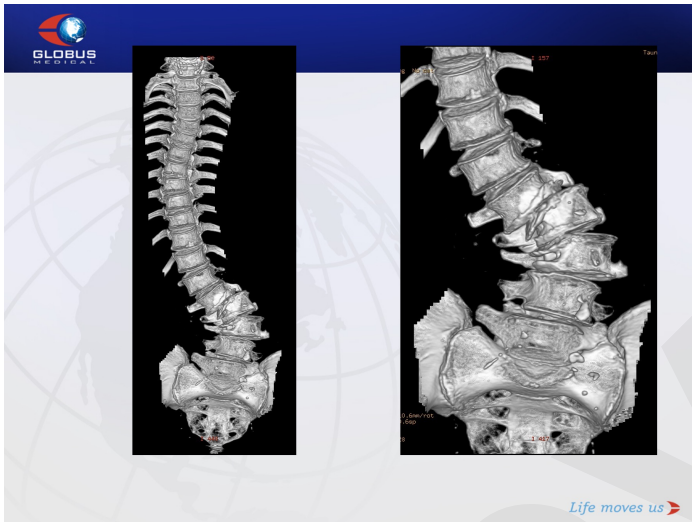


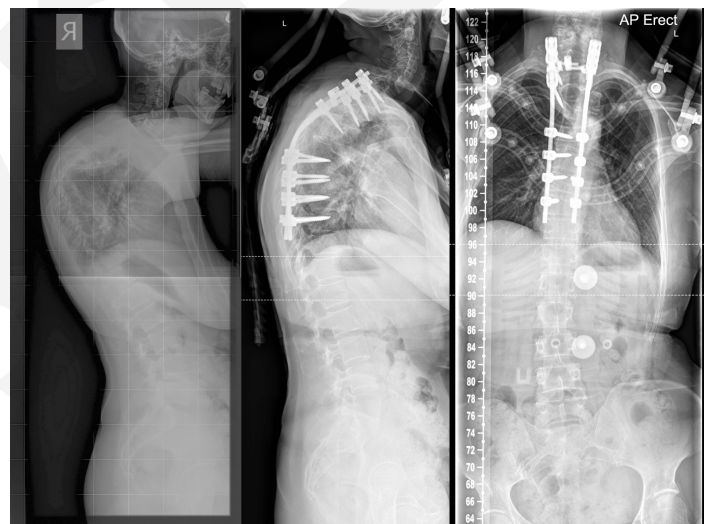
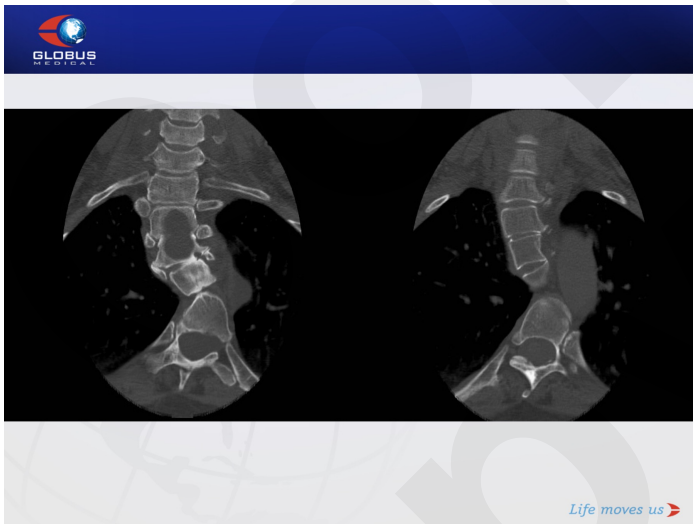
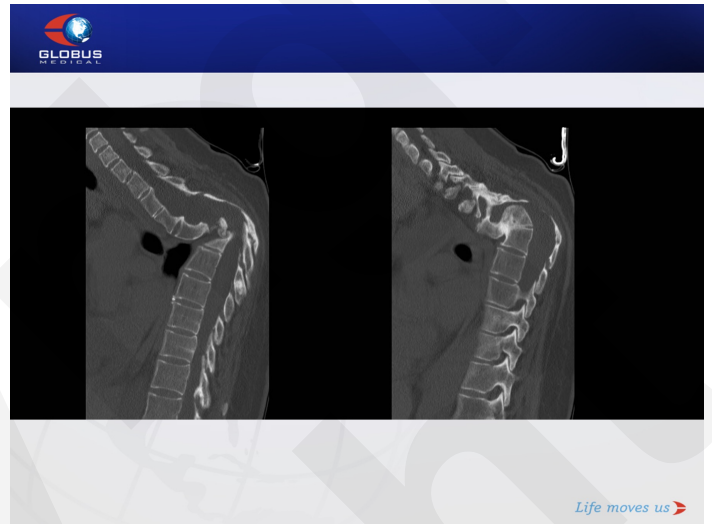
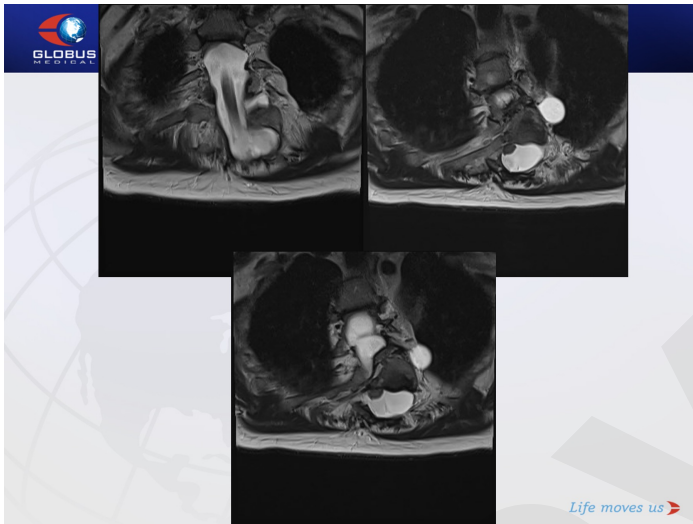
- 75 ♀ cannot go on like this

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Thank you

