KYPHOSIS

Kyphosis
Classification

- Postural
- Mb Scheurmann
- Marfan
- Congenital
- Ankylozing Spondylitis
- Post traumatic

Scheuermann´s disease

Diagnosis

- Scheuermann 1921
- Sørensen 1964
- Bradford 1987

- Kyphosis > 45 degrees
- At least one vertebrae wedged > 5 degrees
- Disc space narrowing
- Irregular end plates, Schmorls's nodes

- Scheuermann type I & type II

Spinal Osteochondrosis - abnormal juvenile kyphosis - Scheuermann's disease

Prevalence, Concordance, and Heritability of Scheuermann Kyphosis Based on a Study of Twins

Frank Damborg, Vilhelm Engell, Mikkel Andersen, Kirsten Ohm Kyvik and Karsten Thomsen
J. Bone Joint Surg. Am. 88:2133-2136, 2006. doi:10.2106/JBJS.E.01302

TABLE I Concordance, Odds Ratio, and Tetrachoric Correlations in Twins with Scheuermann Disease*

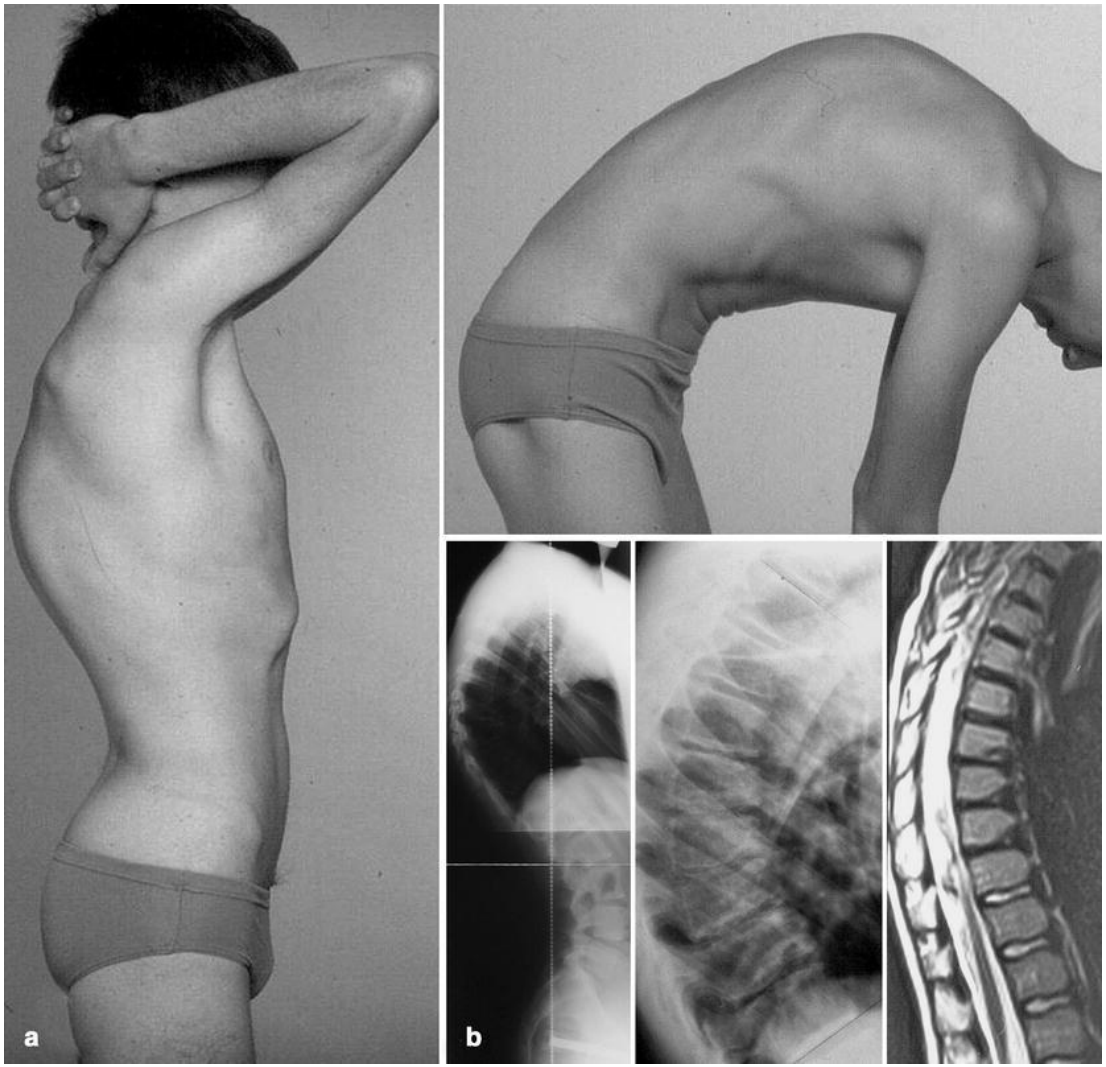
	No. of Pairs (Concordant/ Discordant/ Unaffected)	Pairwise Concordance	Probandwise Concordance	Odds Ratio	Tetrachoric Correlations
Monozygotic pairs	34/57/3146	0.19 (0.13-0.25)	0.31 (0.25-0.37)	32.92 (19.40-55.84)	0.79 (0.70-0.86)
Dizygotic pairs	16/100/3908	0.07 (0.04-0.25)	0.13 (0.09-0.17)	6.25 (3.41-11.31)	0.39 (0.25-0.51)

*All variables were significantly higher in monozygotic than in dizygotic pairs ($p < 0.01$). The 95% confidence intervals are given in parentheses.

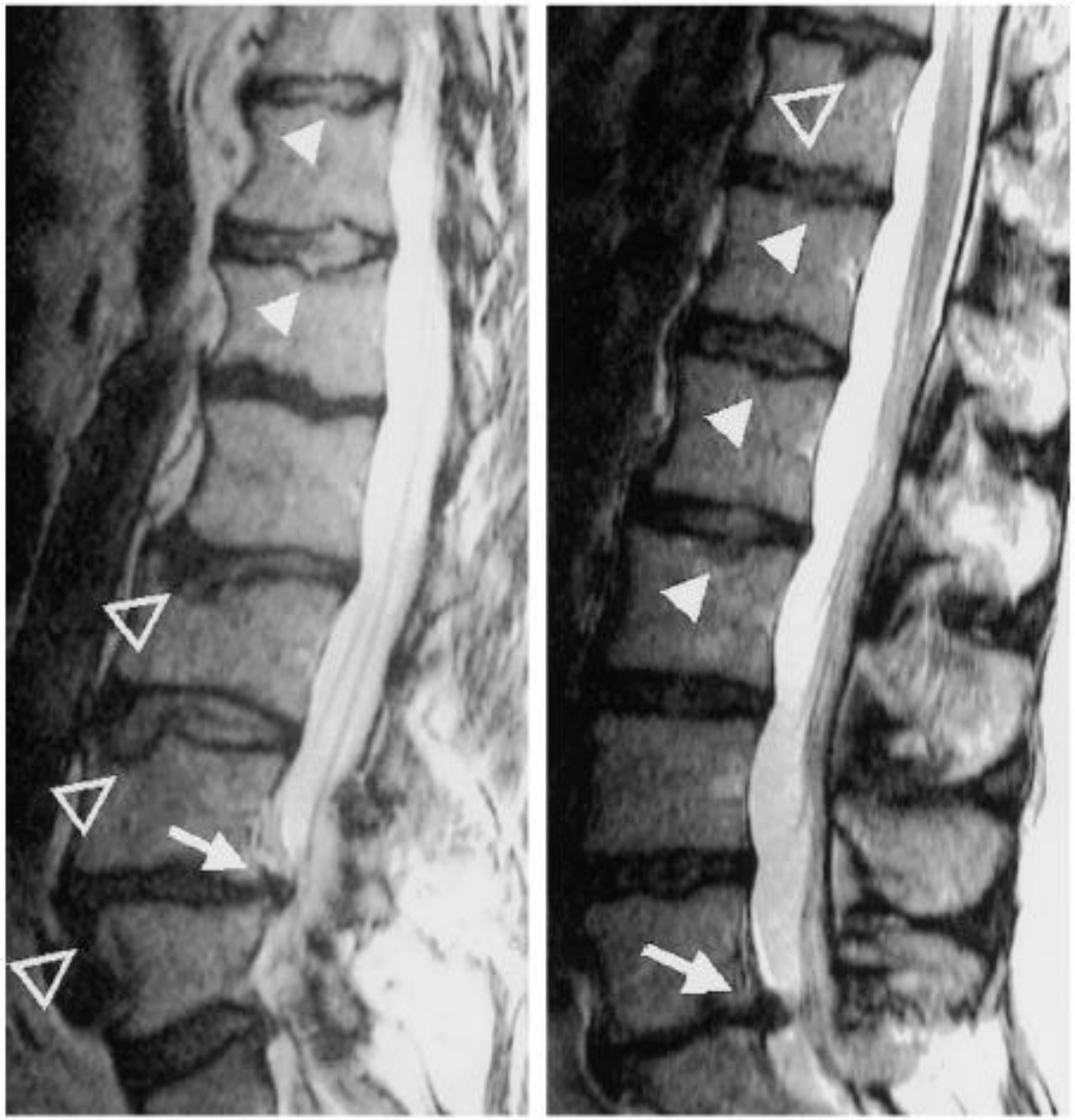
Self reported incidence: 2.8%, 645 out of 22.872 twins individually reported to have SD, male-to-female ratio 2:1, Heridability 74%, autosomal dominant.

Gene defect in the COL9A3 Gene (*Trp*3 allele) of type IX Collagen (Karppinen et al 2003)

Scheuermanns´kyphosis type I



Scheuermanns's type II



Scheuermanns Kyphosis

Natural history

In relation to reasons to treat:

- **Pain (prevalence 38% versus 21% in control subjects, decrease from 50% to 25% at skeletal maturity- but later in adulthood high incidence of pain- dependent of magnitude of kyphosis)**
- **Progressive deformity (most often complaint)**
- **Neurologic compromise (rare- adults-apical thoracic disc herniation)**
- **Cardiopulmonary compromise (>100 degrees)**
- **Cosmesis**

Natural History and Long term follow up of Scheuermanns kyphosis. Murray et al . JBJS 1993;75: 235-48.

- N = 67 out of 118 and matched controls
- Follow up 32 years
- Average 71 degrees kyphosis
- Only moderate functional limitation

Scheuermann kyphosis

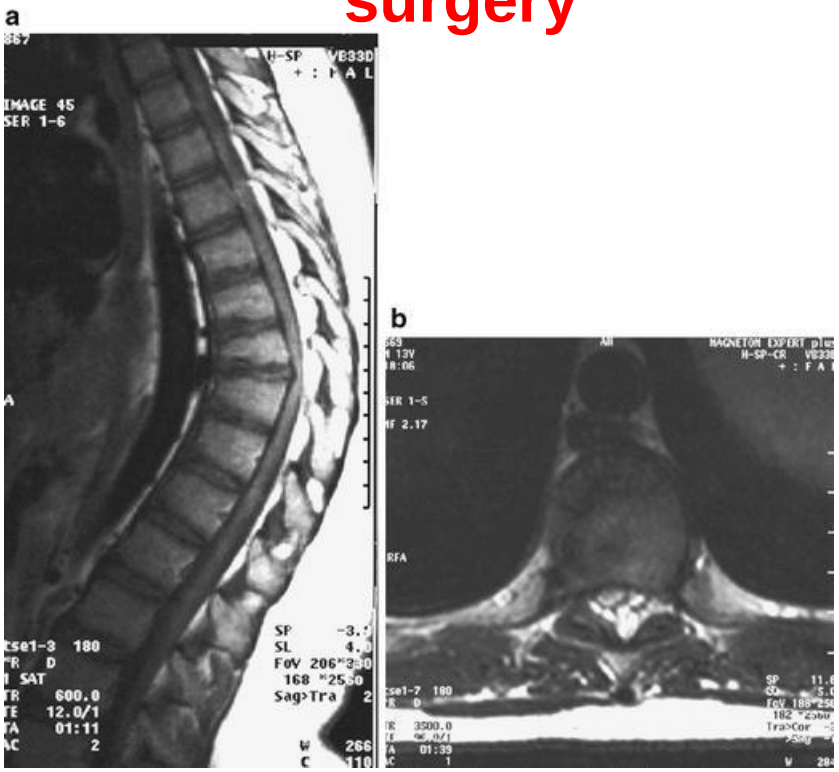
Controversial indications for treatment

- Pain
- Progression of deformity
- Appearance

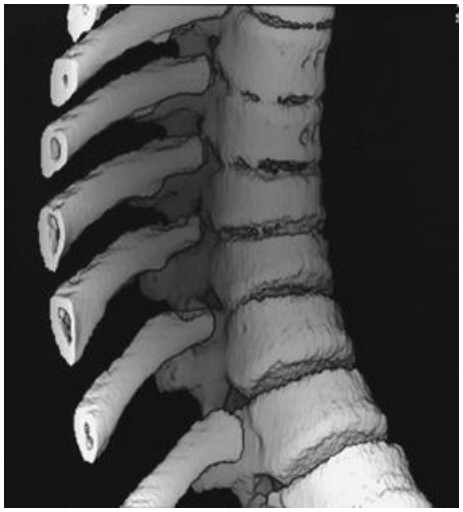
”The majority of patients have no pain,
but a subset of patients have severe pain and warrent aggressive treatment”
Tribus 1998

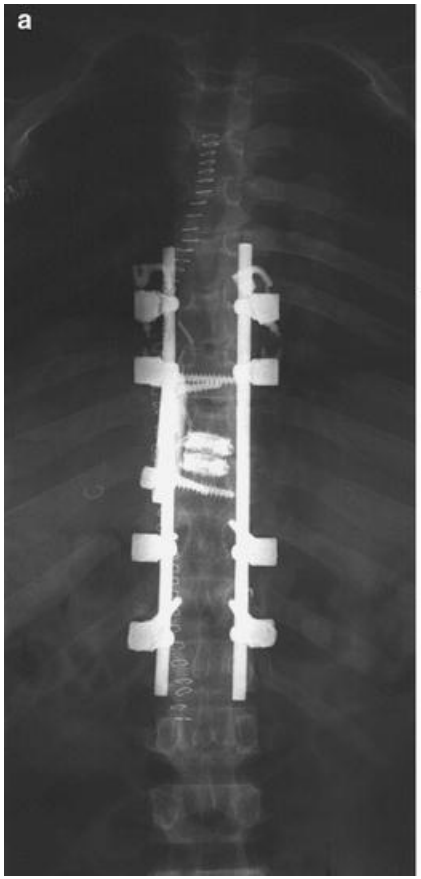
The important relationsship between posture, self-image,
self-confidense and socialization is critical to both patient and parents
Wenger 1999

Apical thoracic disc herniation
A noncontroversial indication for surgery



Anterior decompression and 360 degrees fusion





Scheuermann's kyphosis

Current algoritms of management (Aarhus Denmark)

- Pain, kyphosis < 50 degrees + growth potential: Observational, exercise therapy or brace treatment
- Flexible kyphosis 50 - 75 degrees + growth potential: Brace treatment
- Flexible kyphosis =/> 75 degrees: Posterior column shortening by Posterior approach, segmental pedicle screws.
- Rigid Kyphosis > 75 degrees: Posterior approach segmental pedicle screws with apical SMO's or combined anterior release + posterior pedicle screws + SMO´s. *(SEP+MEP*)
- Rigid Kyphosis > 100 degrees: Posterior approach with pedicular subtraction osteotomies and bilateral costoplasties. (*SEP* + *MEP*)

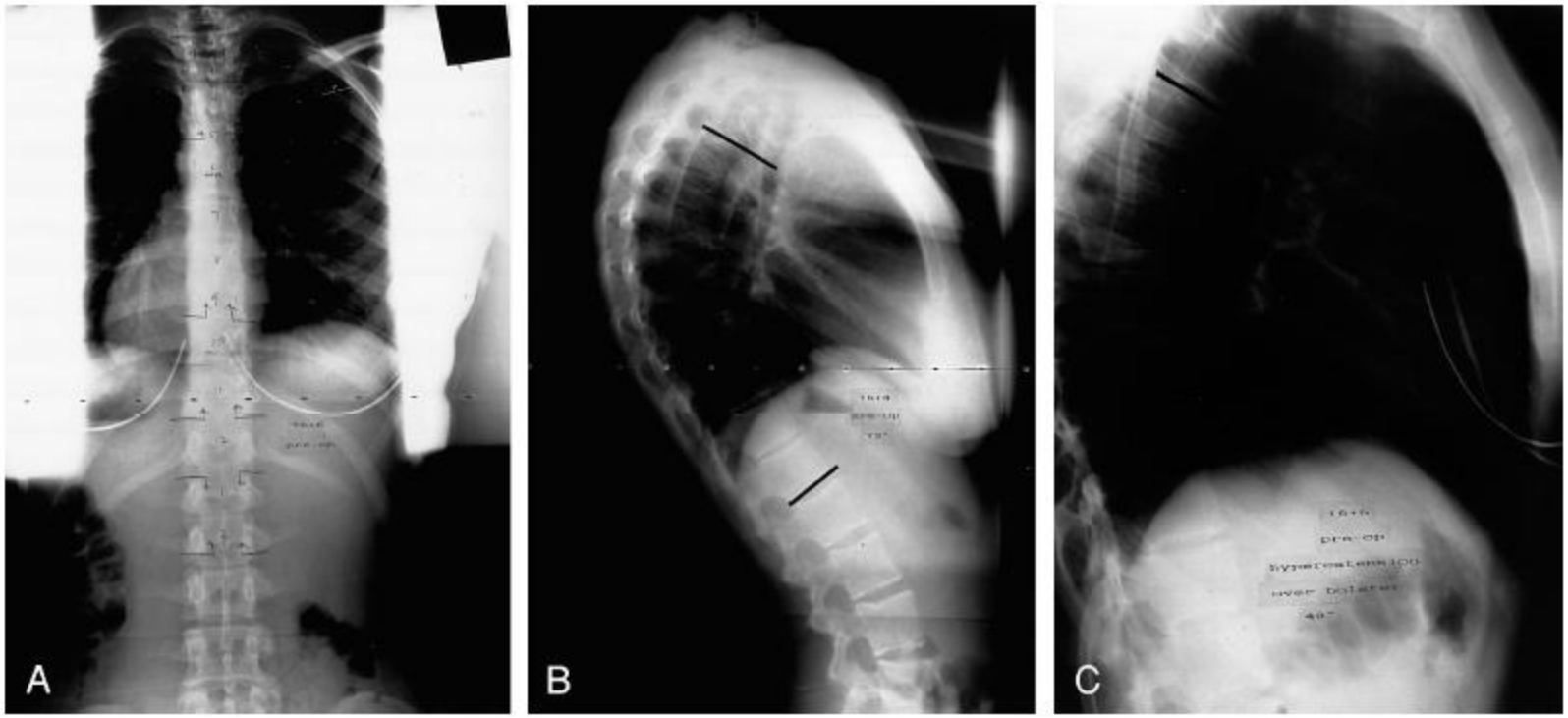


Figure 1. **A**, Standing PA spinal radiograph – in a 16-year-old girl with Scheuermann's kyphosis and severe back pain. She is skeletally mature. **B**, Standing lateral preoperative radiograph. The vertebral wedging is typical of Scheuermann's kyphosis. The kyphosis was measured as 72° (modified Cobb method). **C**, Hyperextension lateral radiograph of the thoracic spine performed over a bolster. The kyphosis reduced to 40°. PA = postero-anterior.

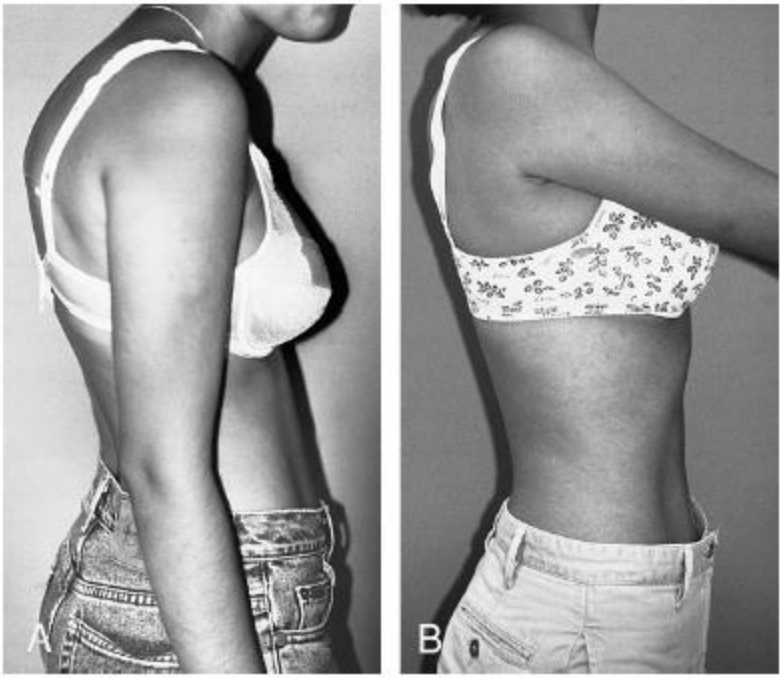


Figure 2. **A**, Standing lateral photograph of the same girl. She complained of severe thoracic back pain and had trunk deformity that was unacceptable to both the girl and her parents. **B**, Standing lateral photograph of the same patient taken 1 year after thoracoscopic anterior release, disc excision, and fusion as well as same day posterior CD horizon spinal instrumentation and fusion.

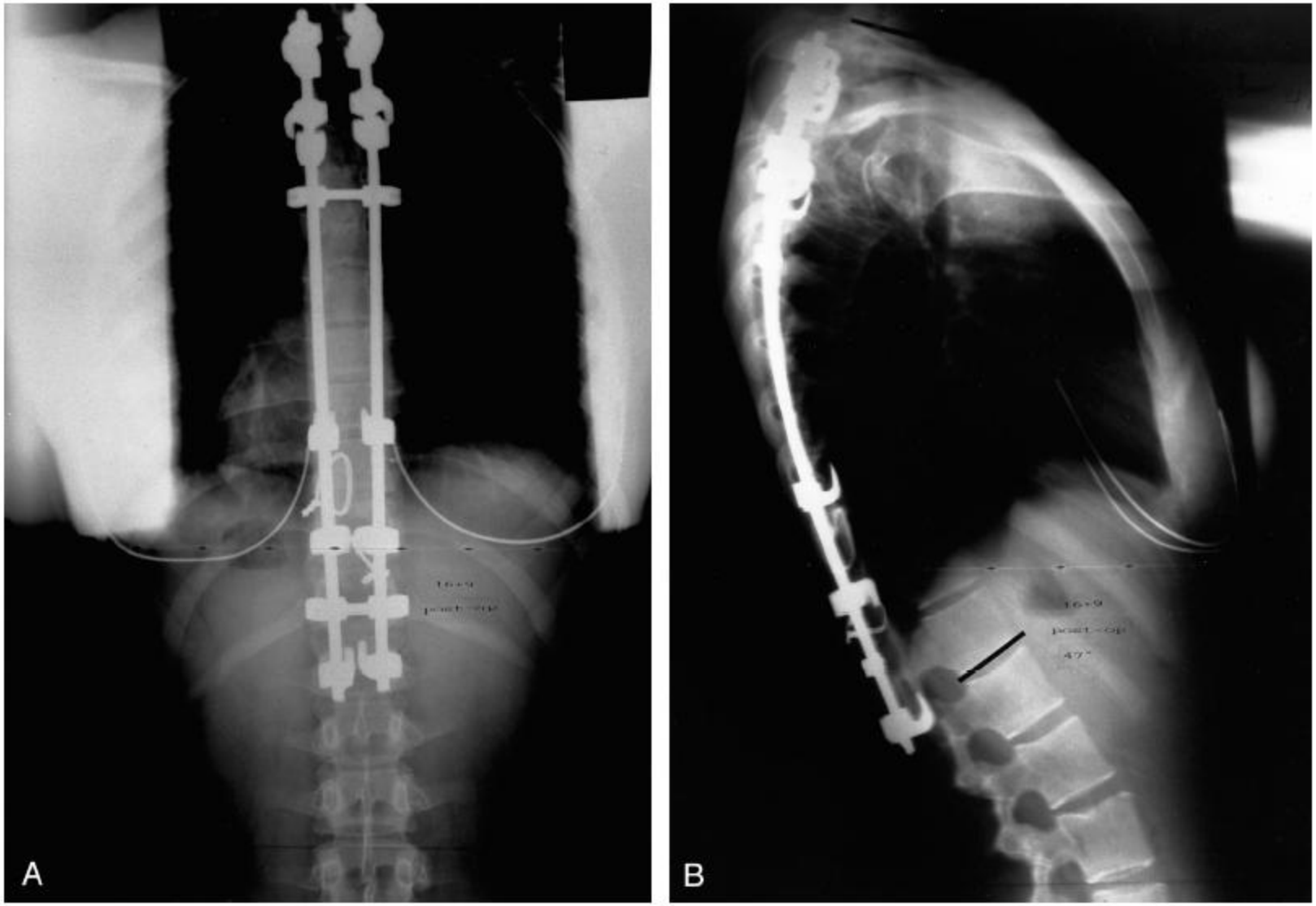
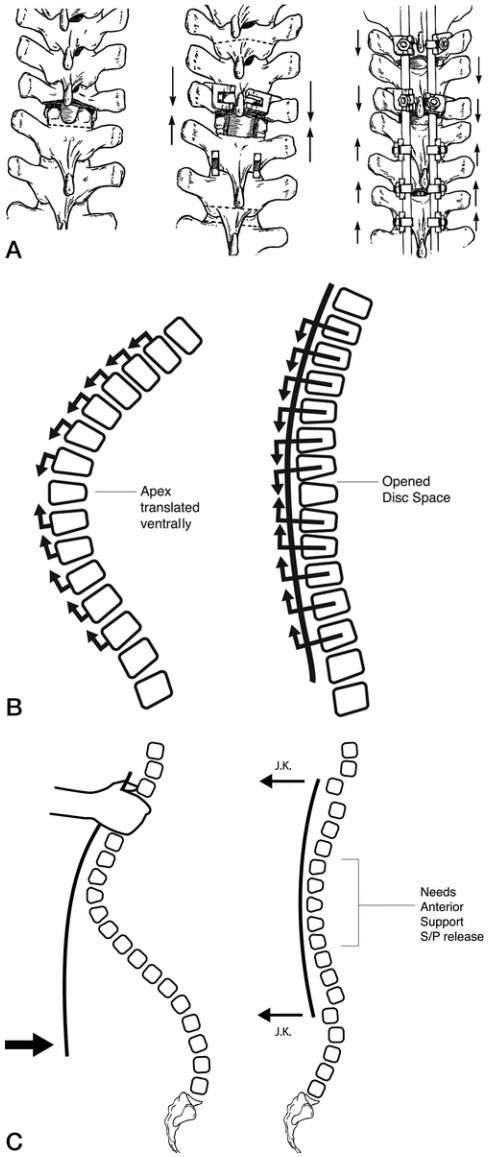
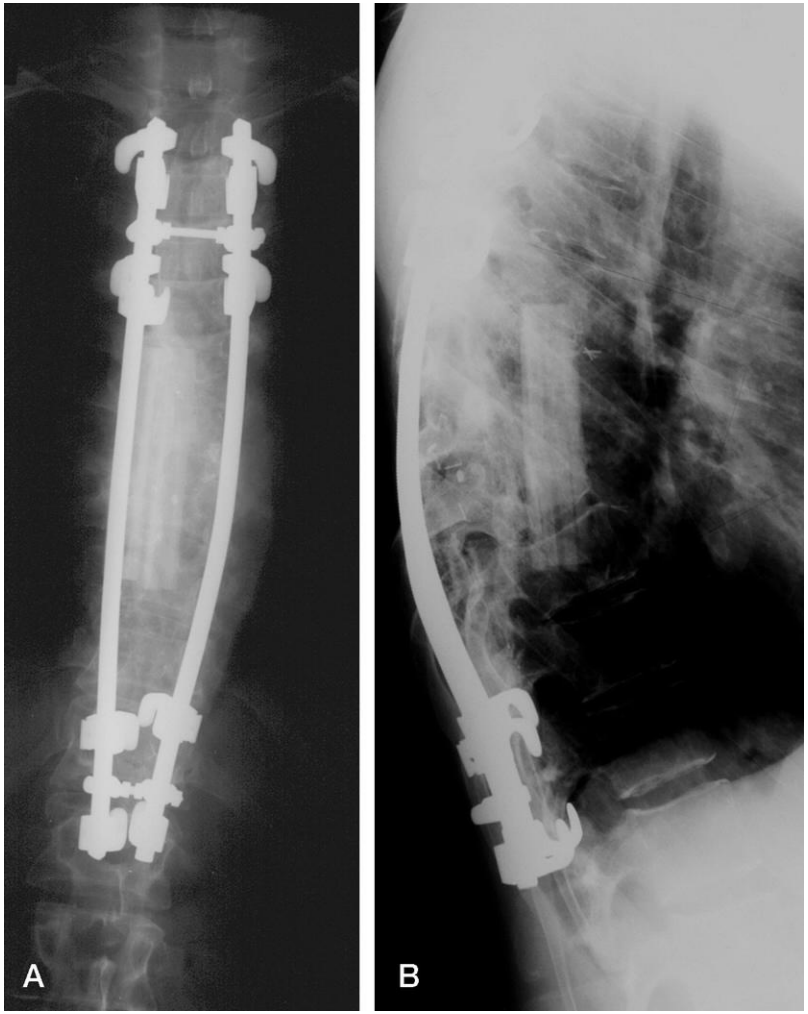
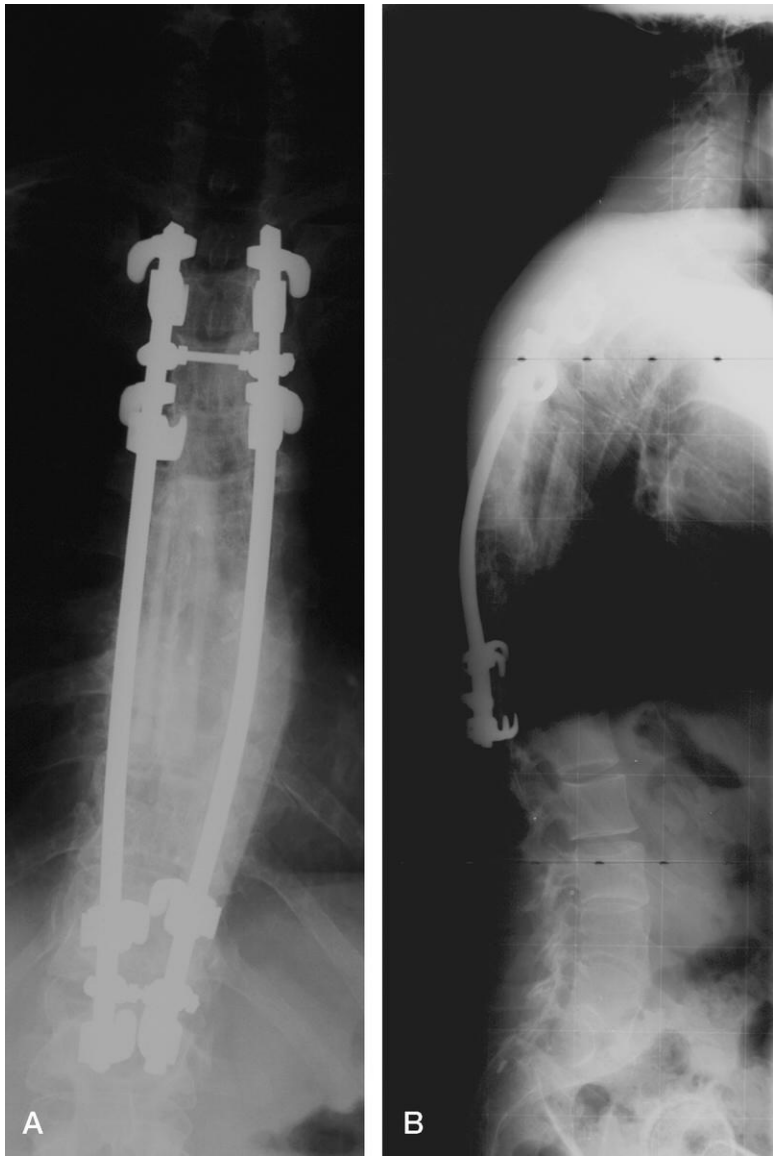
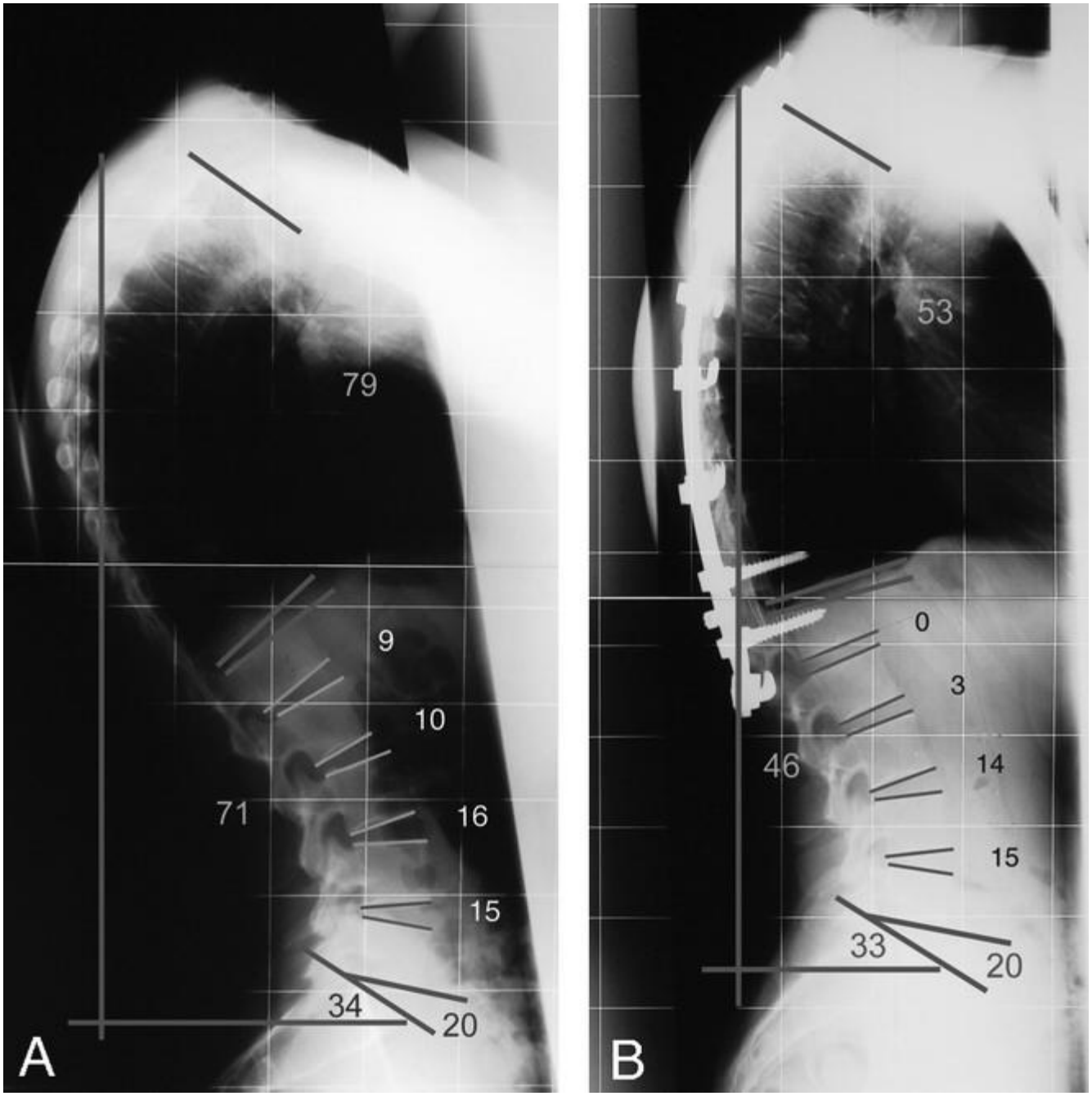


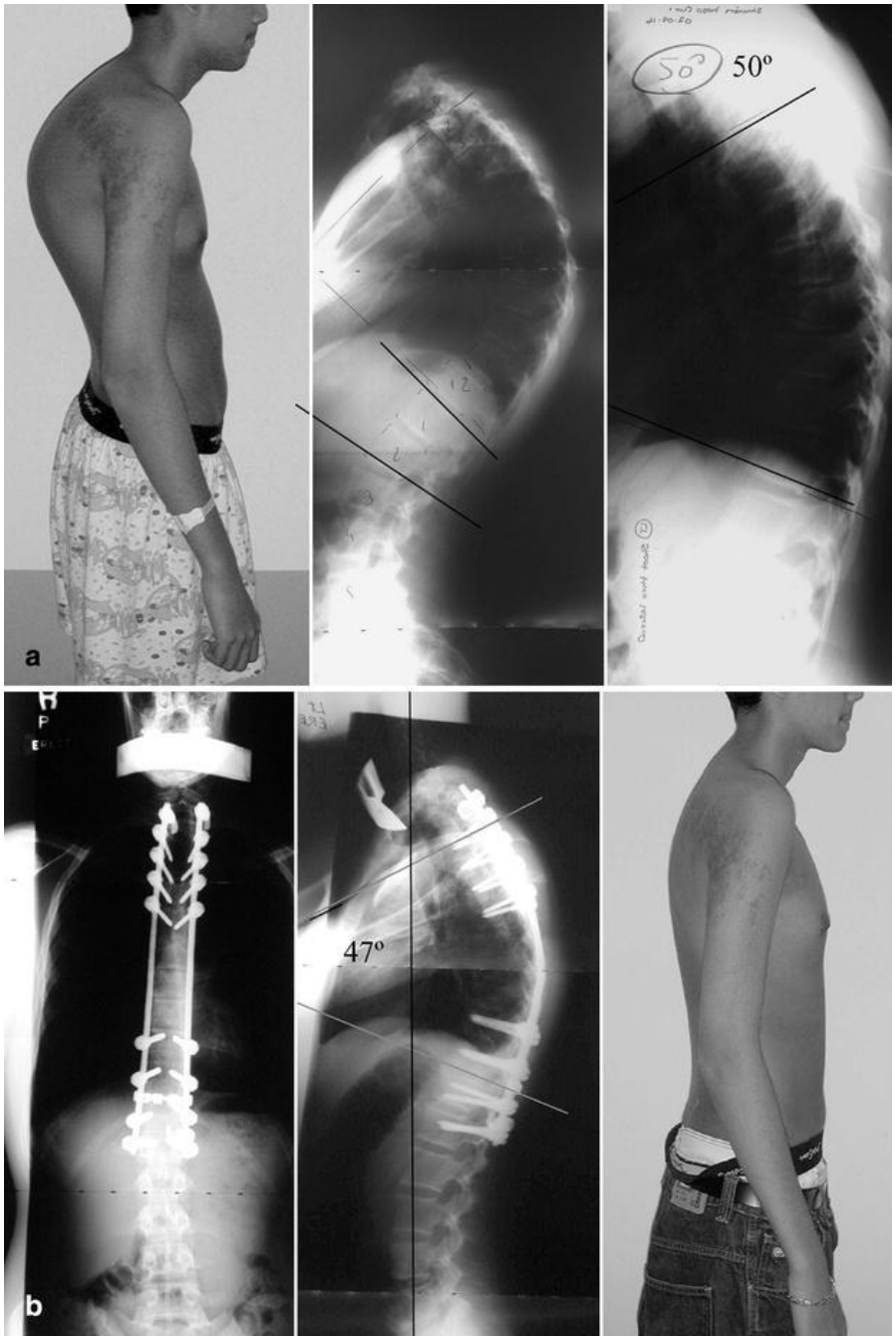
Figure 3. **A**, Postoperative PA radiograph of the spine following corrective instrumentation and fusion. **B**, Postoperative lateral radiograph following anterior disc excision and fusion via thoracoscopic approach and posterior CD horizon spinal instrumentation and fusion. The curve has been reduced to 47°. PA = postero-anterior.


A
Apex
translated
ventrally
Opened
Disc Space
B
J.K.
J.K.
Needs
Anterior
Support
S/P release
C


A
B


A
B


79
9
10
71
16
15
34
20
A
53
0
3
46
14
15
33
20
B


a
50°
47°
b

Pitfalls and Complications in Surgical management of Scheuermanns Kyphosis

- Fusion too short
- Too much correction (limit to < 50%)
- Junctional kyphosis (screws versus hooks)
- Major complications are seen in most series:

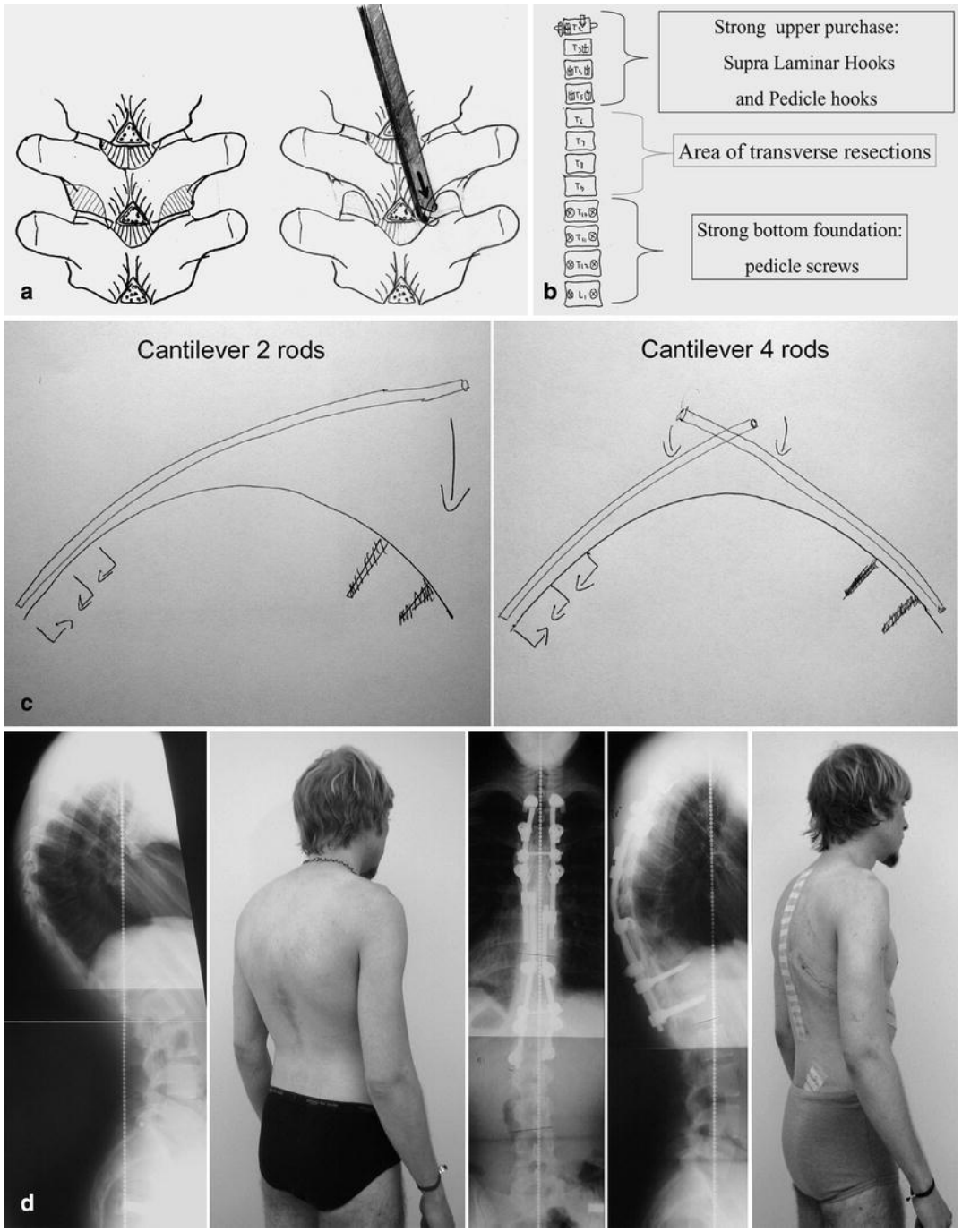
  Deaths, neurological deficits, infections, cast syndrome, pseudarthrosis, hardware failure, pulmonary emboli, persistent back pain

Scheuermann's kyphosis

Conclusions:

- Natural history shows no evidense of increased morbidity or increased mortality for patients with thoracic SK
- Weak evidence of treatment effect of brace treatment if applied during growth
- Other nonoperative measures not scientifically validated.
- The surgical correction of severe SK is feasible, but associated with significant risks
- Newer correction techniques with posterior shortening may lessen risk of complications.

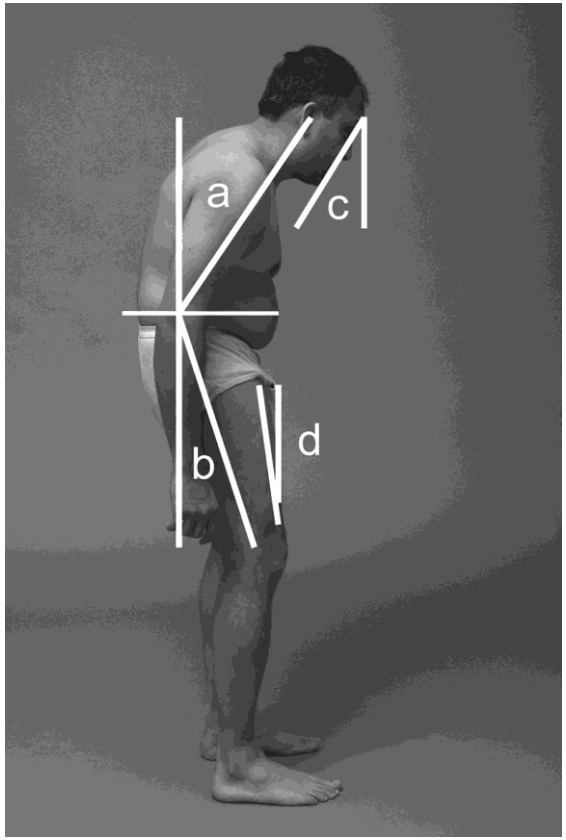

77°
a
b


a
b
Strong upper purchase:
Supra Laminar Hooks
and Pedicle hooks
Area of transverse resections
Strong bottom foundation:
pedicle screws
Cantilever 2 rods
Cantilever 4 rods
c
d

Ankylosing Spondylitis (AS) Surgical Challenges

- Pitfalls in early diagnosis in AS
- High risk of fatality and complications in spine trauma
- Correction of spinal deformity is a demanding procedure with potential serious complications

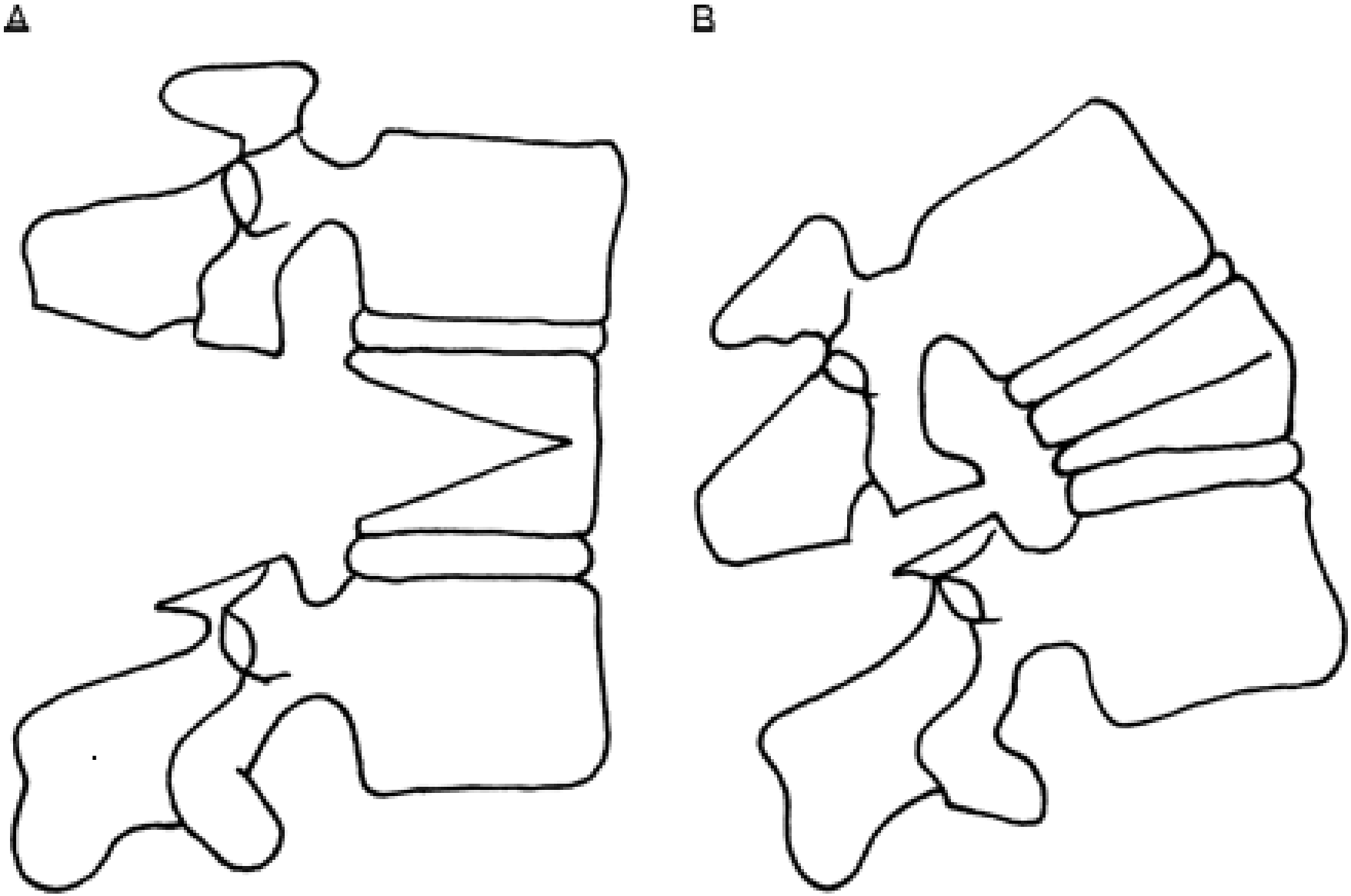
Lumbar spinal osteotomy for kyphosis in ankylosing spondylitis: the significance of the whole body kyphosis angle (WBKA)



Measurement of WBKA: (a + b)

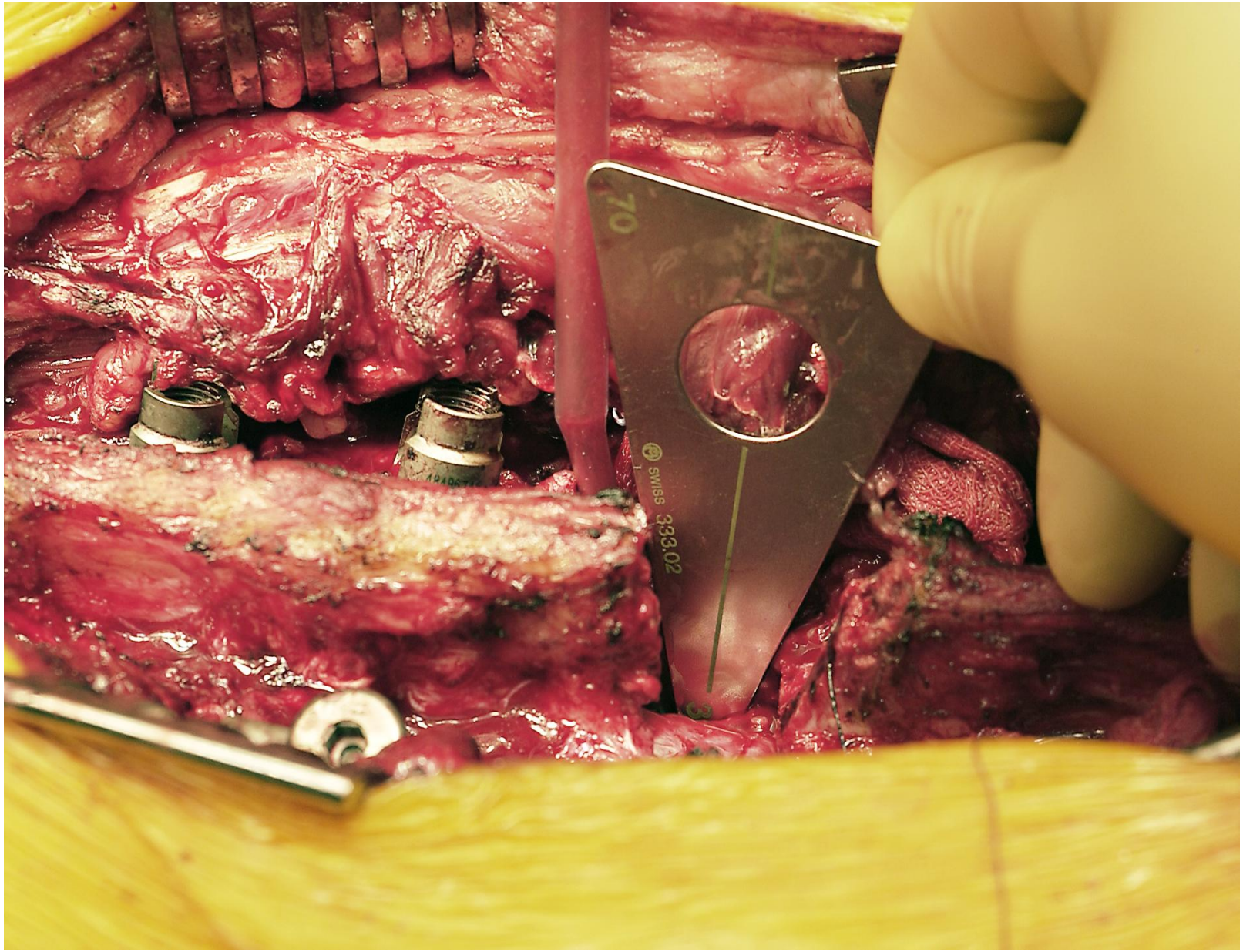
Min: J Spinal Disord Tech, Volume 20(2).April 2007.149-153

Thomasen Pedicle Subtraction Osteotomy



Van Royen BJ, De Gast A , Ann Rheum Dis. 1999


ALM


70
SWISS
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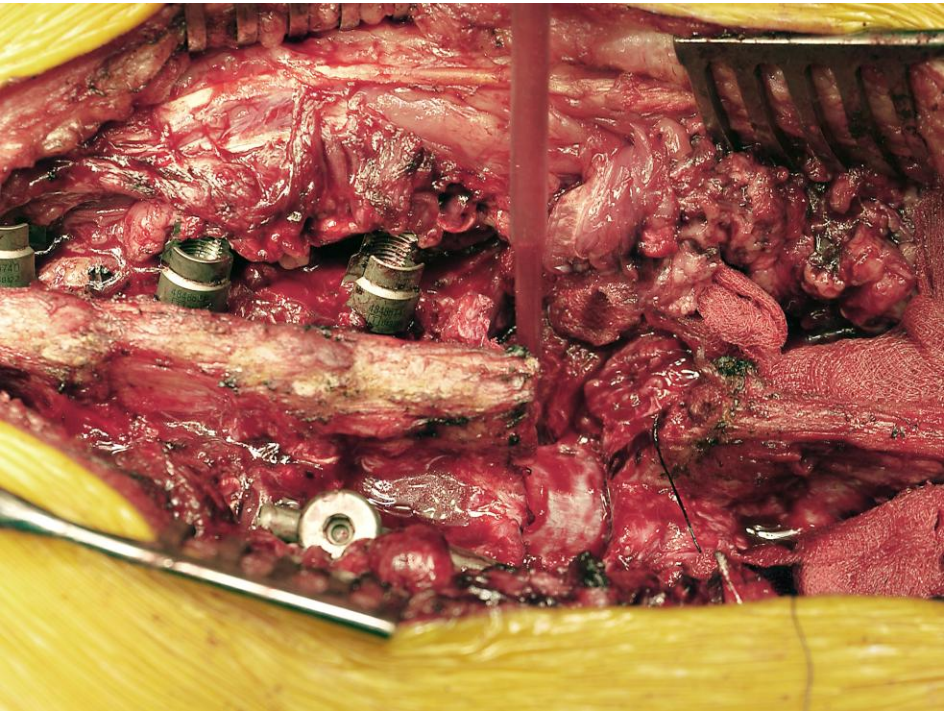
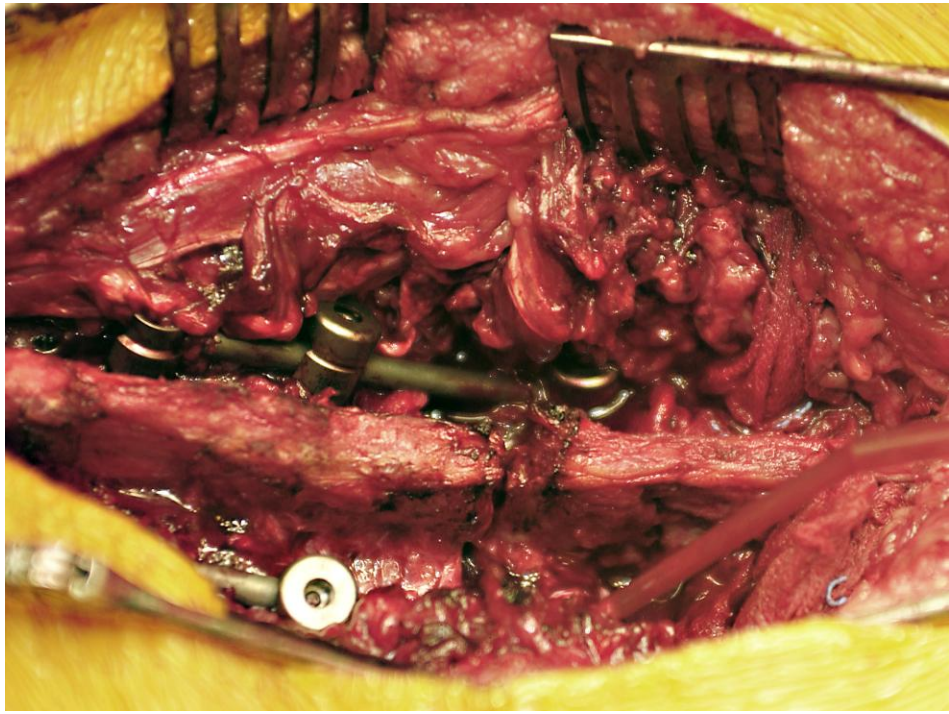
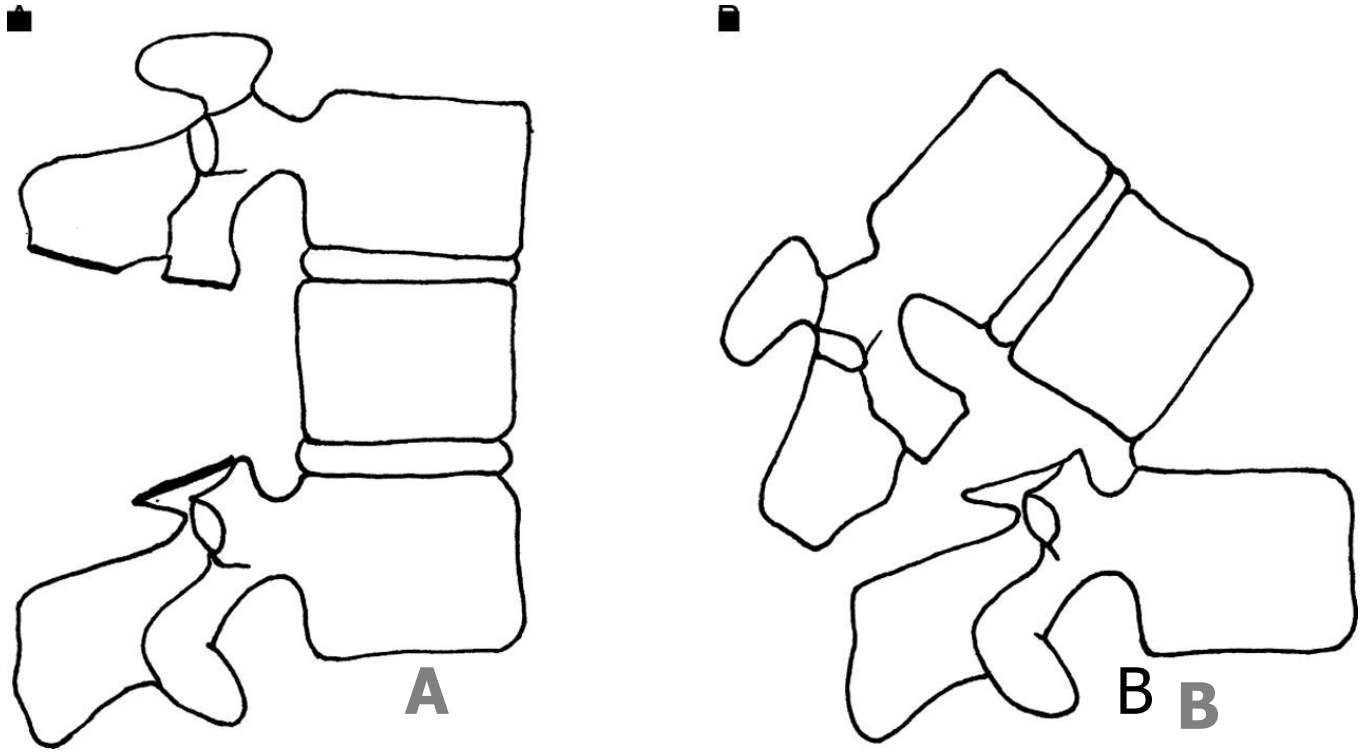
Wedge Osteotomy in AS
Pre –and post reduction





- **Polyaxial screw**
- **Working rods**
- **Undercutting**
- **Closing wedge**

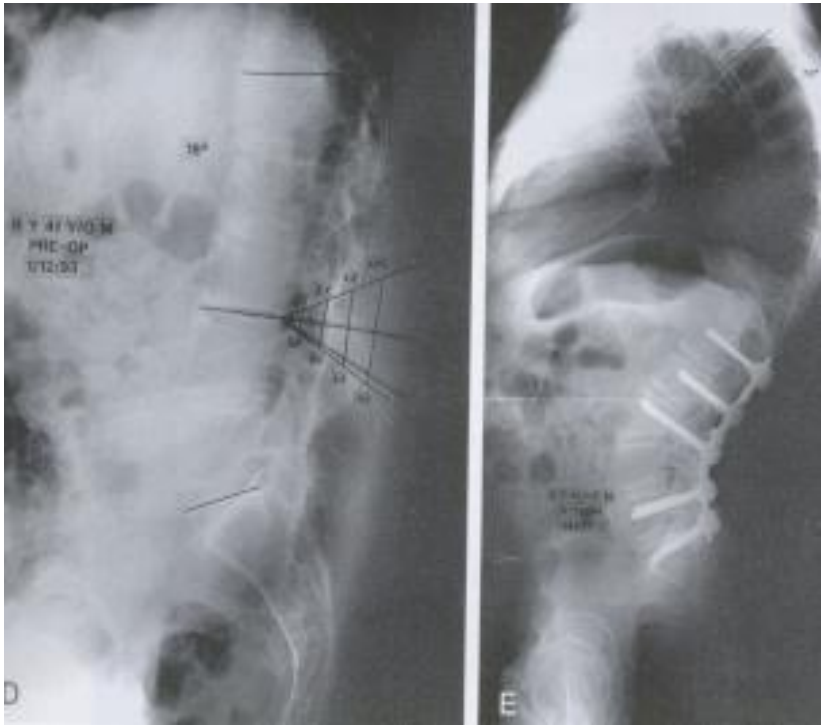
Opening wedge osteotomy (OWO)
Mostly iatrogenic



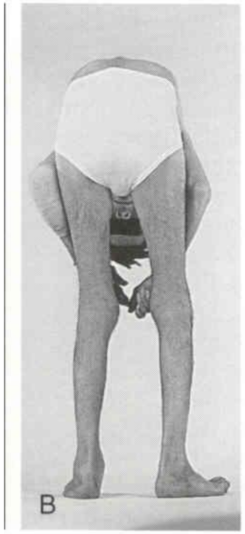
A: Lateral view outlining the bone block to be resected. B: Postoperative lateral view showing how correction is achieved by closure of the posterior elements, and creating an open wedge of the anterior column. (Very unstable, but high correction)

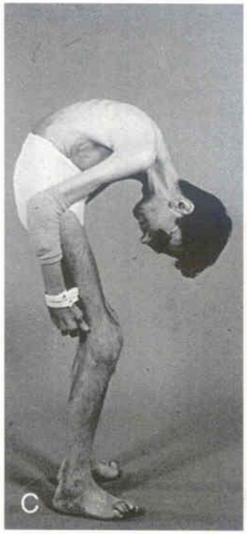
Morbus Bectherew

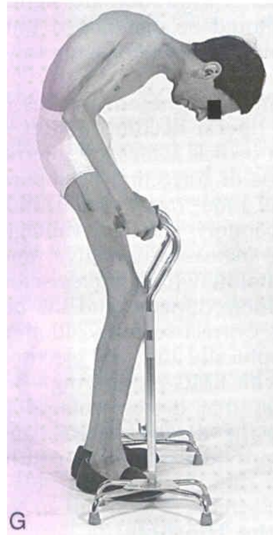
- Open wedge osteotomy

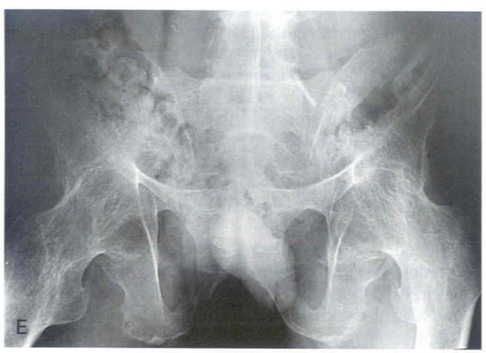


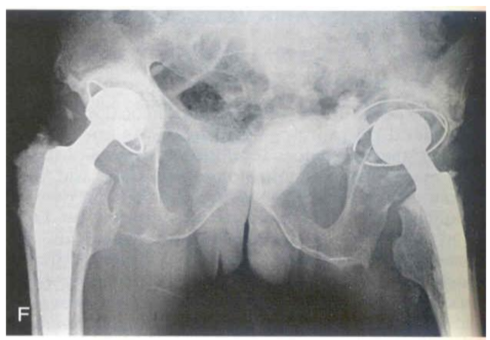
Morbus Bechterew











Morbus Bectherew

Surgical complications

- Iatrogenic cervical fracture at positioning in OR
- Aortic rupture (vascular assessment)
- A mesenterica superior syndrome
- Spinal cord injury
- Dural tear (calcification of dura)
- Pulmonary complications
- Aspiration (Acid block +gastric tube)
- Letalitet up to 30%