

International Society for Snowsports Medicine
36th SITEMSH Congress



Session 4: the knee: part I
Tibia plateau fractures - getting
worse all the time



Christoph Sommer, Head of Trauma Surgery

 Kantonsspital
Graubünden

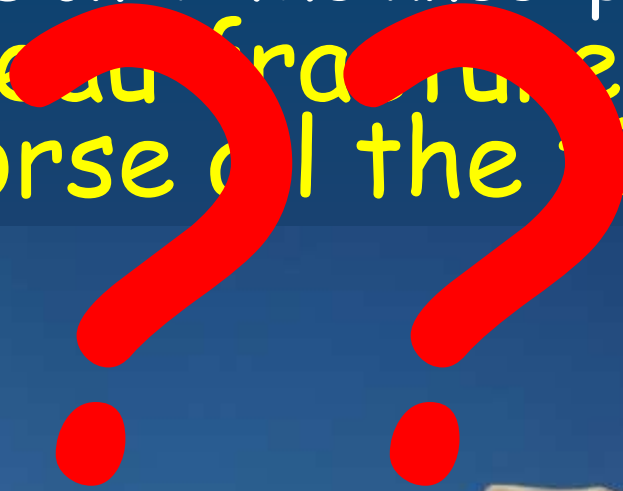


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Tibia plateau fractures - getting worse all the time



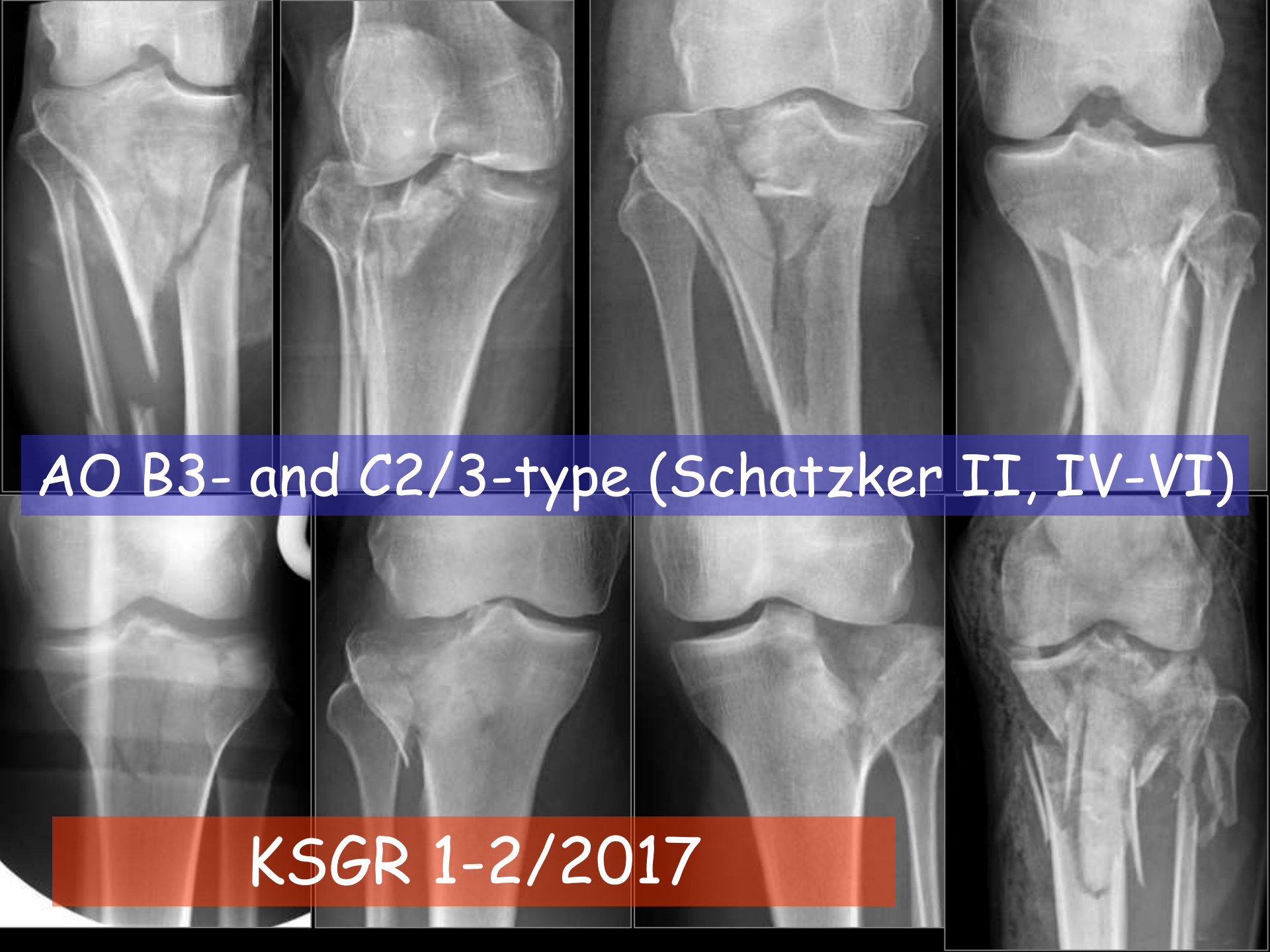
Christoph Sommer, Head of Trauma Surgery





 **Kantonsspital**
Graubünden

300 bed hospital - Trauma level 1 center
Swiss 2. most often helicopter landings by
REGA (after Univ Hosp Berne)



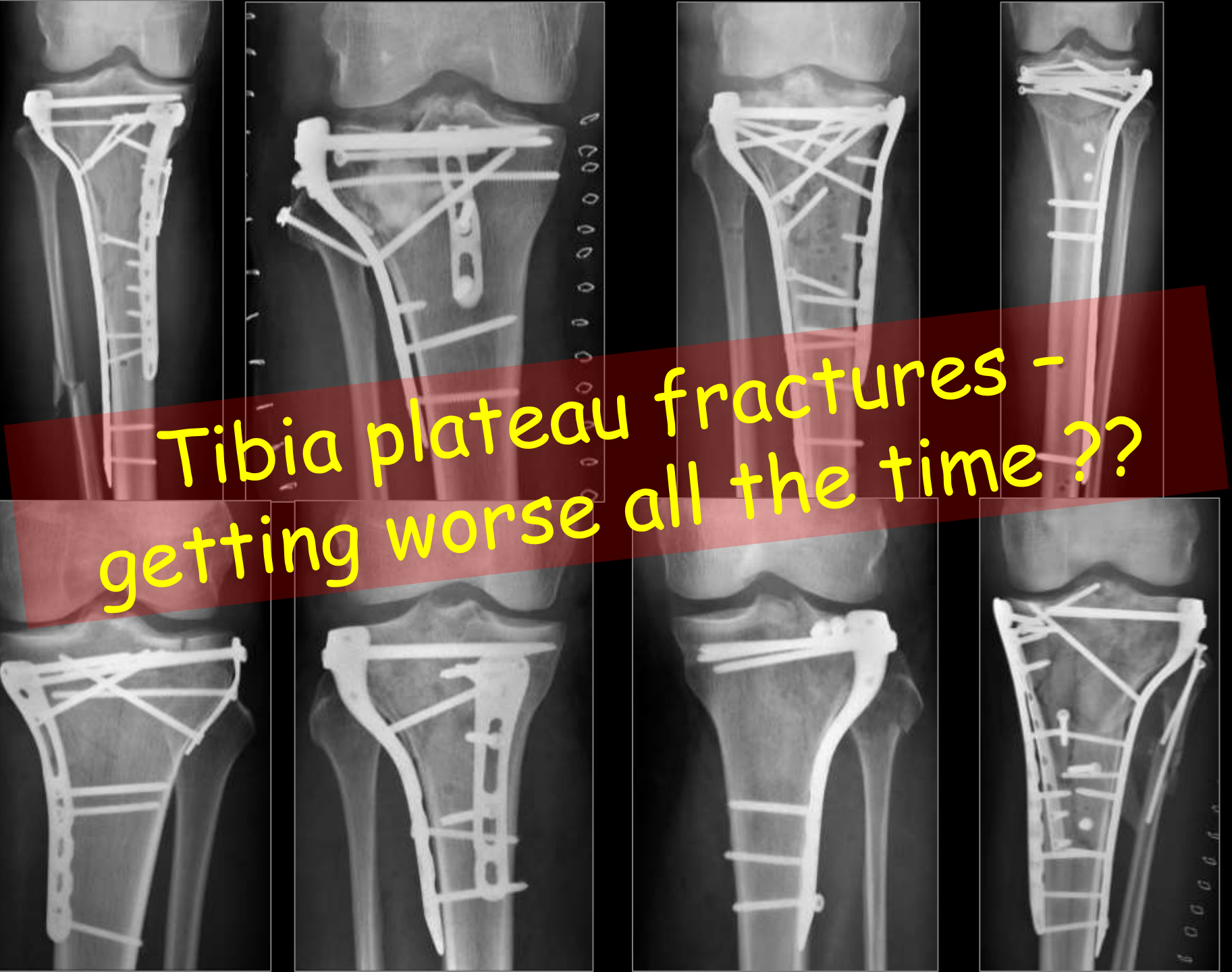
AO B3- and C2/3-type (Schatzker II, IV-VI)

KSGR 1-2/2017



AO B3- and C2/3-type (Schatzker II, IV-VI)

KSGR 1-2/2017



Tibia plateau fractures -
getting worse all the time??

Prox Tibia Fx Wintersport (Ski, SB) (KSGR 2001-2017)

	2003-2007		2008-2012		2013-2017	
	N	%	N	%	N	%
All (all Fx Fixations)	146 (2951)	4.9%	180 (3874)	4.6%	185 (4813)	3.8%
B1 / B2	29	19.8%	19	10.6%	13	7.0%
B3	61	41.8%	109	60.6%	119	64.3%
C1 / C2	6	4.1%	12	6.7%	10	5.4%
C3	37	25.3%	25	13.9%	34	18.4%
Fx Dislocation (Moore types)	13	8.9%	40	22.2%	33	17.8%
2-staged procedure	44	30.1%	51	28.3%	49	26.5%

1. Change: carving technique



Game with the centrifugal forces:
Slalomcarver satisfy your lust for turns– and provide you
with perfect experiences on the slope

2. Change: artificial snow

Independent of the change of climate, technical snow-making has become a precondition for winter tourism. And with the snow-making, the request of the skiers increase. The slopes always have to be perfect – independent of the amount of natural snow.





AO B3- and C2/3-type (Schatzker III-VI)

new admissions 1-2/2011 KSGR Chur



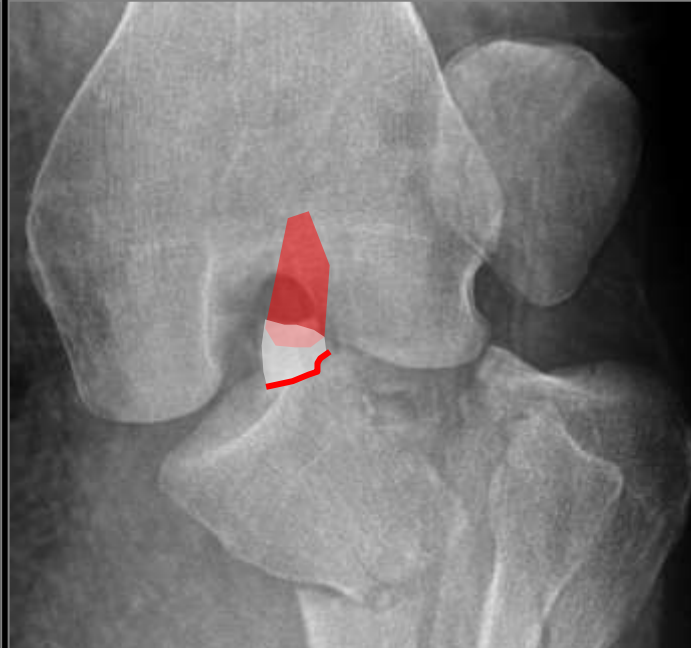


Postop:
Free functional

ligaments intact

"simple" Fx

partial articular Fx
split depression Fx
(AO B3.1)
(Schatzker II)



Postop: No active extension against gravity/resistance

ACL (eminentia)
osseous avulsed

Fx dislocation

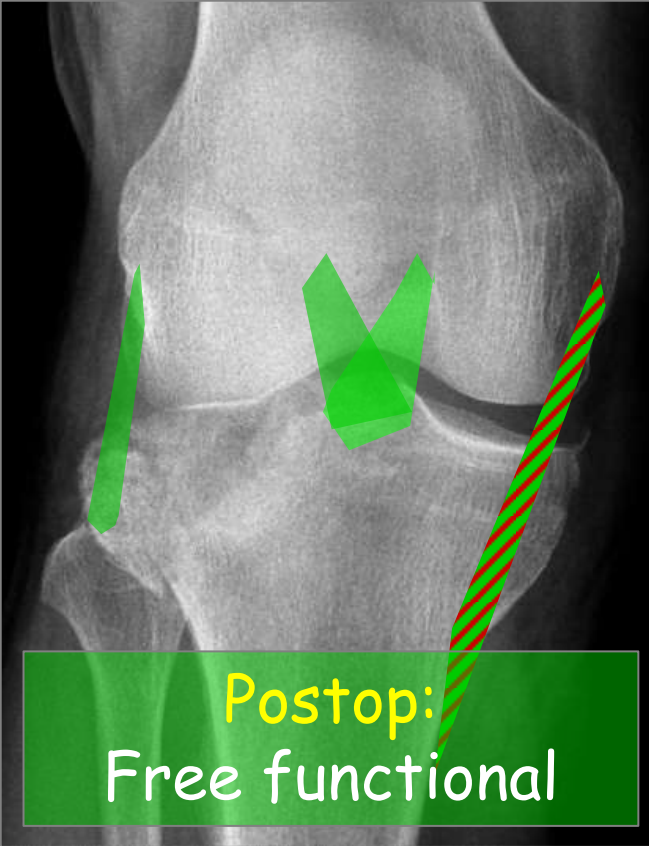
partial articular Fx
Moore II medial
(AO B3.2/B3.3)
(Schatzker IV)



tuberosity
injured
lig pat "avulsed"

"Complex" Fx

complet articular Fx
AO C3.3
(Schatzker VI)



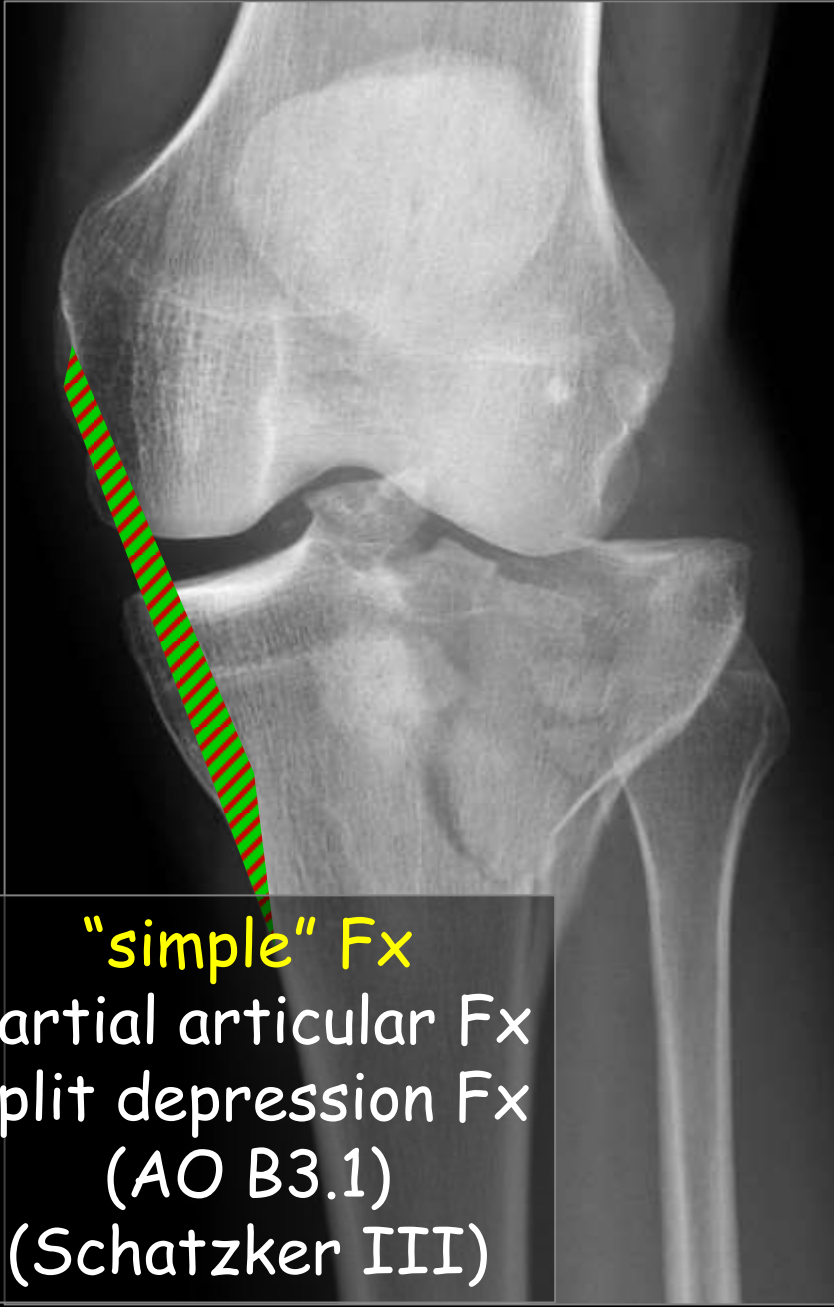
Postop:
Free functional

ligaments intact

"simple" Fx

partial articular Fx
split depression Fx
(AO B3.1)
(Schatzker III)

P.M., 41y, ski accident, B3 PL



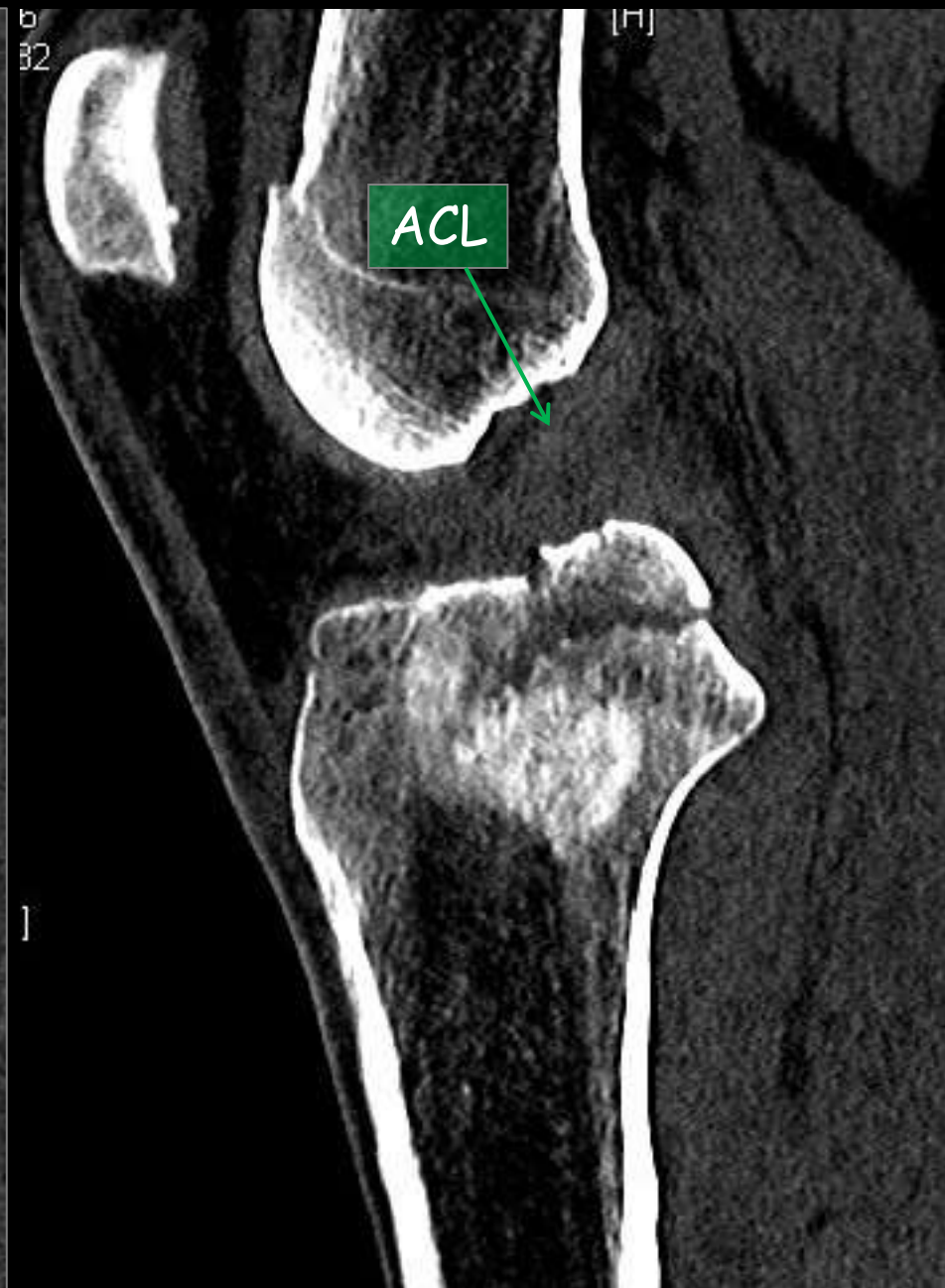
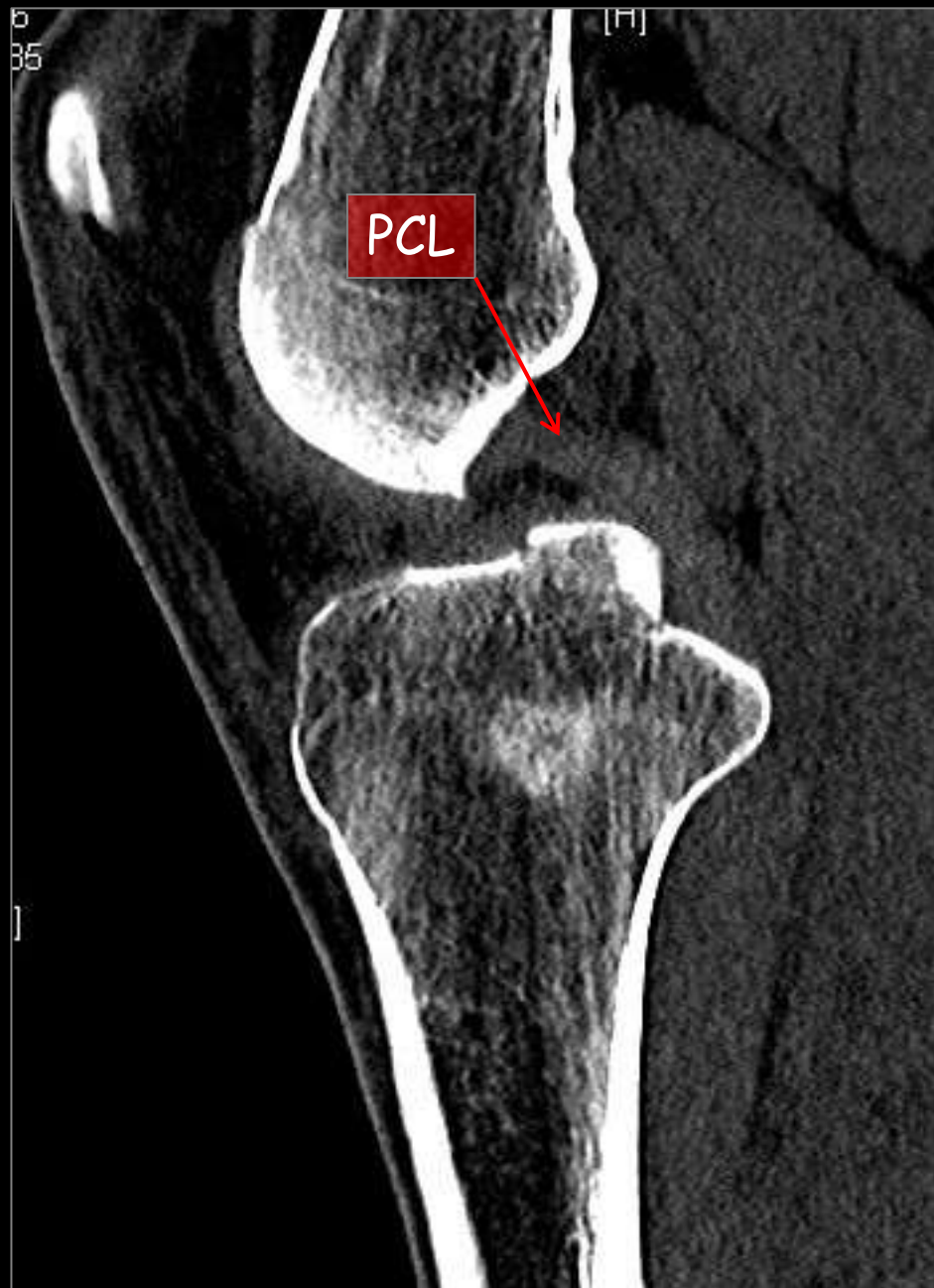
"simple" Fx
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P.M., 41y, ski accident, B3 PL



P.M., 41y, ski accident, B3 PL

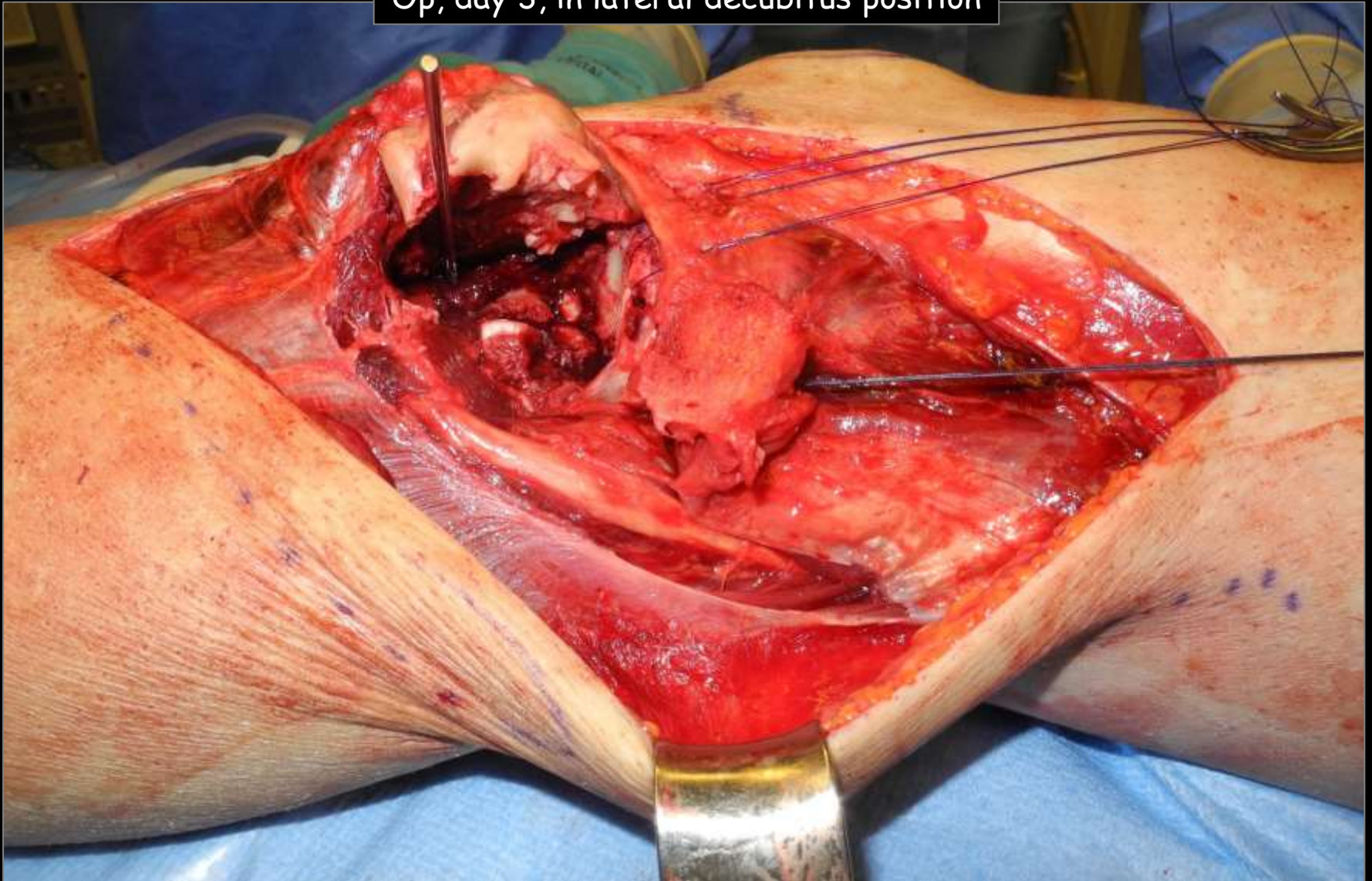


P.M., 41y, ski accident, B3 PL



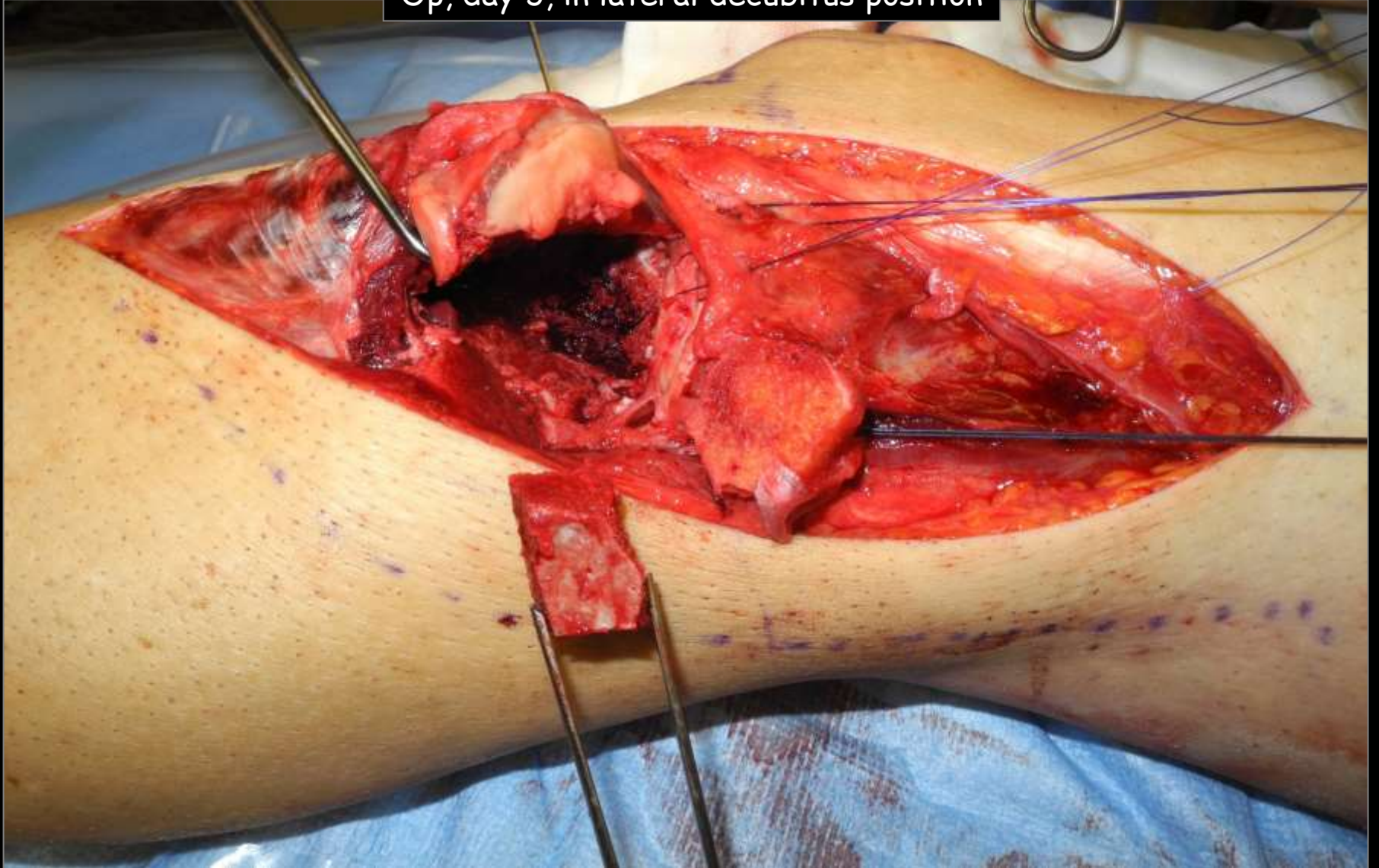
P.M., 41y, ski accident, B3 PL

Op, day 3, in lateral decubitus position



P.M., 41y, ski accident, B3 PL

Op, day 3, in lateral decubitus position



P.M., 41y, ski accident, B3 PL

Op, day 3, in lateral decubitus position



P.M., 41y, ski accident, B3 PL

14 months



P.M., 41y, ski accident, B3 PL

14 months



P.M., 41y, ski accident, B3 PL

14 months



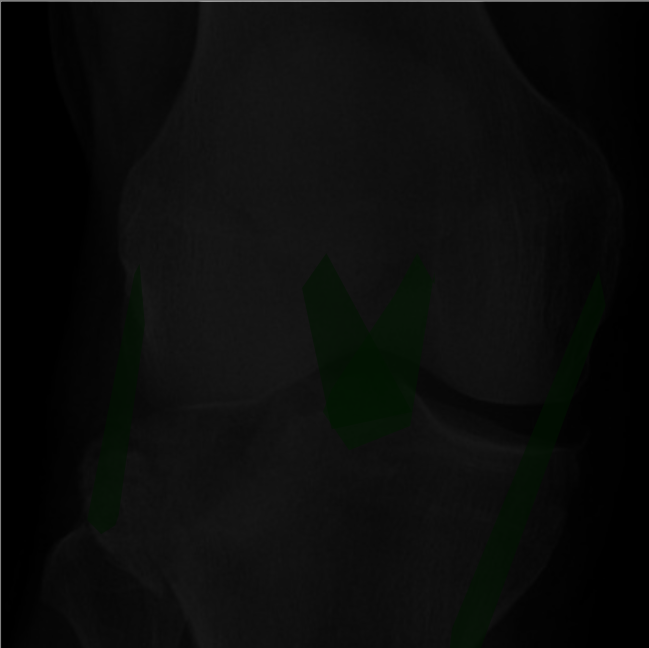


Postop:
Free functional

ligaments intact

"simple" Fx

partial articular Fx
split depression Fx
(AO B3.1)
(Schatzker III)



Postop:
Free functional

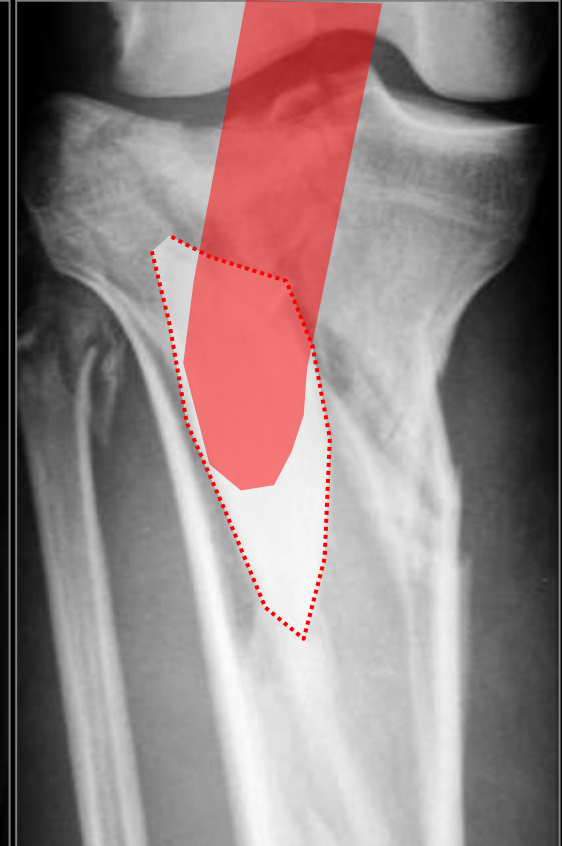
ligaments intact

"simple" Fx
partial articular Fx
split depression Fx
(AO B3.1)
(Schatzker III)



ACL (eminencia)
osseous avulsed

Fx dislocation
partial articular Fx
Moore II medial
(AO B3.2/B3.3)
(Schatzker IV)



tuberosity
injured
lig pat "avulsed"

"Complex" Fx
complet articular Fx
AO C3.3
(Schatzker VI)

Treatment goals



1. Respect **soft tissue** (approach(es), timing)
2. Anatomic restoration **articular** surface(s)
3. **Stable** fixation fx fragments (including tibial spine(s) in correct **alignment** (axis, length, rotation)
4. Repair of **meniscal** and/or ligamentous injuries as far as necessary and possible

Treatment goals

2-3 staged procedure, initial ex fix knee bridging

1. Respect **soft tissue** (approach(es), timing)
2. Anatomic restoration **articular** surface(s)
3. **Stable** fixation fx fragments (including tibial spine(s) in correct **alignment** (axis, length, rotation)
4. Repair of **meniscal** and/or ligamentous injuries as far as necessary and possible

F.M., 48y, ski, 41-C3, compartment syndrom

3h after injury

⇒ DCO

Damage Control Orthopedics



F.M., 48y, ski, 41-C3, compartment syndrom



F.M., 48y, ski, 41-C3, compartment syndrom



Temporary ex fix proximal tibia (KSGR 2001-2017)*

262 (851 prox tibia fx)

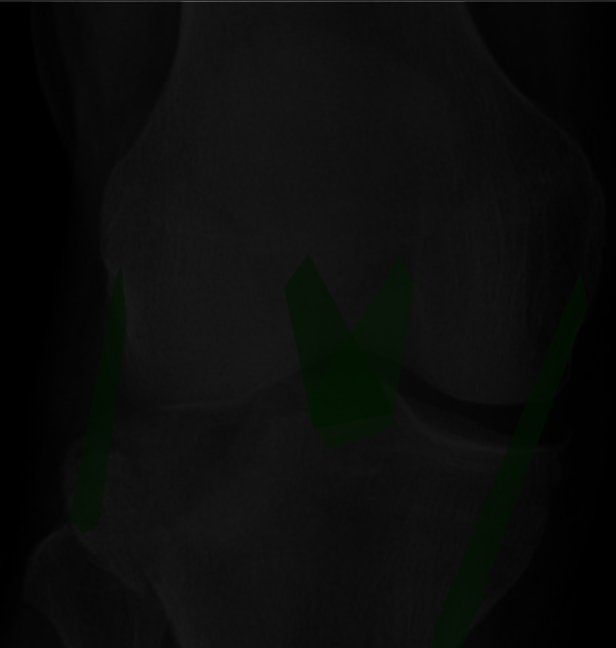
Soft tissue injury

Compartment syndrom	76
Open fracture	49

Fracture classification (AO)

B3	69 (Moore II)
C1	9
C2	21
C3	144 (total: 171)

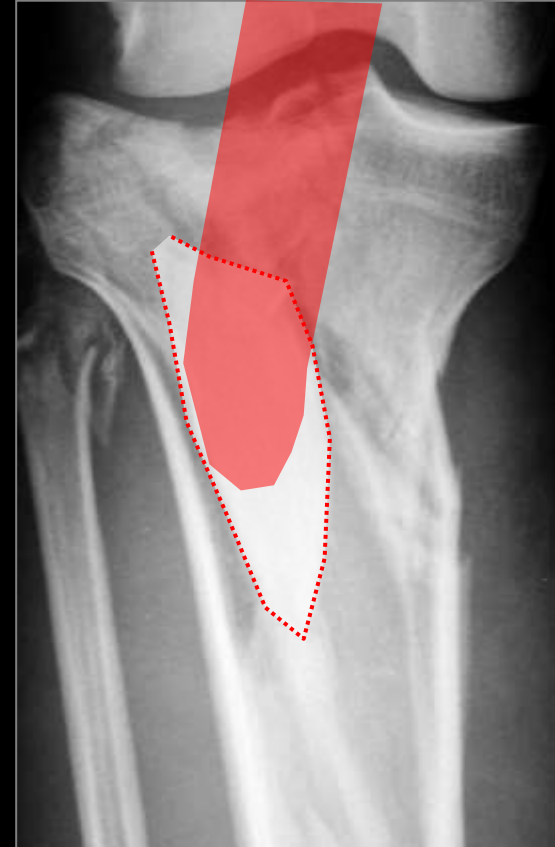
* Acklin, Sommer. Compartment syndrome in dislocation and non-dislocation type proximal tibia fractures: analysis of 356 consecutive cases. Arch Orthop Trauma Surg (2012) 132:227-231



Postop:
Free functional

ligaments intact

"simple" Fx
partial articular Fx
split depression Fx
(AO B3.1)
(Schatzker III)



tuberosity
injured
lig pat "avulsed"

"Complex" Fx
complet articular Fx
AO C3.3
(Schatzker VI)

J.U., 31y, AO C3, Moore V, 2-step-proc.

C3-type



Ex Fix, then CT Scan

L

J.U., 31y, AO C3, Moore V, 2-step-proc.



Postop 1



medial

J.U., 31y, AO C3, Moore V, 3-step-proc.

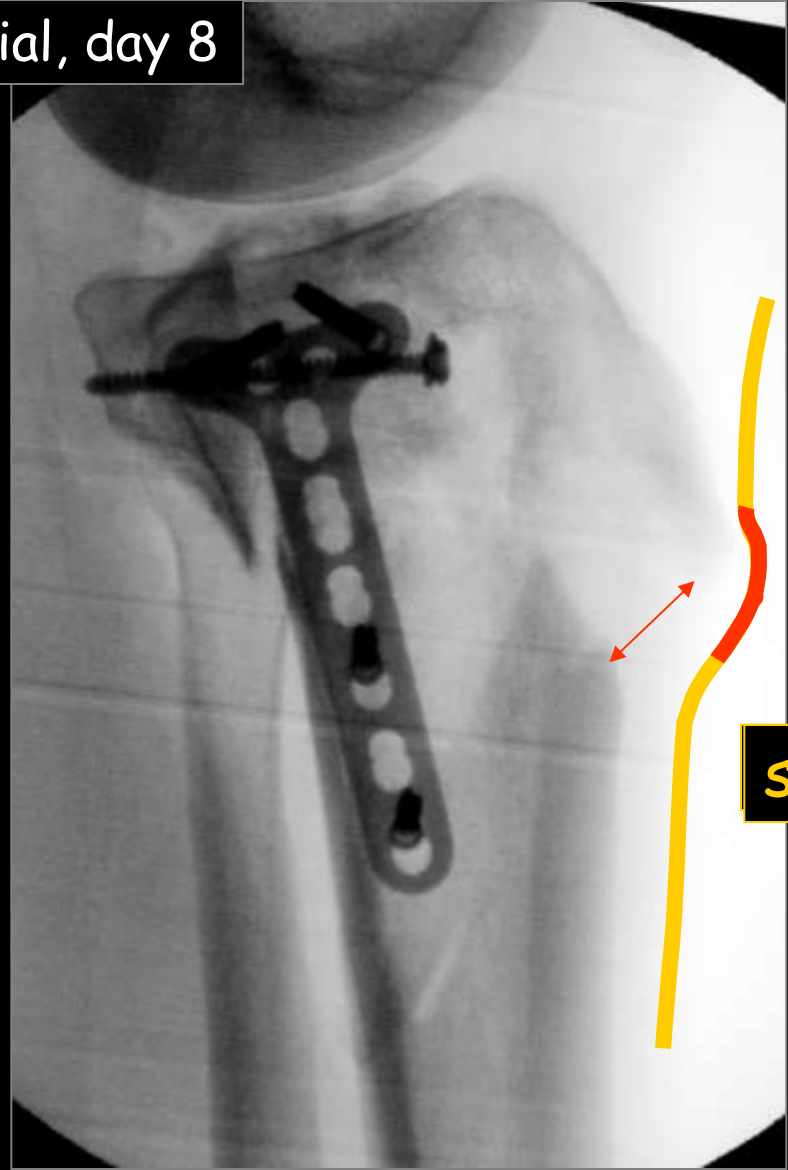
Op 2, medial, day 8

medial „extensive“ approach (1.step)



J.U., 31y, AO C3, Moore V, 3-step-proc.

Op 2, medial, day 8



skin

J.U., 31y, AO C3, Moore V, 3-step-proc.

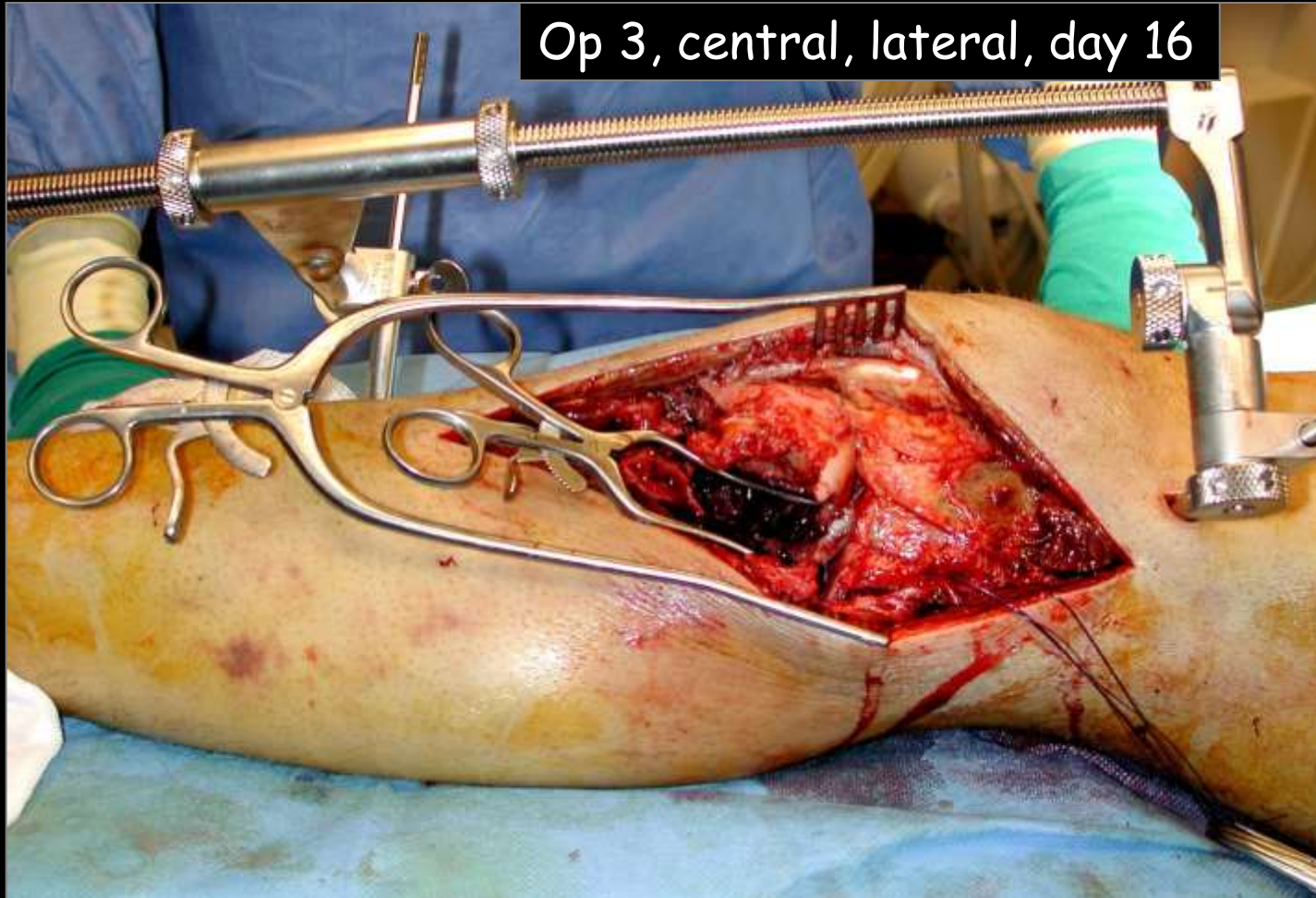
Op 2, medial, day 8



skin

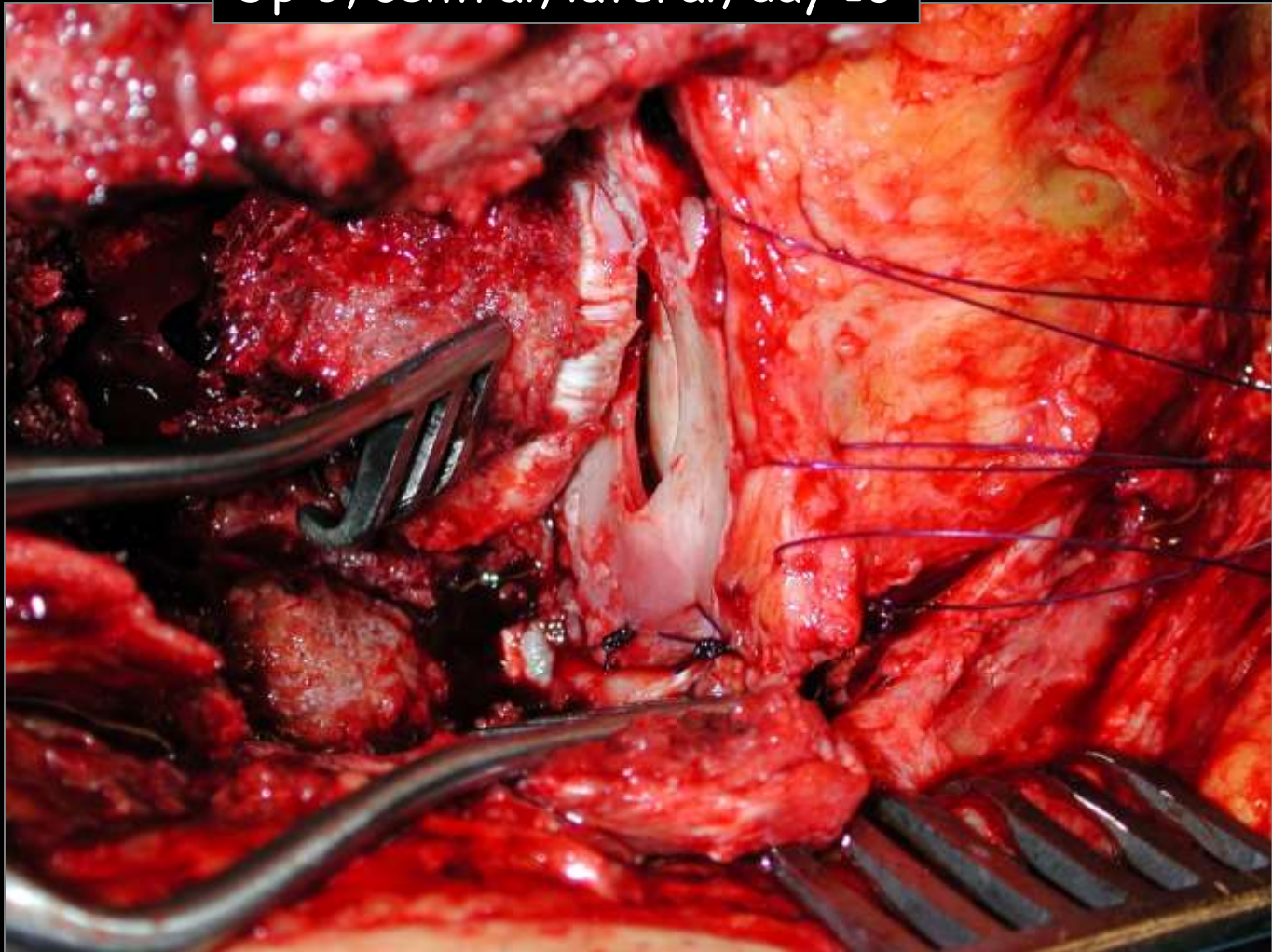
J.U., 31y, AO C3, Moore V, 3-step-proc.

Op 3, central, lateral, day 16



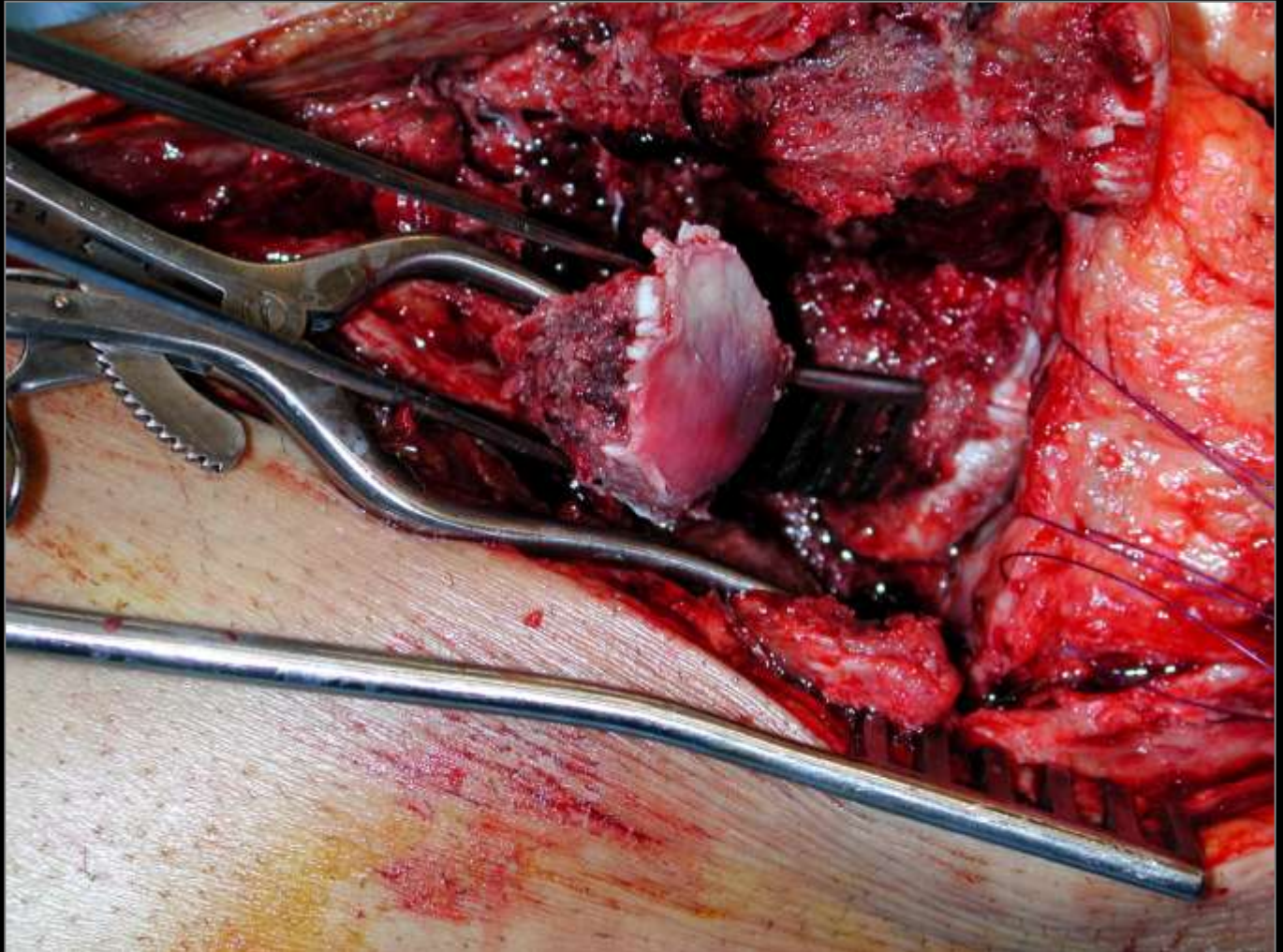
J.U., 31y, AO C3, Moore V, 3-step-proc.

Op 3, central, lateral, day 16



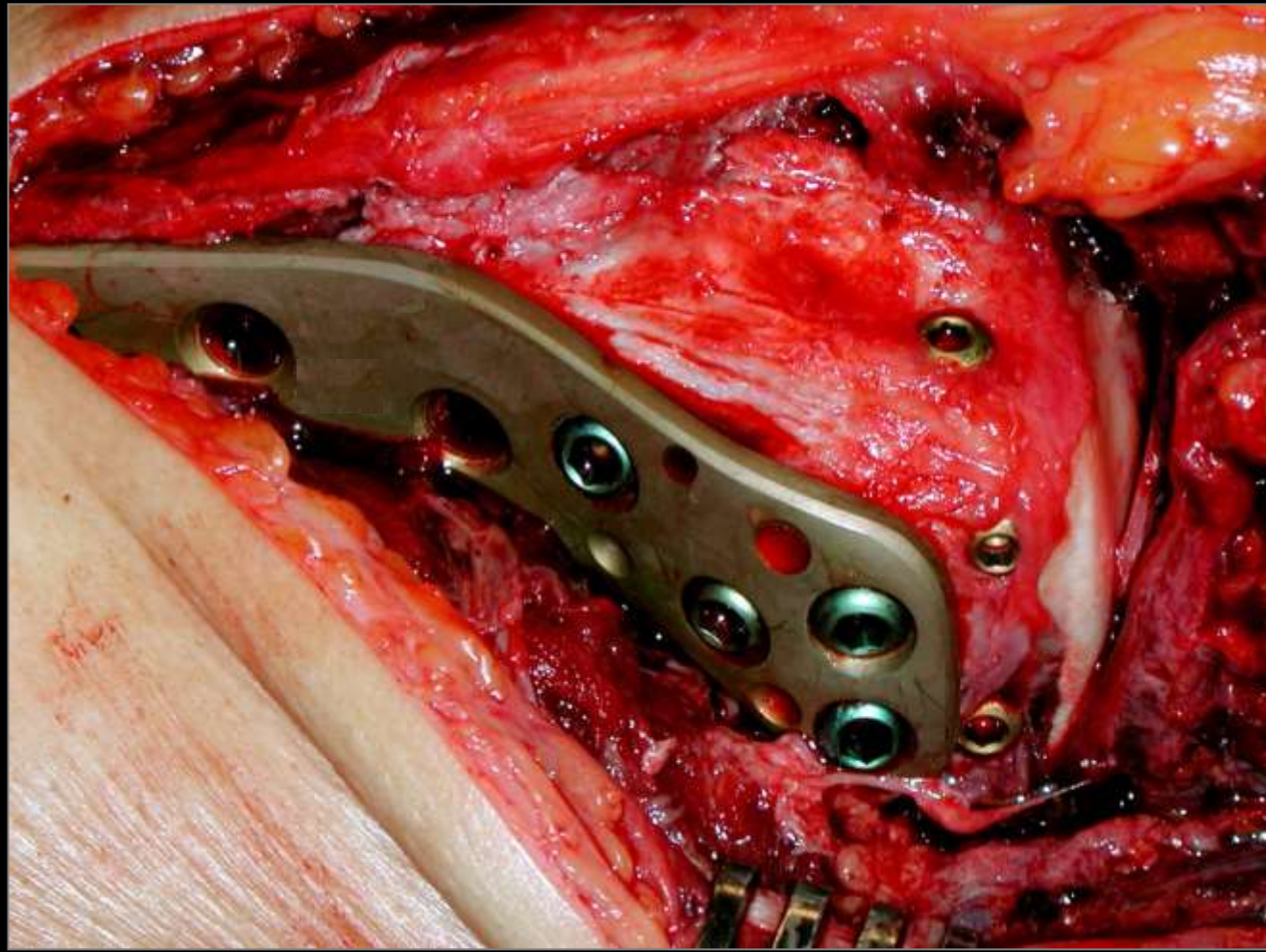
J.U., 31y, AO C3, Moore V, 3-step-proc.

Op 3, central, lateral, day 16



J.U., 31y, AO C3, Moore V, 3-step-proc.

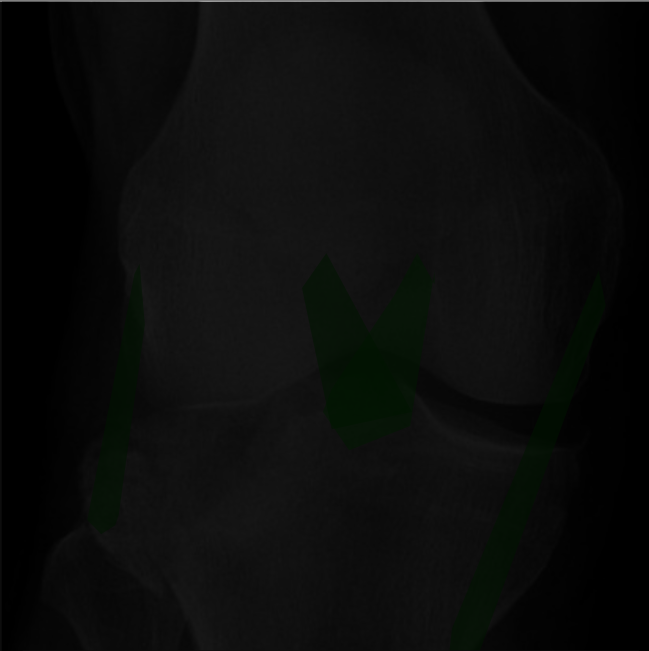
Op 3, central, lateral, day 16



J.U., 31y, AO C3, Moore V, 2-step-proc.

14 months

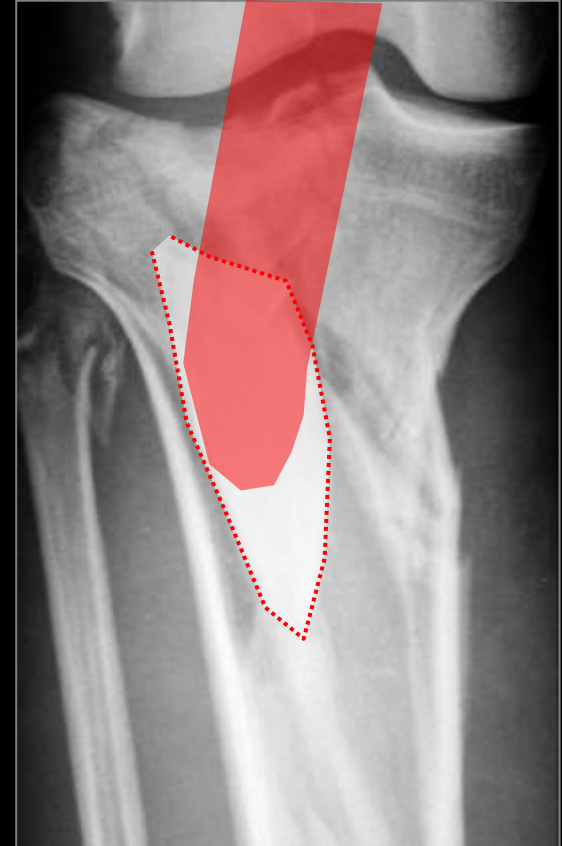




Postop:
Free functional

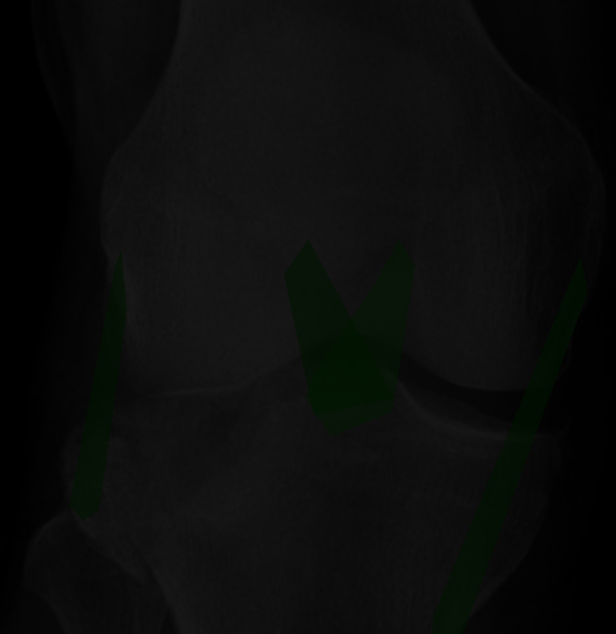
ligaments intact

"simple" Fx
partial articular Fx
split depression Fx
(AO B3.1)
(Schatzker III)



tuberosity
injured
lig pat "avulsed"

"Complex" Fx
complet articular Fx
AO C3.3
(Schatzker VI)



Postop:
Free functional

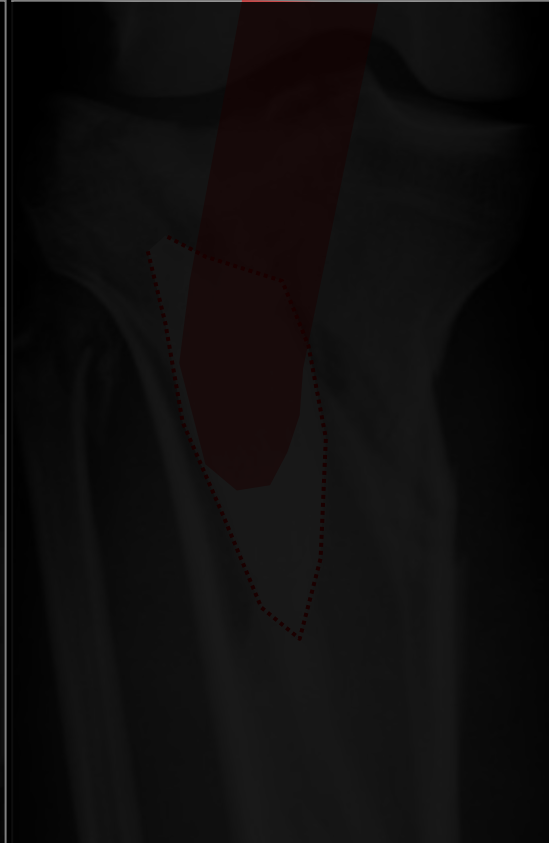
ligaments intact

"simple" Fx
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(AO B3.1)
(Schatzker III)



ACL (eminencia)
osseous avulsed

Fx dislocation
partial articular Fx
Moore II medial
(AO B3.2/B3.3)
(Schatzker IV)

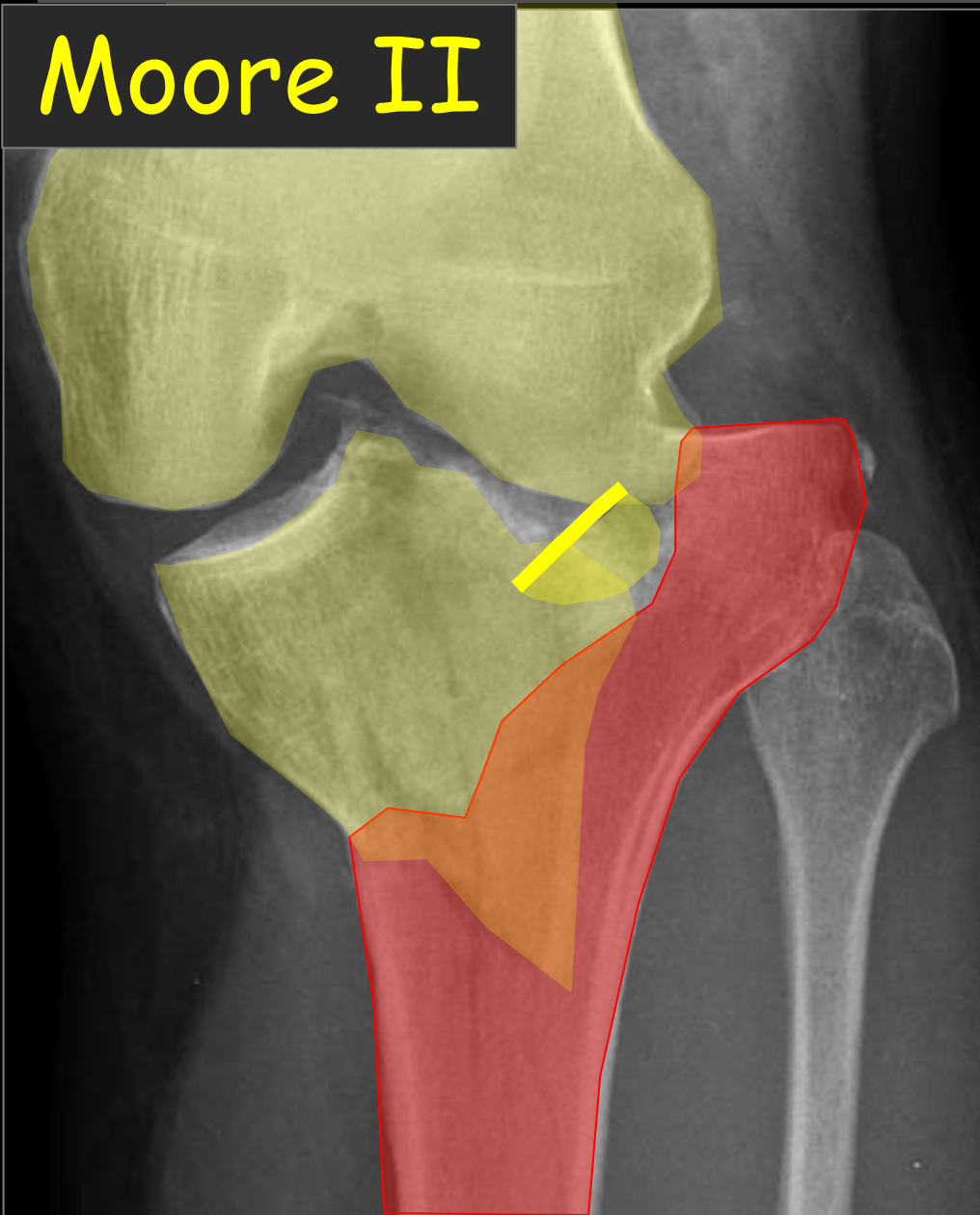


tuberosity
injured
lig pat "avulsed"

"Complex" Fx
complet articular Fx
AO C3.3
(Schatzker VI)

F.S., male, 42y, ski accident

Moore II

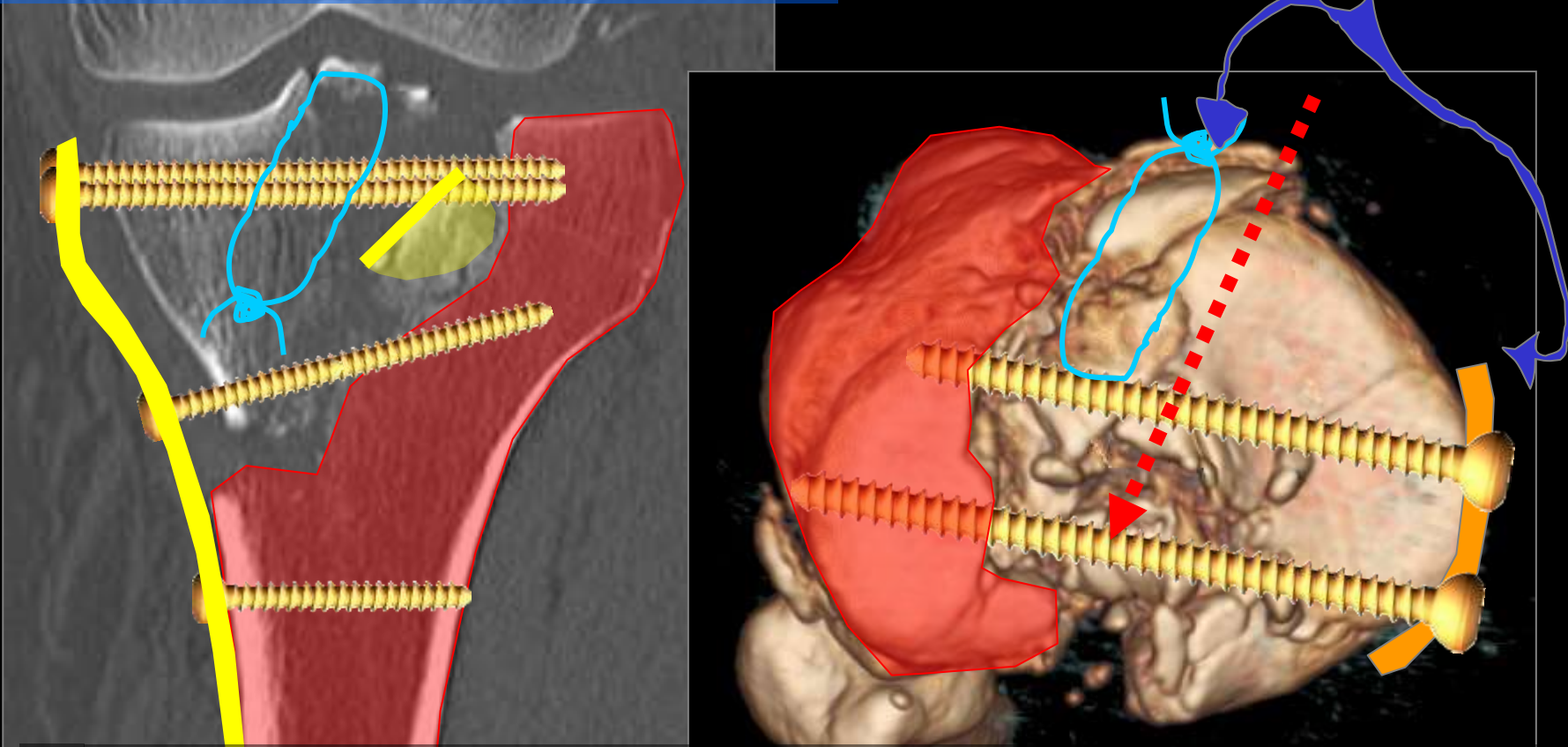


F.S., male, 42y, ski accident

3 operative goals

- reduction of postlat depression
- posteromedial buttressing
- fixation of tibial spine (ACL)

one (larger) antero-medial approach*



* Potocnik, Acklin, Sommer. Operative strategy in postero-medial fracture-dislocation of the proximal tibia. Injury, Int. J. Care Injured 42 (2011) 1060-1065.

L.M., female, 66y, ski accident

Moore II



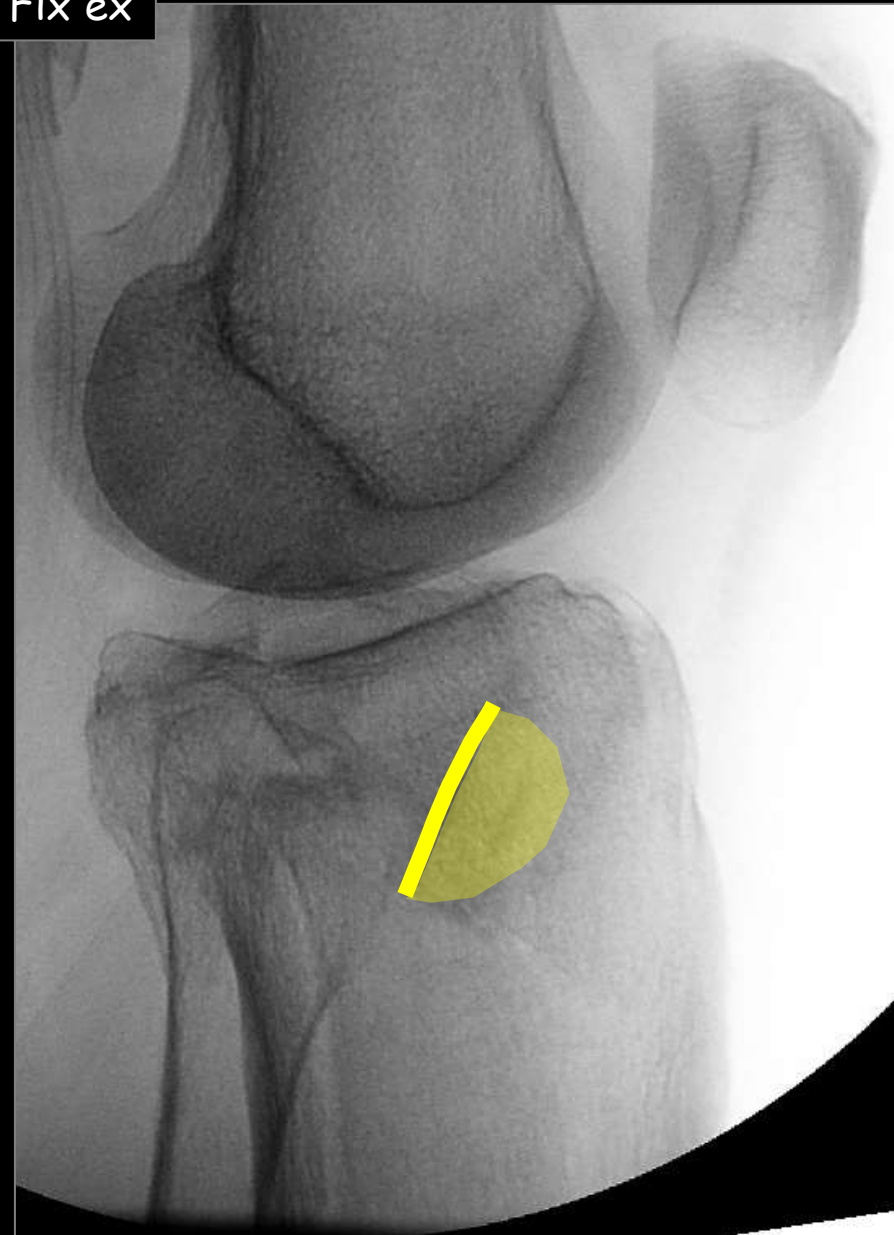
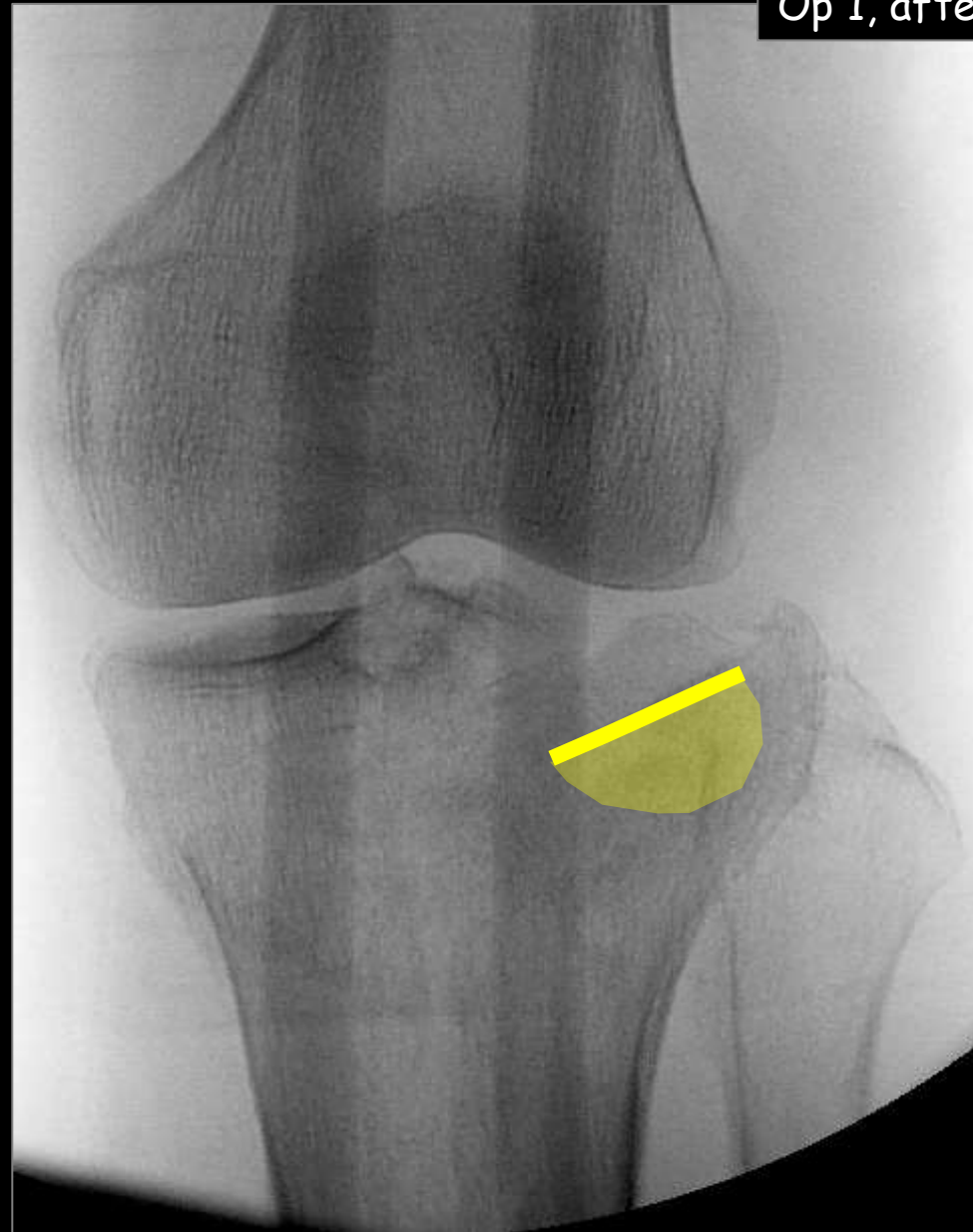
L.M., female, 66y, ski accident

Moore II



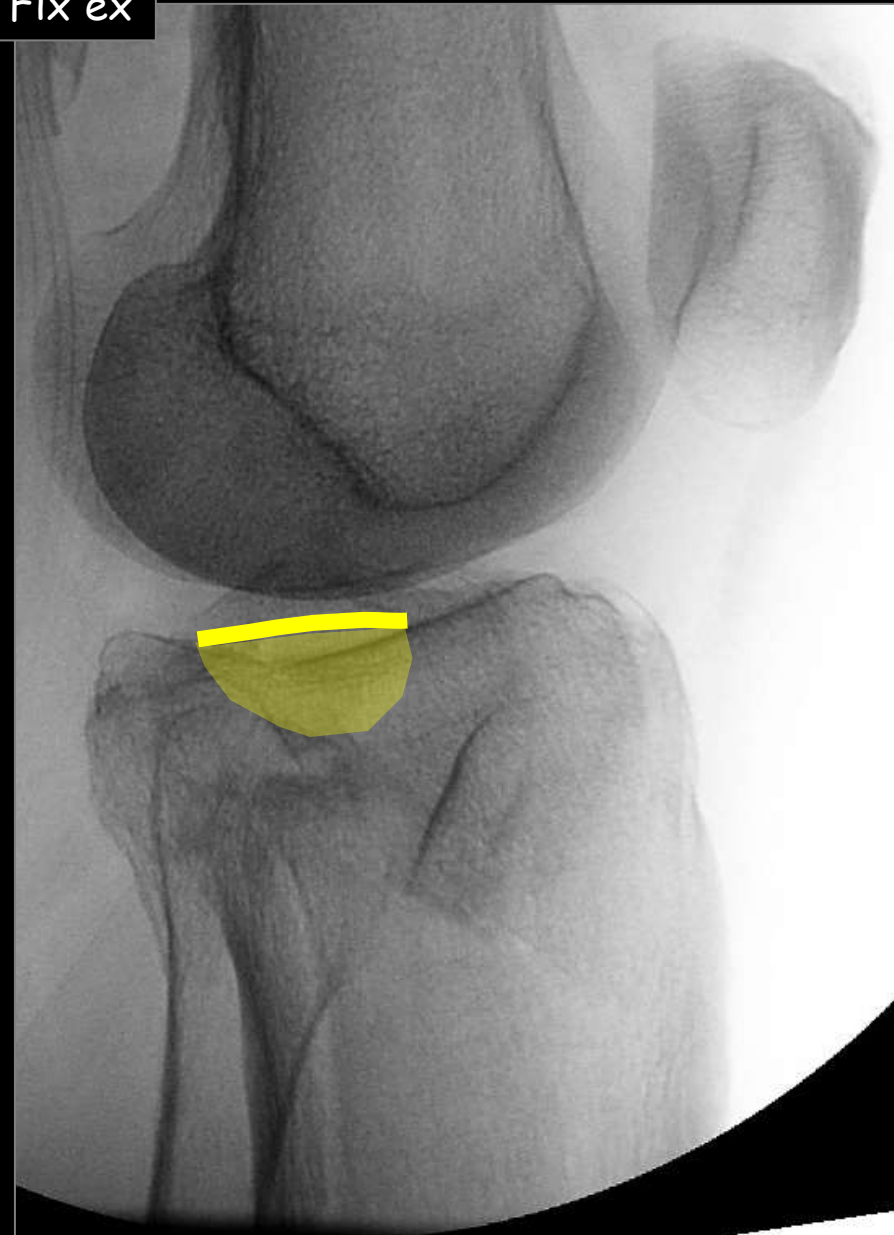
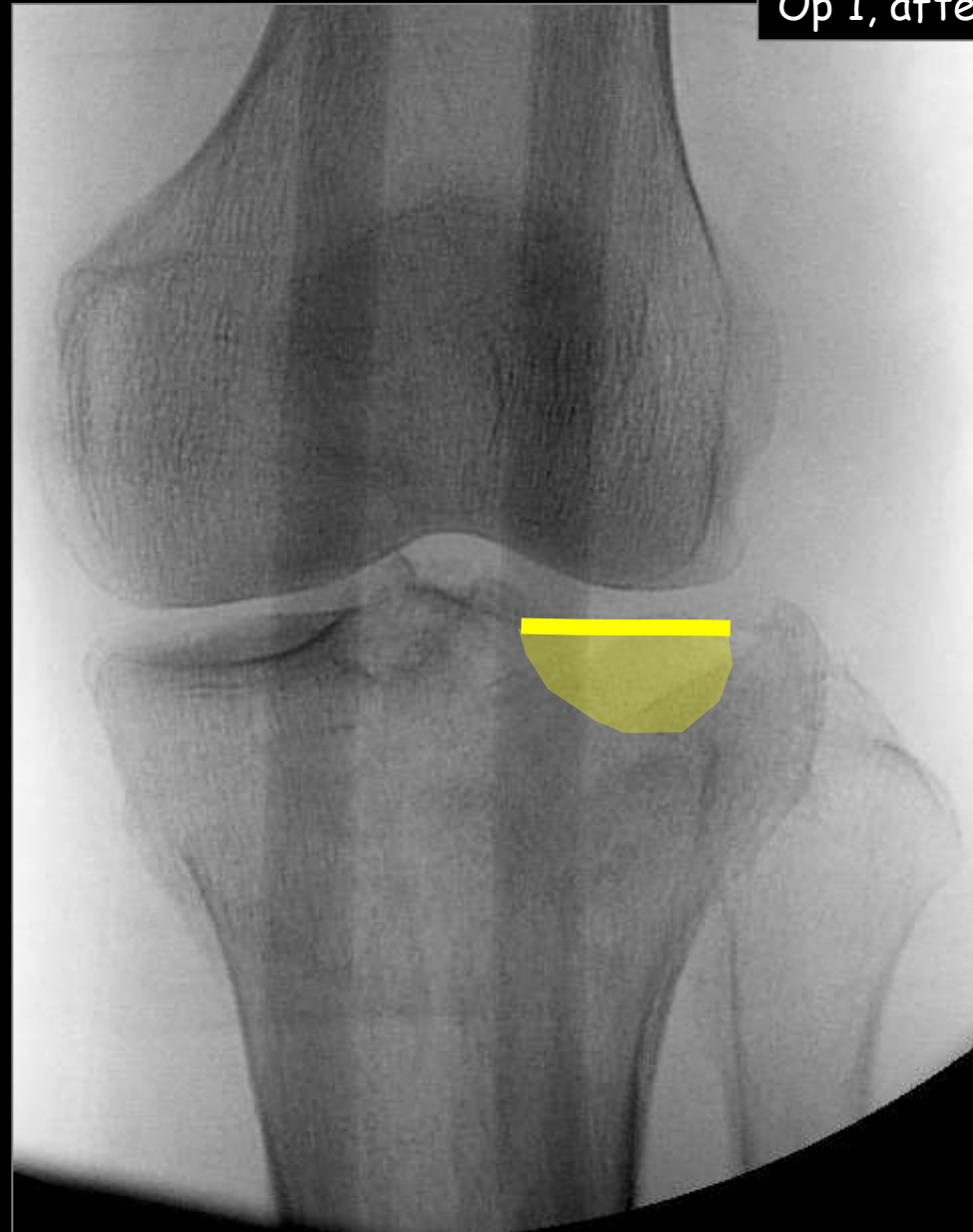
L.M., female, 66y, ski accident

Op 1, after Fix ex



L.M., female, 66y, ski accident

Op 1, after Fix ex



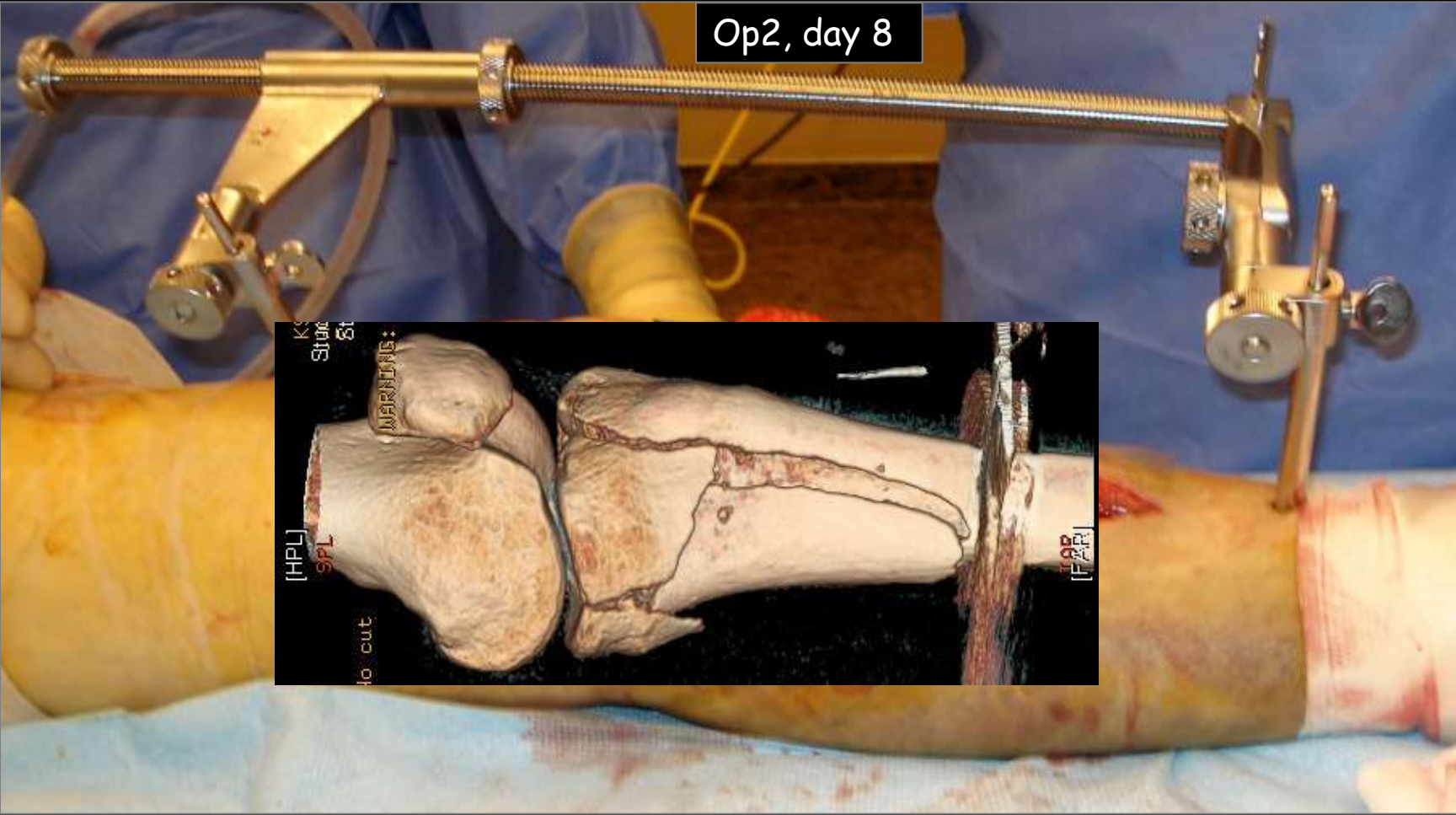
L.M., female, 66y, ski accident

Op2, day 8



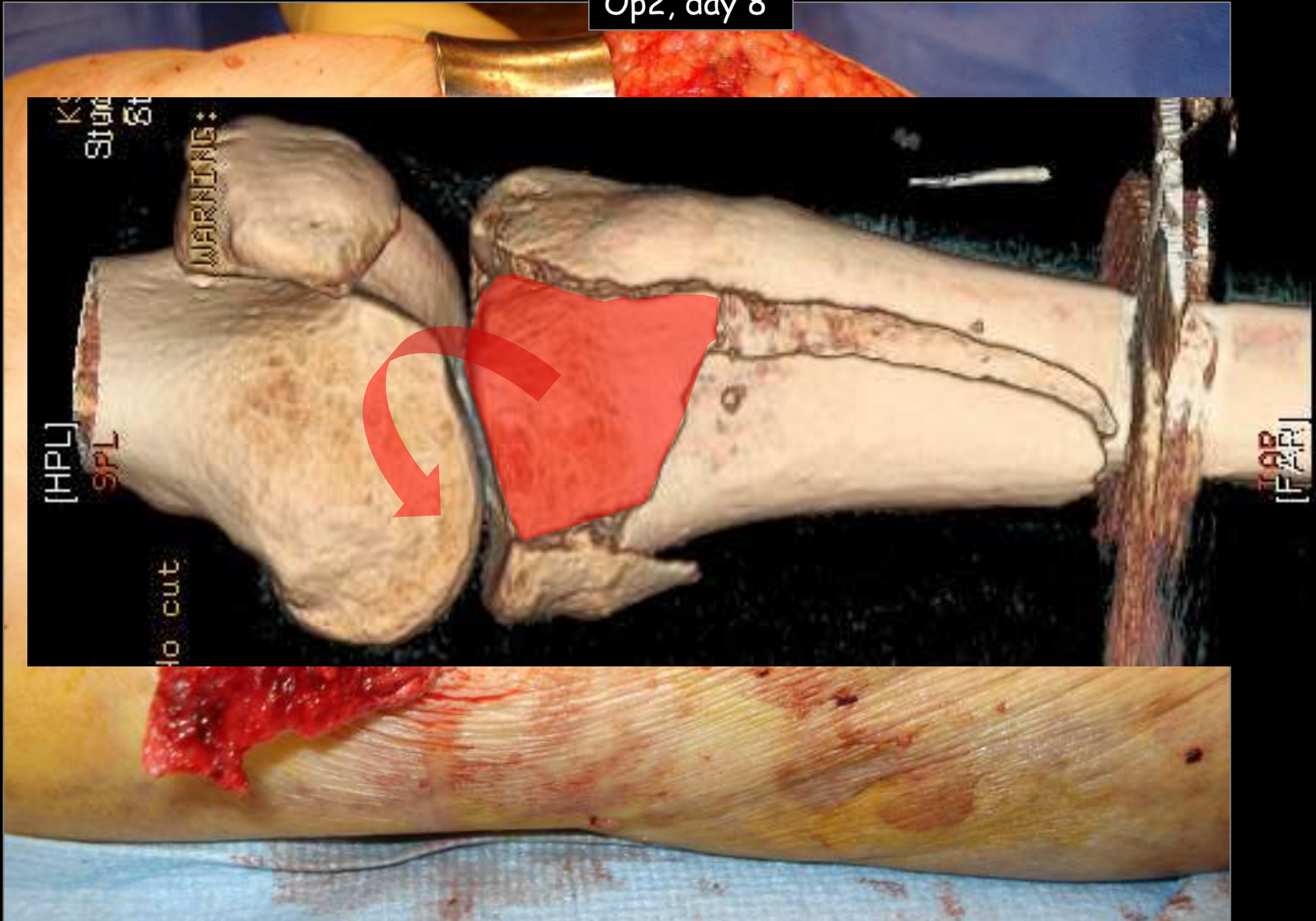
L.M., female, 66y, ski accident

Op2, day 8



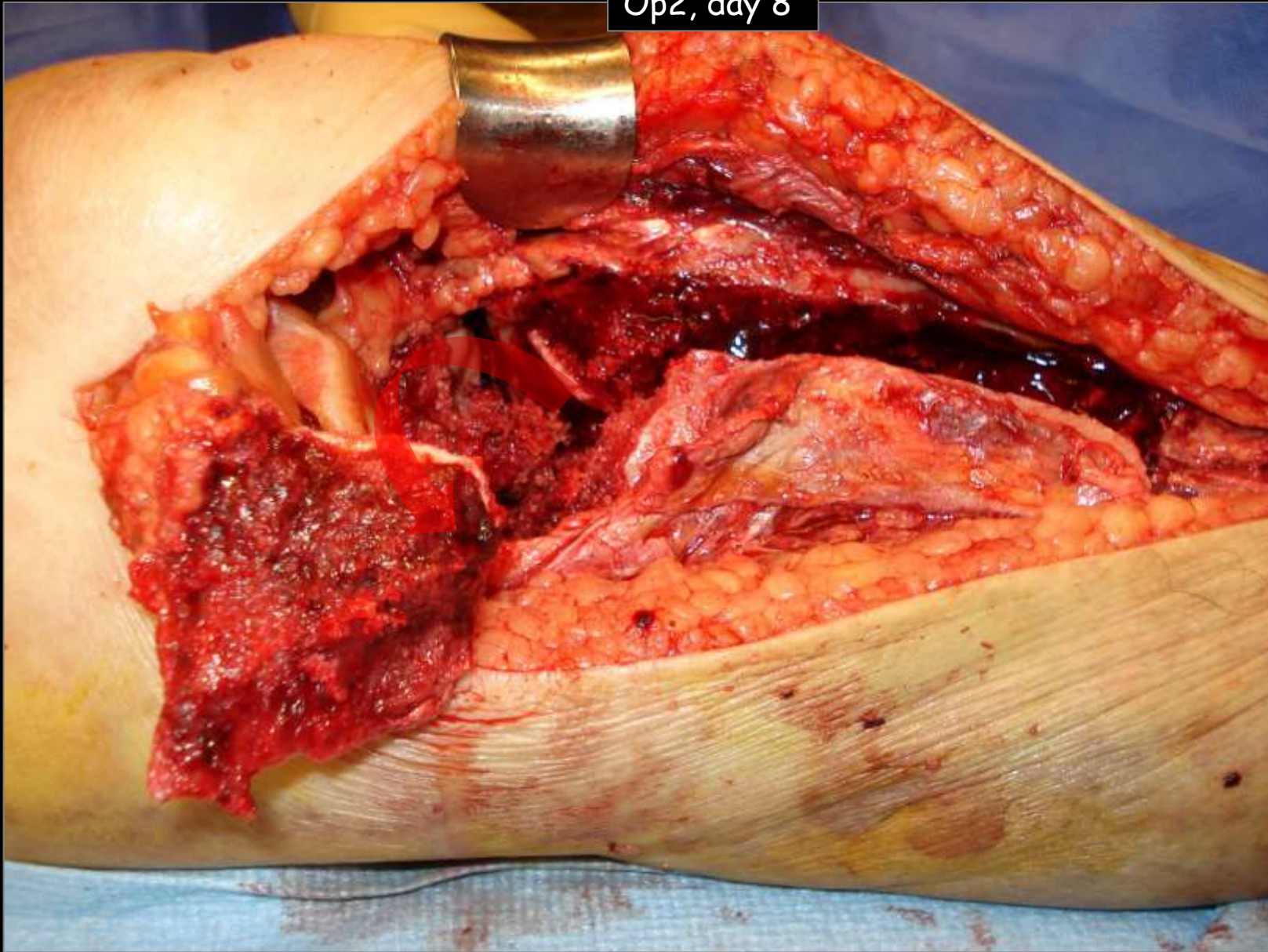
L.M., female, 66y, ski accident

Op2, day 8



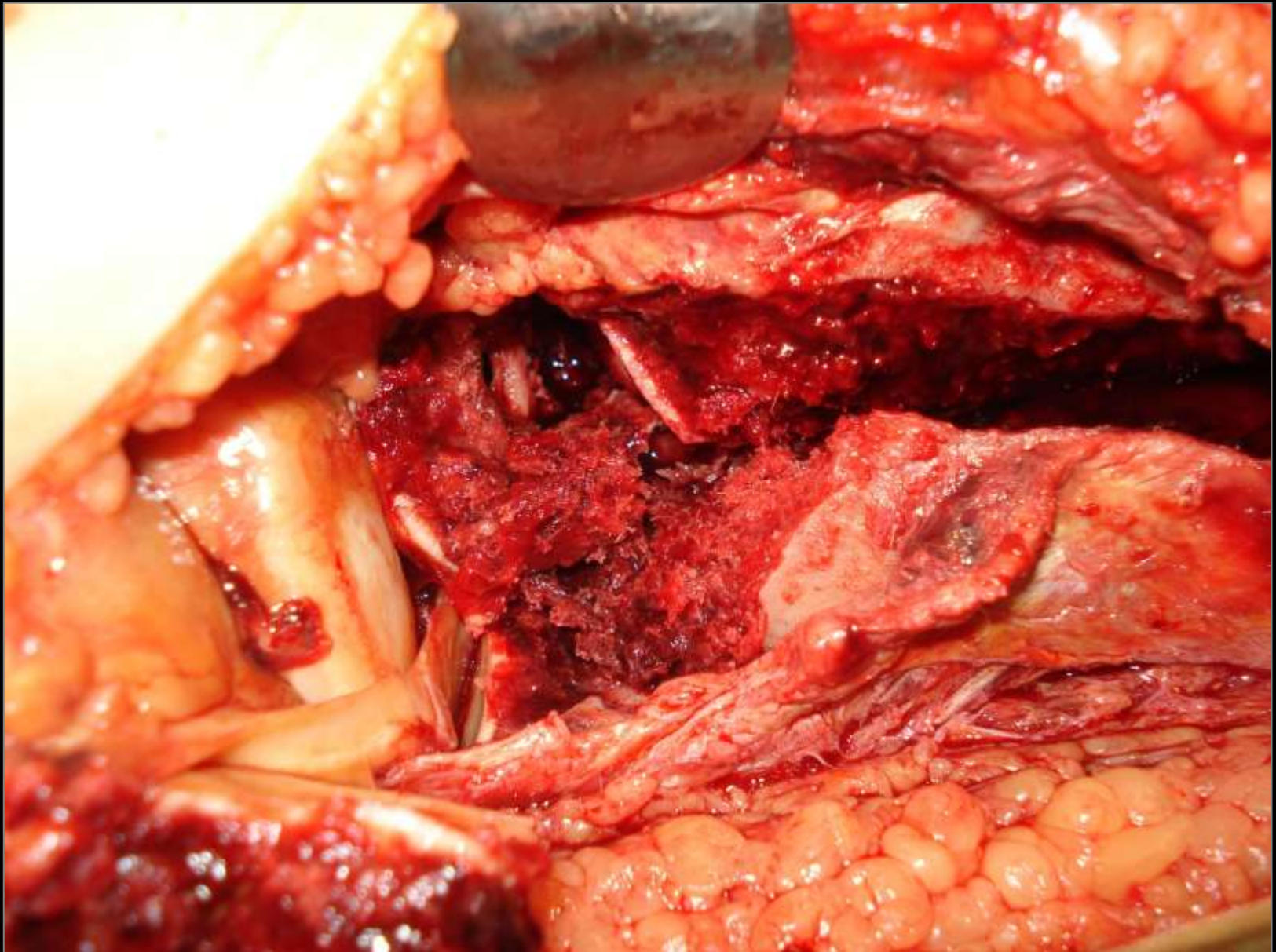
L.M., female, 66y, ski accident

Op2, day 8



L.M., female, 66y, ski accident

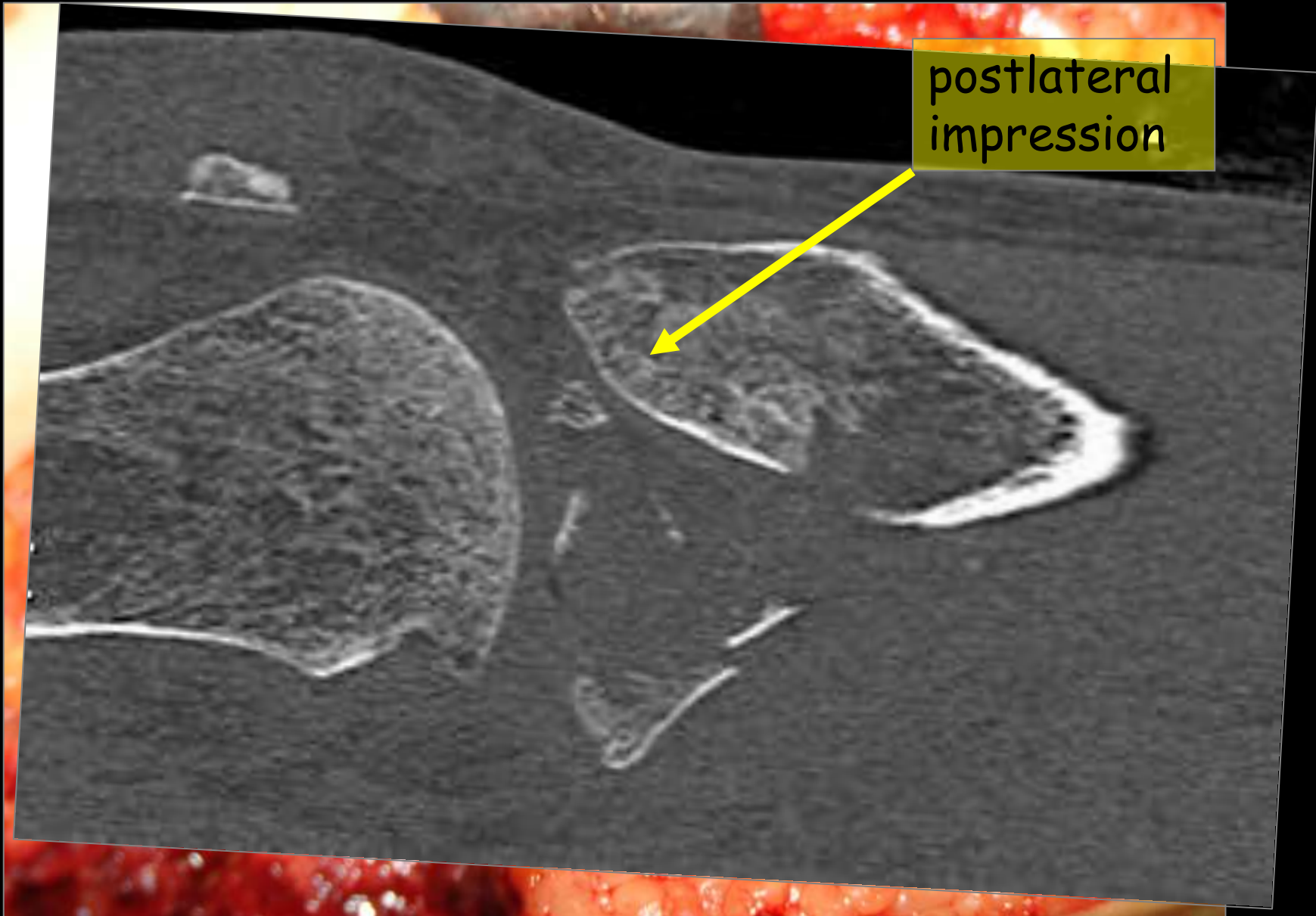
Op2, day 8



L.M., female, 66y, ski accident

Op2, day 8

postlateral
impression



L.M., female, 66y, ski accident

Op2, day 8



Reversed LCP medial distal tibia plate 3.5 (low bend)

L.M., female, 66y, ski accident

Op2, day 8



Reversed LCP medial distal tibia plate 3.5 (low bend)

L.M., female, 66y, ski accident

Postop 2



L.M., female, 66y, ski accident

17 months





Tibia plateau fractures- getting always worse !? **take home message**



- Worse with craving/artificial snow
- 3 typical fracture pattern
- «simple» fx: 1-staged procedure
- «complex» fx / fx dislocation: 2-staged
- Mostly: open surgery with plates/screws

3 operative goals

- reduction of postlat depression
- posteromedial buttressing
- fixation of tibial spine (ACL)

Postop: Free functional	Postop: No active extension against gravity/resistance	
ligaments intact	ACL (eminencia) osseous avulsed	tuberosity injured lig pat "avulsed"
"simple" Fx partial articular Fx split depression Fx (AO B3.1) (Schatzker II)	Fx dislocation partial articular Fx Moore II medial (AO B3.2/B3.3) (Schatzker IV)	"Complex" Fx complet articular Fx AO C3.3 (Schatzker VI)

3h after injury

⇒ DCO Damage Control Orthopedics

