

NORDICFORUM www.nordictraumarad.com
TRAUMA & EMERGENCY RADIOLOGY

Trauma Radiology

11th Nordic Course

May 2024

Stockholm

AAST
Grading

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TRAUMA & EMERGENCY RADIOLOGY

Boring! In the late 1980s, the American Association for the Surgery of Trauma (AAST) formed an Organ Injury Scale (OIS) committee including trauma, orthopaedic surgery, urology, and neurosurgery specialists in order to create a more comprehensive classification.

Boring! Abbreviated Injury Scale - developed in 1971 in collaboration with the automotive industry to improve vehicle safety, as well as the Injury Severity Score - developed in 1974, first to predict survival Abdominal Trauma Index - developed in 1981, updated for blunt trauma in 1990, organ-specific injury grading, estimating morbidity/mortality

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Boring!

Purpose

Enable research

Promote communication

Promote methodological
developments

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TRAUMA & EMERGENCY RADIOLOGY

Boring!

Purpose

Enable research

Promote communication (with radiologists??

Promote methodological developments

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TRAUMA & EMERGENCY RADIOLOGY

No Radiologists

Developed by surgeons
using surgical methods

Grading can be your best friend

But

On call

Alone

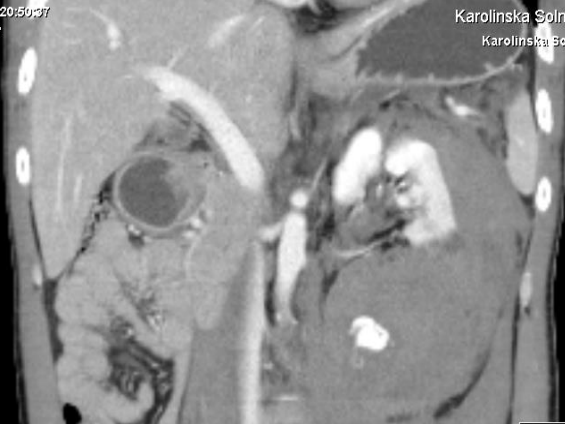
Unstable patient

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2012-05-08, 20:59:37
44887038 01



Karolinska Solna Trauma
Karolinska Solna Trauma
27
Q, R

26
Q, R
1.0

C: 50.0, W: 350.0



Karolinska Solna Trauma
25
Q, R

C: 50.0, W: 350.0

- Shattered kidney, lower pole not enhancing, active LARGE extravasation

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Most common

- liver
- kidney
- spleen
- pancreas

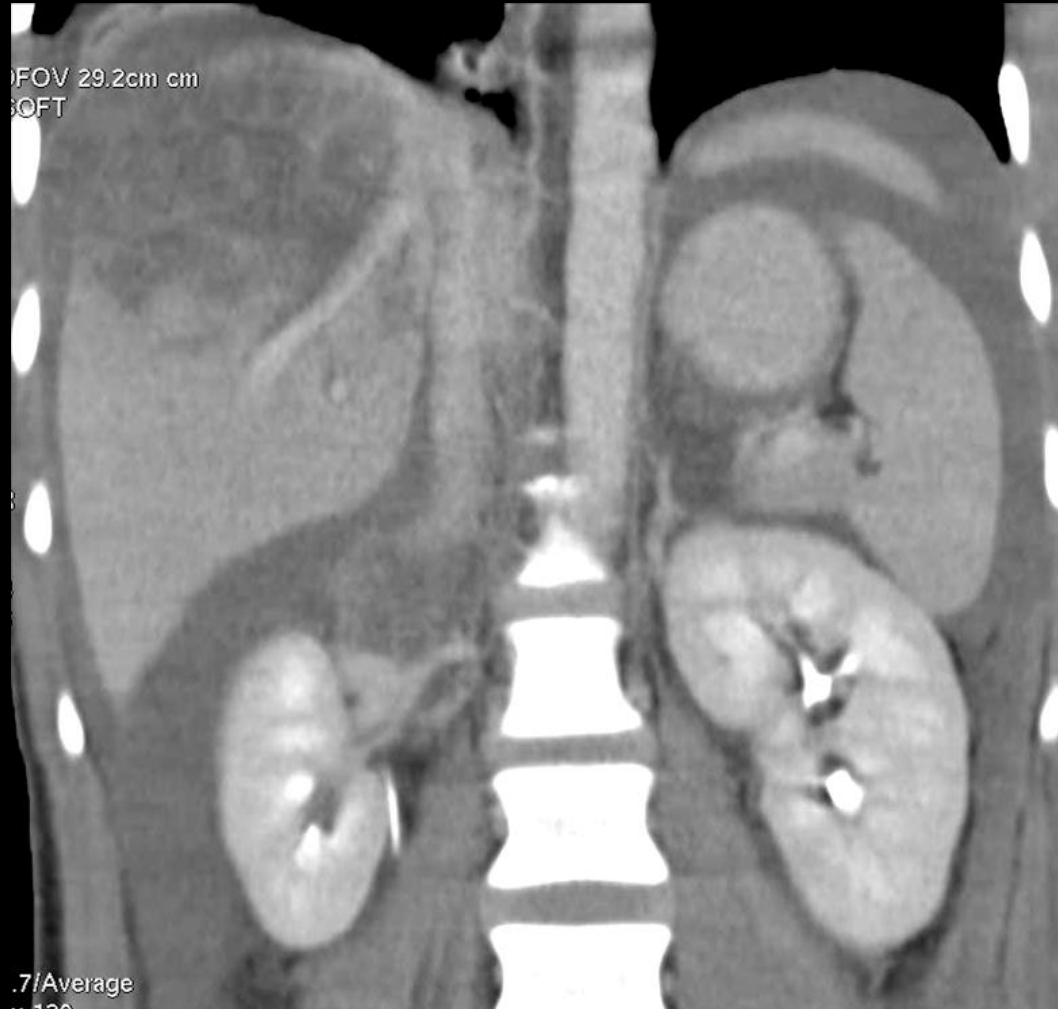
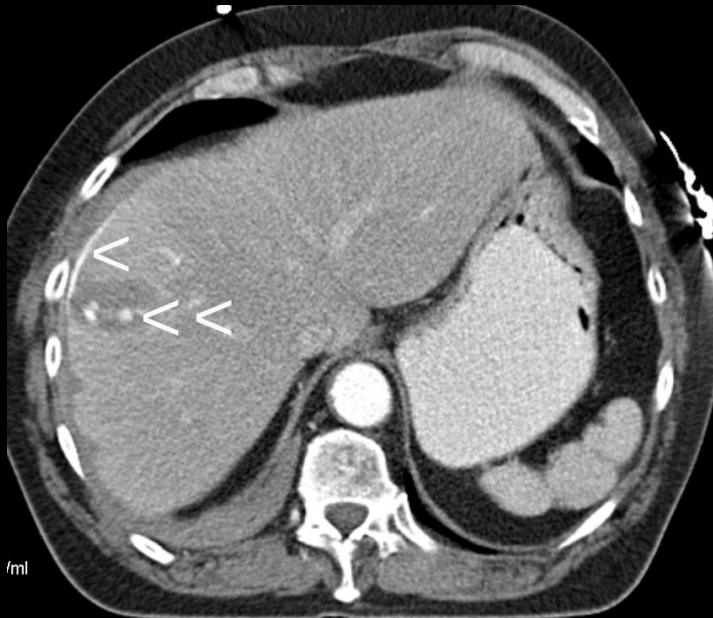
Many many more

- cervical vascular injury
- chest wall
- heart
- lung
- thoracic vascular injury
- diaphragm
- extrahepatic biliary tree
- oesophagus
- stomach
- small bowel
- colon
- rectum
- abdominal vascular injury

- ureter
- bladder
- urethra
- uterus
 - pregnant
 - non-pregnant
- fallopian tube
- ovary
- vagina
- vulva
- testis
- scrotum
- penis
- peripheral vascular organ injury

Most common

- liver



TRAUMA & EMERGENCY RADIOLOGY

- **grade I**
 - hematoma: subcapsular, <10% surface area
 - laceration: capsular tear, <1 cm parenchymal depth
- **grade II**
 - hematoma: subcapsular, 10-50% surface area
 - hematoma: intraparenchymal <10 cm diameter
 - laceration: capsular tear 1-3 cm parenchymal depth, <10 cm length
- **grade III**
 - hematoma: subcapsular, >50% surface area; ruptured subcapsular or parenchymal hematoma
 - hematoma: intraparenchymal >10 cm
 - laceration: capsular tear >3 cm parenchymal depth
 - vascular injury with active bleeding contained within liver parenchyma
- **grade IV**
 - laceration: parenchymal disruption involving 25-75% of a hepatic lobe or involves 1-3 [Couinaud segments](#)
 - vascular injury with active bleeding breaching the liver parenchyma into the peritoneum
- **grade V**
 - laceration: parenchymal disruption involving >75% of hepatic lobe
 - vascular: juxtahepatic venous injuries (retrohepatic vena cava / central major hepatic veins)

TRAUMA & EMERGENCY RADIOLOGY

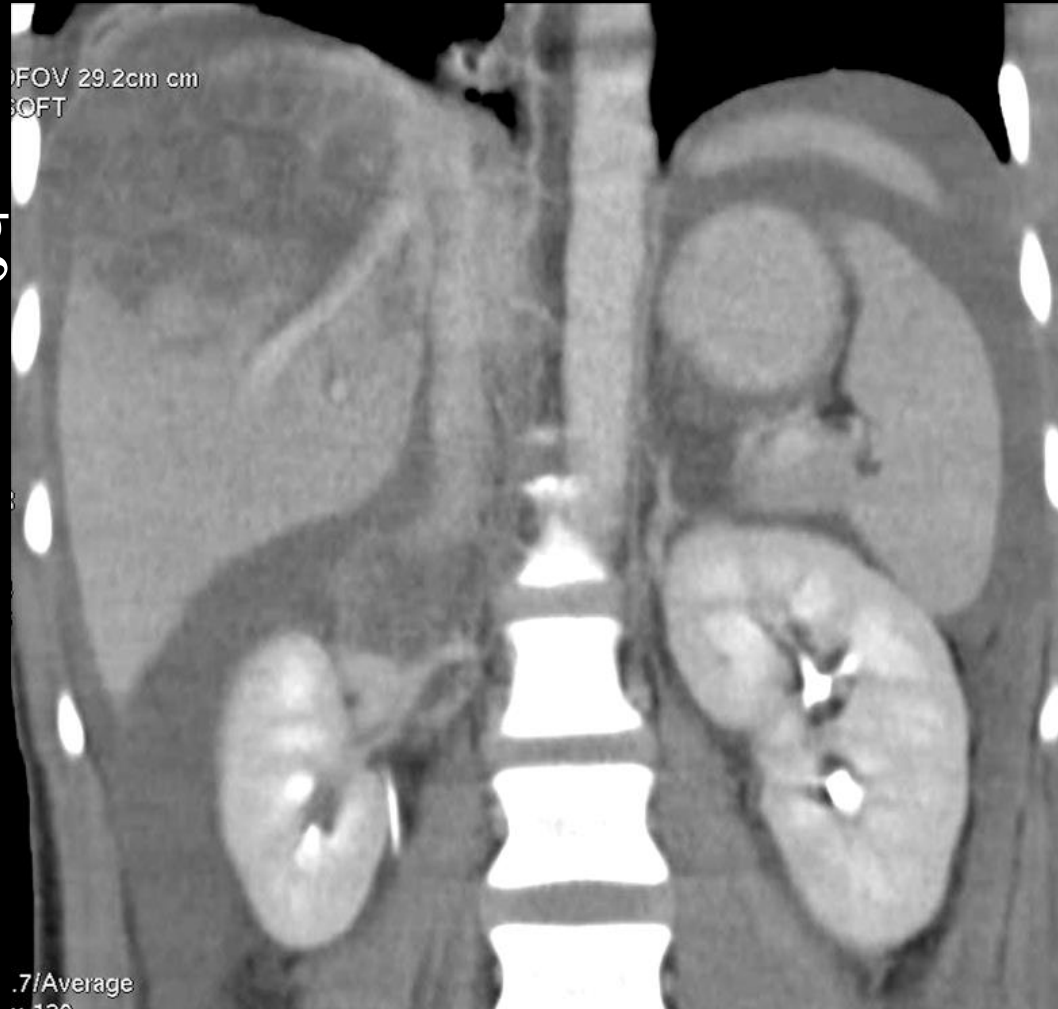
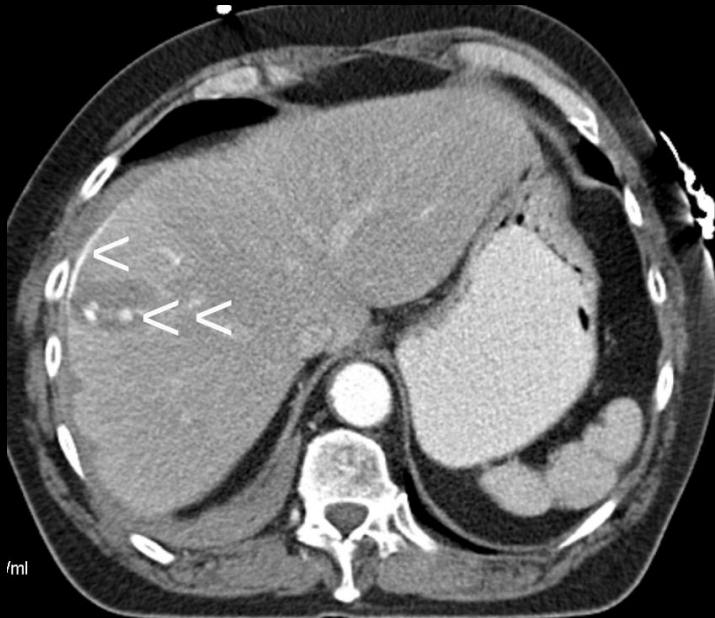
- **grade I**
 - hematoma: subcapsular, <10% surface area
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 - hematoma: subcapsular, 10-50% surface area
 - hematoma: intraparenchymal <10 cm diameter
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 - hematoma: subcapsular, >50% surface area; ruptured subcapsular or parenchymal hematoma
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Grade IV
Active bleeding

- liver



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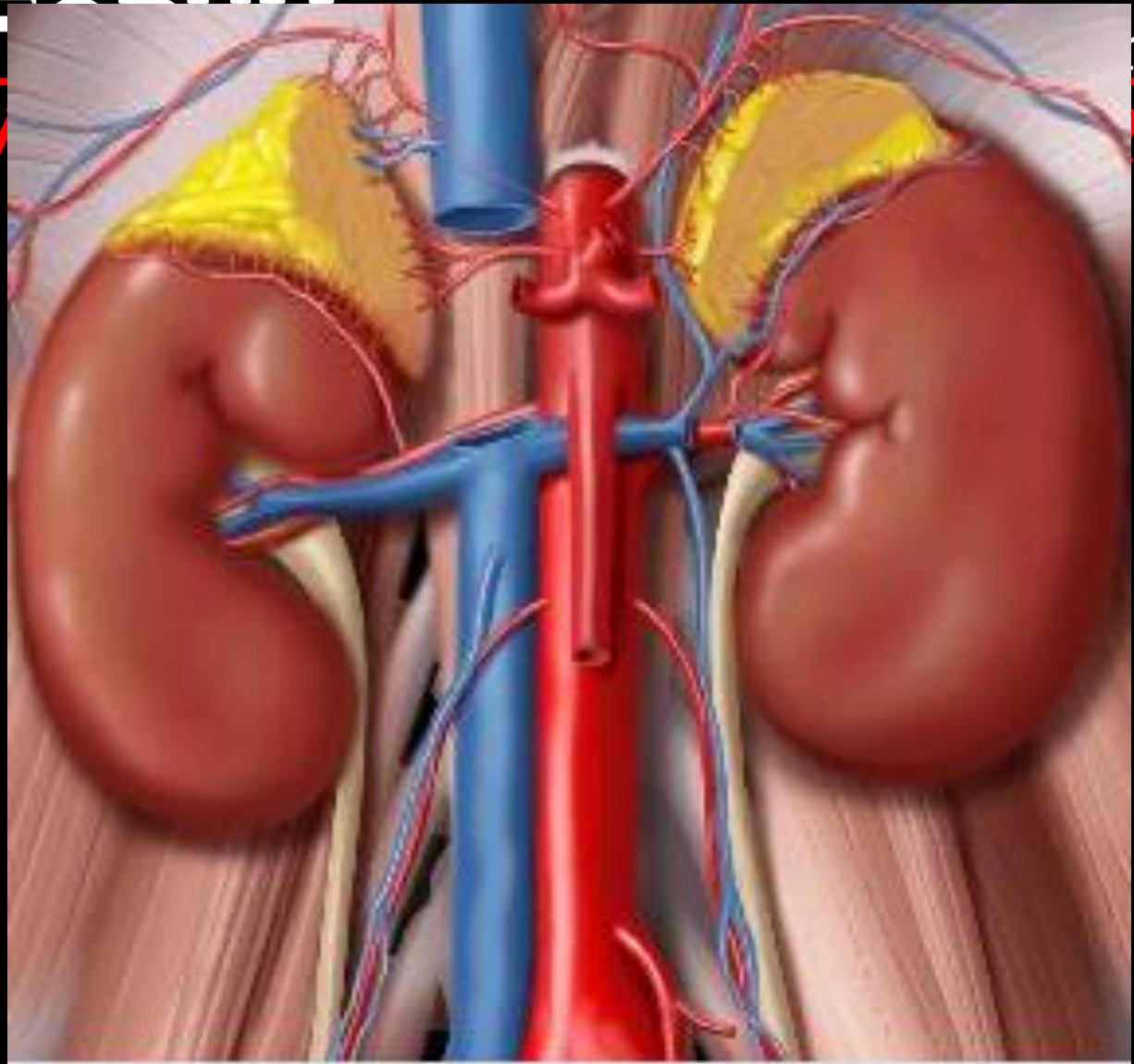
TRAUMA & EMERGENCY RADIOLOGY

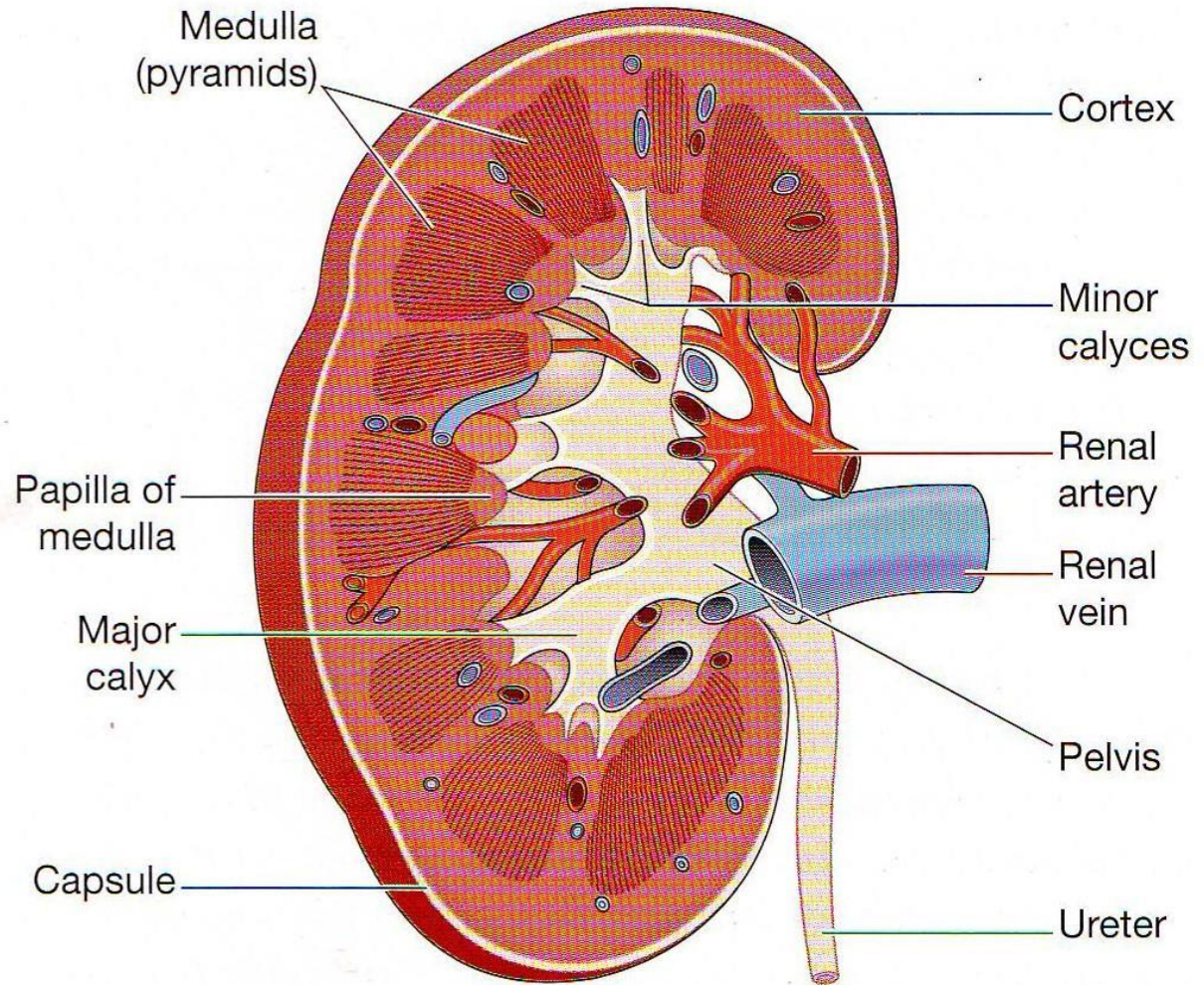
Most common

- liver
- kidney
- spleen
- pancreas

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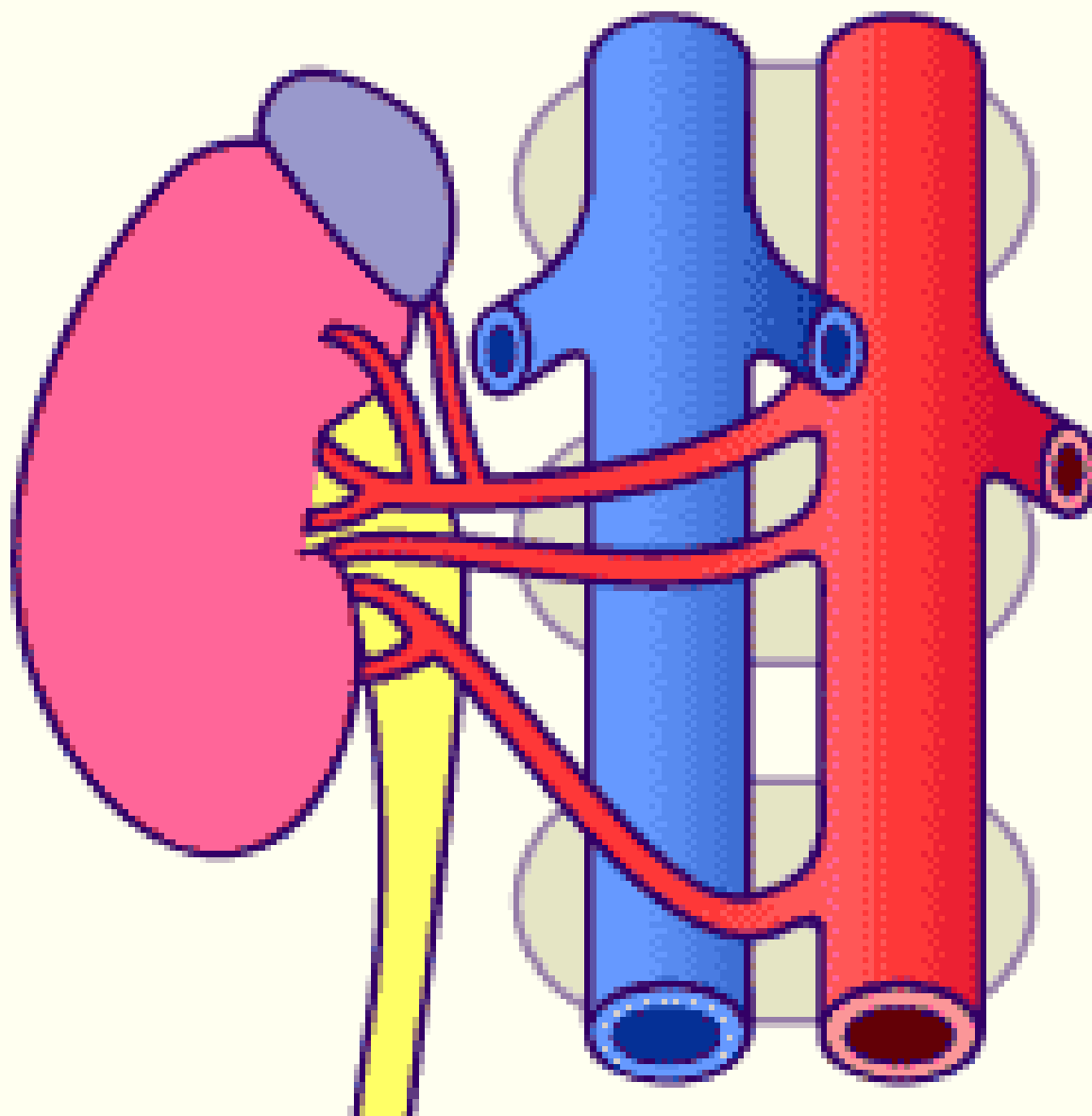
TRAUMA





A longitudinal section of the right kidney.

No



l.com
OGY

Renal Trauma Classification

Class I- Renal contusion or contained subcapsular haematoma

Class II - Cortical laceration without urinary extravasation

Class III - Parenchymal lesion extending more than 1 cm into renal substance

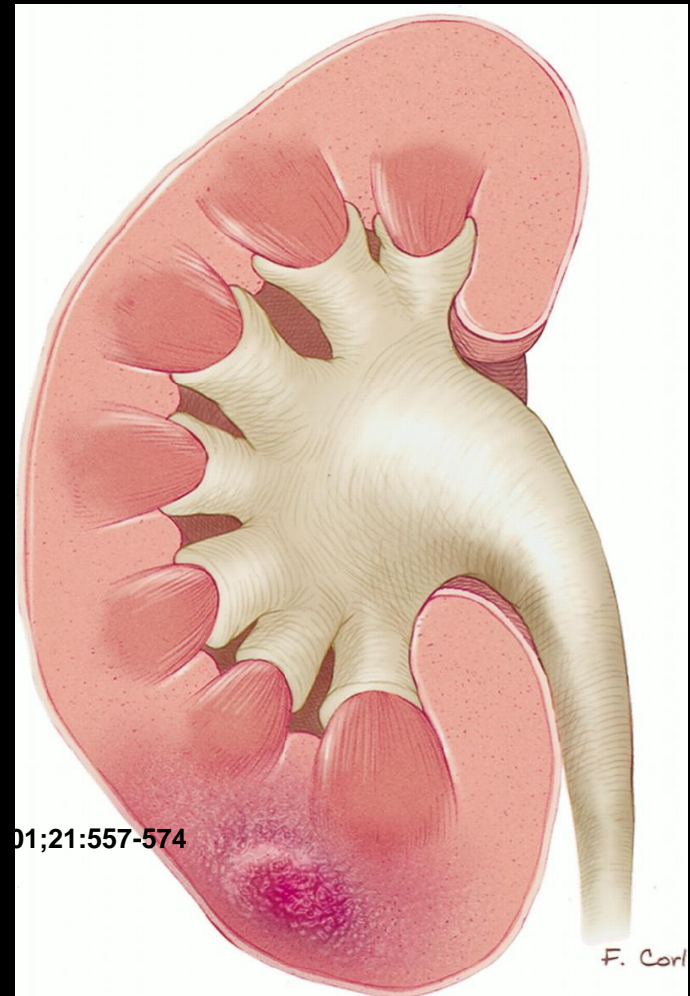
Class IV - Laceration extending across cortico-medullary junction

Class V - Renal fragmentation or reno-vascular pedicle injury

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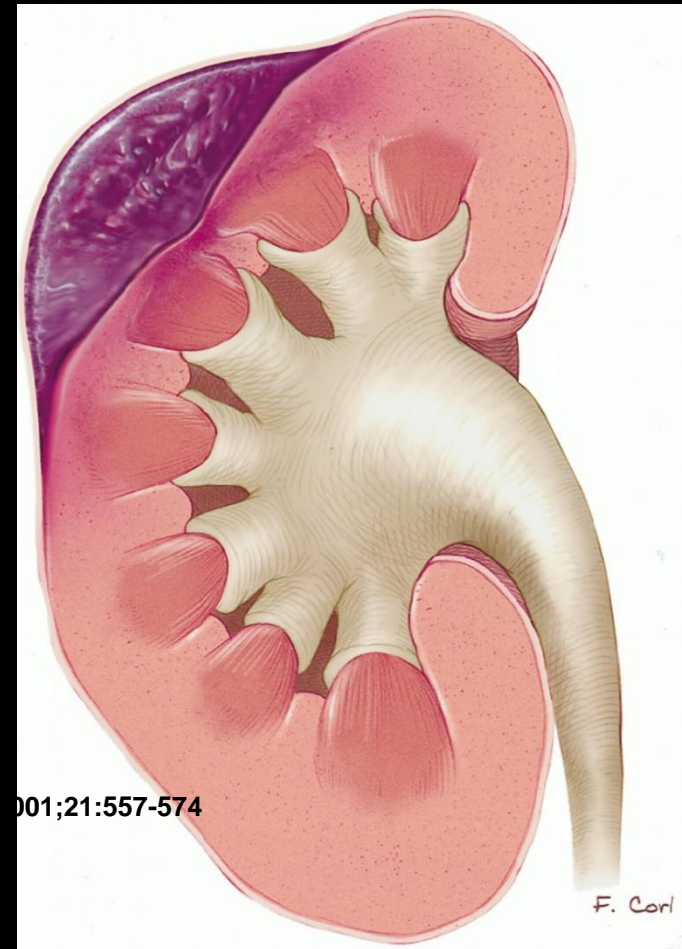
Class I - Renal contusion or contained subcapsular haematoma



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TRAUMA & EMERGENCY RADIOLOGY

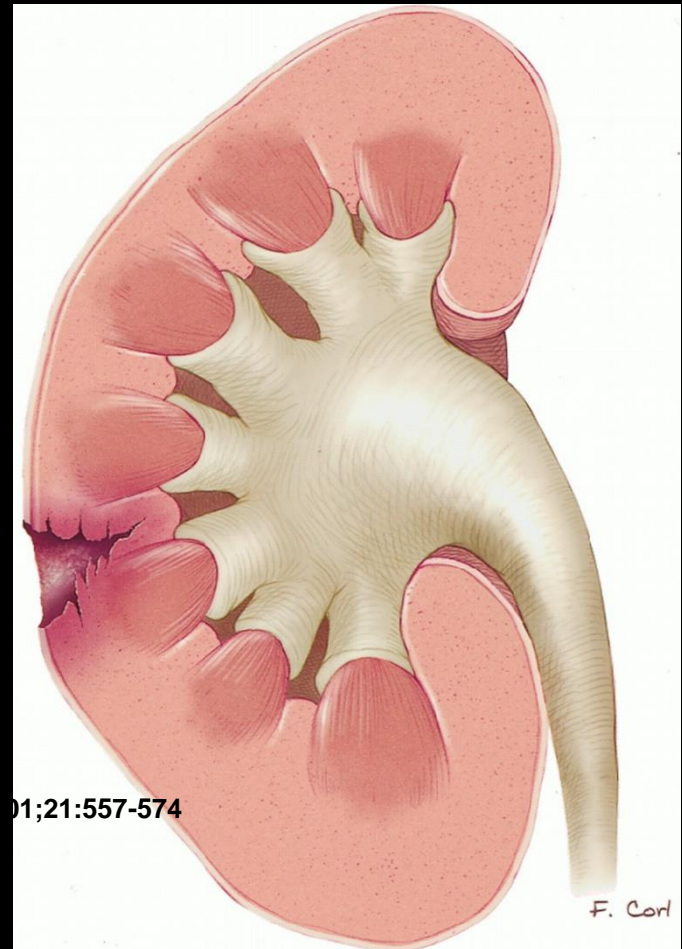
Class I - Renal contusion or contained subcapsular haematoma



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Class II - Cortical laceration without urinary extravasation

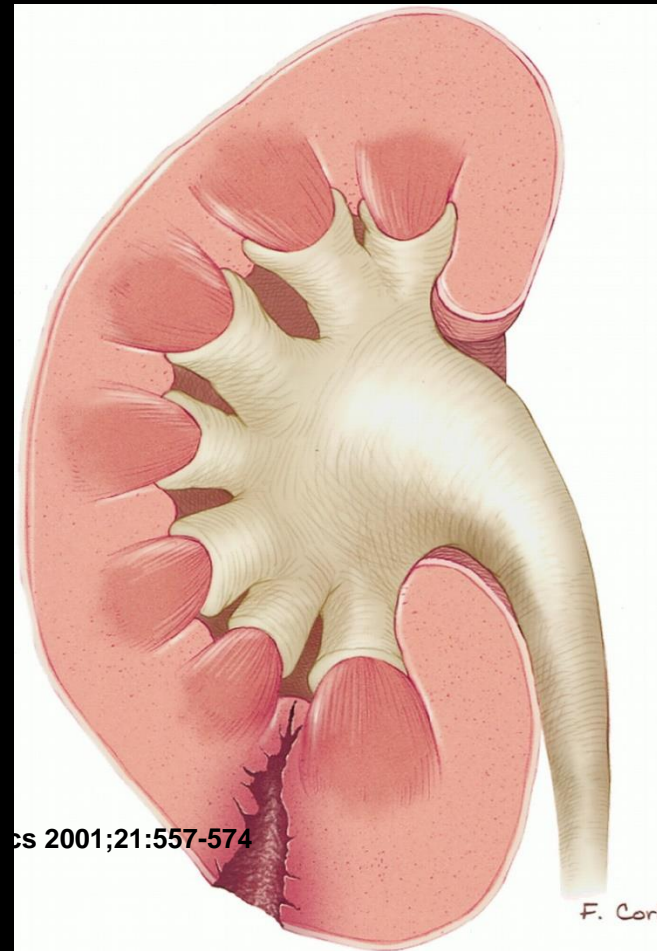


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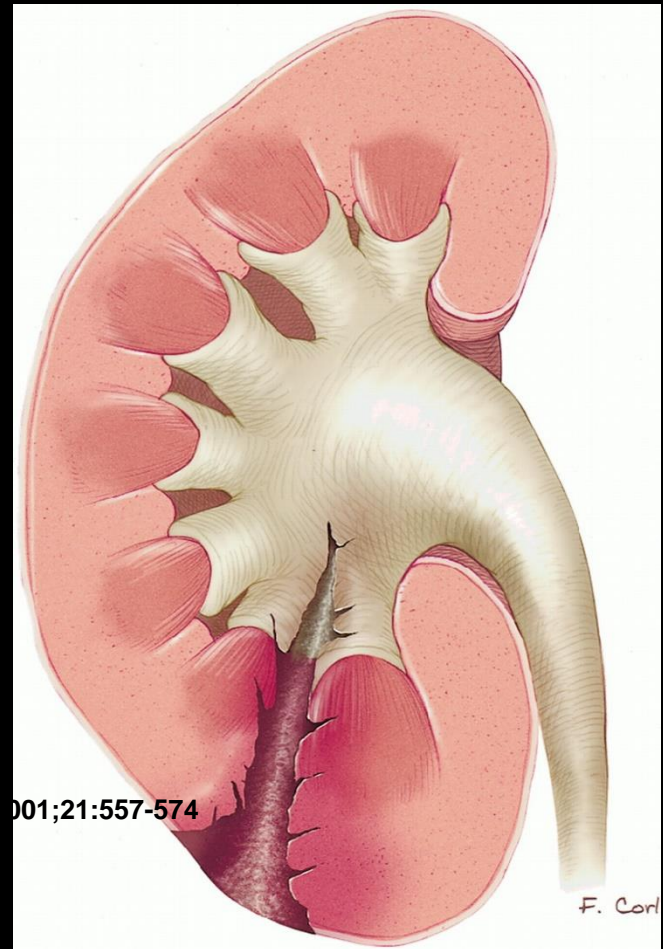
Class III - Parenchymal lesion extending more than 1 cm into renal substance



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TRAUMA & EMERGENCY RADIOLOGY

Class IV - Laceration extending across cortico-medullary junction

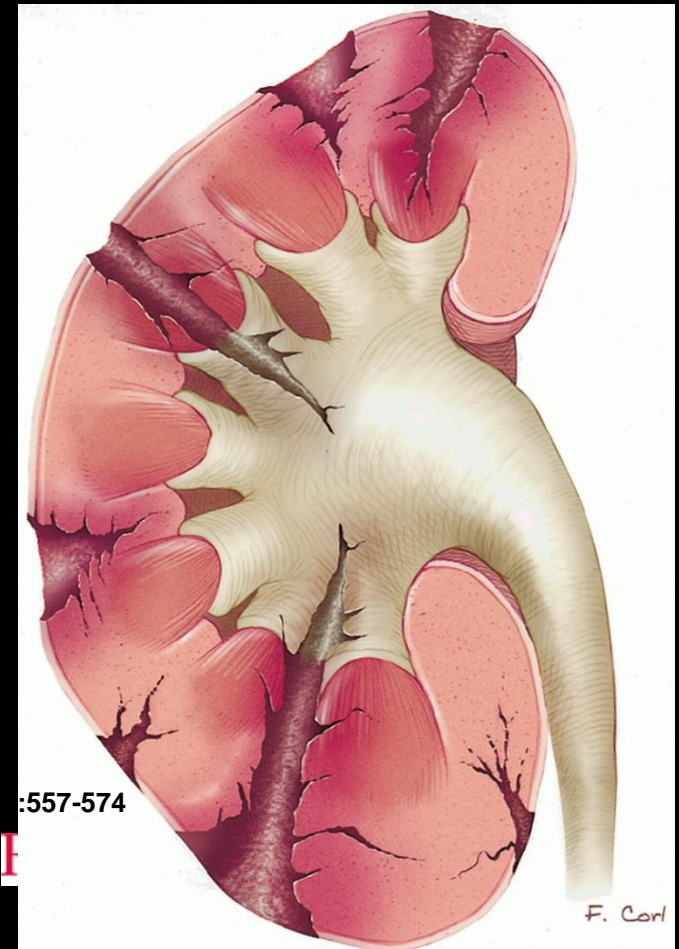


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Class V - Renal fragmentation or reno-vascular pedicle injury

Class V - Renal fragmentation **Or reno-vascular pedicle injury**



Outside classification
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Pseudoaneurysms

Ureter transection/obstruction

Segmental infarcts

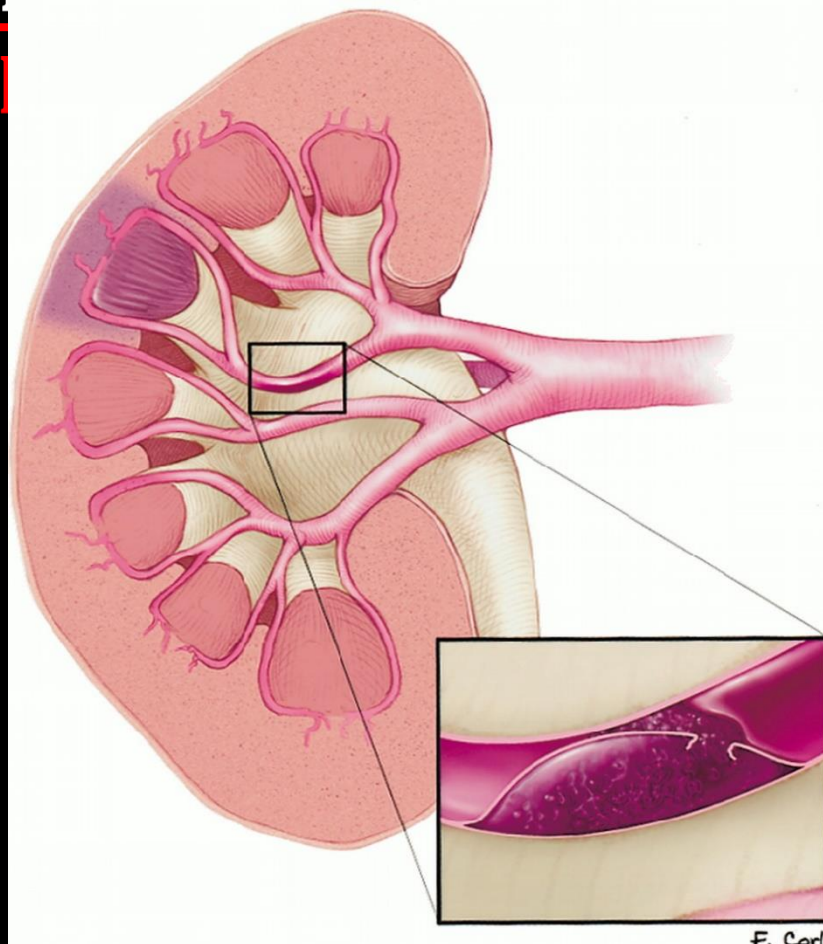
Renal artery thrombosis

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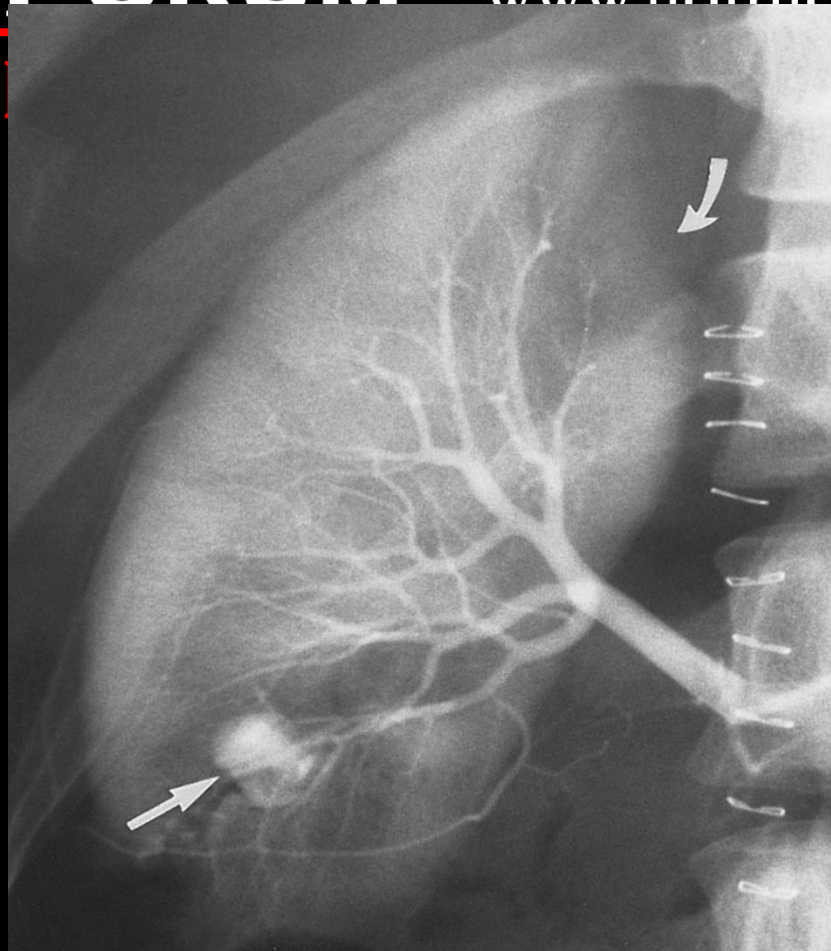
RadioGraphics

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RadioGraphics

Renal Trauma Management

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80% injuries are minor (Class I/II) and can be managed conservatively

Early surgical intervention is required for:

- Reno-vascular pedicle injury
- Pelviureteric junction disruption
- Shock with signs of intraperitoneal or retroperitoneal trauma

Surgery should be performed through a midline incision and transperitoneal approach

Control of the renal pedicle should be obtained before the retroperitoneal haematoma is opened

Bike handle accident

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Karolinska Solna Trauma

11



2012-05-08, 21:04:21
44887038 01



Karolinska Solna Trauma

Karolinska Solna Trauma

32



2012-05-08, 20:49:34
44887038 01



Karolinska Solna Trauma

Karolinska Solna Trauma

21



C: 40.0, W: 400.0

C: 50.0, W: 350.0

2h later late phase no
urinary extravasation
Blood also in abdominal
cavity
Still large arterial
bleeding

Bike handle accident NORDIC FORUM

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2012-05-08, 22:21:06
44887133 01

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TRAUMA & EMERGE

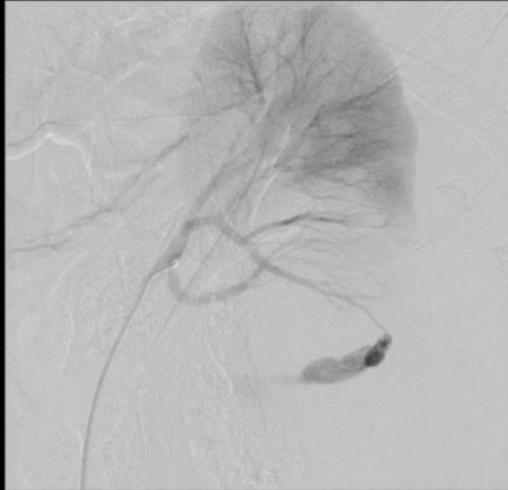
1



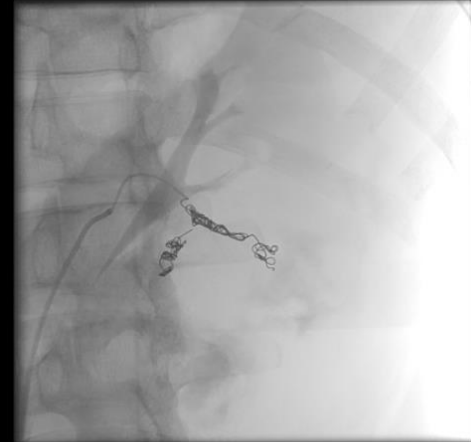
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44887133 01

Karolinska Universitetssjukhuset Solna
Karolinska Universitetssjukhuset Solna

1



C: 2047.0, W: 4095.0



C: 2047.0, W: 4095.0

>>angio 1h later
Coiling

N

19-500725-0359 1800-01-01

Okänd, Man,

2007-03-18, 01:04:03

31443200 01

Karolinska Solna Trauma

CT

70m

3Y

Serienr: 8
Bildnr: 69
Antal bilder: 157
FoV: 450 mm
Bords pos: -821.5
F: STANDARD
90ml Optiray350

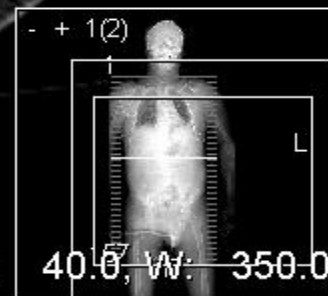
120 kV
200 mA

Snitt: 5mm
Gantry: 0°
Tid: 400 ms



L

P



C: 40.0, W: 350.0

19-500725-0359 1800-01-01

Okand, Man.

2007-03-18, 03:22:49

31443213 01

KAROLINSKA Sjukh

XA

1

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C: 127.5, W: 255.0

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Most common

- liver
- kidney
- spleen
- pancreas

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- grade I
 - subcapsular hematoma <10% of surface area
 - parenchymal laceration <1 cm depth
 - capsular tear
- grade II
 - subcapsular hematoma 10-50% of surface area
 - intraparenchymal hematoma <5 cm
 - parenchymal laceration 1-3 cm in depth
- grade III
 - subcapsular hematoma >50% of surface area
 - intraparenchymal hematoma \geq 5 cm
 - parenchymal laceration >3 cm in depth
 - ruptured subcapsular or intraparenchymal hematoma

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- **grade IV**
 - any injury in the presence of a splenic **vascular injury*** or **active bleeding** confined within splenic capsule
 - parenchymal laceration involving segmental or hilar vessels producing >25% devascularisation
- **grade V**
 - shattered spleen
 - any injury in the presence of splenic vascular injury* with **active bleeding extending beyond the spleen** into the peritoneum



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Compressed 11:1
IM: 239 SE: 3



- Spleen grade 3 be cool
- Grade 4 and 5 INTERVENTION

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□ Additional points

- advance one grade for multiple injuries, each up to grade III
- "vascular injury" (i.e. pseudoaneurysm or AV fistula) appears as a focal collection of vascular contrast which decreases in attenuation on delayed images
- "active bleeding" - focal or diffuse collection of vascular contrast which increases in size or attenuation on a delayed (i.e. later) phase

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TRAUMA & EMERGENCY RADIOLOGY

- liver
- kidney
- spleen

- pancreas

TRAUMA & EMERGENCY RADIOLOGY

Pancreas

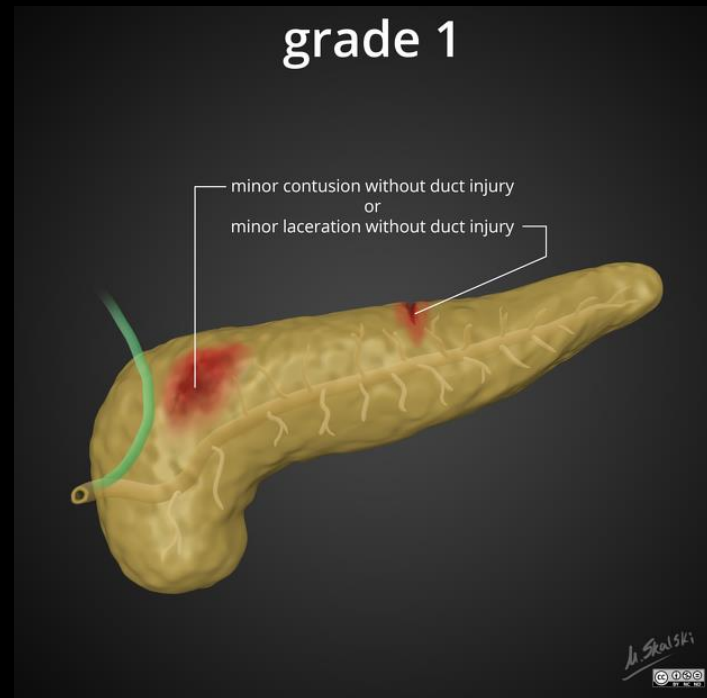
- **grade I:** hematoma with minor contusion or superficial laceration without duct injury
 - **grade II:** major contusion or laceration without duct injury
 - **grade III:** distal transection or deep parenchymal injury with duct injury
 - **grade IV:** proximal transection or deep parenchymal injury involving the ampulla (and/or intrapancreatic common bile duct)
 - **grade V:** massive disruption of the pancreatic head ("shattered pancreas")
- N.b. **advance one grade** for multiple injuries up to grade 3.

- The *proximal* pancreas is defined as the gland to the right of the superior mesenteric vein (SMV)-portal vein axis whereas the *distal* pancreas is to the left of the axis. The term *deep* refers to an injury down to the level of the duct whereas *superficial* implies the injury is superficial to the duct

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- **grade I:** hematoma with minor contusion or superficial laceration without duct injury



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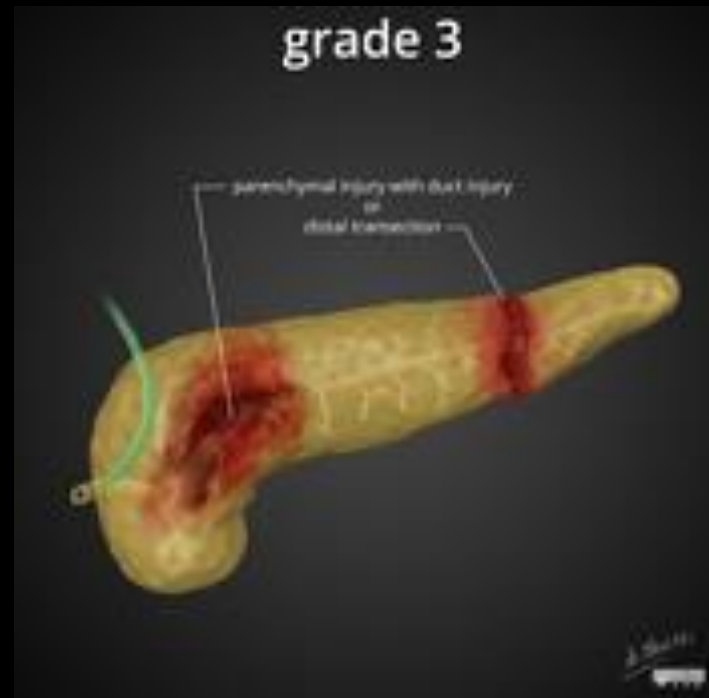
- **grade II:** major contusion or laceration without duct injury



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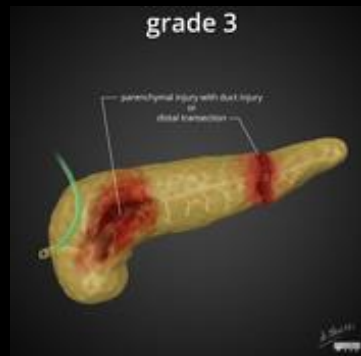
- **grade III:** distal transection or deep parenchymal injury with duct injury



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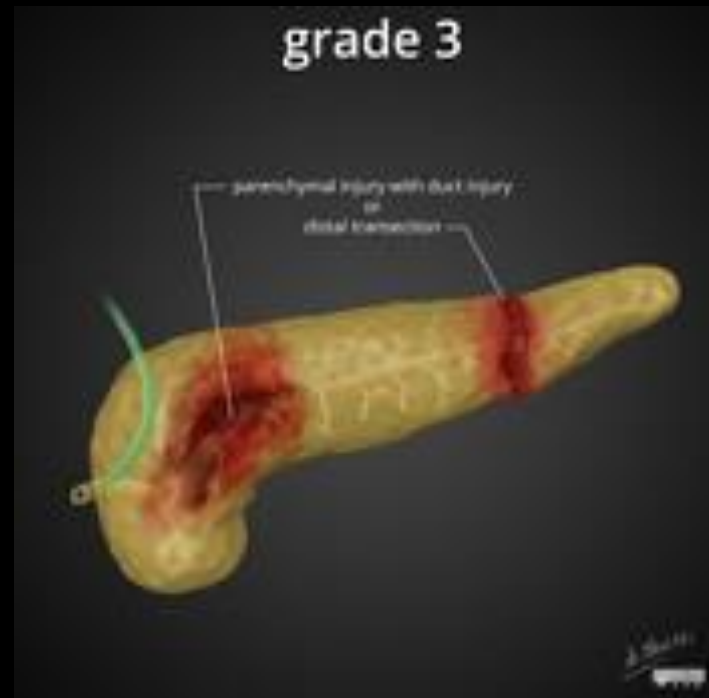
- **grade III:** distal transection or deep parenchymal injury with duct injury



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TRAUMA & EMERGENCY RADIOLOGY

- **grade IV:** proximal transection or deep parenchymal injury involving the ampulla (and/or intrapancreatic comm on bile duct)

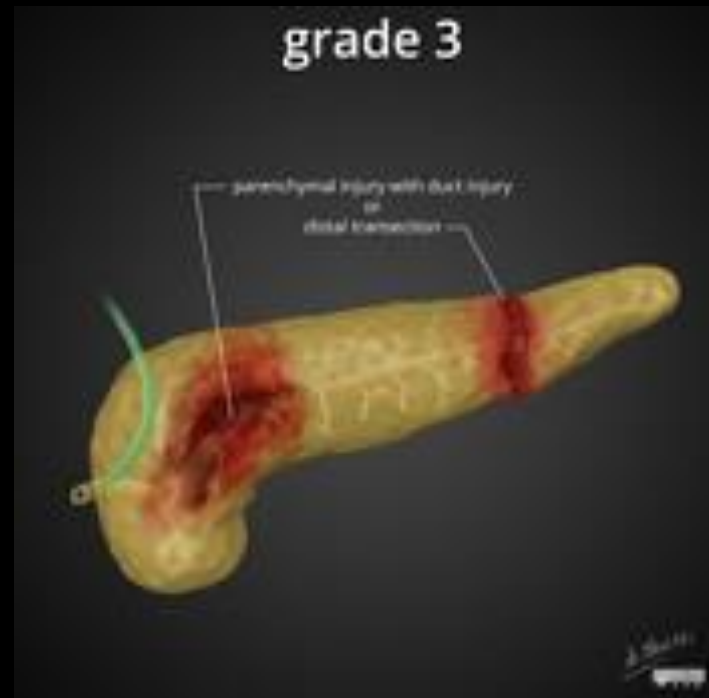


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- **grade V:** massive disruption of the pancreatic head ("shattered pancreas")



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**ALL PANCREATIC INJURIES ARE
SLOW TICKING BOMBS**