

A large, stylized anchor graphic in a dark teal color, positioned on the right side of the slide. The anchor is composed of thick, hand-drawn style lines. It features a central vertical shaft, two curved flukes, and a cross-shaped base. The background is a light gray gradient.

Anchor Strategies and Management of Displaced Anchors

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Disclosure

- K2M (b)
- DePuy (c)

(b) Consulting fees

(c) Speakers' bureau



Anchor

Ankara

In classical antiquity and during the medieval period, the city was known as **Ánkyra**(**Ἄγκυρα**, 'anchor') in Greek and Ancyra in Latin; the Galatian Celtic name was probably a similar variant



Anchor

****Anchor:** Any of various devices dropped by a chain, cable, or rope to the bottom of a body of water for preventing or restricting the motion of a vessel or other floating object typically having broad, hooklike arms that bury themselves in the bottom to provide a firm hold.*

**Merriam Webster Dictionary*

Spinal anchor

various devices: Hooks, wires, bands and screws

by a chain, cable, or rope: Rod(s)

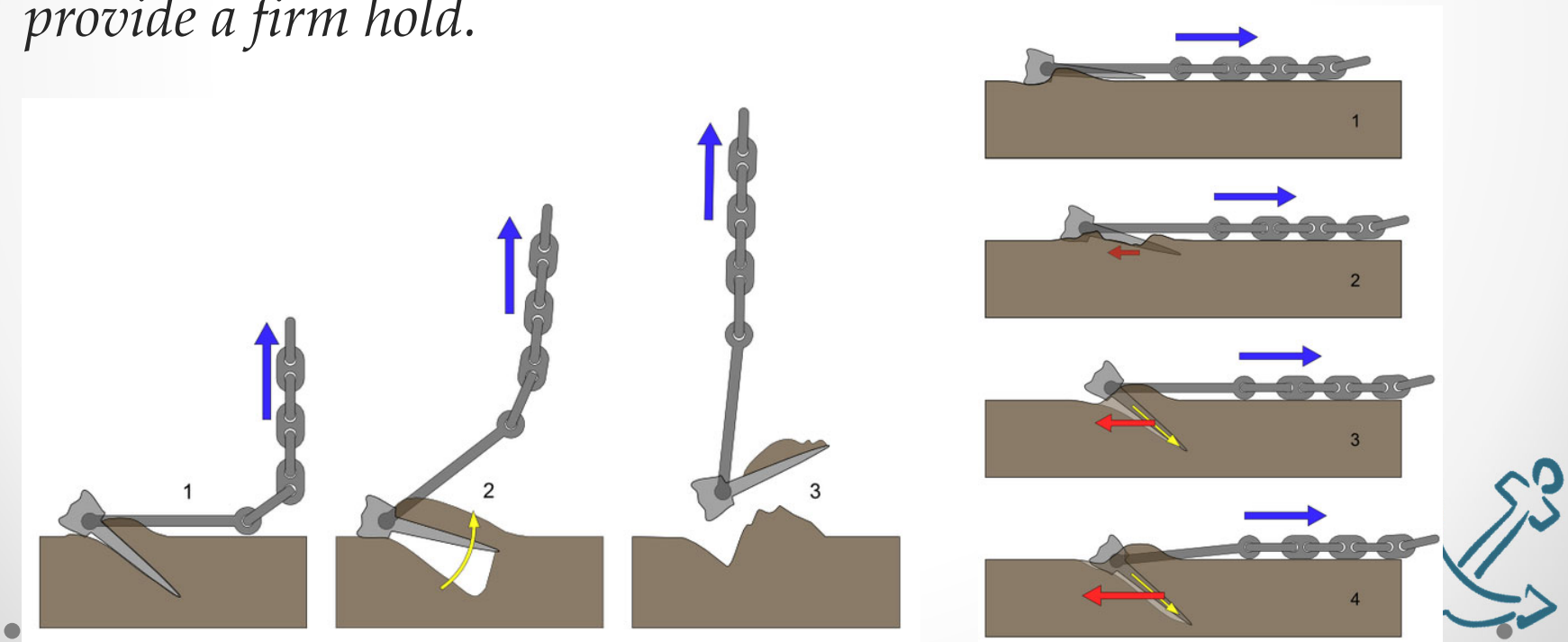
floating object: Spine

firm hold: in growing spine and fusionless procedures??



Anchor

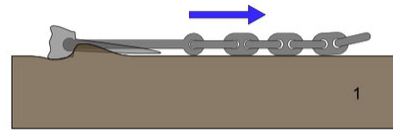
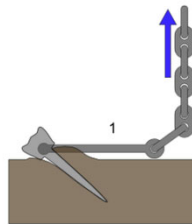
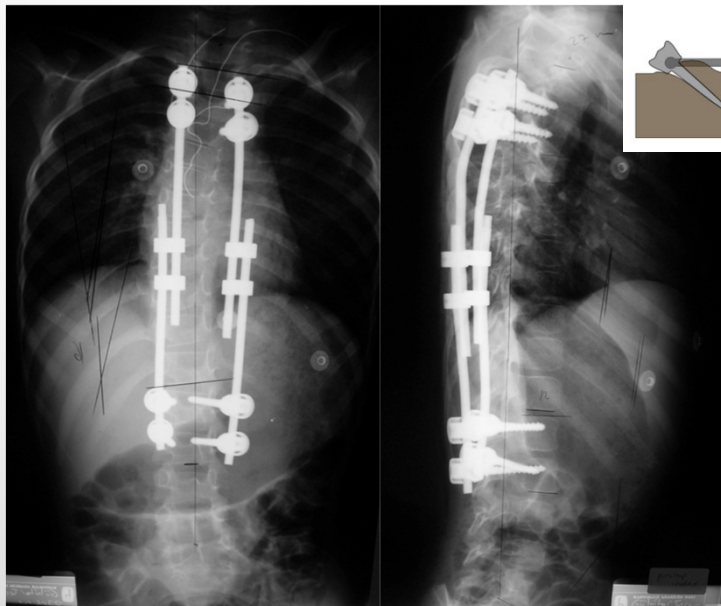
Anchor: Any of various devices dropped by a chain, cable, or rope to the bottom of a body of water for preventing or restricting the motion of a vessel or other floating object typically having broad, hooklike arms that **bury themselves in the bottom to provide a firm hold.*



Fusionless vs. Long-fusion

Inherently instable or prone to failure

- Nature of the bone
- Number of anchoring point
- Growth(motion) preservation



Spinal anchors in GR

Proximal

- Supra-infralaminar hook claw
- Infralaminar-TP hook or pedicle screw claw
- Pedicle screws claw
- Additional sublaminar wires
- Rib hooks

Distal

- Pedicle screws
- Hook claw??
- Iliac screw/rod



Anchor for GR

- Effective distraction
 - Distraction force and intra-discal pressure differences in different GR systems, Mahar. et. al., ICEOS 2009
 - Pedicle screw vs. laminar hooks as upper upper foundation
 - Pig study
 - Significantly greater distraction forces in pedicle crew group
- Durable fixation



Anchor safety/stability

Implant related

Type of anchors

Pedicle screw claw

pros

Strongest combination

In-vitro biomechanical study

Mahar et.al., The Spine J, 2008

Less complication

Clinical series

Skaggs et.al., AAOS 2011

cons

Neurological risks

During the insertion

With pulling-out



Anchor safety/stability

Implant related

Maximum stability(in general)

- Bilateral fixation (dual growing rod)

- Claw configuration

- Additional wire

- More than two-levels fixation

- Transverse connector application

Maximum stability(for pedicle screw)

- Convergent placement

 - More risky, if pulled-out

- HA coating

 - Upsani et. al., Spine 2009

 - Clinical efficacy?



Anchor safety/stability

Procedure related

One level fusion

‘End-fusion technique’

Anchor placement and fusion first, rod
implantation and distraction at 2nd stage

All-in-one



Anchor safety/stability

Procedure related

Avoiding excessive correction

Especially overcorrection of kyphosis

Postoperative brace

Between index and 1st lengthening



Risk for failure of anchors

Localization

Mostly at proximal side

Distal failure is very rare

Exception!

Pelvic fixation in ambulatory patient

Deformity

Excessive kyphosis

Bone quality

Weak bone disease

Childs

Hyperactivity

Overweight child??



Failure modes

Spine Hook

- Simple dislodgement
- Laminar breakage

Screw

- Pull-out
- Plowing

Iliac screw

- Pull-out
- Iliac bone fracture
- Windshield wiper

Rib hooks

- Fracture
- Drift



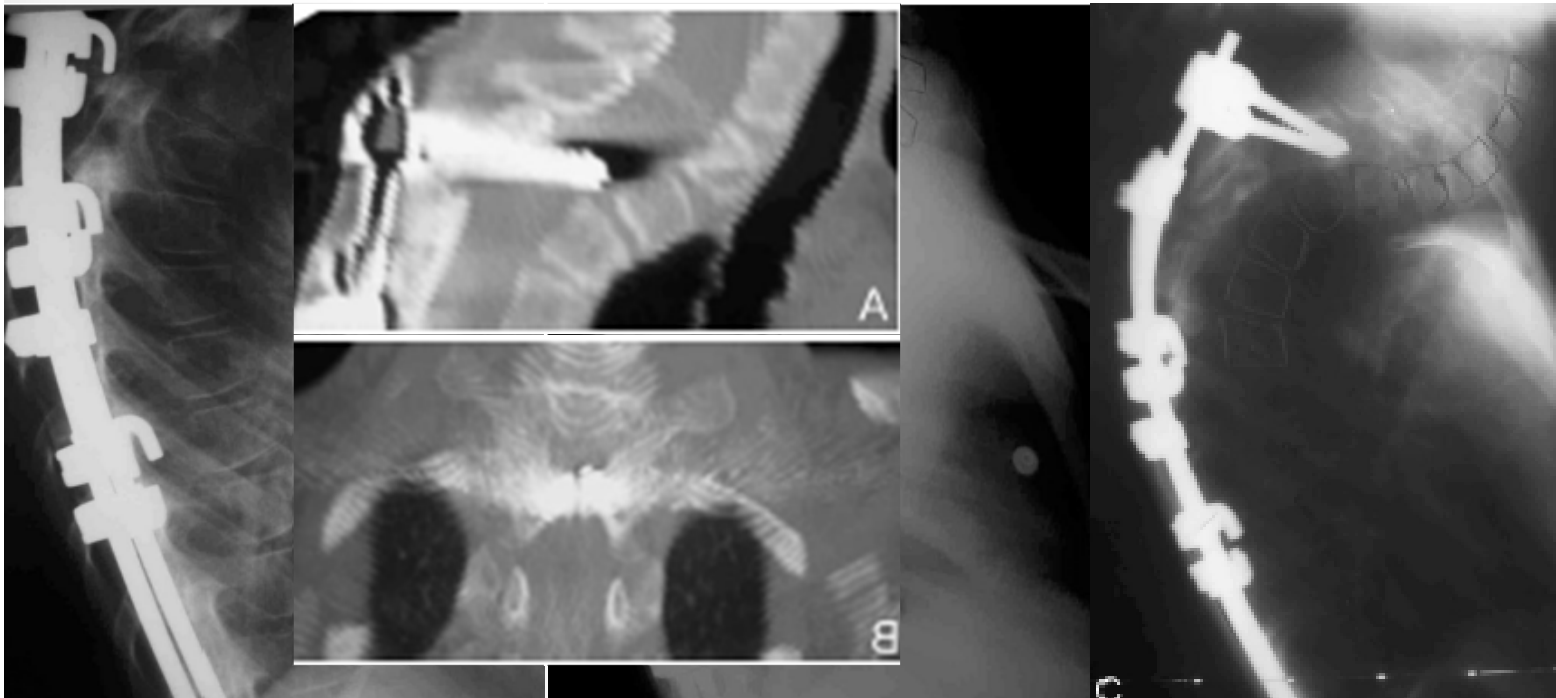
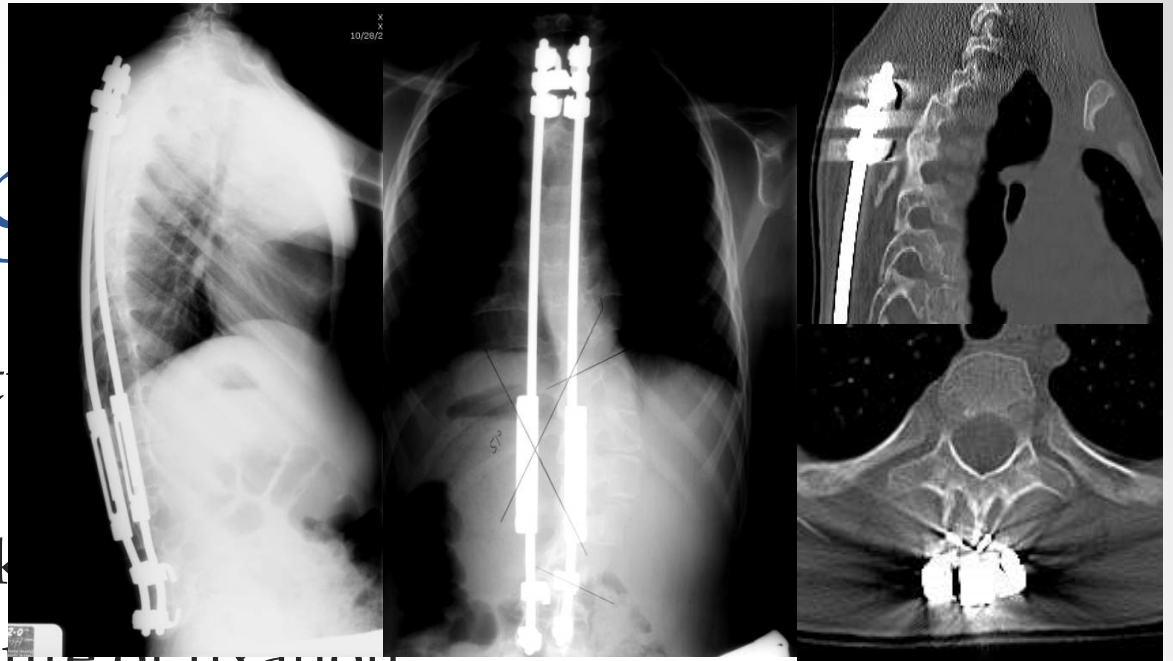
Anchor type

Probably screw is better

Risk-benefit ratio?

Failure of hook

Just failure of fixation



Revision

Hook dislodgement or laminar breakage

Pedicle screw

Additional level fixation

Rib hooks

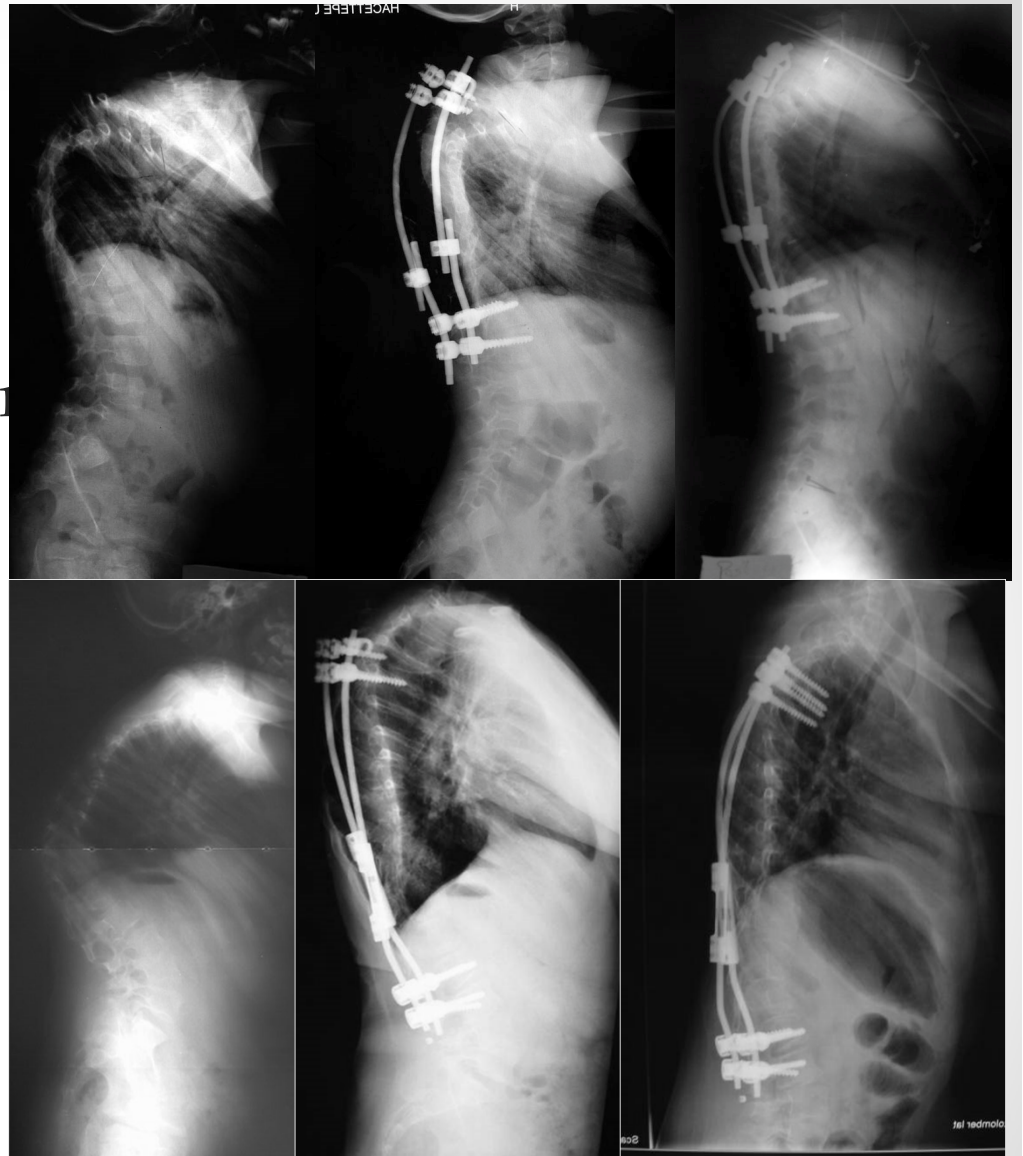
Re-insertion (replacement) of hooks / re-decortication and re-grafting/ waiting for 3-4 months without rods/ then replacement of rods and re-distraction

'End-fusion technique after failure'



Revision

Hook dislodgement or laminectomy



Revision

Pedicle screw pull-out

- Bigger and/or larger size screw

- Additional level fixation

- Hook fixation if lamina is still intact

- Additional sublaminar wire if lamina is still intact

- Rib hooks

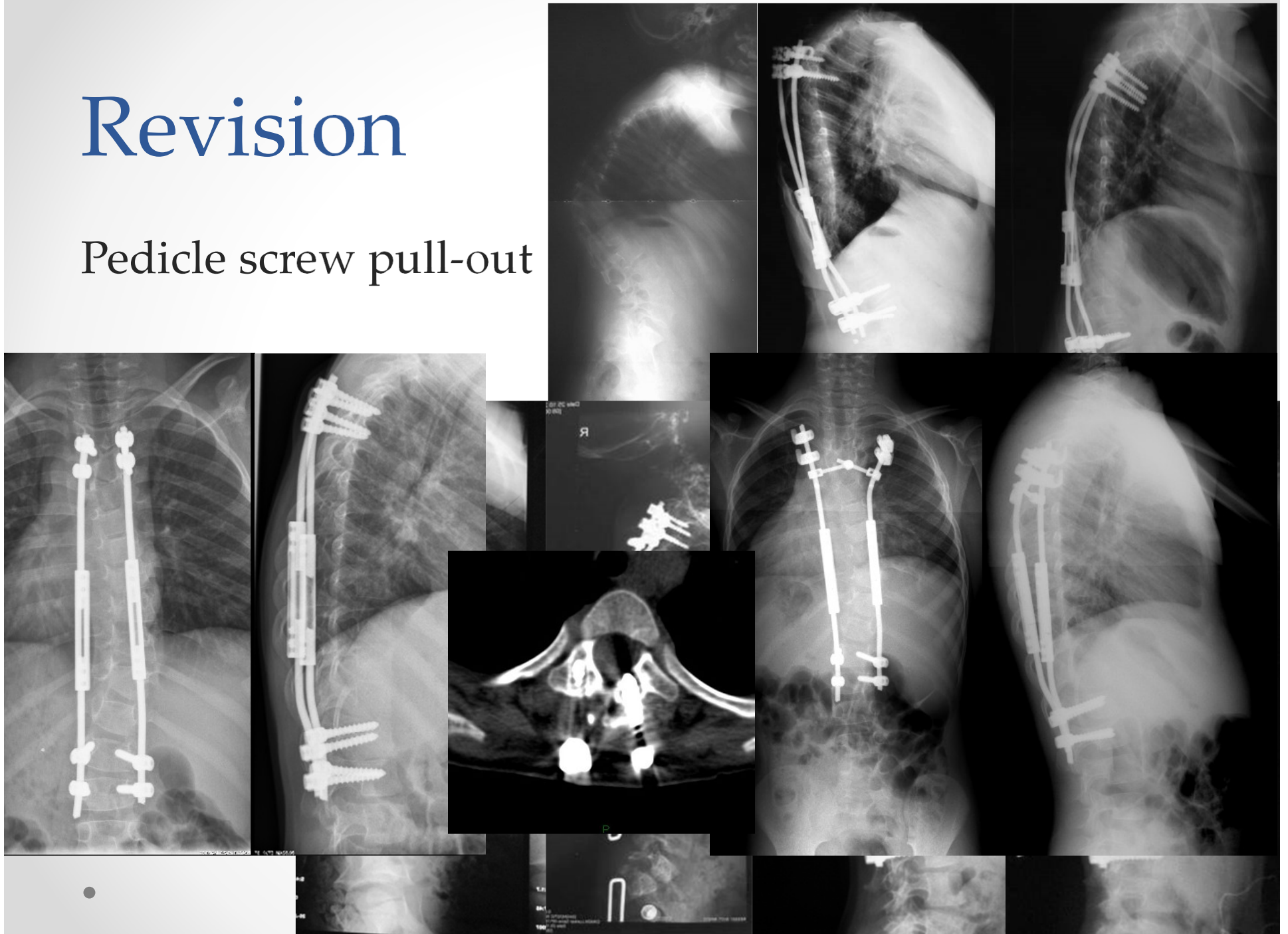
Pedicle screw migration

- Reorientation of screw



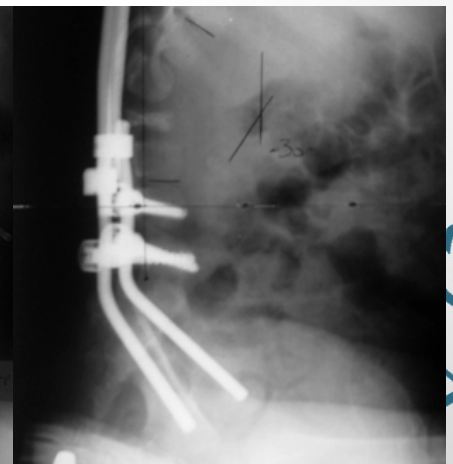
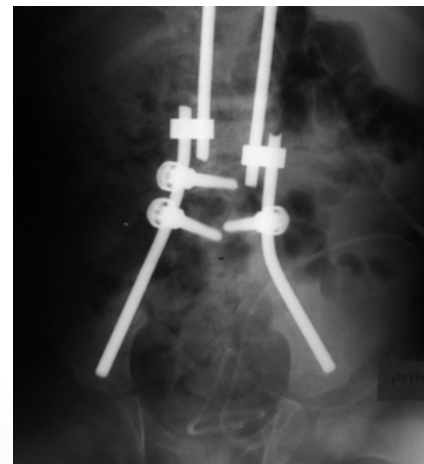
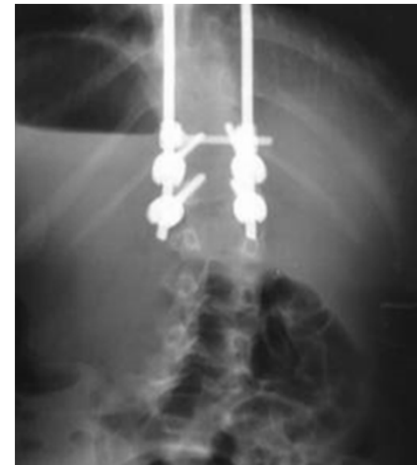
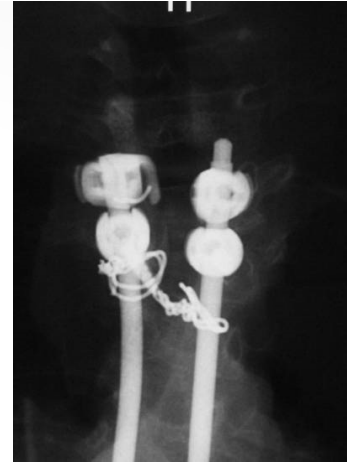
Revision

Pedicle screw pull-out



Conclusion

- Current choices



Conclusion

Anchor failure

Not fully preventable

It can be reduced

Difficult to manage in some case

Tailoring strategy

It is not an excuse for giving-up!

