31 Congrès annuel international de la SACOT

24,25 et 26 janvier 2025

Nation invitée

ALLEMAGNE

Treatment of Severe Pelvic and Acetabular Injuries

The way we (some of use) like to do it

U. Schweigkofler

DGOU Deutsche Gesellschaft für Orthopädie und Unfallchirurgie

DEUTSCHE GESELLSCHAFT FÜR UNFALLCHIRURGIE

Disclaimer

I (Uwe Schweigkofler) do not maintain any financial relationships with commercial organizations that are active in the field of musculoskeletal surgery or that manufacture/supply corresponding products/services

I apologize that I will be giving the lecture in English

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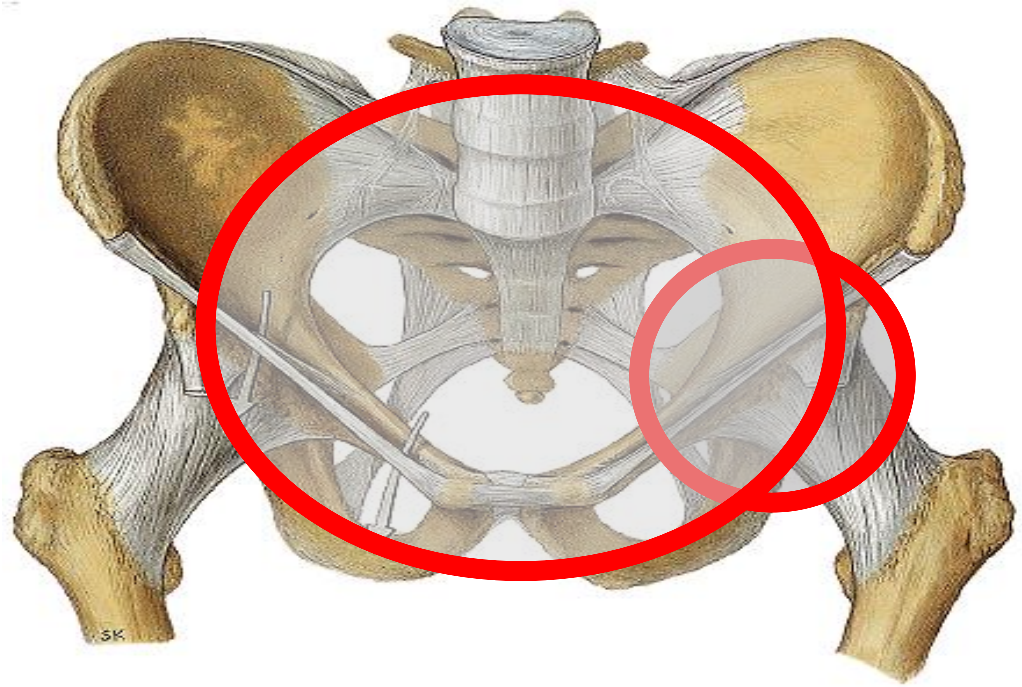
Agenda



Pelvic ring fractures

Acetabular fractures

Injuries in geriatric patients

Pelvic ring fractures

Epidemiology:

- 20 - 37 / 100,000 inhabitants
- 3 - 8 % of all fractures
- ~ 62 % polytraumatised patients
- ♂ > ♀2 Age peaks: 20 - 30 y., 70 y.

Tabelle 14: Verteilung der Verletzungen aller erfassten Patientenfälle (Basiskollektiv) über die Jahre 2020-2022

	TR-DGU 2020-2022
Patienten aus dem Basiskollektiv	100 % (N = 89.496)
Kopf	45,6 % (n = 40.828)
Gesicht	10,8 % (n = 9.656)
Hals	1,8 % (n = 1.565)
Thorax	45,6 % (n = 40.830)
Abdomen	14,0 % (n = 12.573)
Wirbelsäule	29,8 % (n = 26.669)
Arme	29,2 % (n = [illegible])
Becken	15,5 % (n = 13.851)
Beine	22,6 % (n = 20.186)

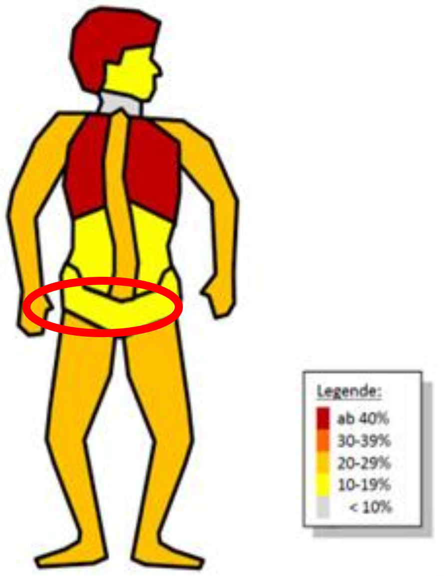


Abbildung 30: Verletzungsmuster im TR-DGU für das Basiskollektiv aus 2020-2022

50 % stable pelvic ring injuries

Percentage of isolated complex pelvic ring# < 10%

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Pelvic ring fractures

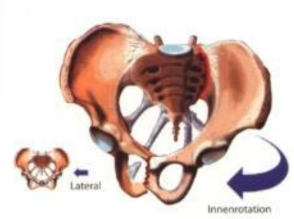
Ethiology:

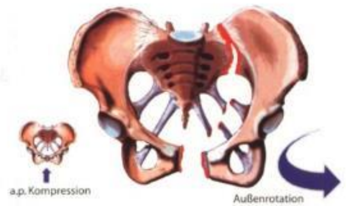
High-impact trauma

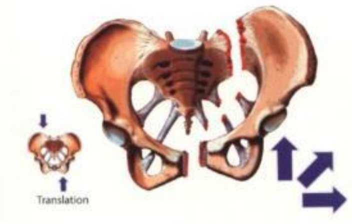
- 60% trafic accidents
- 30% high falls
- 10% Burial, hydraulic acidents, etc.

Lethality:

- Approx. 10%







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Pelvic ring fractures

Injuries:

Osseous

Ligamentary

Osteoligamentous

Risks:

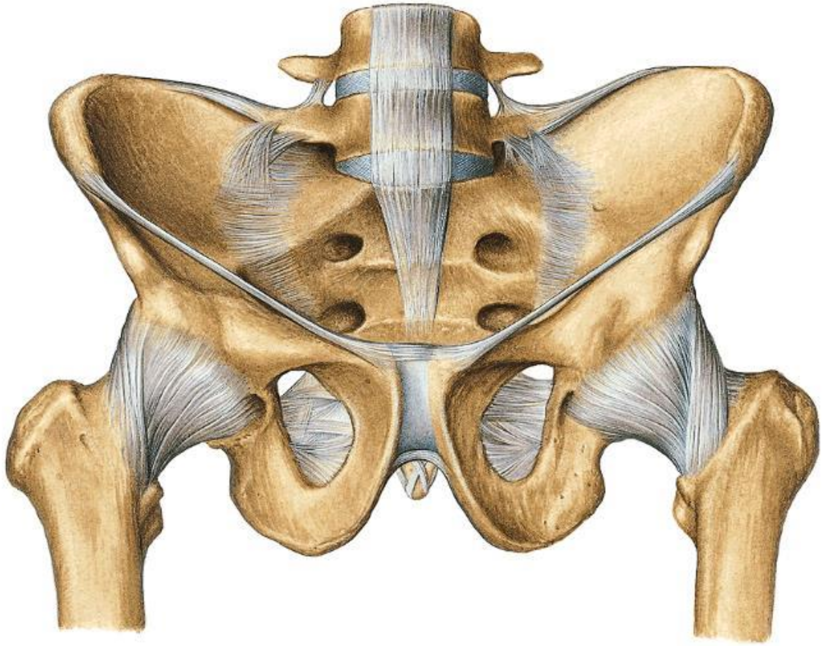
Haemorrhage

Accompanying injuries (organs)

Soft tissue damage (e.g. Morell-Lavallé)

Nerve injuries / pain

Permanent instability



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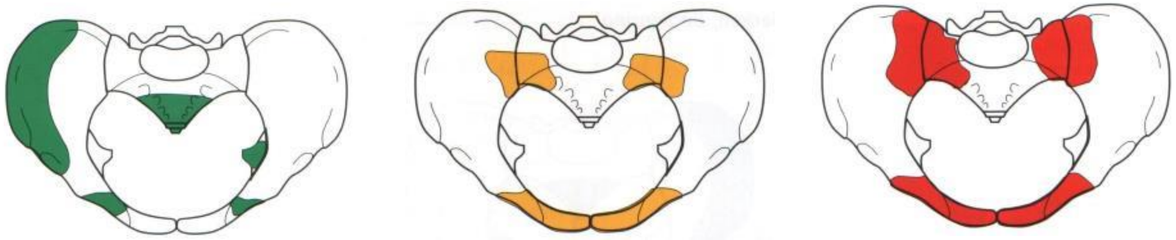
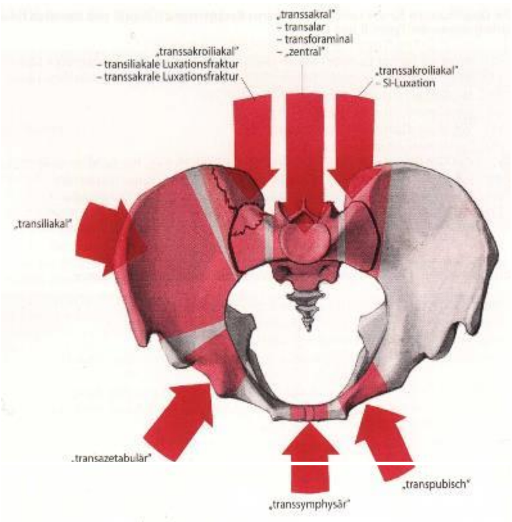
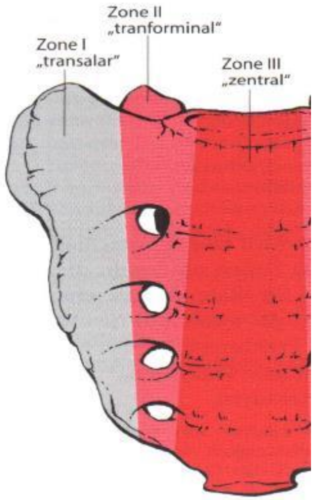
Classification

- AO / Tile   (A B C)



Direction of instability





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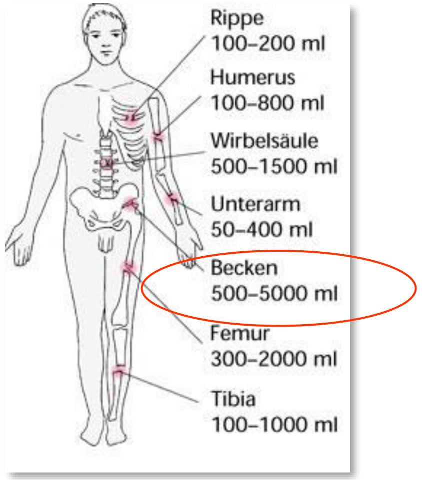
Pelvic bleeding

Significant bleeding with consecutive haemodynamic instability of the patient occurs in 1-3% of all pelvic ring fractures



The cause of death in severely injured patients with a complex pelvic fracture is bleeding to death in 34% of cases!

Holstein, J.H., et al., What are predictors of mortality in patients with pelvic fractures? Clin Orthop Relat Res, 2012. 470(8): p. 2090-7.

Gänsslen A, Hildebrand F, Pohlemann T. Management of hemodynamic unstable patients "in extremis" with pelvic ring fractures. Acta Chir Orthop Traumatol Cech. 2012;79(3):193-202.

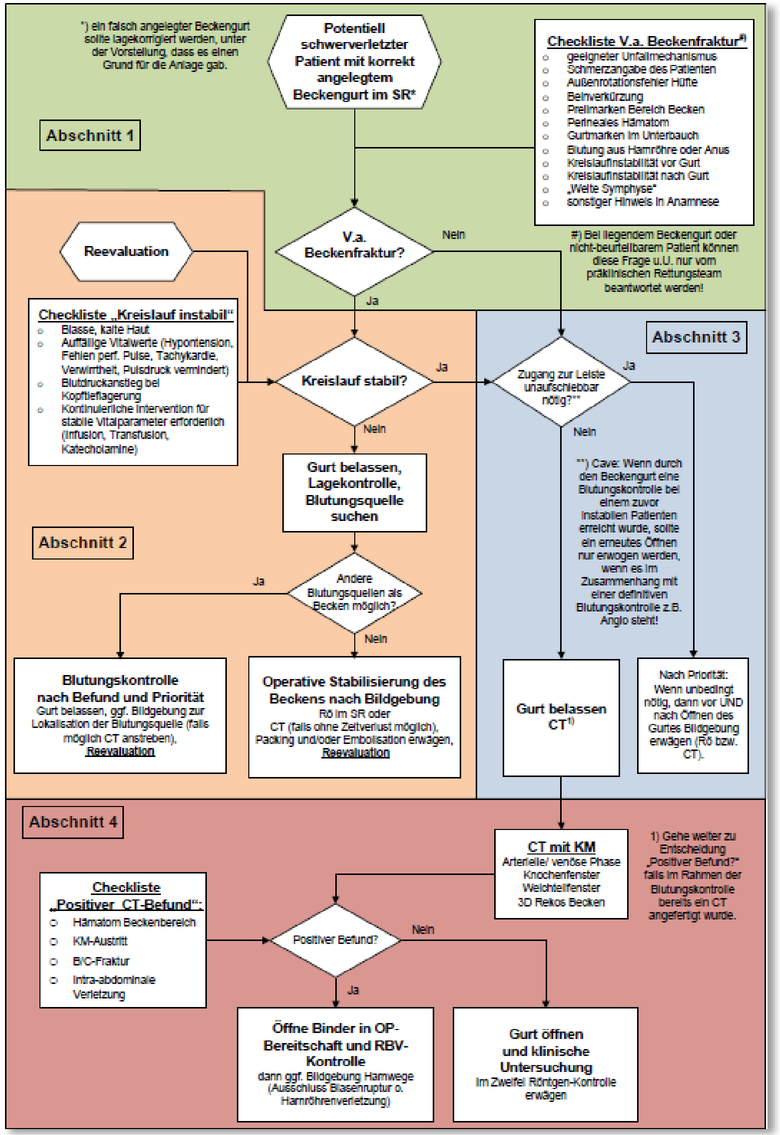
(C-) Problem: Bleeding

• Arterial haemorrhage
(10 - 20%)

• Haemorrhage from venous plexus
(70 %)

•Haemorrhage from the bone
(10 %)

Diagnostics



- Clinical examination
- Mechanical stability test (sensitivity<50%)
- Target diagnostics (sonography, CT+ KM, angiography)
- **Clear the pelvis algorithm**

The pelvis as a source of bleeding must be proven or excluded!

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Pelvic bleeding control

- Non-invasive stabilisation of the pelvic ring
  (e.g. pelvic belt)

- Invasive stabilisation of the pelvic ring
  (pelvic clamp; external fixator)

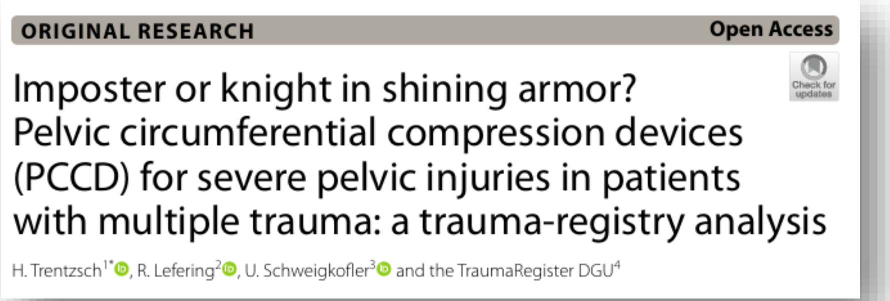
- Extraperitoneal packing

- Direct surgical haemostasis

- Angioembolization

Non invasive circumferential compression devices

Do they really help?



ORIGINAL RESEARCH Open Access

Imposter or knight in shining armor? Pelvic circumferential compression devices (PCCD) for severe pelvic injuries in patients with multiple trauma: a trauma-registry analysis

H. Trentzsch[1*], R. Lefering[2], U. Schweigkofler[3] and the TraumaRegister DGU[4]

Used more frequently

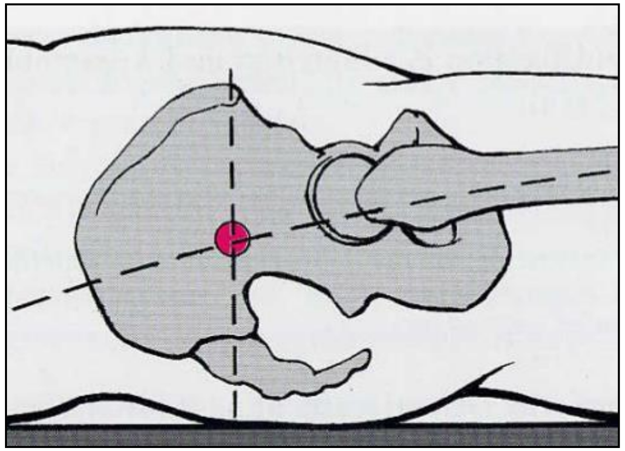
No salutary effect on survival or transfusion (Registry analyses)

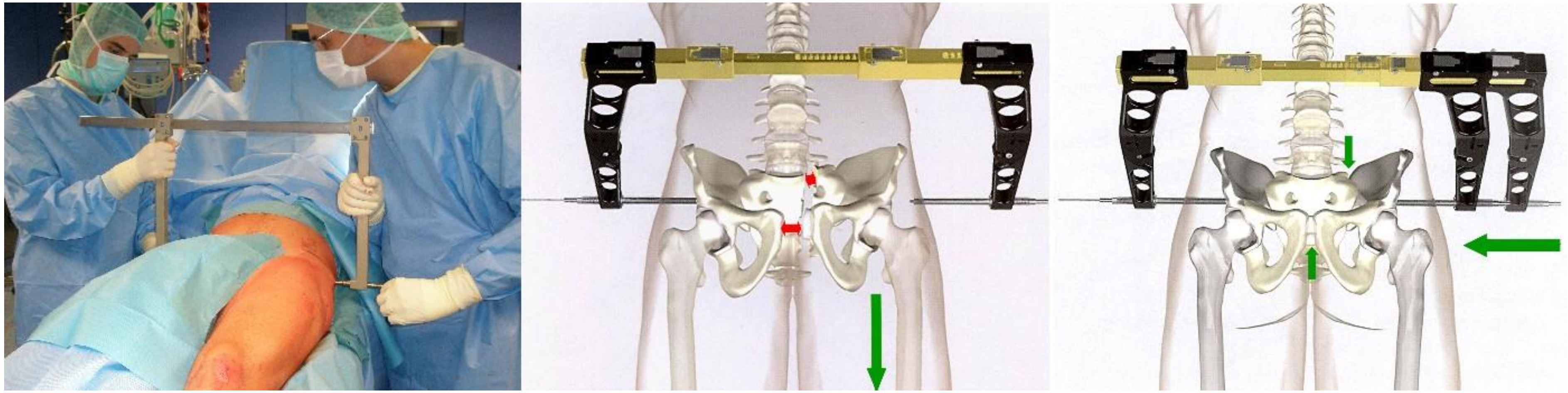
Good clinical tool in (mecanical) unstable pelvic ring fractures

Surgical pelvic stabilization

Pelvic (C)- clamp
(ER oder OP)

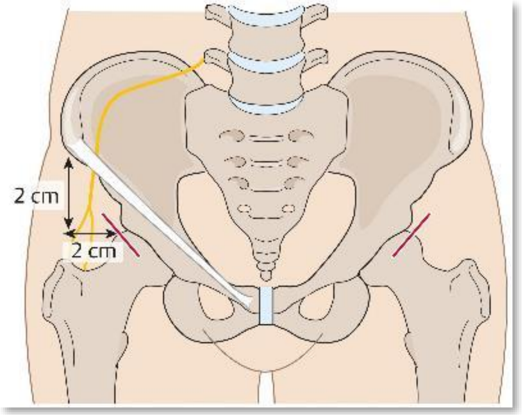
Anatomical landmarks

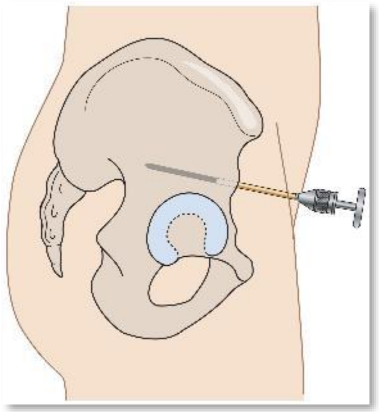


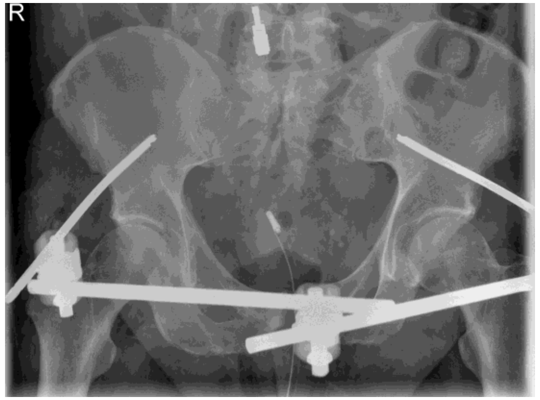


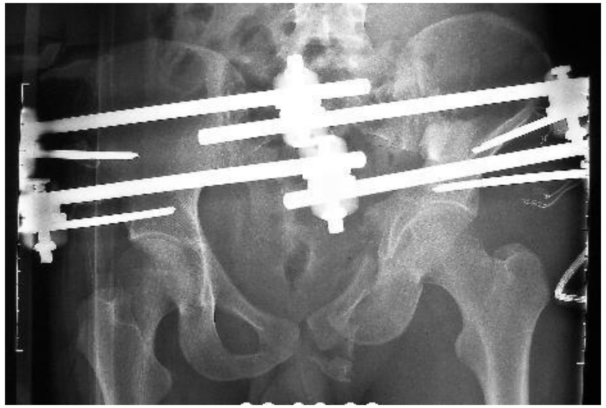
Pelvic fixator

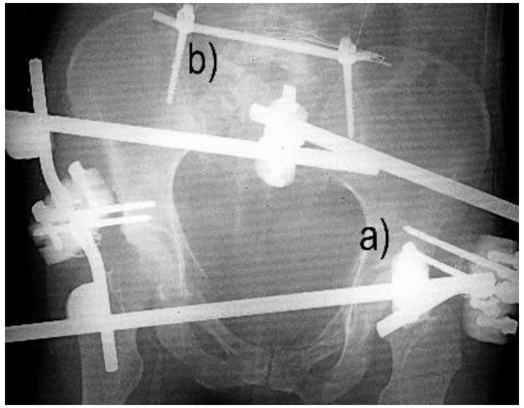
- “Workhorse” of emergency interventions
- Universal application (also in ER)‘
- “Weaknesses” in the posterior pelvic ring
- Can be combined with def. osteosynthesis











* Franke A et al. Notfallmanagement bei Beckenverletzungen: Blutstillung. In: Schwerverletztenversorgung. 1. Auflage. Stuttgart: Thieme; 2018

Angioembolization

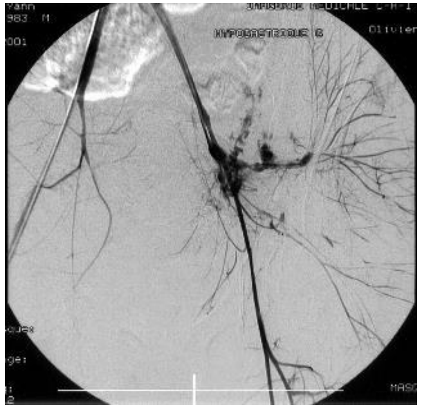
a) Stabilization/packing (venous/bony bleeding)

b) Stabilization (also non-invasive) and angioembolization (arterial bleeding)

c) Stabilization/packing +
secondary additive angioembolization

(persistent haemodynamic instability
after packing/stabilization)

Cave: time-management



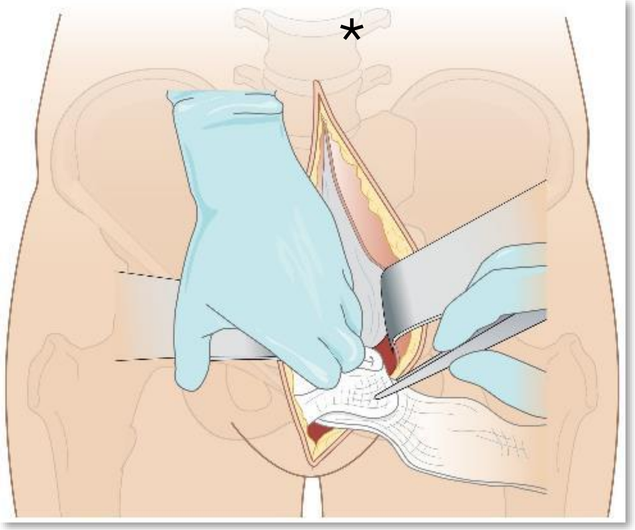
Extraperetoneal pelvic packing

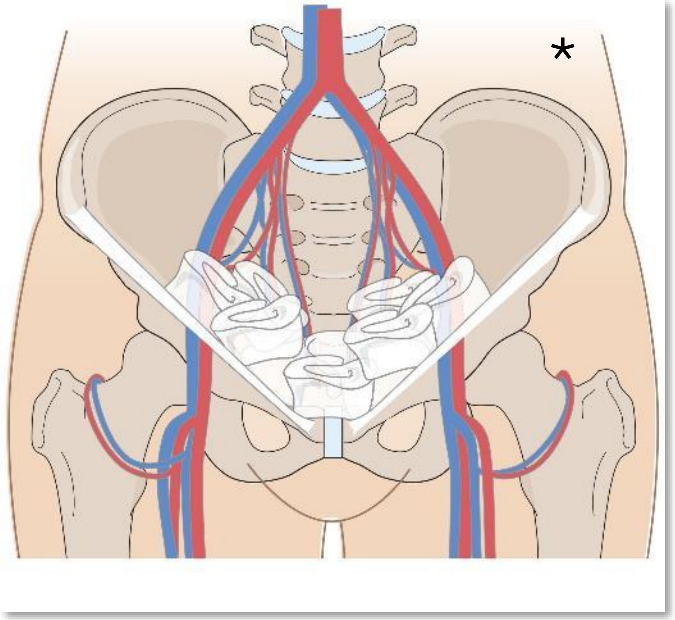
For the treatment of:

venous / osseous pelvic hemorrhages

Not effective for arterial bleeding

Usually to be combined with external fixator





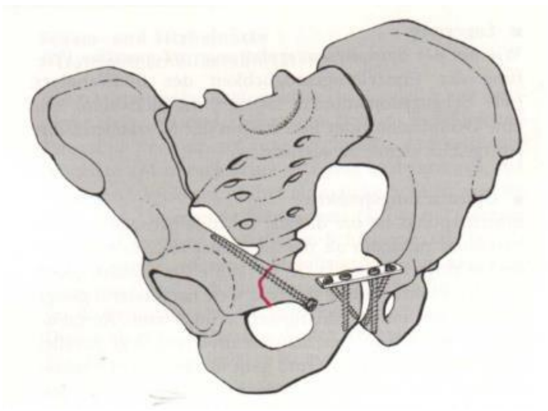
* Franke A et al. Notfallmanagement bei Beckenverletzungen: Blutstillung. In: Schwerverletztenversorgung. 1. Auflage. Stuttgart: Thieme; 2018.

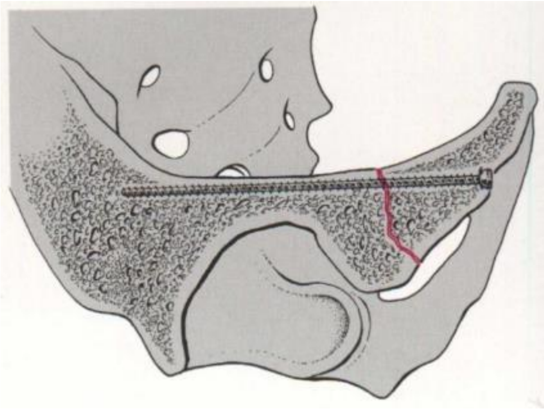
Anterior pelvic ring techniques

Supraacetabular external fixator

Symphyseal plating

Transpubic screw
(Creep screw)





Dorsal pelvic ring techiques

- SI-screw
- Plate osteosynthesis
- Trianguläre Osteosynthesis

  Distraction-spondylodesis
- Lumbo-pelvic stabilization

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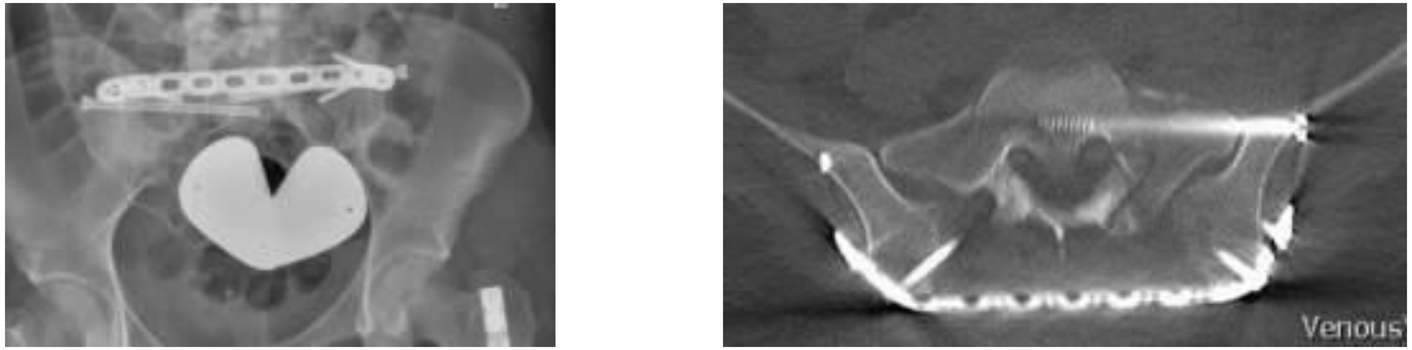
Examples

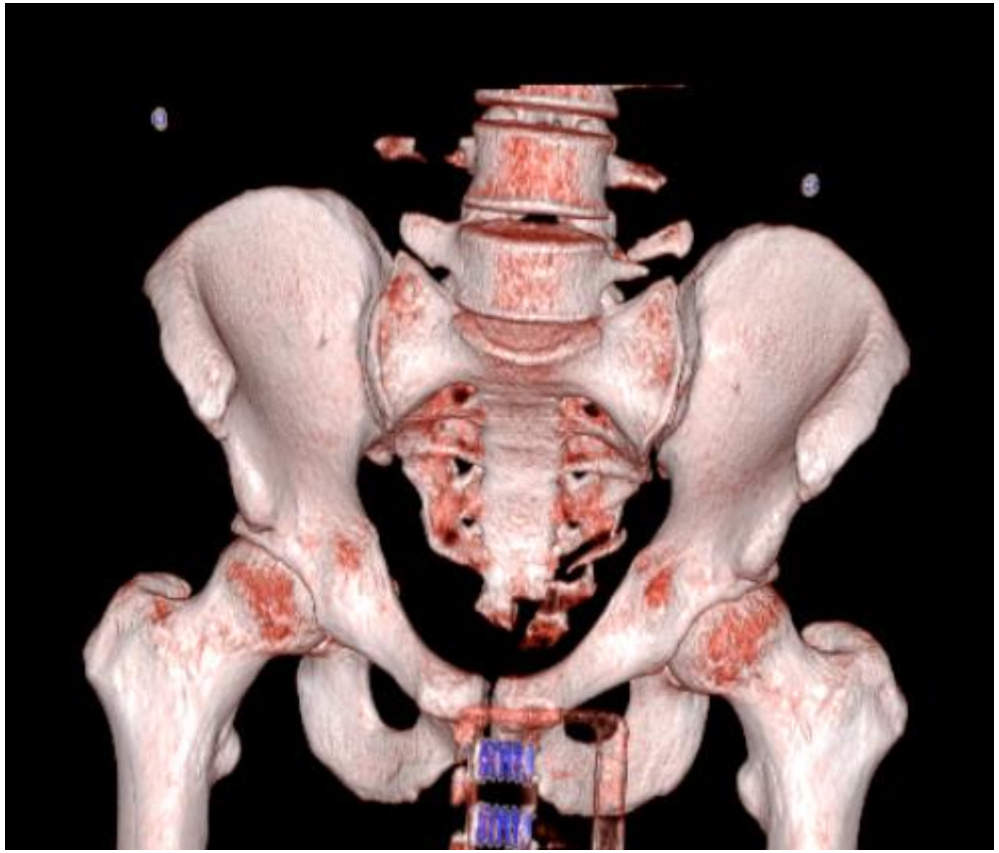
1.

2.

3.

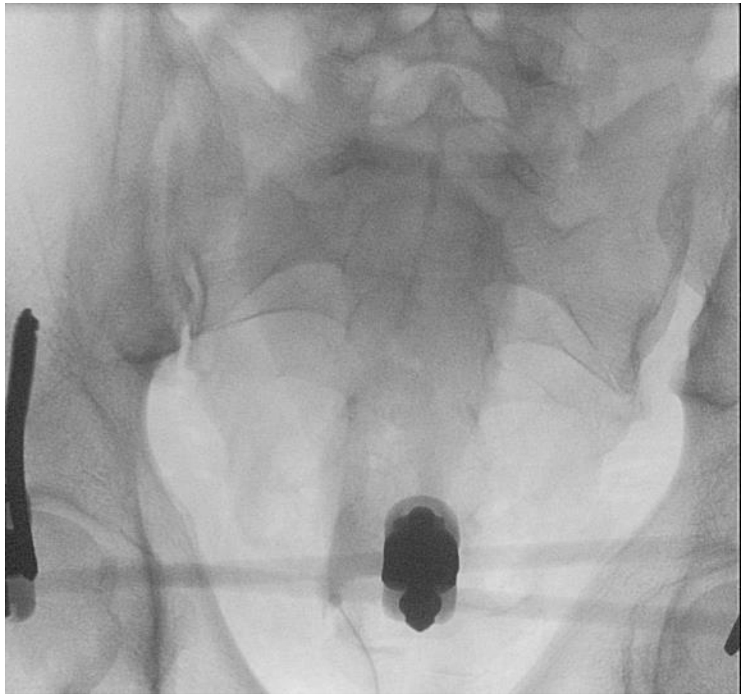


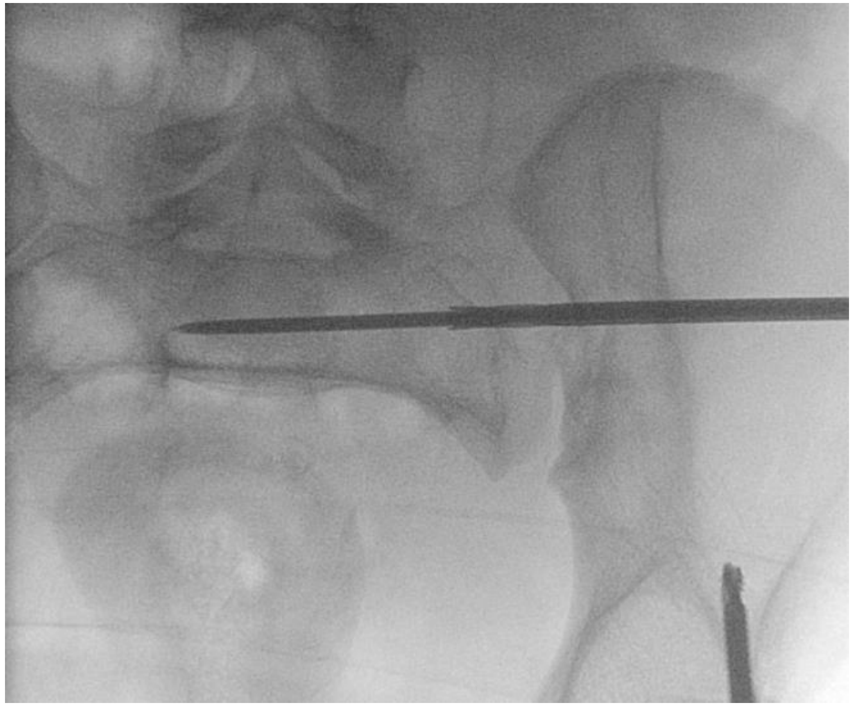
High fall; 35 y; male

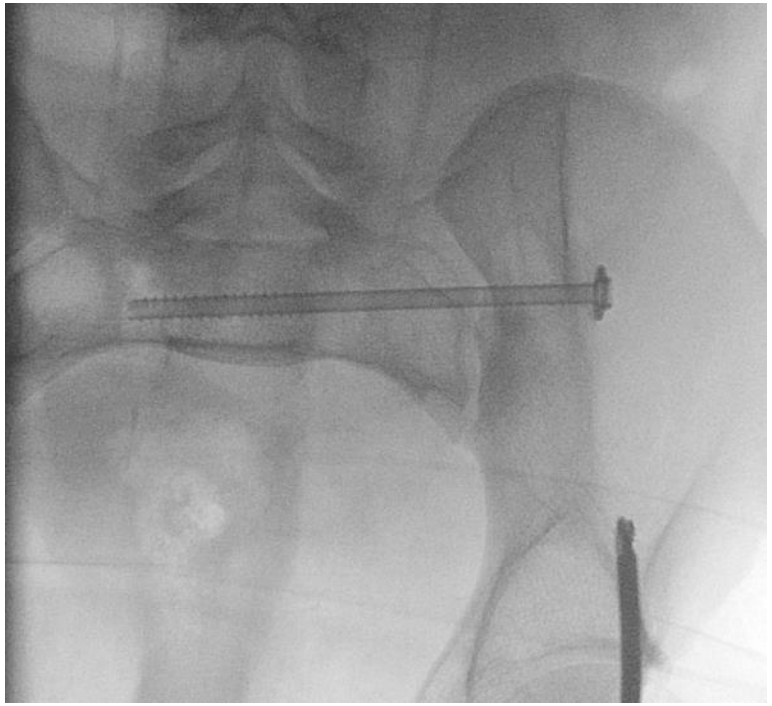


C-problem; hemodynamic instable (RRsyst: 90mmHg)

High fall; 35 y; male







Rescue SI-screw

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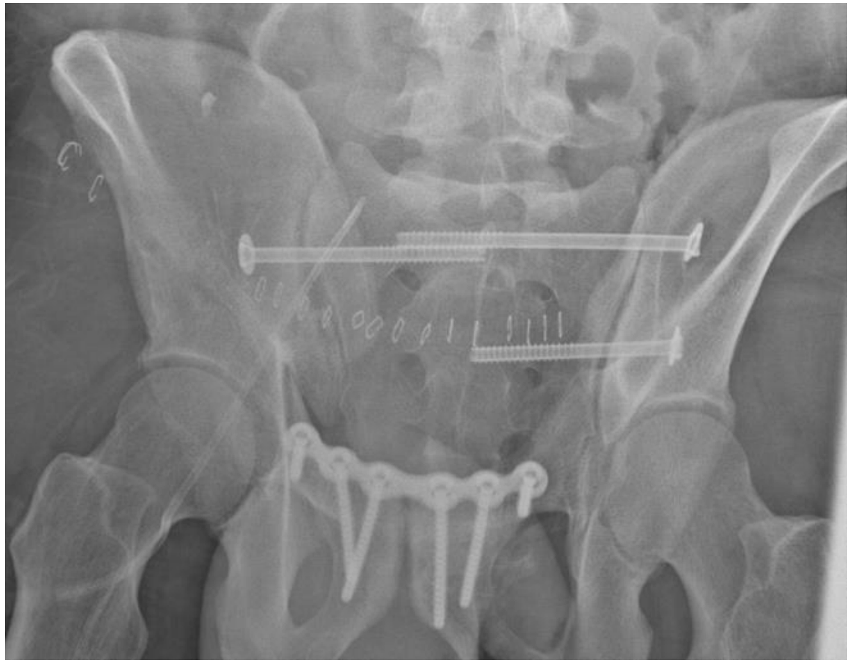
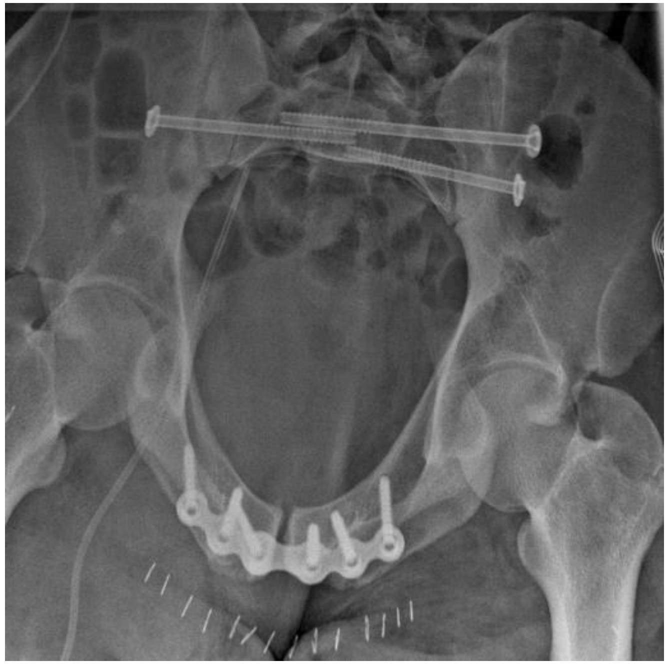
High fall; 35 y; male





Outcome

Dependent on fracture type and concomitant injuries

- Lethality 10 - 50 %
  - haemorrhagic Shock (early)
  - Sepsis (late)
- SI joint problems ~ 27 %
- Late neurological damage 9 – 24 %
- Pseudarthrosis ~ 3,2 %
- Malpositions 5 – 8 %
- Sexual problems 2 – 10 %

DGU-collective	anatomical healing	constant pain	unchanged lifestyle
Typ-A	100 %	13 %	49,4 %
Typ-B	90 %	21 %	50 %
Typ-C	71 %	30 %	26,4 %

Acetabulum

Where are the problems
- Joint congruence/load capacity
- Post-traumatic arthrosis

Therapy options
- Conservative
- Surgical Joint-preserving (ORIF)
- Joint replacement (TEP)

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Acetabular fracture

Epidemiology:

- Rare (12/100000)
- Male/female: 55/45 %

- (High) fall
- Car accidence (dash-board)

The position of the femoral head in relation to the acetabulum at the moment of force distribution is decisive for the fracture shape

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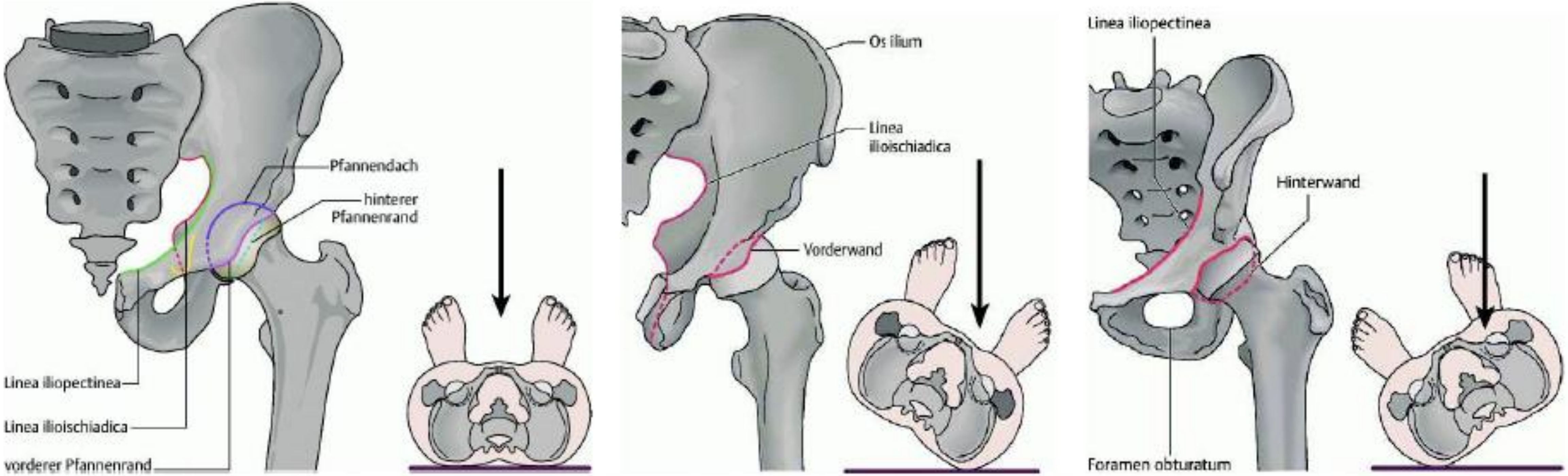
X-Ray Diagnostics

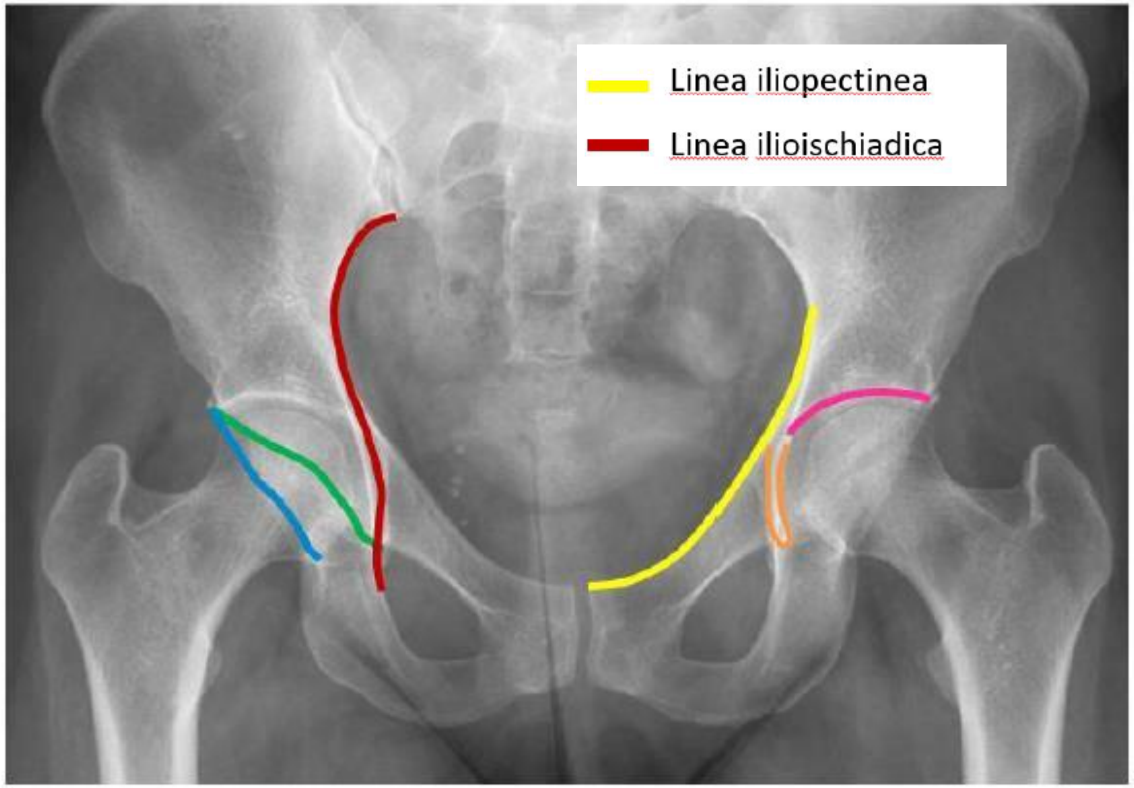
Pelvic ap | obturator-view | ala-view

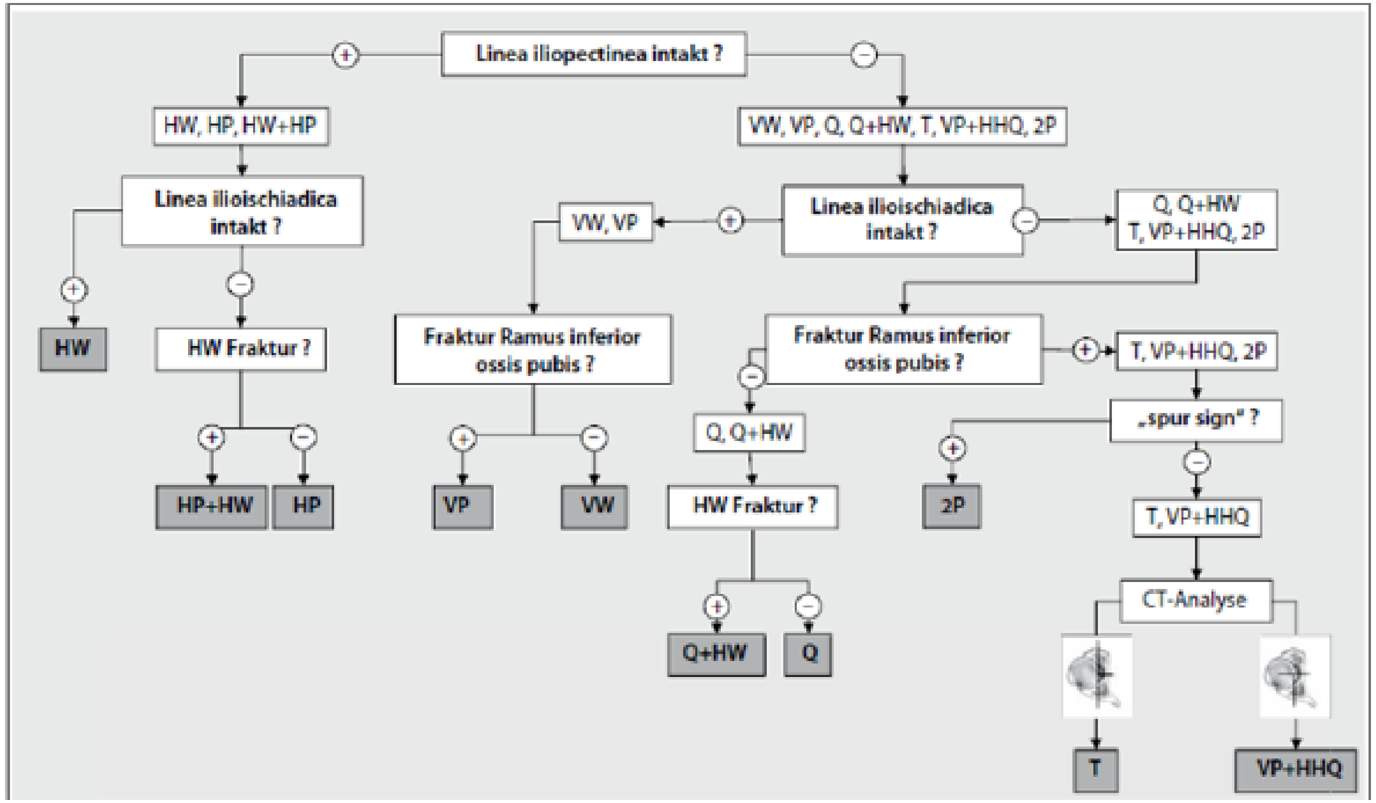


Pohlemann T, Wirbel R. Bildgebende Diagnostik. In: Wirth C, Mutschler W, Kohn D et al., Hrsg. Praxis der Orthopädie und Unfallchirurgie. 3., vollständig überarbeitete Auflage. Stuttgart: Thieme; 2013

Diagnostics

the path to fracture identification and classification

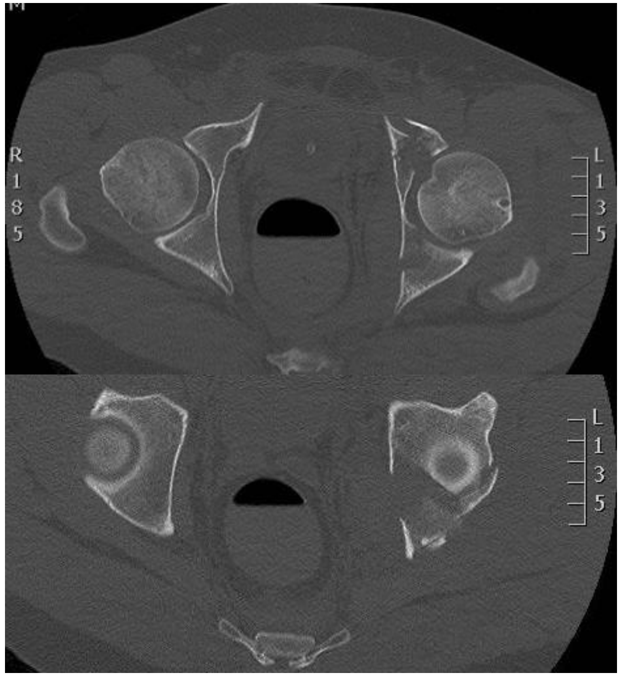


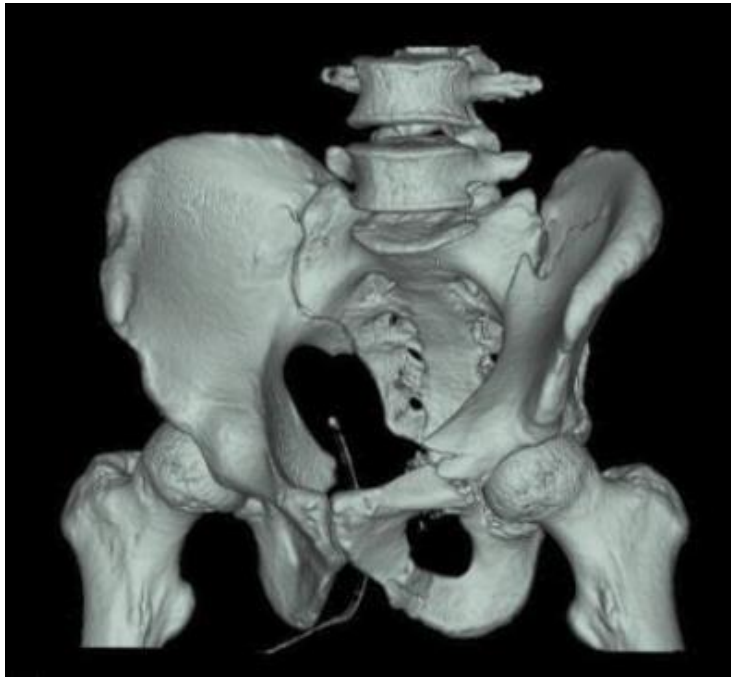


CT Imaging

CT/3-D reconstruction:

- Assessment of spatial positional relationship
- Number of fracture fragments
- Fracture dislocation, intra-articular fragments
- Preoperative planning, osteosynthesis





Classification Judet and Letournel

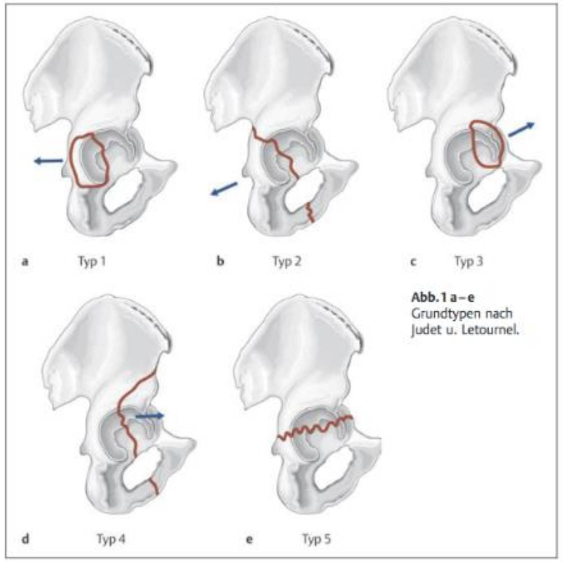
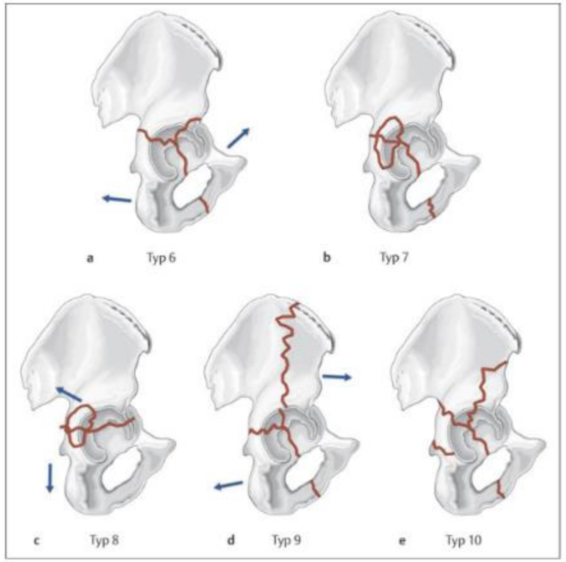


Abb. 1 a–e
Grundtypen nach Judet u. Letournel.



Basic types

Typ 1 posterior cup/rim fracture 24%

Combination injuries

Typ 8 transverse fracture 20%

Typ 9 front pillar/hemiquer 15%

Typ 10 two-pillar fracture 23%,

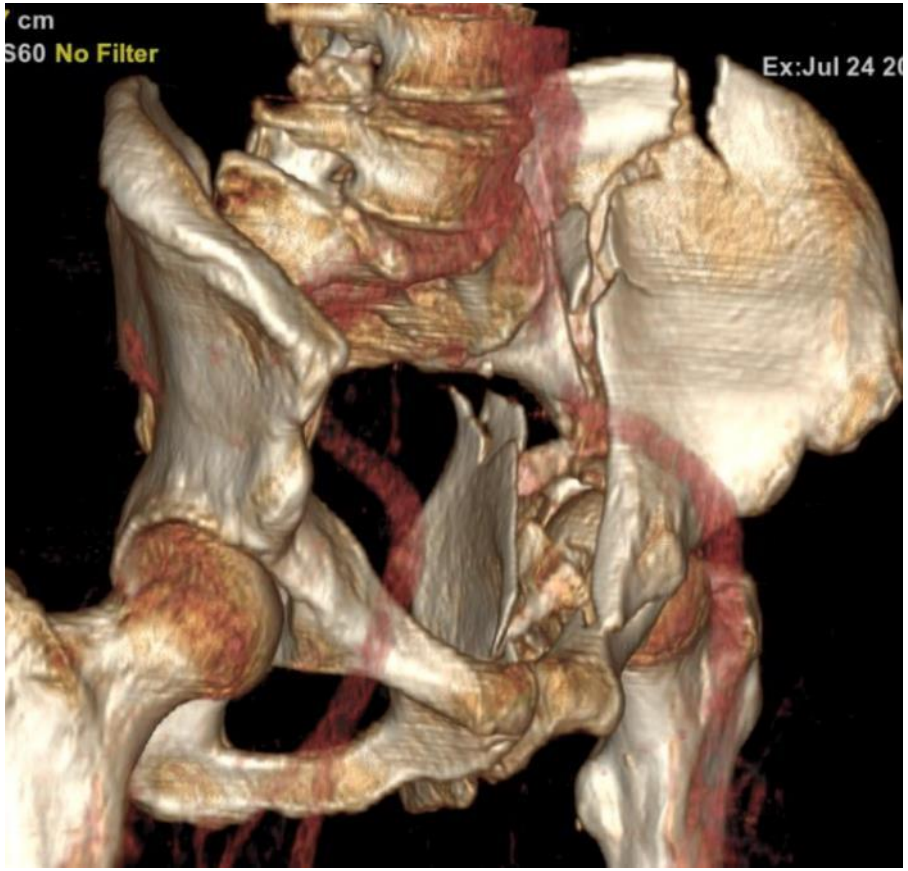
The AO classification is comparable - but less common in the clinical setting.

Indication for surgical therapy

- Cranial weight-bearing part involved (joint level displaced by more than 2 mm)
- CT fracture <1 cm away from subchondral compaction zone
- Fracture gap > 2mm
- Intra-articular joint stage with dislocation > 2mm
- Two-pillar fractures with strong medialisation despite secondary congruence
- Pantile roof angle in all three projections <45

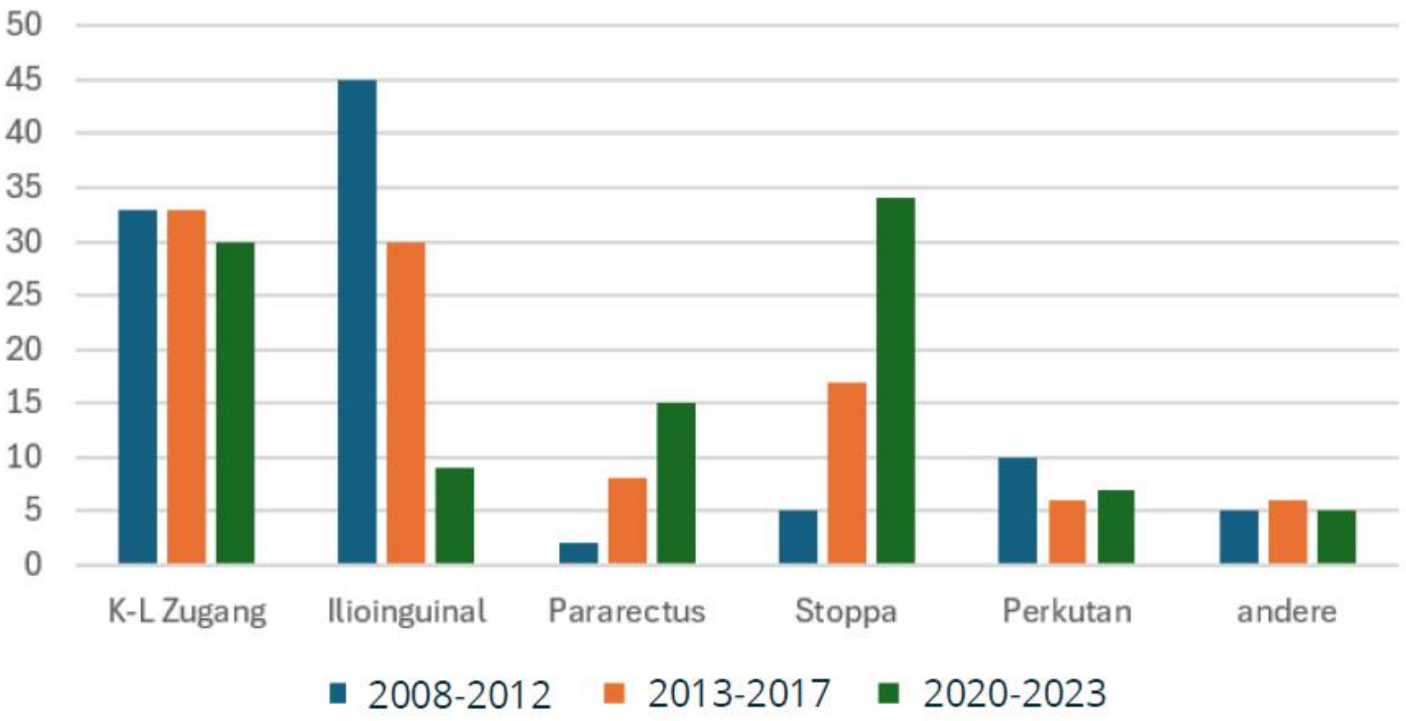
Therapy-goals

- Exercise stability
- (Full) weight bearing
- Good mobility
- Low complications
- Joint-preserving



surgical aproach

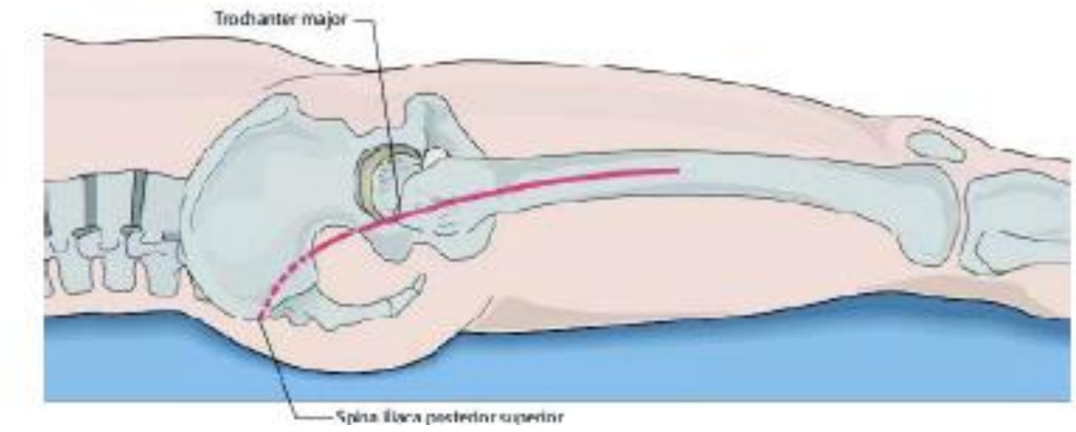
- The access route is changing
- anterior access preferred
- smaller - more atraumatic



Dorsal aproach

- Kocher-Langenbeck access
- extension with trochanter flip
- surgical hip dislocation

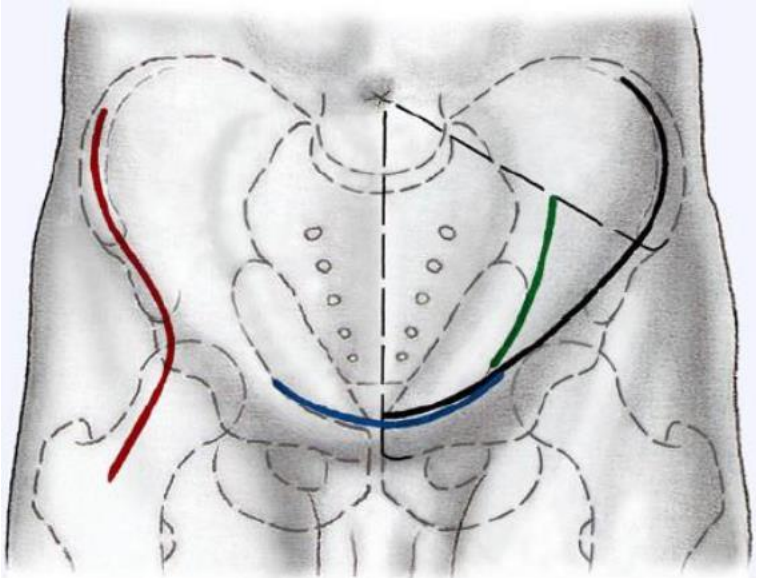
Risk:
Ischatic nerve
Art. circumflexa femoris med.
Heterotopic ossifications
Necrosis of the femoral head

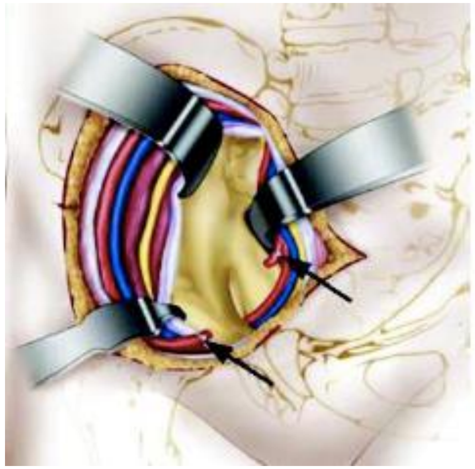


Indication:
rear wall, rear pillar, intra-articular fragments

Ventral aproach

- Ilioinguinal access
- Modifizierter Stoppa-aproach
- Pararectus approach





Risk:

A./V. iliaca ext

N. Femoralis

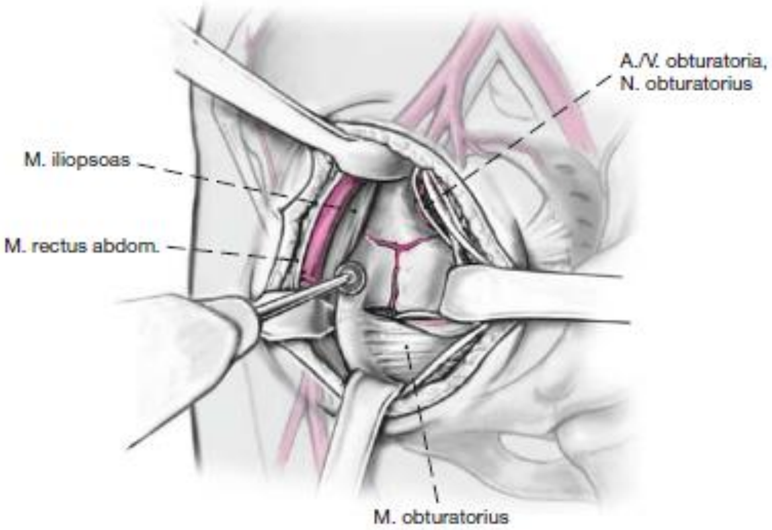
N. Obturatorius

You can´t see the joint

Ventral aproach

Stoppa-Zugang – intrapelviner anterior access

Indication:
Anterior pillar
Fractures of the quadrilateral surface



The specific risks include

- Bleeding from the corona mortis
- Urinary bladder injuries
- Injury to the peritoneum
- Hernia formation with incomplete fascial closure

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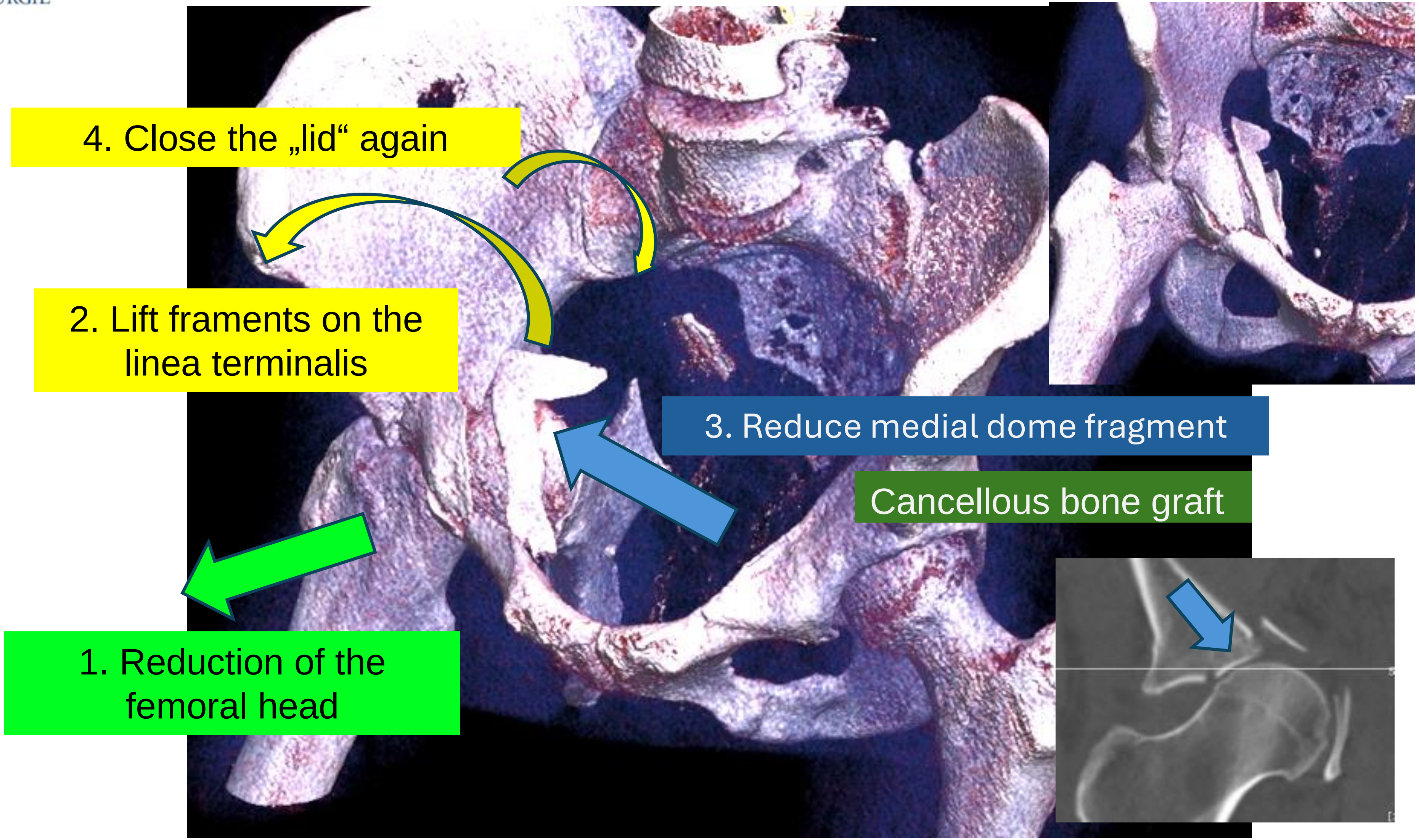
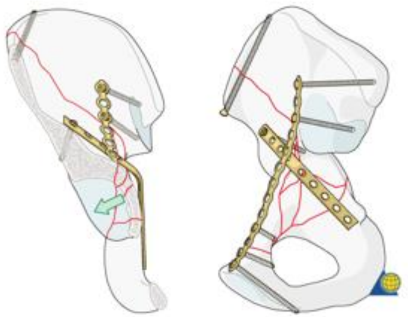
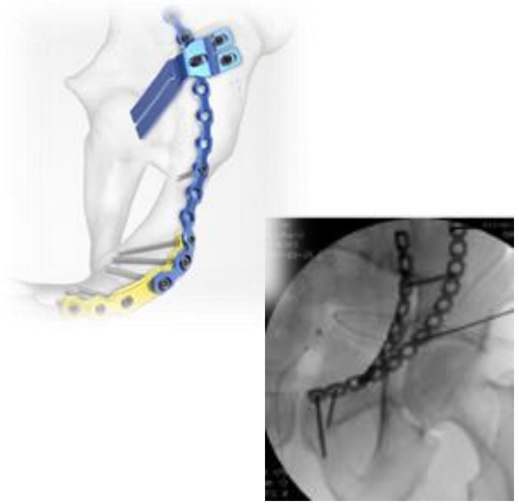
Operative strategy



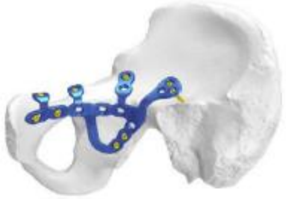
Modern plate-designs

- Spring plate
- Buttress plate
- Double plating





preformed special implants



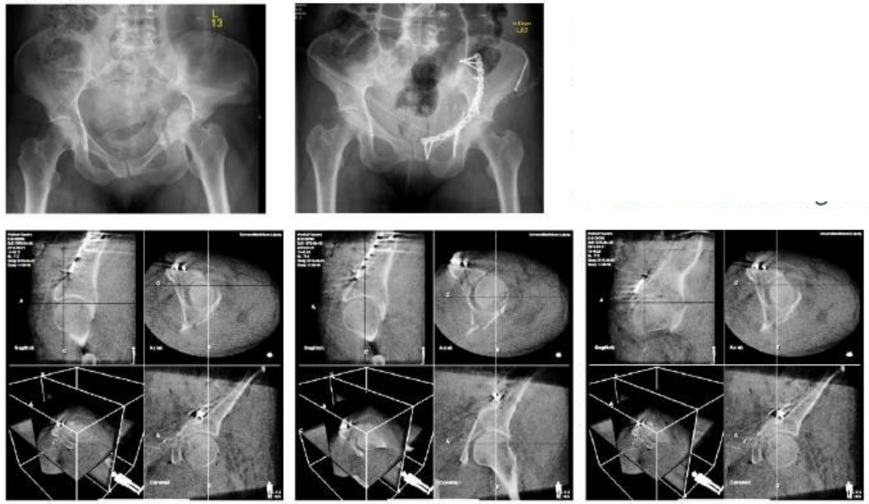
Stryker
J&J, Synthes
ITS Implants
KLS Martin
Double Medical

Quality control

- Post vs . intraoperative control 3 D-scan

Postoperative CT-Kontrolle

W, 41J (2016)



post-operative CT control:
ca. 15% revisions indicated
Standard control?

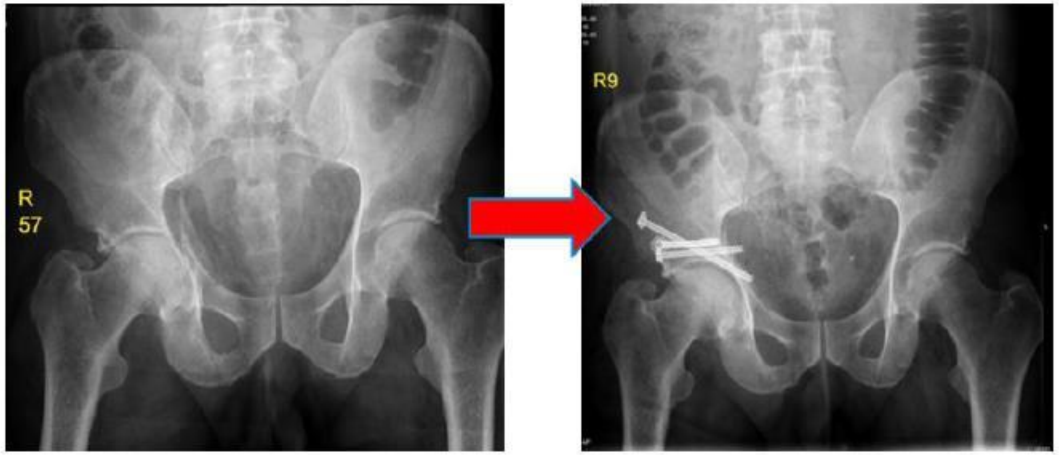
if available> clear recommendation
immediate corrections possible

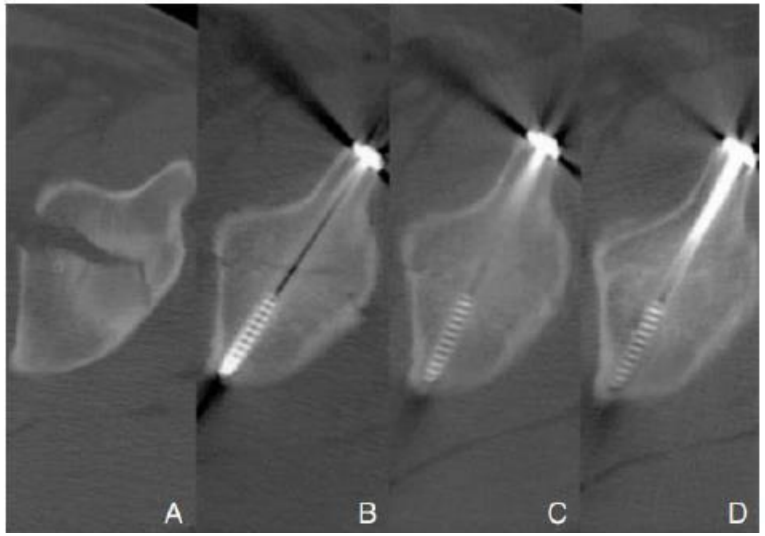
demanding standard for
pelvic/acetabular surgery?

Example

load during mobilisation?

Minimally invasive Treatment





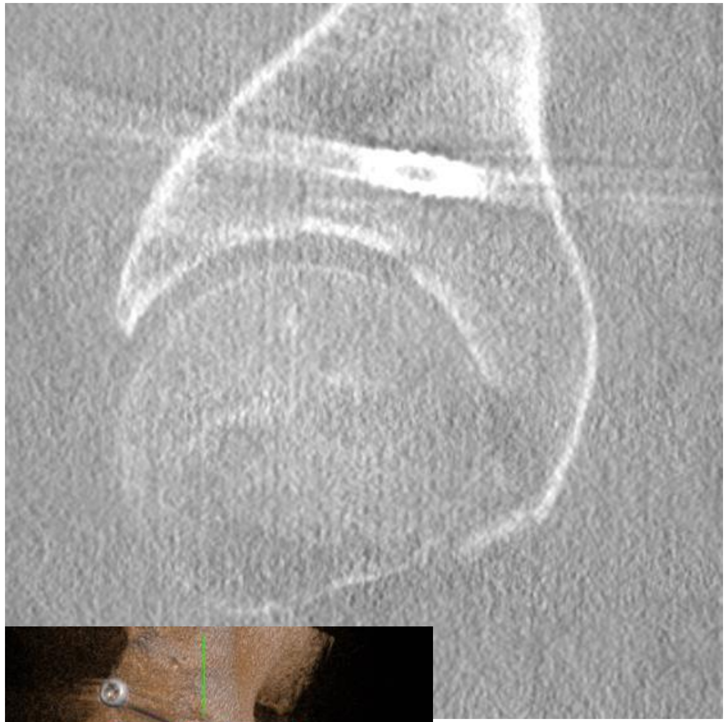
percutaneous/limited access

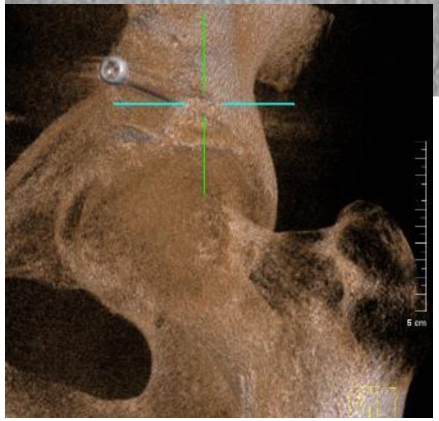
navigates recommended

especially for geriatric / multimorbid patients

Example

Male, 59 years





mobilisation under full weight bearing

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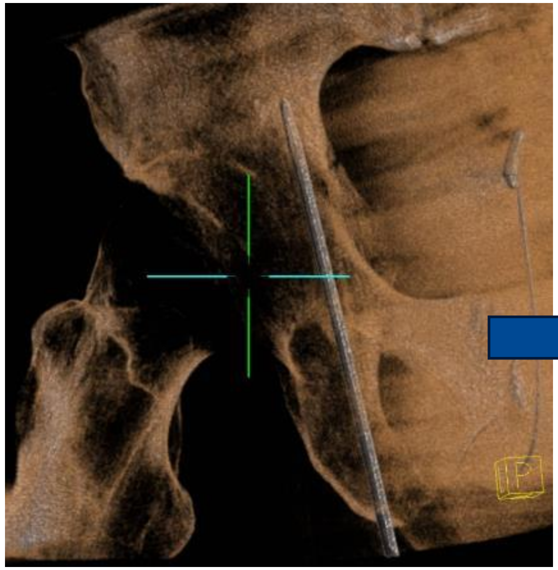
Example



Navigated screw positioning in the dorsal pillar

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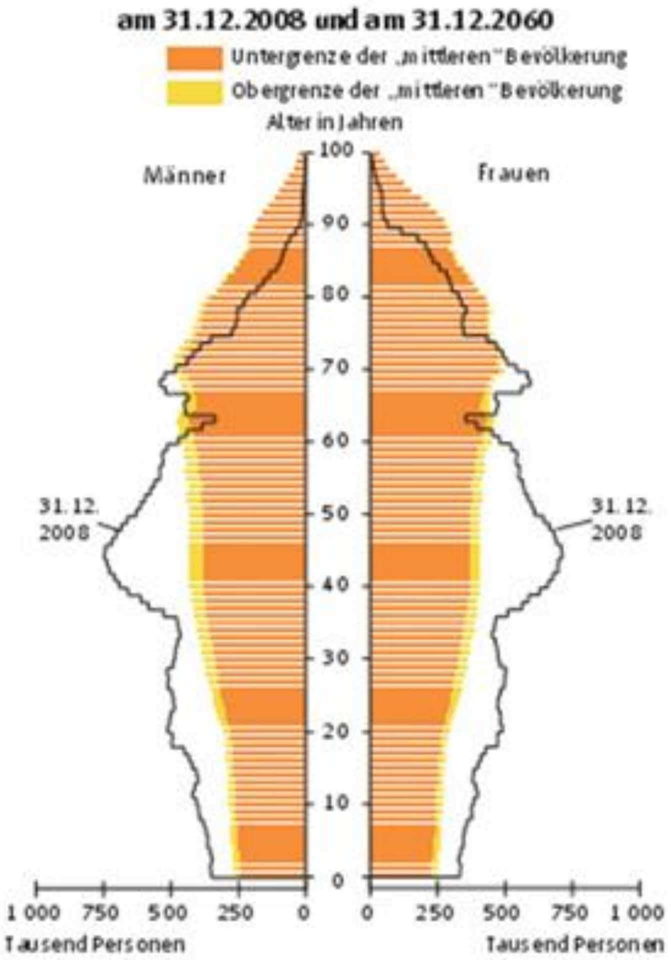
Outcome / Complications

• good + very good results Merle-d'Aubigné scores	70%
• Coxarthrosis	
minimal arthrotic changes	13.8%
significant changes	8.8%
destruction of the hip	7.3%
• Secondary femoral head necrosis	5.6%.
• Heterotopic ossifications	31.9%
• Infections	2-3%

Geriatric patients

Ethiology:

- ‘Lighter’ fractures
- usually caused by simple falls in a domestic environment
- Osteoporosis associated
- Fragility-Fractures



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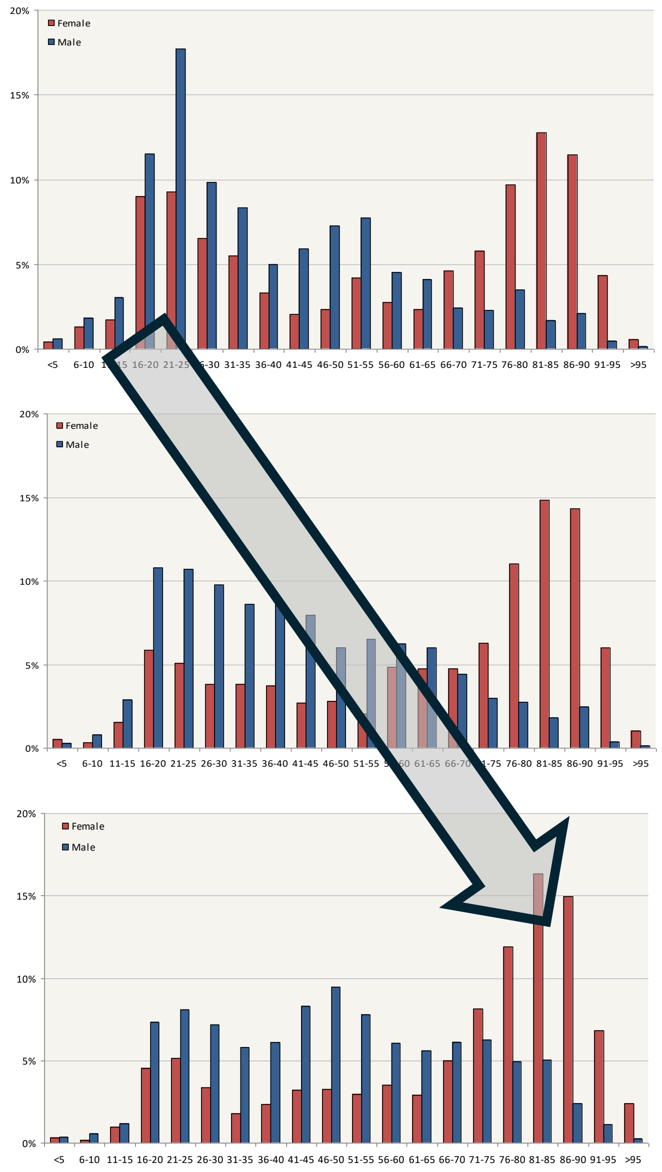
Geriatric patients – pelvic fractures

Working Group on Pelvic Fractures
of the German Trauma Society:

AG 1, 1991-1993 n=1.350

AG 2, 1998-2000 n=1.738

AG 3, 2004-2011 n=5.623



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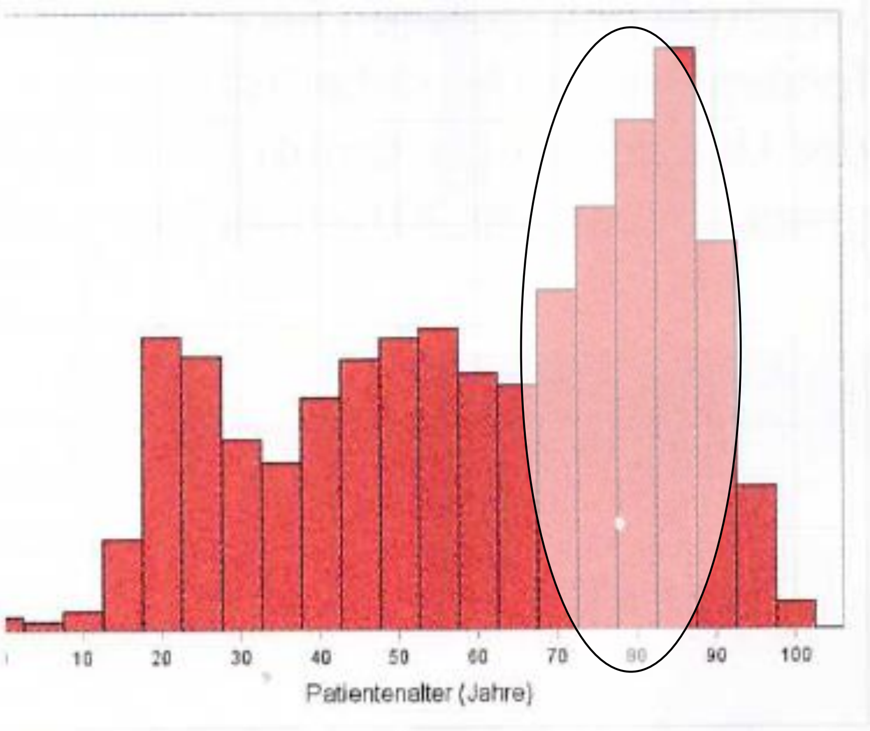
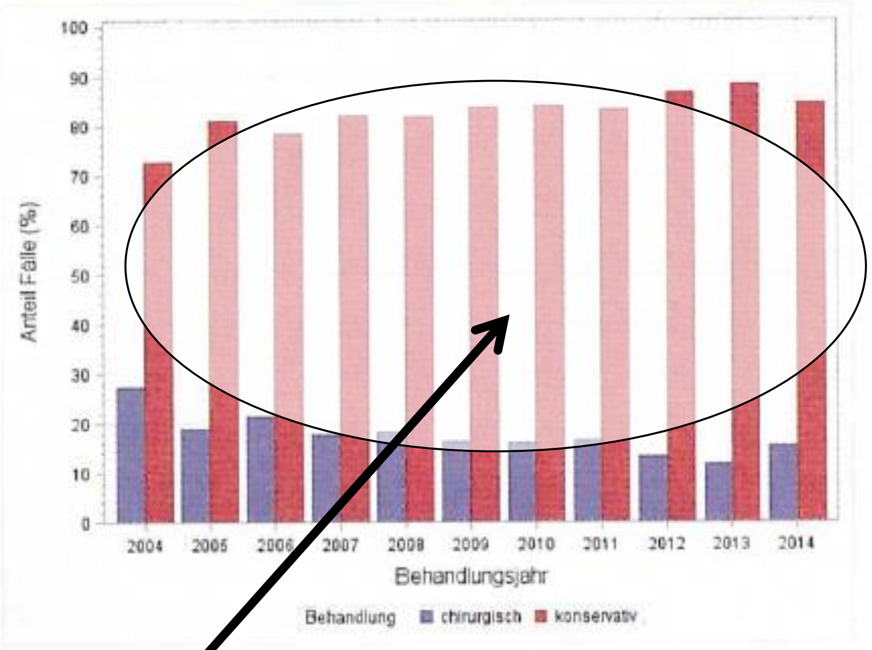
Operative vs conservative treatment

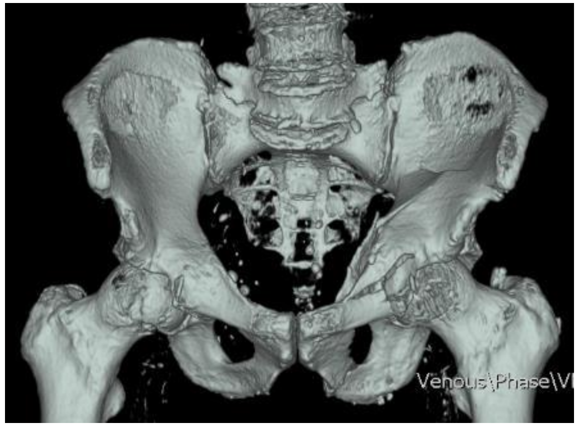




Anzahl der operativ versus konservativ behandelter Acetabulumfrakturen 2004–2014

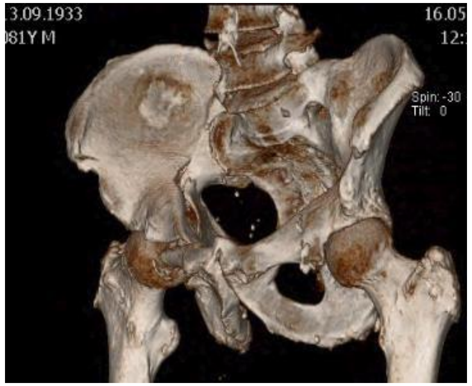
Non surcical = conservative treatment usually works, especially for older people

„typical“ geriatric acetabular fracture



Frequent low-energy trauma direct fall on the trochanter

- Anterior pillar#+rear hemitransverse#
- 2 pillars# with central femoral head protrusion



Consider: „If You can’t treat the fracture forget about the fracture“

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Operative treatment in elderly patients

- The goal of the treatment is to reconstitute the hip joint to provide a stable, painless construct capable of rapidly recovering its pre-injury level of function.
- Mortality (1 year after surgery) 8 % (2% normal)
- Secondery THA 23%
- Complications 16%

- No consens: ORIF or THA

Trauma

EOR | VOLUME 2 | APRIL 2017
DOI: 10.1302/2058-5241.2.160036
www.efortopenreviews.org

EFORT open reviews

Surgical treatment of acetabular fractures in the elderly: a systematic review of the results

Originalien

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Operative Therapie der Acetabulumfraktur beim älteren Patienten

Osteosynthese oder Endoprothese

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Example: male, 85y

Fracture

Post OP

After 6 month

Final result

Operativ treatment in elderly patients with acetabular fracture

- Only 40% good reduction
- Pain / mobilisation better after endoprosthesis
- Increased periarticular calcifications and revisions after osteosynthesis
- No sig. differences in functional outcome

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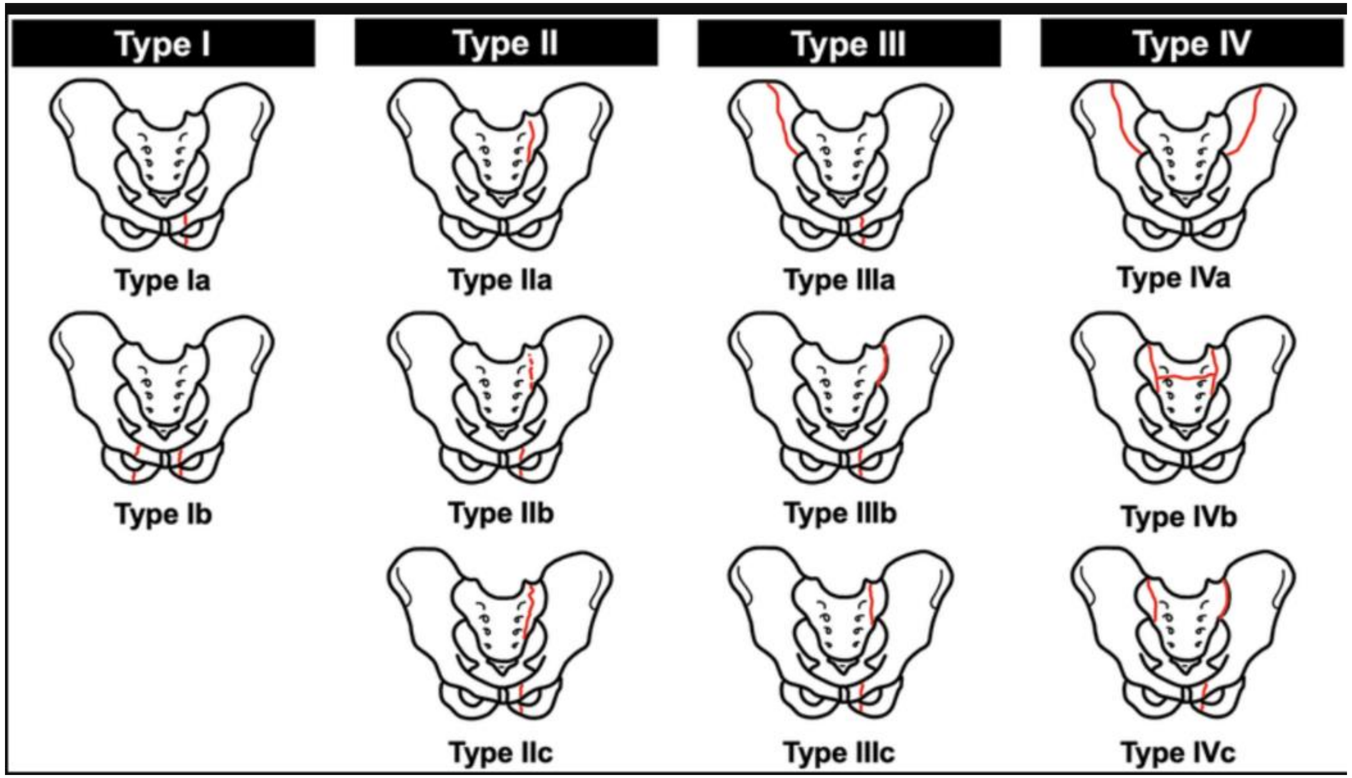
fragility fractures of the pelvic ring

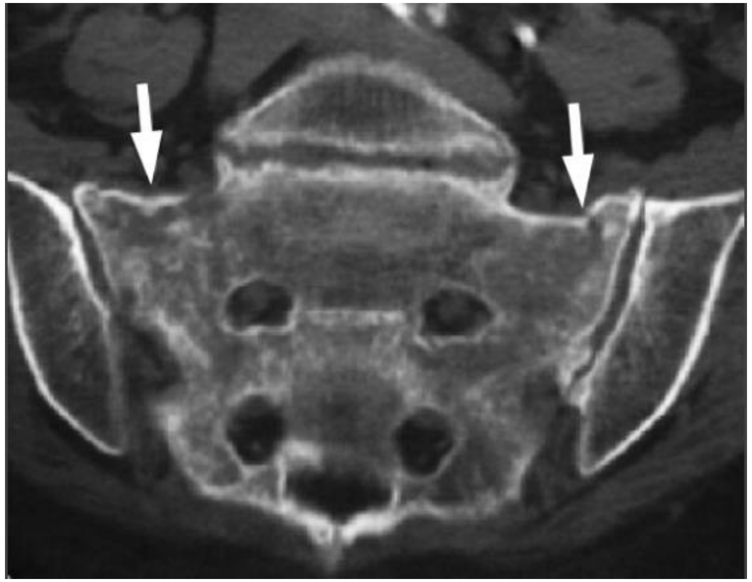


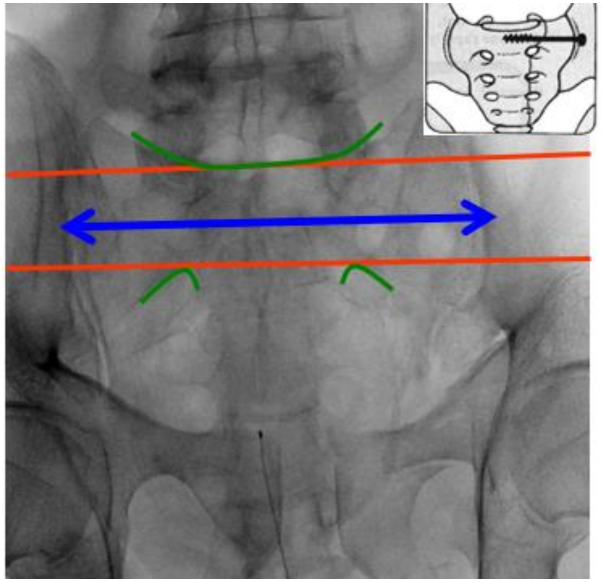
Rommens PM, Hofmann A. Comprehensive classification of fragility fractures of the pelvic ring: Recommendations for surgical treatment. Injury 2013; 44: 1733-1744

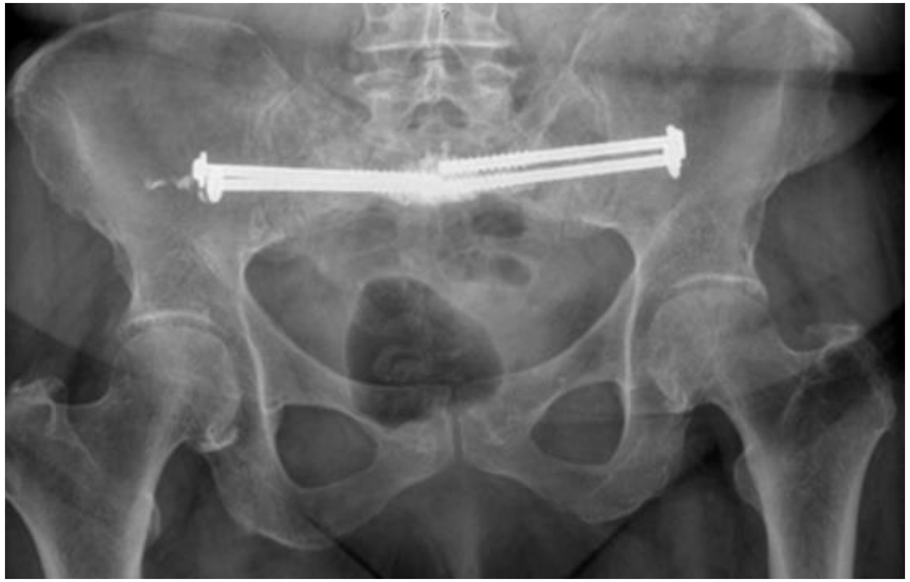
- inadequate trauma
- osteoporosis associated
- often anterior and posterior pelvic ring

- mobilisation under pain therapy
- osteoporosis therapy (vitamin D)
- for pain persistence: percutaneous SI-screw fixation

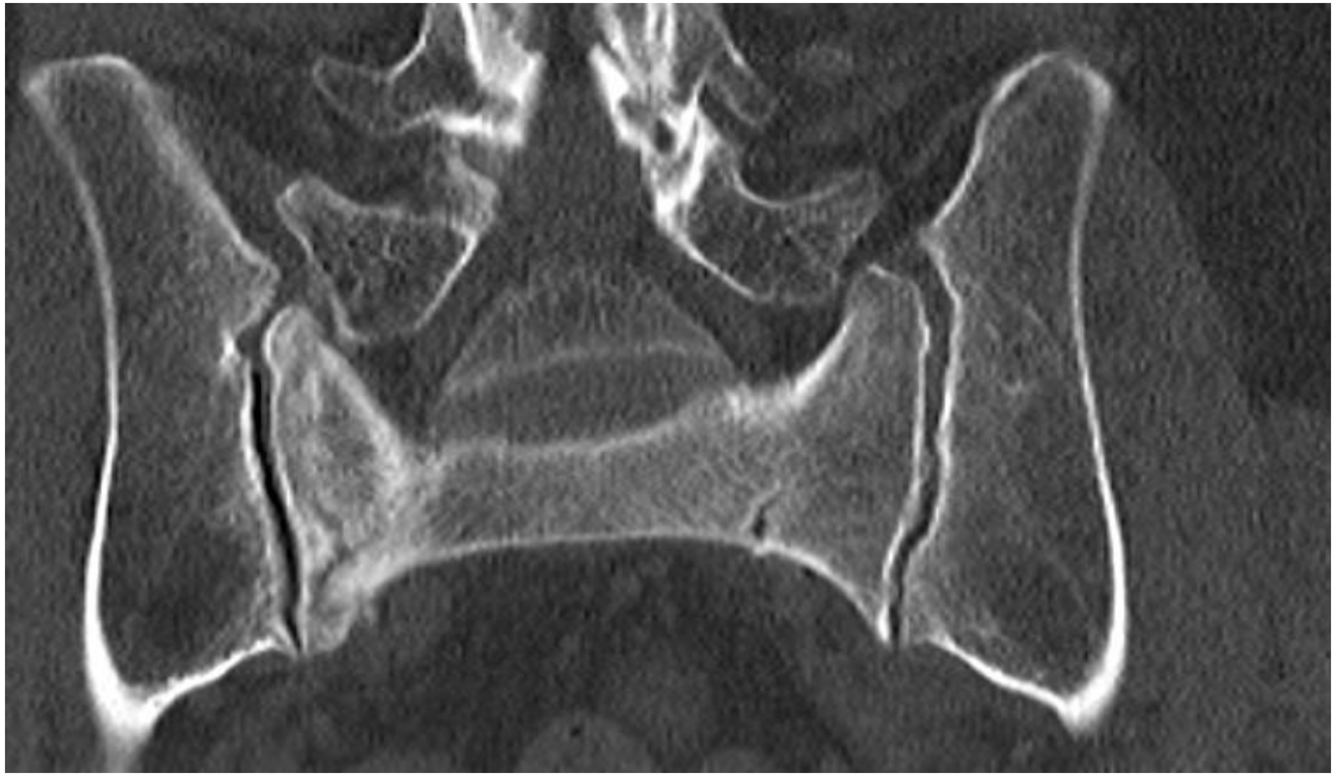
Percutaneus SI-Screw







Example



- Female, 63 years, low or „no“-fall   07.2022
- What are the therapy options?

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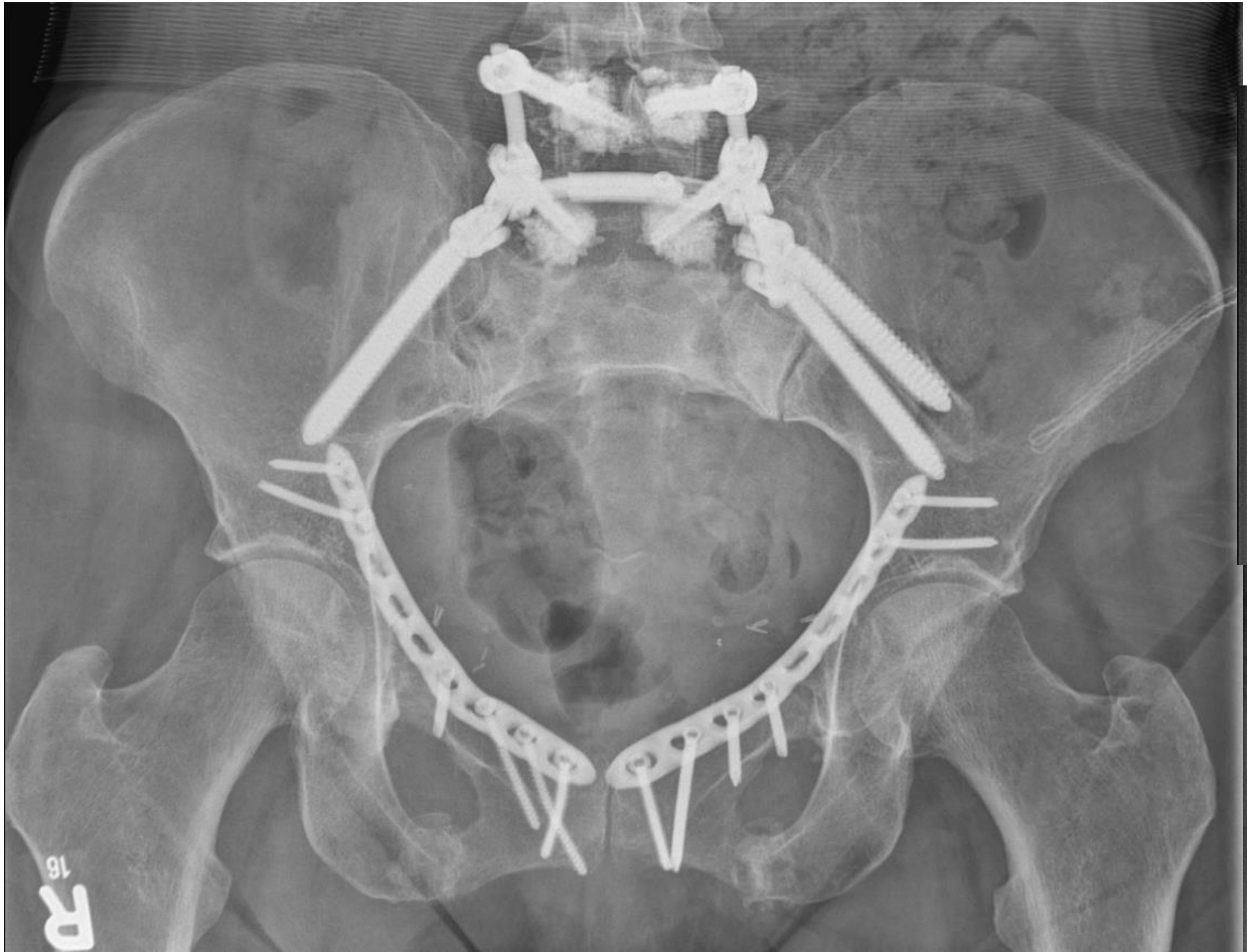
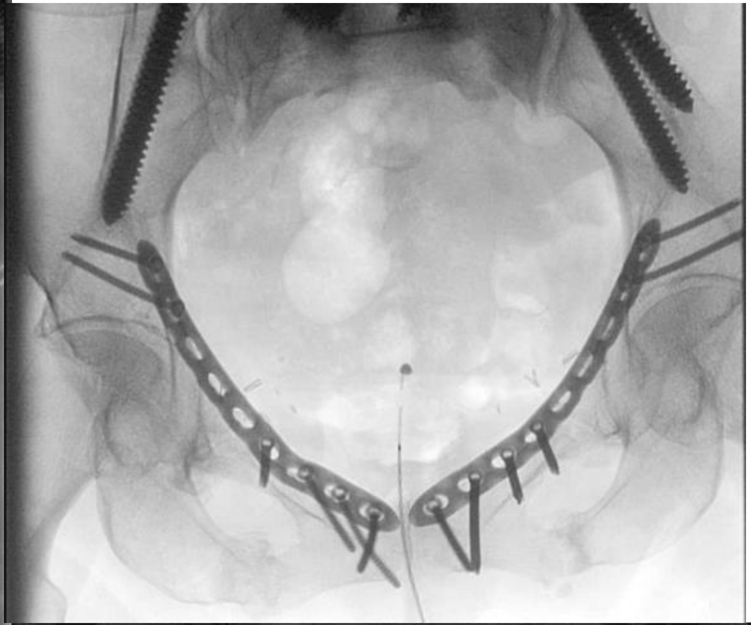
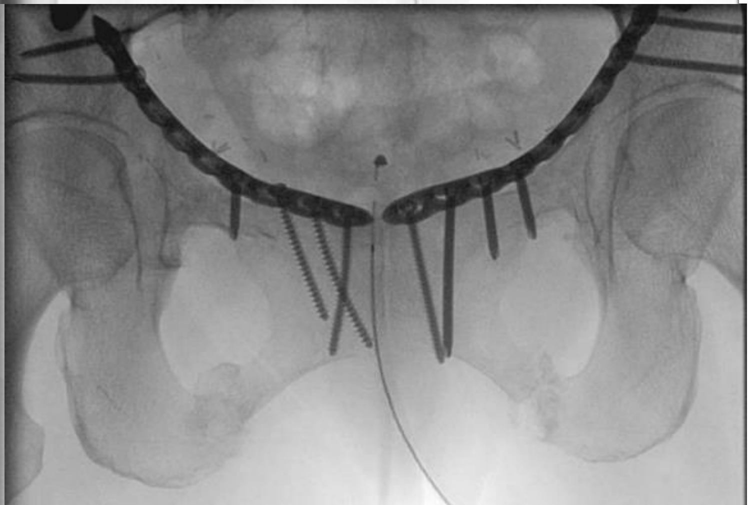
Example







Summary - pelvic ring

- are rare fractures
- Often demanding and challenging for the team and infrastructure
- lead in 2% to relevant hemorrhage
- Emergency care through

  stabilization, packing, embolization
- Definitive stabilization (anterior and/or posterior) with fix ex, plates, screws

DEUTSCHE GESELLSCHAFT FÜR UNFALLCHIRURGIE

Summary - acetabular fracture

- show a clear shift in the age peak
- require differentiated diagnostics and therapy planning
- Therapy goal: joint preservation in young
  mobilization under full load in geriatric patients
- Intraoperative 3D imaging is desirable

- experience required
- Special instruments an implants are helpful
- Endorothetics is part of the therapy portfolio

31 Congrès annuel international de la SACOT

24,25 et 26 janvier 2025

Thank you for your attention