



Anterior surgical correction of thoracic and lumbar deformities

Professor Ostrovskij V.V., MD, DSc; Shulga A.E., MD, PhD,

Zaretskov V.V., MD, DSc; Bazhanov S.P., MD, DSc;

Likhachev S.V., MD, PhD; Smolkin A.A., MD

Objectives

Rigid posttraumatic thoracic and lumbar deformities



Surgical management



Anterior corrective interventions



Importance



Function



?





Method

60 patients with consequences of thoracic and lumbar traumas lacking neurological symptoms

Estimation of surgical outcomes

Group I (30 patients) with the consequences of type A (AO/Spine) spine traumas

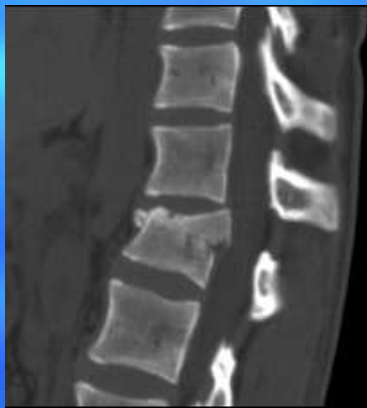
Group II (30 patients) with the consequences of type B and C (AO/Spine) spine traumas

1. Isolated anterior approach
2. Two-stage surgery (P/A): dorsal release, anterior fixation

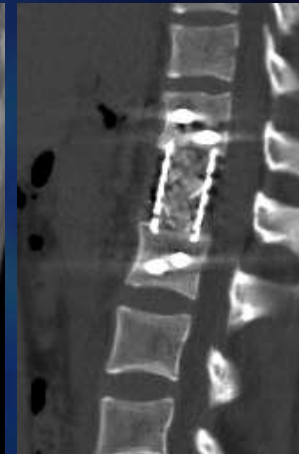
Surgery severity (blood loss, intraoperative time);
X-ray and clinical outcomes (VAS, ODI)

Results

Group I – patients with the consequences of type A spine traumas



L1 anterior resection
and deformity correction



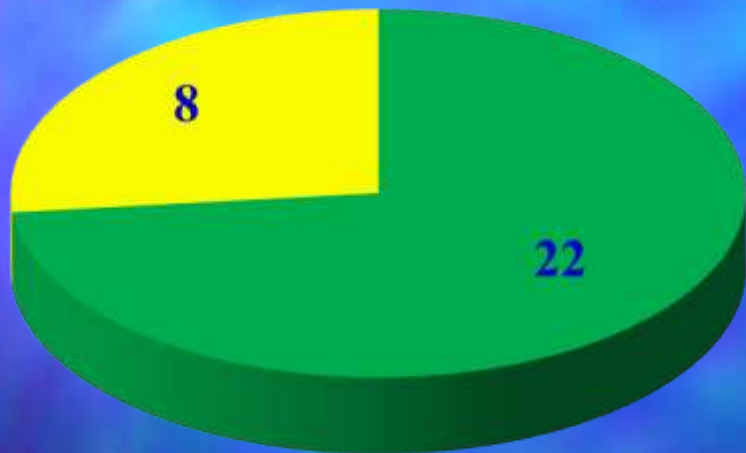
CT image in 12 months
after Th12-L2 anterior fixation

CT and X-ray images
before the surgery
(consequences of L1 fracture)

Results

Assessment of Quality of Life in Group I patients
in 12 months of the surgical management (n – 30)

Oswestry Disability Index (ODI спина)

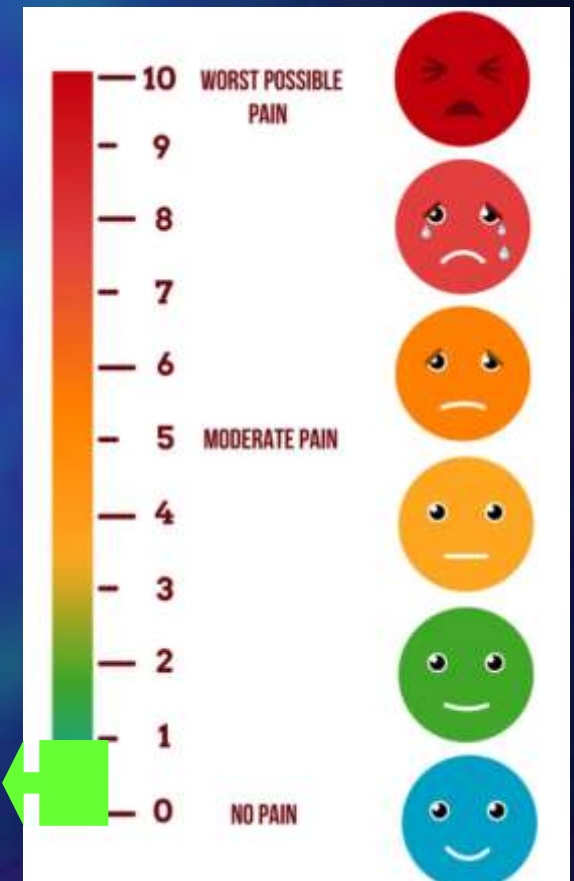


■ ODI – 0% ■ ODI – 0-20% ■ ODI – 26-80%

- **Compete rehabilitation of the patient**
- **Minimal influence on the patients' daily routine (intermittent moderate pain syndrome)**
- **The patient suffers from severe pain syndrome. The daily routine is hindered or impossible to perform**

Me 0.0
(0.0-1.0)

Visual Analog Scale (VAS)



Results

Group II – patients with the consequences of type B and C spine traumas

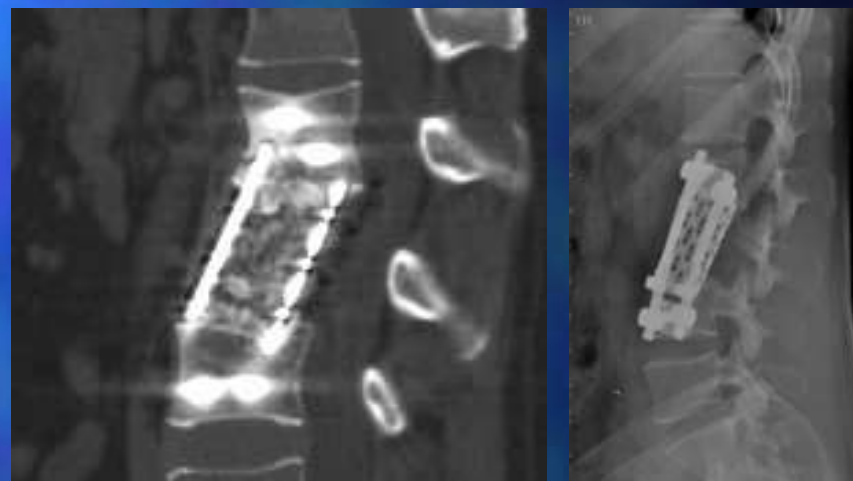
Case #1



CT image before the surgery (consequences of L3 fracture)



CT image after the surgery

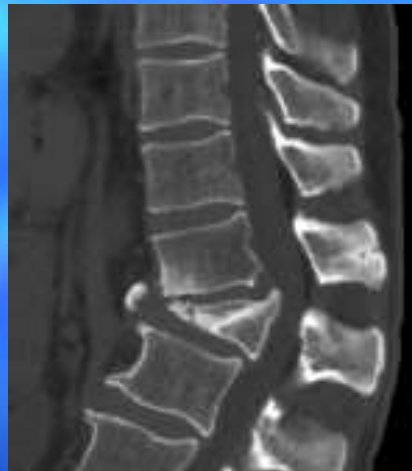


CT and X-ray images in 12 months of the L2-L4 anterior fixation

Results

Group II – patients with the consequences of type B and C spine traumas

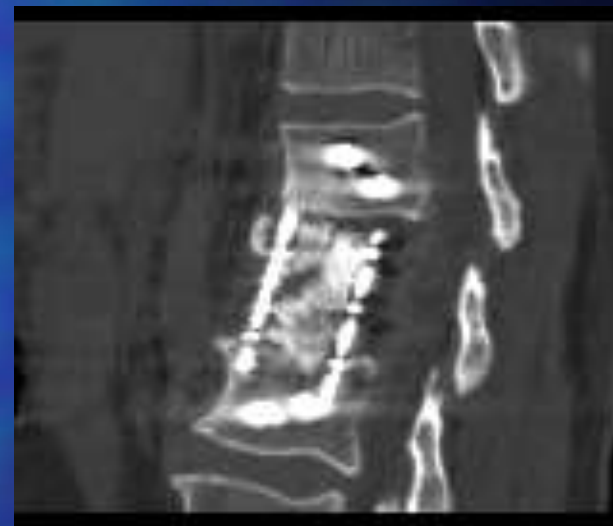
Case #2



CT and X-ray images before the surgery (consequences of L1 fracture)



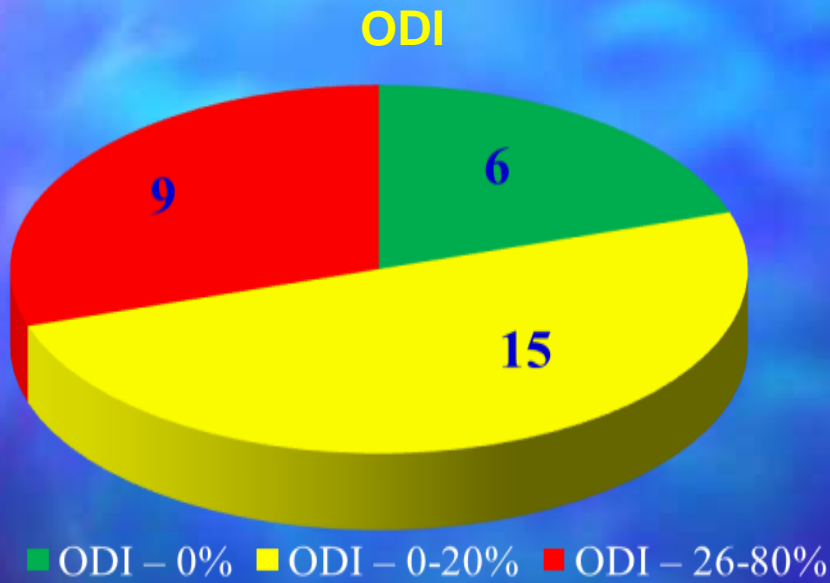
X-ray image after the surgery



CT image in 12 months of the Th12-L2 anterior fixation

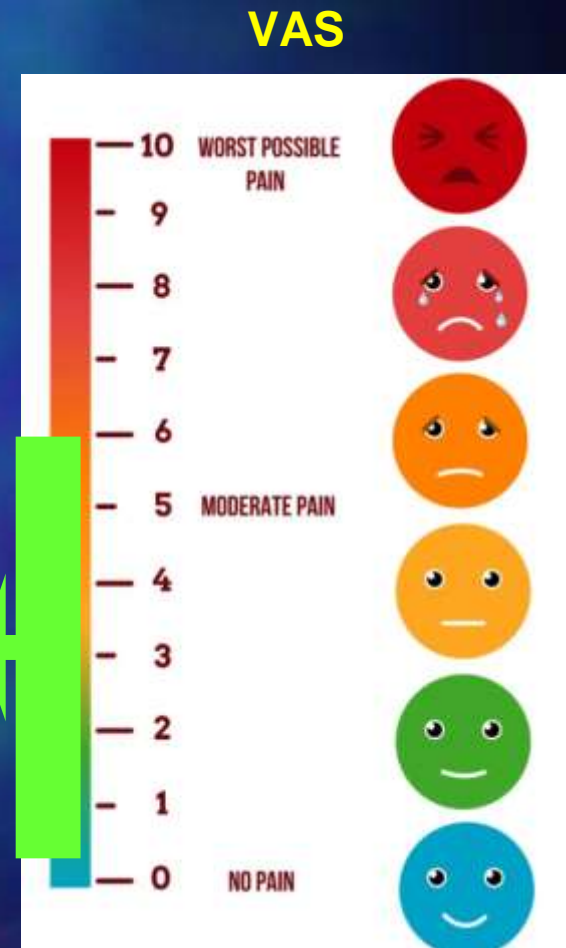
Results

Assessment of Quality of Life in Group II patients in 12 months of the surgical management (n – 30)



- **Complete rehabilitation of the patient**
- **Minimal influence on the patients' daily routine (intermittent moderate pain syndrome)**
- **The patient suffers from severe pain syndrome. The daily routine is hindered or impossible to perform**

Me 4.0
(0.25-6.0)



Results

Comparison of Group I and II surgical outcomes

Criterion	Group I	Group II	P
<i>Residual postoperative kyphosis</i>	1.0° (0.0 – 2.0)	4.5° (3,0 – 10,0)	p<0.001
<i>Loss of correction in 12 months of the surgery</i>	0.5° (0.0 – 2.0)	4.5° (3.0 – 10.0)	p<0.001
<i>VAS in 12 months of the surgery (scores)</i>	0.0 (0.0 – 1.0)	4.0 (0.25 – 6.0)	p=0.001
<i>ODI in 12 months of the surgery (%)</i>	7.5 (4.3 – 10.0)	39.0 (15.3 – 44.5)	p<0.001
<i>Blood loss (ml)</i>	625 (462 – 837)	1000 (950 – 1237)	p<0.001
<i>Operative time (min)</i>	107 (86 – 136)	150 (131 – 169)	p<0.001



Conclusion

- The indications for anterior surgical management of rigid posttraumatic thoracic and lumbar deformities are limited with biomechanical capacities of ventral screw systems.
- This method is justified only for patients with consequences of stable injuries (type A).
- The use of anterior fixation for inveterate types B and C injuries of thoracic and lumbar vertebrae is fraught with higher percent of unfavorable X-ray and clinical outcomes.



References

1. Wang Q, Xiu P, Zhong D, Wang G, Wang S. Simultaneous posterior and anterior approaches with posterior vertebral wall preserved for rigid post-traumatic kyphosis in thoracolumbar spine. *Spine*. 2012;37(17):1085-1091. doi: 10.1097/BRS.0b013e318255e353.
2. Wu H, Wang C-x, Gu C-y, Zhang Z-y, Tong S, Yan H-d, Wang J-c. Comparison of three different surgical approaches for treatment of thoracolumbar burst fracture. *Chin J Traumatol*. 2013;16(1):31-35. 26.
3. Hempfing A, Zenner J, Ferraris L, Meier O, Koller H. Restoration of sagittal balance in treatment of thoracic and lumbar vertebral fractures. *Orthopade*. 2011;40(8):690-702. doi: 10.1007/s00132-011-1796-4. 27.
4. Li S, Li Z, Hua W, Wang K, Li S, Zhang Y. et al. Clinical outcome and surgical strategies for late post-traumatic kyphosis after failed thoracolumbar fracture operation: Case report and literature review. *Medicine (Baltimore)*. 2017;96(49):e8770. doi: 10.1097/MD.0000000000008770.
5. Kaliciński M, Szczeńsiak A, Kalisz J, Tęsiorowski M. Anterior fixation of thoracolumbar traumatic spinal injuries. *Ortop Traumatol Rehabil*. 2015;17(1):7-20. doi: 10.5604/15093492.1143526.
6. Smits AJ, Noor A, Bakker FC, Deunk J, Bloemers FW. Thoracoscopic anterior stabilization for thoracolumbar fractures in patients without spinal cord injury: quality of life and long-term results. *Eur Spine J*. 2018;27(7):1593-1603. doi: 10.1007/s00586-018-5571-7.
7. Wang S, Duan C-Y, Yang H, Kang J-P, Wang Q. Novel screw insertion method for anterior surgical treatment of unstable thoracolumbar fracture: quadrant positioning method. *Orthop Surg*. 2019;11(4):613-619. doi:10.1111/os.12506.
8. Pan XM, Li W, Huang X, Deng SL, Qu B, Fan L, Ma Z, Jiang K. Single level anterior interbody fusion and fixation in the treatment of thoracolumbar fractures. *J Back Musculoskelet Rehabil*. 2014;27(4):499-505. doi: 10.3233/BMR-140473.
9. Ma LT, Gong Q, Li T, Song YM, Pei FX, Zhao XD, Zhang WL, Liu LM, Zeng JC, Liu H. Relationship between the angle of vertebral screws and spinal lateral angulation after fixation of thoracolumbar fractures via an anterior approach. *Genet Mol Res*. 2014;13(4):8135-46. doi: 10.4238/2014.October.7.8.
10. Pishnamaz M., Scholz M., Trobisch P.D., Lichte P., Herren C., Hildebrand F., Kobbe P. Posttraumatic deformity of the thoracolumbar spine. *Unfallchirurg*. 2020;123(2):143-154. doi: 10.1007/s00113-019-00764-8.
11. Mazel C., Ajavon L. Malunion of post-traumatic thoracolumbar fractures. *Orthop Traumatol Surg Res*.2018;104(1S):55-62. doi: 10.1016/j.otsr.2017.04.018.
12. Viljoen SV, DeVries Watson NA, Grosland NM, Torner J, Dalm B, Hitchon PW. Biomechanical analysis of anterior versus posterior instrumentation following a thoracolumbar corpectomy: Laboratory investigation. *J Neurosurg Spine*. 2014;21(4):577-81. doi: 10.3171/2014.6.SPINE13751.
13. Zahra B, Jodoin A, Maurais G, Parent S, Mac-Thiong JM. Treatment of thoracolumbar burst fractures by means of anterior fusion and cage. *J Spinal Disord Tech*. 2012;25(1):30-7. doi: 10.1097/BSD.0b013e31820bb0a9.
14. Zhang S, Thakur JD, Khan IS, Menger R, Kukreja S, Ahmed O, Guthikonda B, Smith D, Nanda A. Anterior stabilization for unstable traumatic thoracolumbar spine burst fractures. *Clin Neurol Neurosurg*. 2015;130:86-90. doi: 10.1016/j.clineuro.2014.10.020.

Author Disclosure Information

- Grants/Research Support
- Consultant
- Stock/Shareholder
- Speakers' Bureau
- Other Financial Support

Corresponding Author:

Vladimir Ostrovskij

No Disclosures

Co-Authors:

Aleksey Shulga

No Disclosures

Vladimir Zaretskov

No Disclosures

Sergey Bazhanov

No Disclosures

Sergey Likhachev

No Disclosures

Aleksey Smolkin

No Disclosures