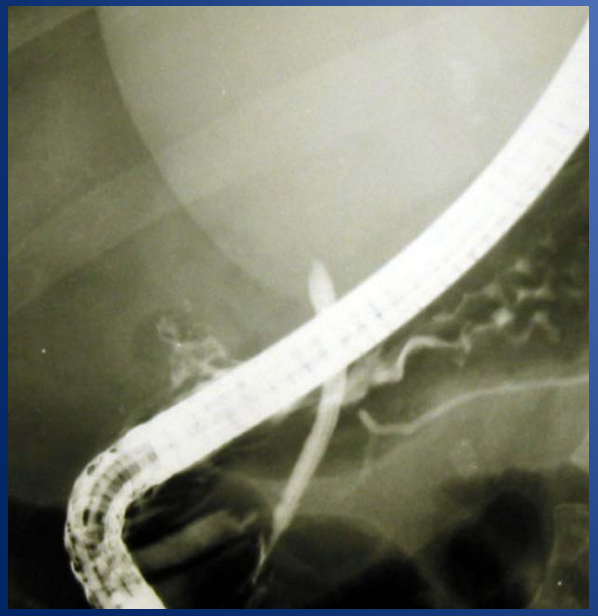
Difficulties in management of bile duct injuries after laparoscopic cholecystectomy



Martin Smith
University of the Witwatersrand, Johannesburg
Chris Hani Baragwanath Hospital

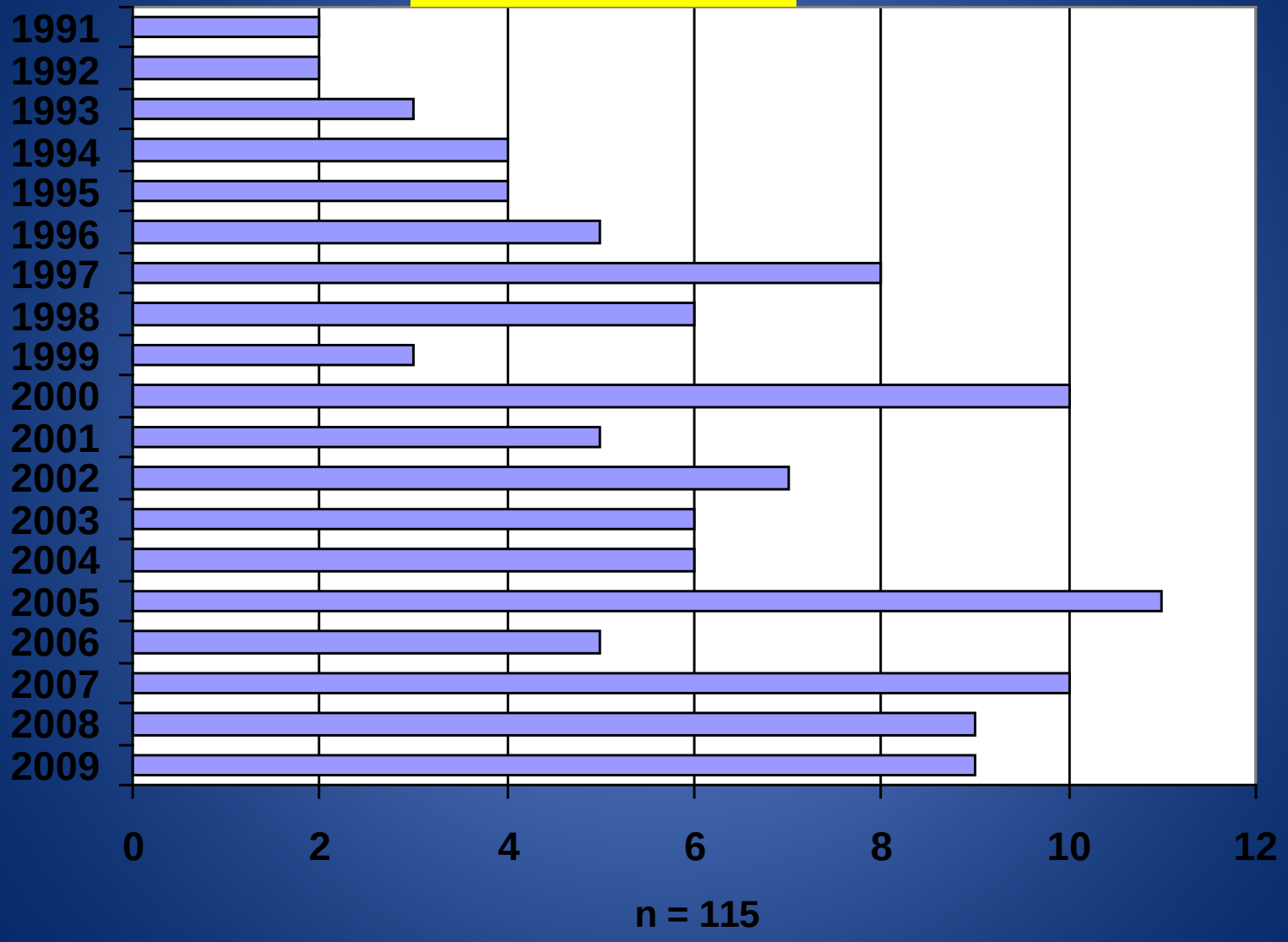
UP controversies 2015

Laparoscopic bile duct injuries : 25 years later

magnitude of the problem

- incidence 0.1%-0.5%
- bile leak 0.3% - 0.5% (85% from cystic duct)
- 34%-49% of surgeons in USA and British Columbia
- 50%-75% missed during the operation
- 60%- 80% delayed recognition

Bile Duct Injuries
GSH: 1991-2009



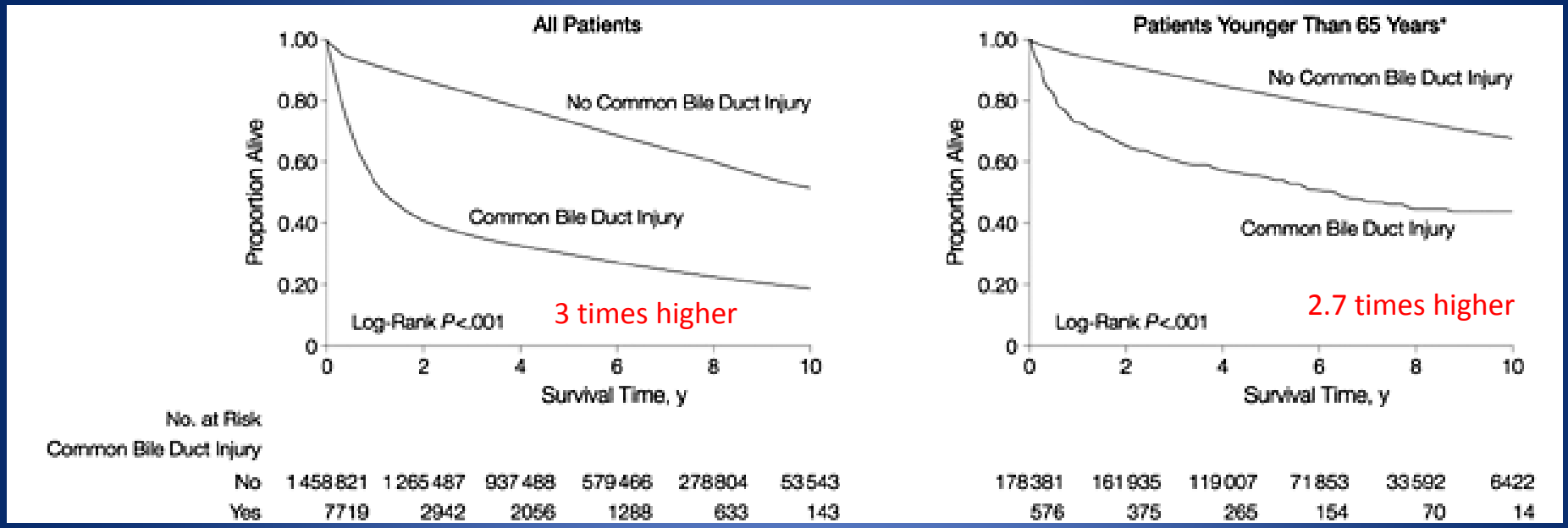
n = 115

bile duct injury is serious

- leads to considerable morbidity
- inappropriate treatment may cause death
- long-term sequeleae may be devastating
- reduces QOL

- 15% of all surgical indemnities are for BDI
- 22%- 71% seek litigation after CBDI
- may ruin a surgeon's career

survival after bile duct injury



collected series(15) 602 patients

no of deaths 17 (2.8%)

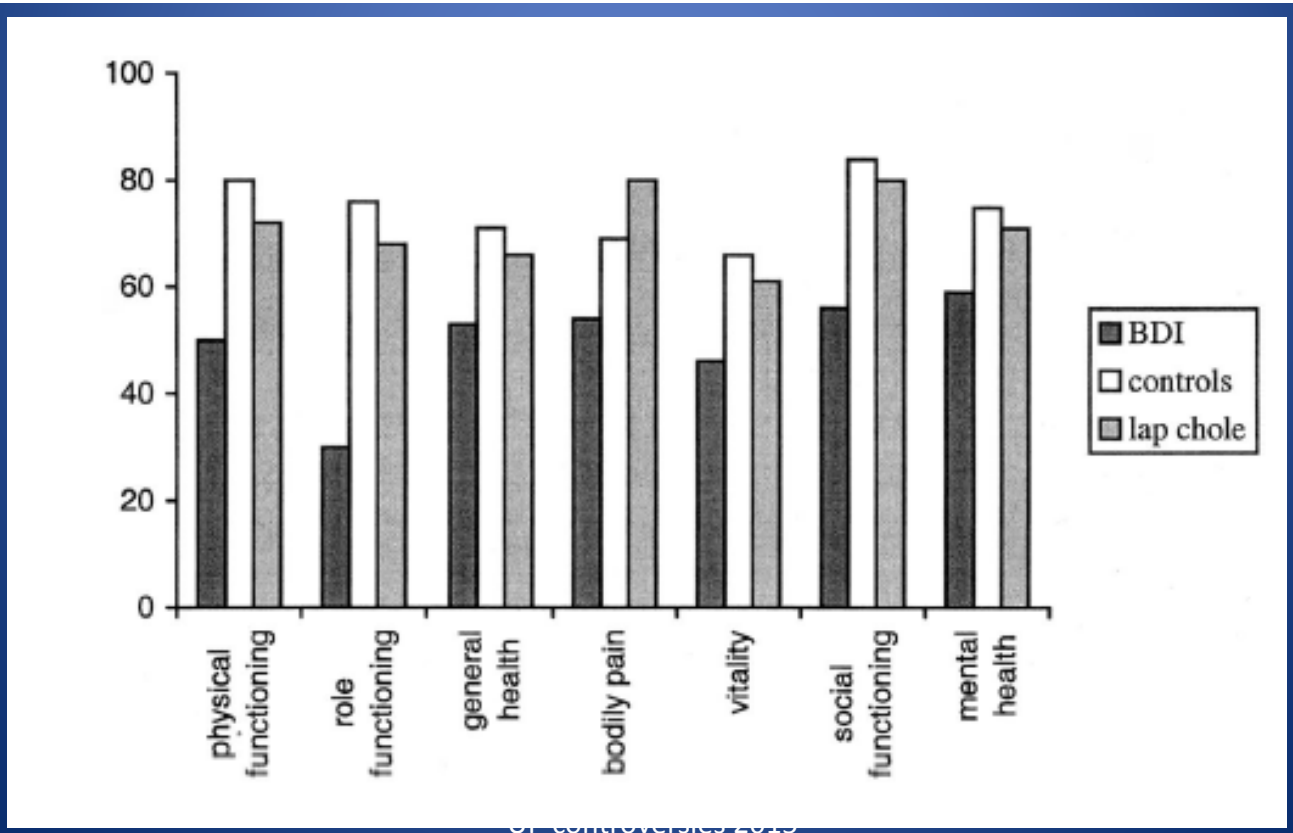
Flum et al JAMA 2003

Impaired Quality of Life 5 Years After Bile Duct Injury During Laparoscopic Cholecystectomy

A Prospective Analysis

Djemila Boerma, PhD,* Erik A. J. Rauws, PhD,† Yolande C. A. Keulemans, PhD,* Jacques J. G. H. M. Bergman, PhD,† Huug Obertop, PhD,* Kees Huibregtse, PhD,† and Dirk J. Gouma, PhD*

*From the Departments of *Surgery and †Gastroenterology, Academic Medical Center, Amsterdam, The Netherlands*



Laparoscopic cholecystectomy-related BD injury

- a health and financial disaster

- 49 patients

- total cost $ 51,411 : 4.5-26 times of uncomplicated cases
- average 32 days hospital stay
  10 days outpatient care days
- 2 deaths (4%)

Savader et al Ann Surg 1997

A COST ANALYSIS OF OPERATIVE REPAIR OF MAJOR LAPAROSCOPIC BILE DUCT INJURIES

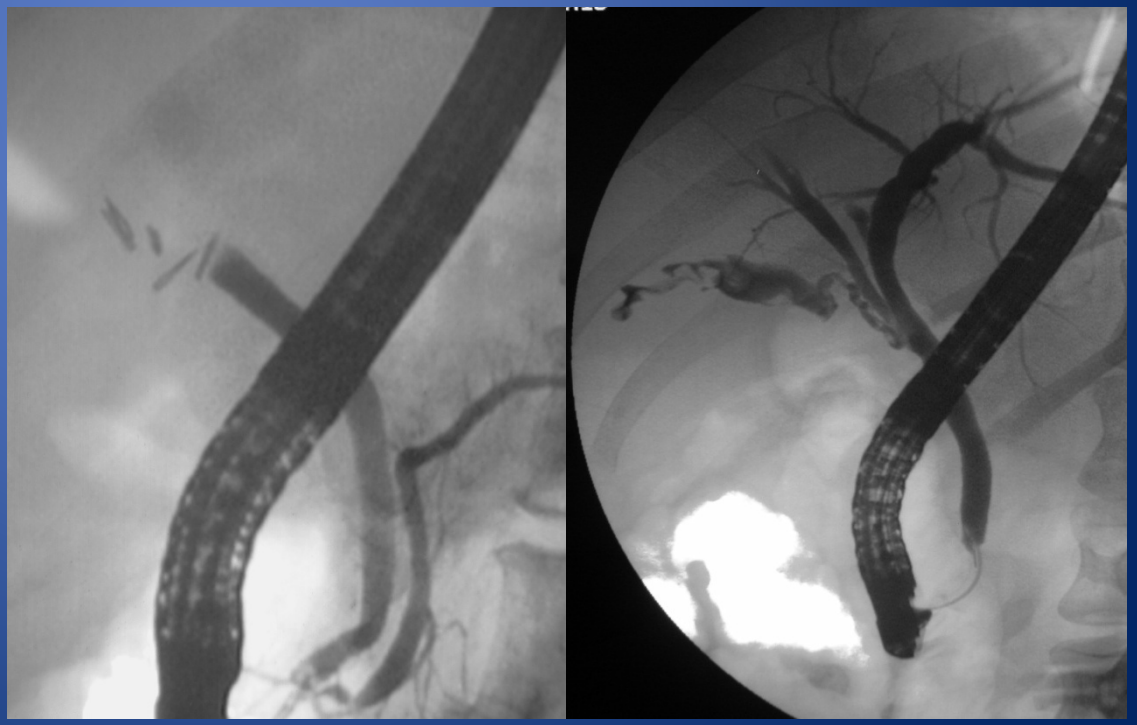
- 43% of injuries were recognised during the index operation
- Referral : median of 14,5 (1-3 662) days
- The inflation-adjusted mean total cost of repair was
  - R215 711 (range R68 764 - 980 830).
  - Theatre costs 22%
  - ICU costs 21%

Hofmeyr SAMJ. 2015:105; 454-457

causes of bile duct related complications

- misidentification of biliary anatomy
- technical errors

  - cystic duct leak
  - thermal injuries
  - bleeding
  - “tenting”



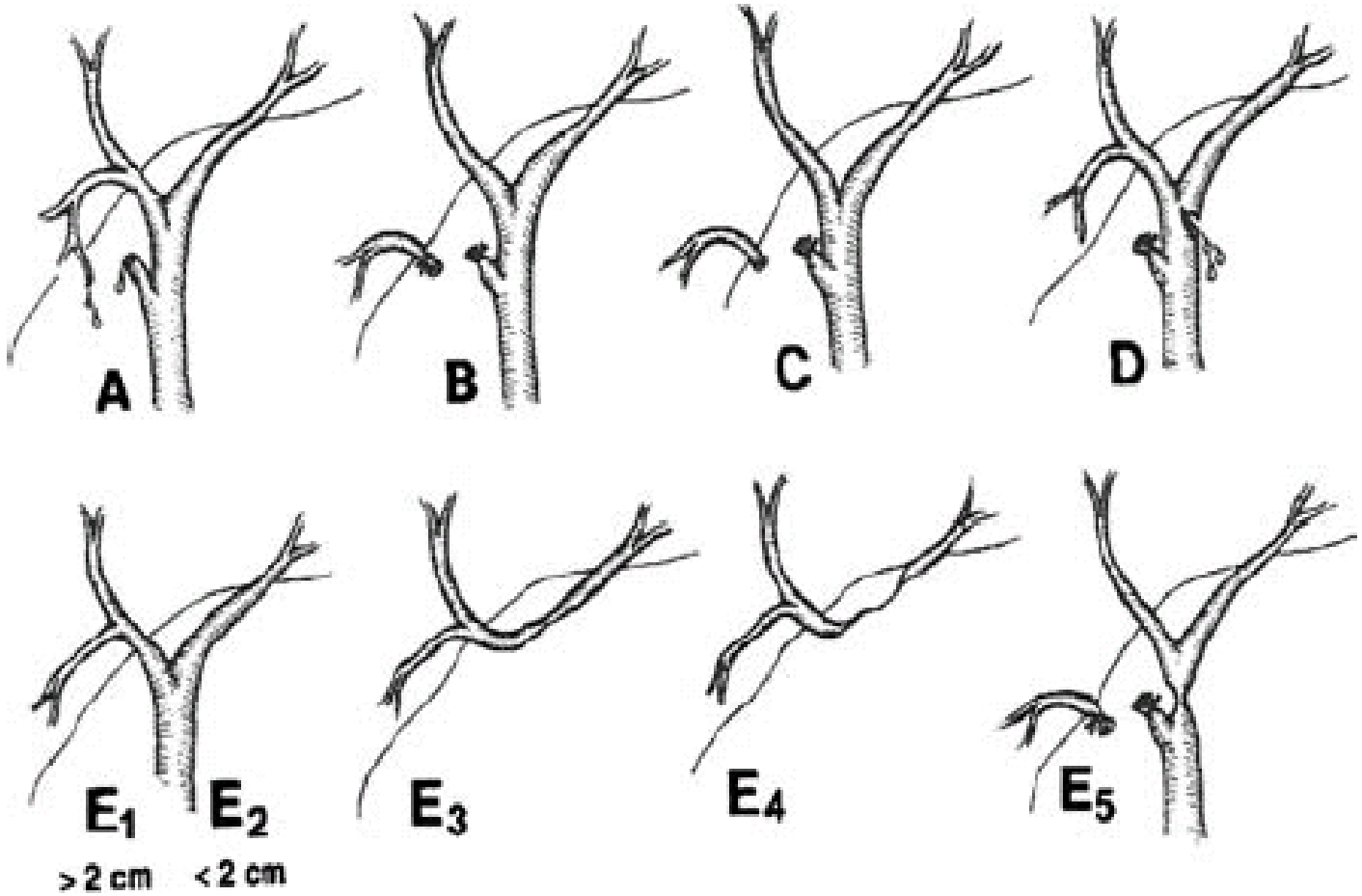
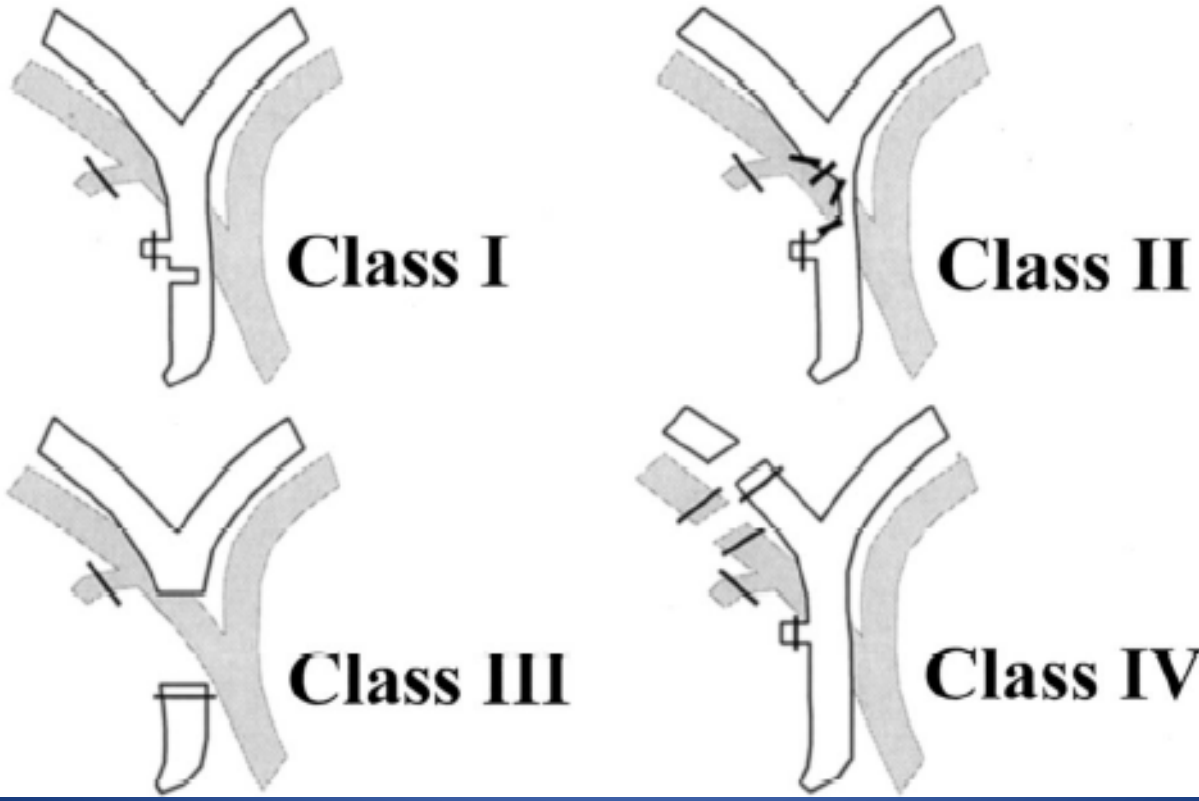


Fig. 1. The Strasberg Classifications of Biliary Injury from Laparoscopic Cholecystectomy. (adapted from *J Am Coll Surg. 1995;180(1):101–125*)

Stewart-Way Classification
Laparoscopic Bile Duct Injuries



(Way et al Ann Surg 2003)

How does this occur?

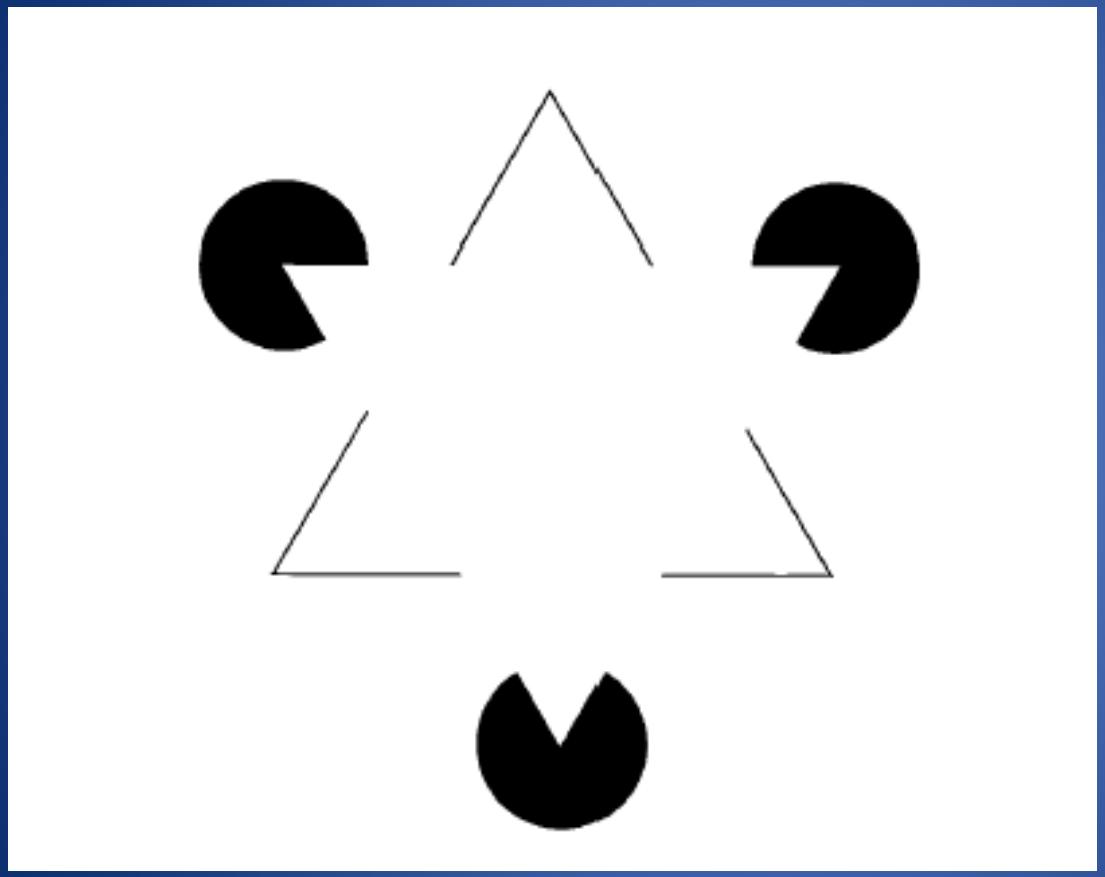
Scientific principles from human factor research and cognitive psychology to understand BDI

- misconception leading to misidentification of anatomy
- skills error leading to dangerous dissection

Way et at al Ann Surg 2003

Kanizsa Triangle

creation of visual perceptions as a form of heuristics



subconscious

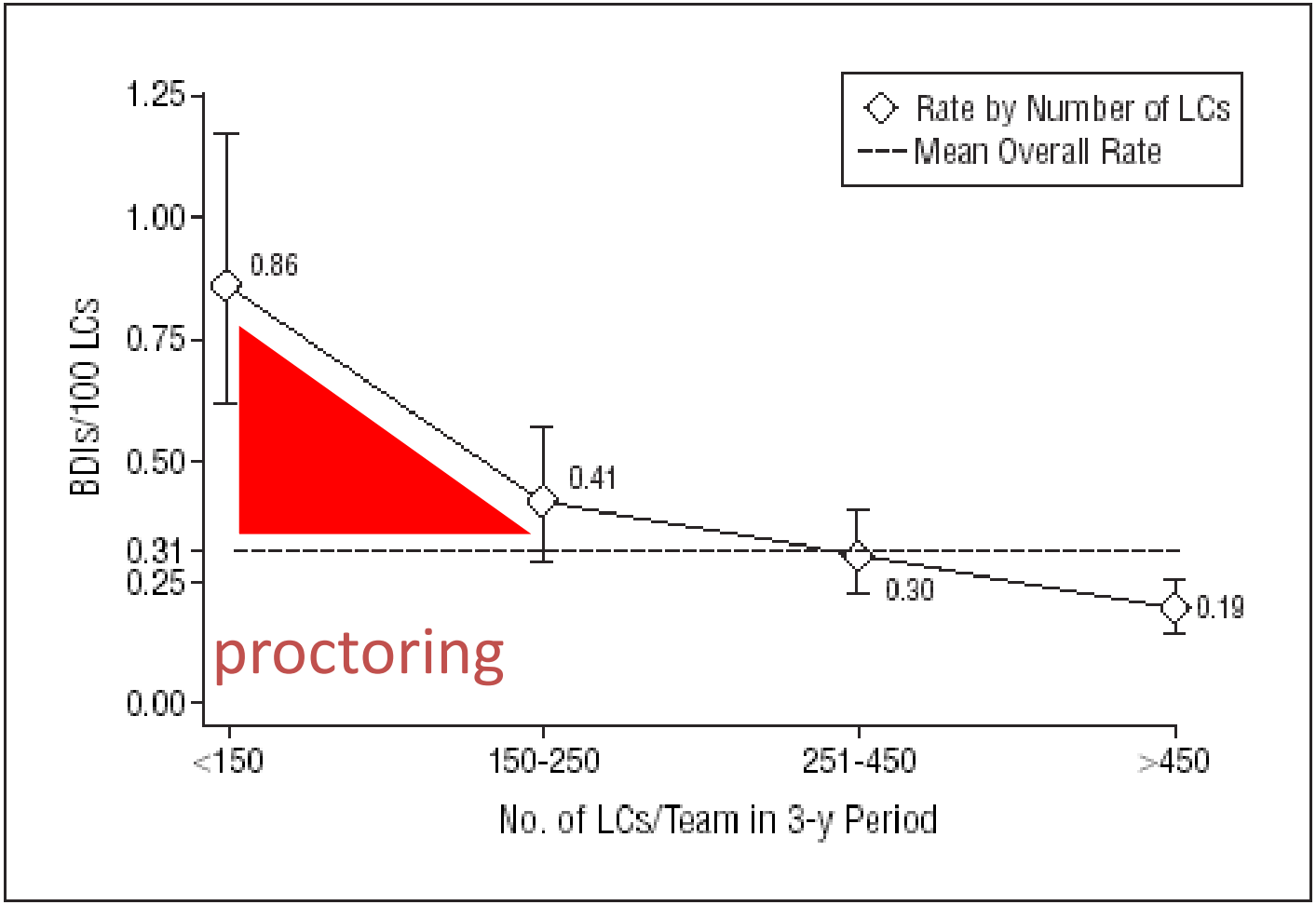
once it is there you can’t make an illusion disappear

laparoscopic cholecystectomy

how can we make it a safer procedure ?

- training
- identifying the high risk patient
- operative cholangiography
- refinements to operative technique
- built in “stopping rules”

the learning curve



Nuzzo et al Arch Surg 2005

Bile duct injuries
- the learning curve continues

- 30% of BDI - > 200 cases
- no reduction in other complications

  - bleeding and bile leaks from cystic duct

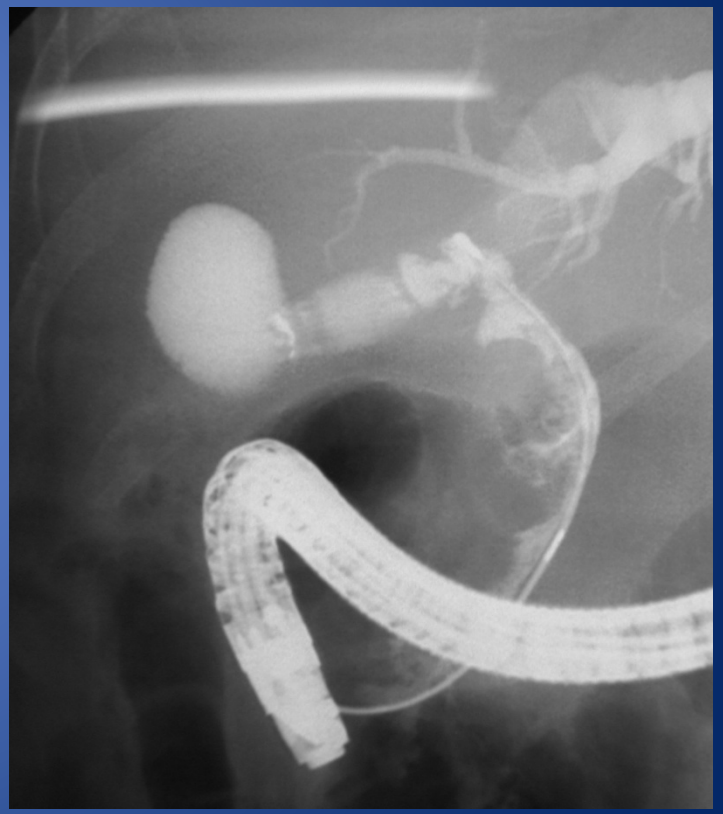
may cause major M&M

Archer et al Ann Surg 2001

who are at risk for bile duct injury ?

- elderly,males,obesity
- cholecystitis(previous attacks)
- gallstone pancreatitis
- previous BDS
- Mirizzi syndrome

not for the beginner



No risk factors in 80% of BDI

Routine operative cholangiography ?

Protagonists

- reduces incidence of BDI
- early recognition
- less severe injury
- less inclined to misinterpret

Sceptics

- Does not prevent BDI
- BDI frequently occur before IOC
- BDI may occur as a result of IOC
- IOC frequently misses BDI
- BDI may occur after IOC

Ludwig et al Surg Endosc 2002

operative cholangiography

collected series	% bile duct injury
• routine	0.20 – 0.39
• selective	0.30 – 0.60
• none	0.34 – 0.58

Debru et al Surg Endosc 2005

Cholangiography and the risk of common bile duct injury
1.5 million laparoscopic cholecystectomies

Table 3. Rate of Common Bile Duct (CBD) Injury Based on the Surgeon's Frequency of Intraoperative Cholangiogram (IOC) Use With and Without IOC Use

IOC Use Categories	Rate of CBD Injury, %		
	Overall*	Without IOC	With IOC†
<25% (n = 741 742)	0.52	0.49	0.78
25%-49% (n = 279 270)	0.54	0.56	0.50
50%-75% (n = 211 880)	0.51	0.85	0.31
>75% (n = 337 469)	0.43	1.50	0.26
All (N = 1 570 361)	0.50	0.58	0.39

*Differences between the overall rate in the greater than 75% IOC use group compared with all other levels of IOC use were statistically significant ($P<.001$).
†Differences between CBD rates with and without IOC were all statistically significant ($P<.001$).

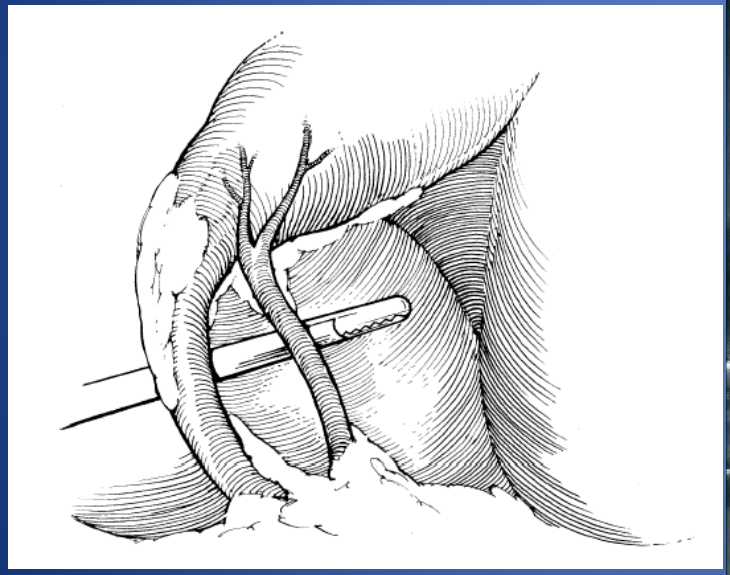
Flum et al JAMA 2003

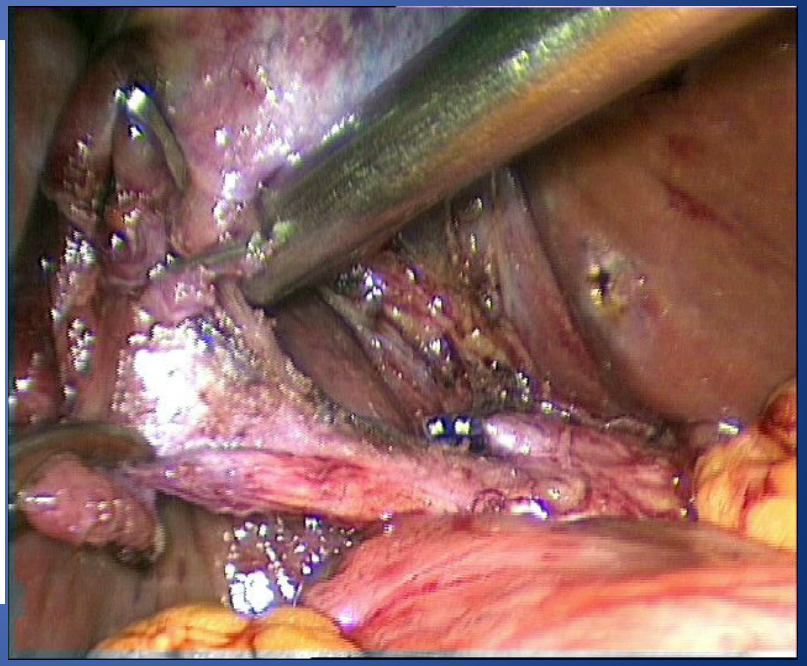
verdict - operative cholangiography

- routine: continue if that's the way you were taught
- selective: ? doubt about anatomy
- none: extra care to define biliary anatomy

How can we prevent bile duct injury ?

There is no substitute for meticulous dissection of Calot's triangle with the emphasis on identifying the cystic duct / infundibulum junction.





"the critical view of safety"
(Steven Strasberg)

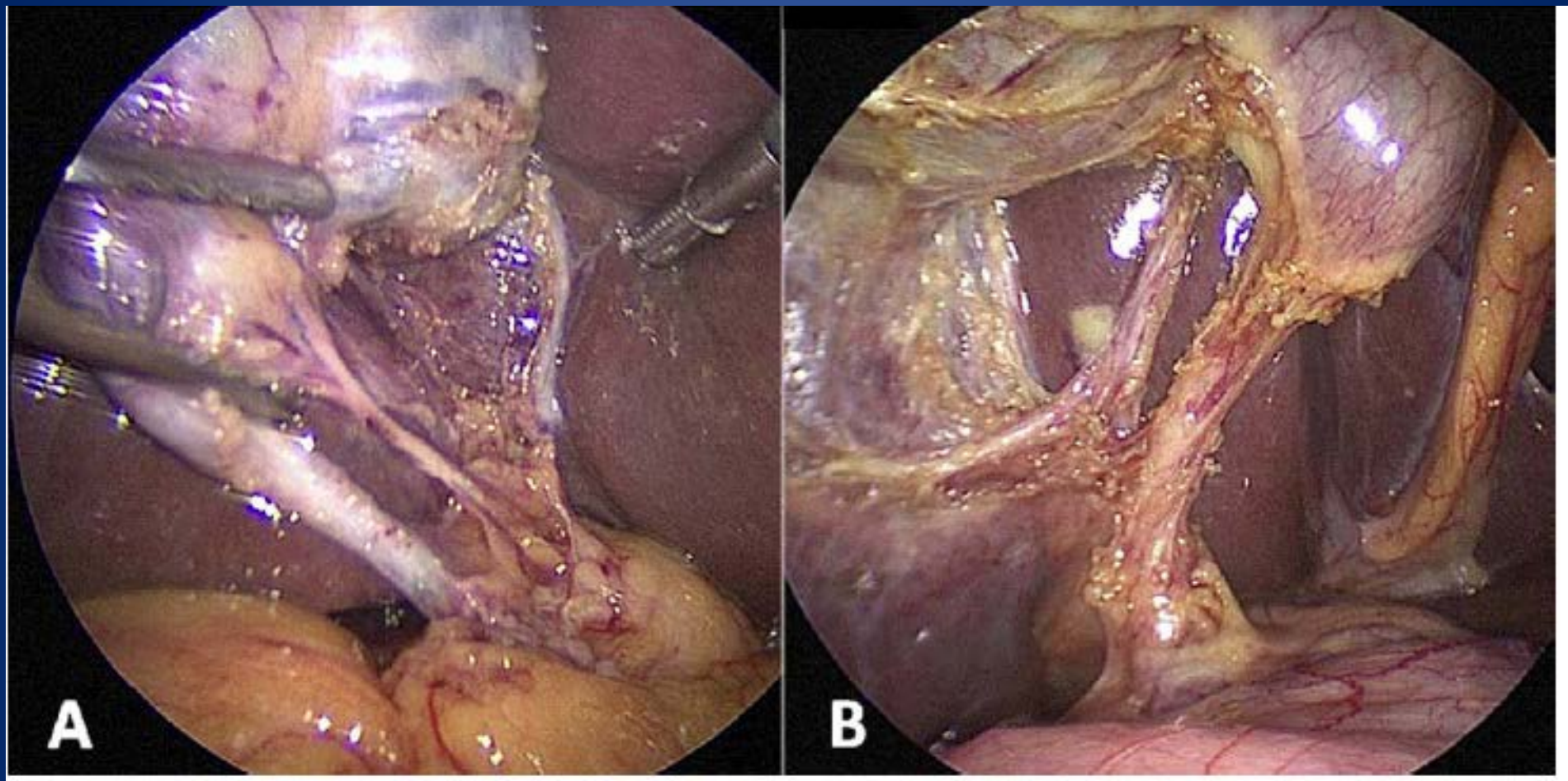


Figure 4. Different appearances of the cystic plate. (A) Critical view of safety (CVS) is seen from in front of the gallbladder as usually shown. The cystic plate is very thin. (B) CVS is seen with the gallbladder reflected to the left so that a posterior view of the triangle of Calot is shown. The cystic plate is thicker and whitish. Both views fulfill criteria for CVS.

Technical approaches to the Anatomy

- Critical view of safety – routine approach
- Infundibulum approach – sometimes of value but avoid when significant inflammation present
- Start by identifying the cystic duct – common bile duct junction - avoid
- Subtotal cholecystectomy – in very selective cases

Management of bile duct injury

The ideal scenario

- early detection
- maximum information on biliary anatomy
- specialised multi-disciplinary unit

Principles of Repair

- Tension free hepatico-jejunostomy
- Mucosa to mucosa anastomosis
- Well vascularised BD

laparoscopic cholecystectomy

recognition of bile leaks / duct injuries

- intra-operative
- early post-operative
- delayed presentation

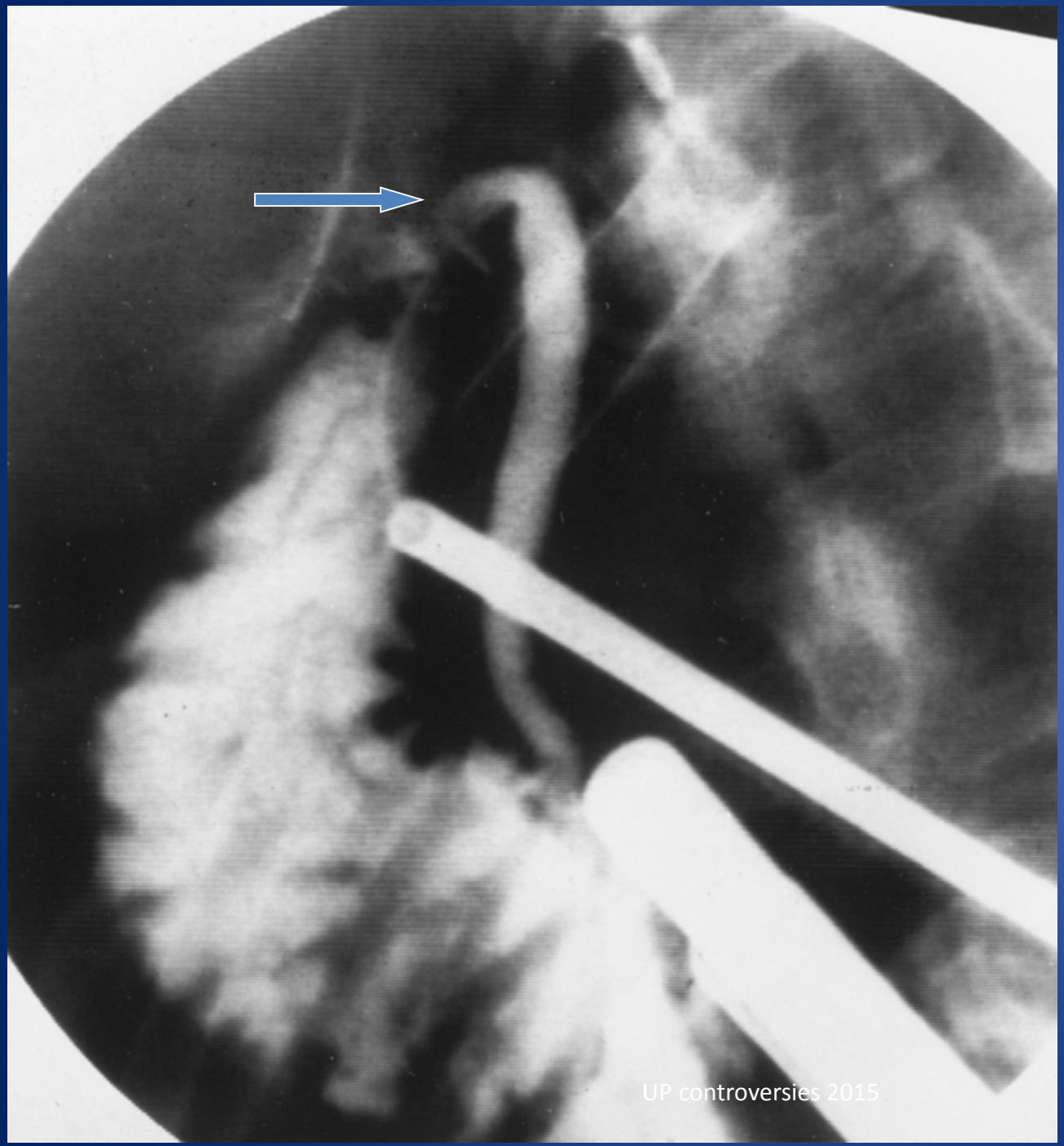
} key to successful outcome

intra-operative detection of bile duct injury

only 20-50%

telltales of an injury ?

- unexplained bile leak
- unexpected structure is divided
- division of large cystic duct
- major bleeding is encountered
- non-filling of intra-hepatic ducts on IOC



IOC showing non filling of intra-hepatic ducts

intra-operative detection

partial defect

- primary repair
- avoid T- tube
- drain

complete transection

- hepatico-jejunostomy
  (HPB surgeon)
- drain and refer

successful outcome after bile duct repair

the surgeon factor	success rate
• “injuring” surgeon	17-27%
• specialist surgeon	79-95%

Steward & Way Arch Surg 1995
Caroll et al Surg Endosc 1998
Flum et al JAMA 2003

successful outcome after bile duct repair

the surgeon factor	success rate
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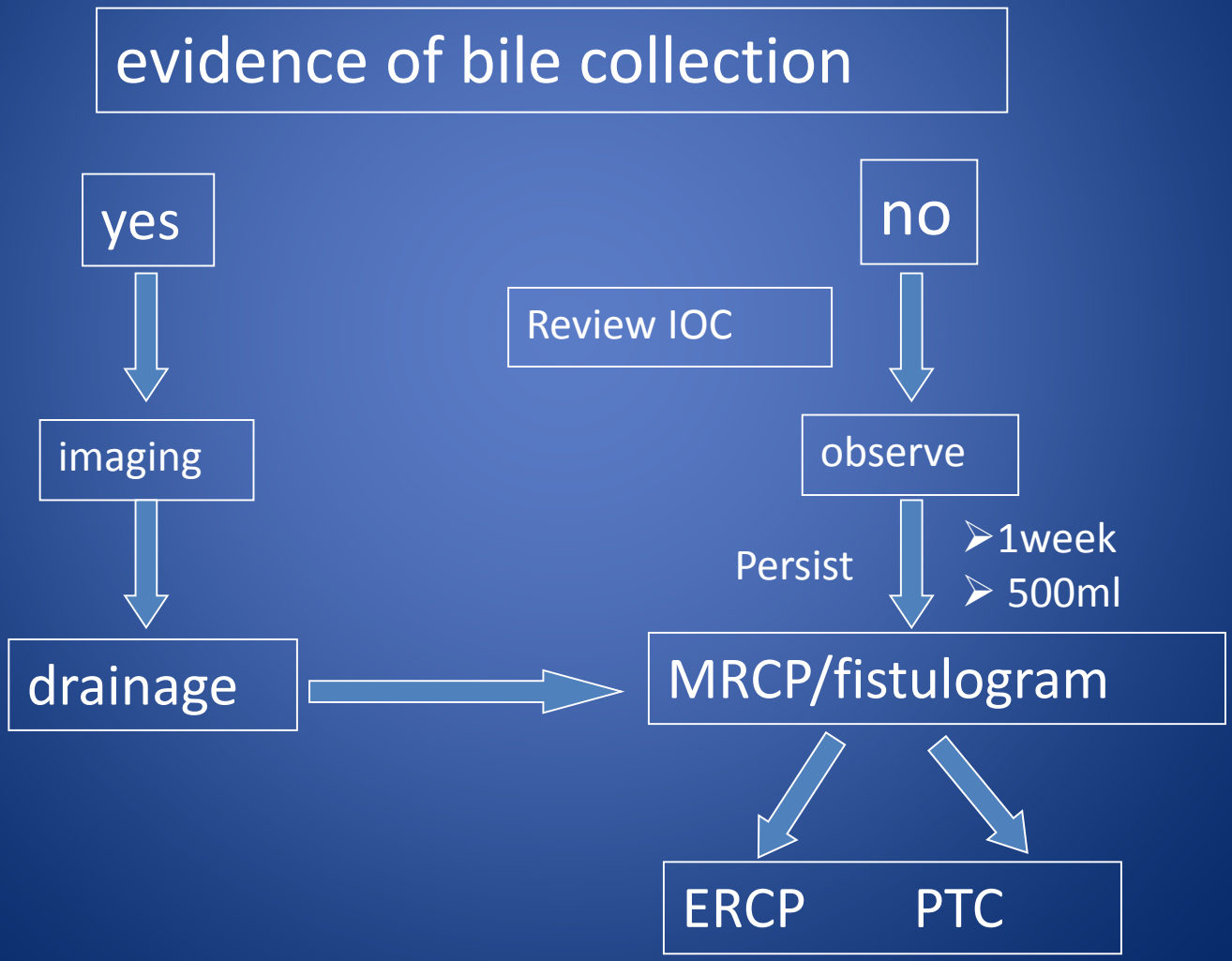
50-75% repairs are still done by primary surgeon !

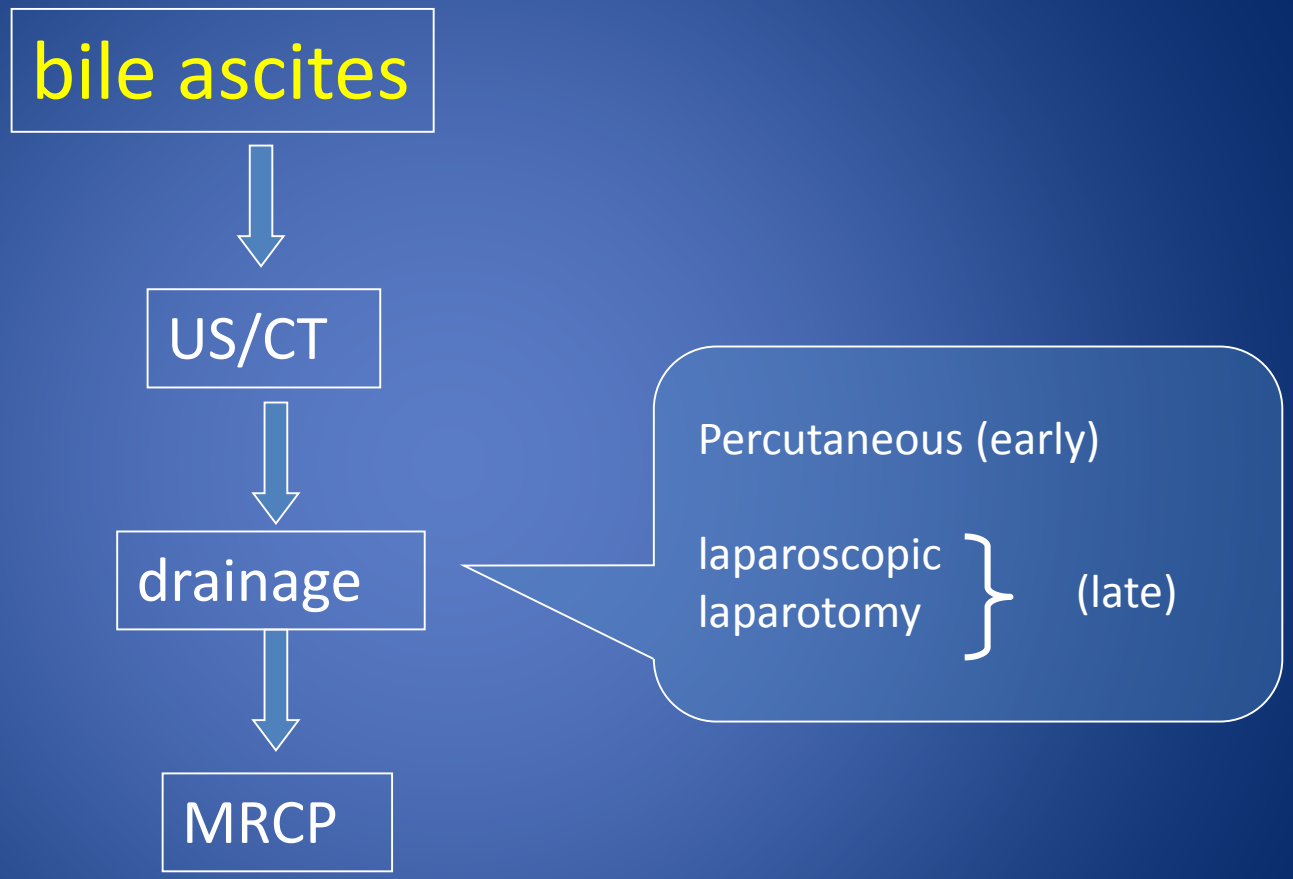
Steward & Way Arch Surg 1995
Caroll et al Surg Endosc 1998
Flum et al JAMA 2003

Clinical Scenarios

- Early:
  - Bile Leak from drain site
  - Ascites
  - Abnormal LFT's / Obstructive jaundice
- Late:
  - Consequence of biliary stricture

post operative bile leak from drain site




bile ascites
US/CT
drainage
MRCP
Percutaneous (early)
laparoscopic
laparotomy
(late)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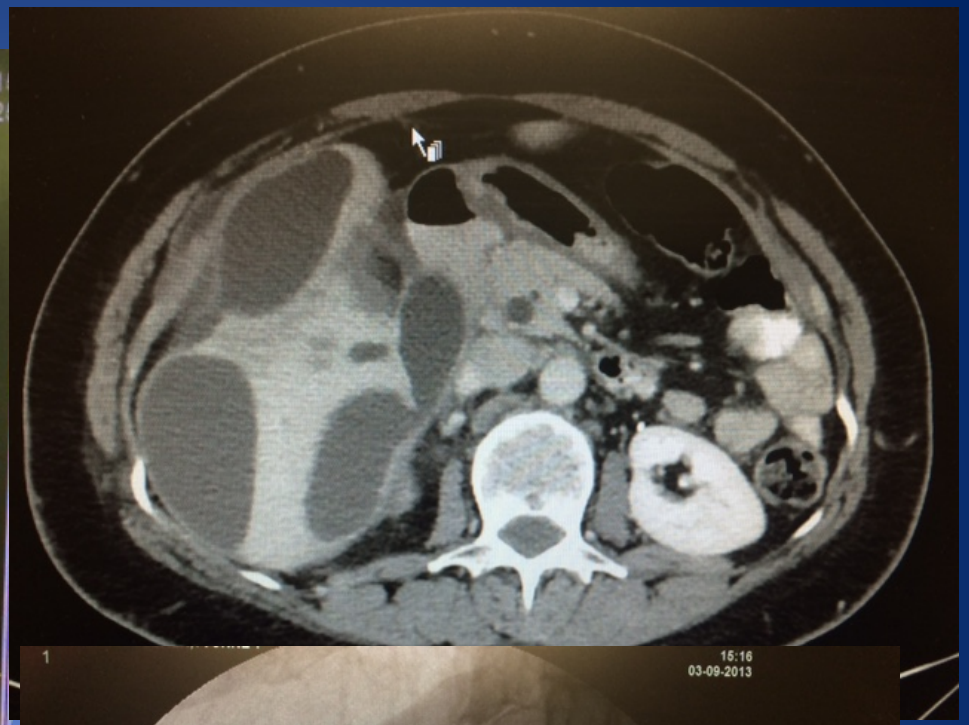

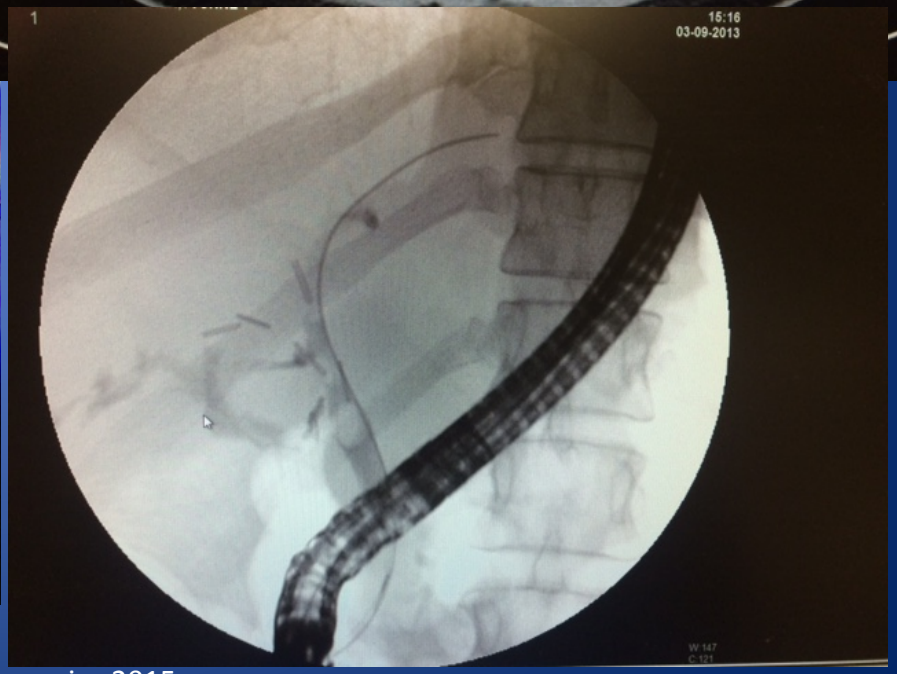
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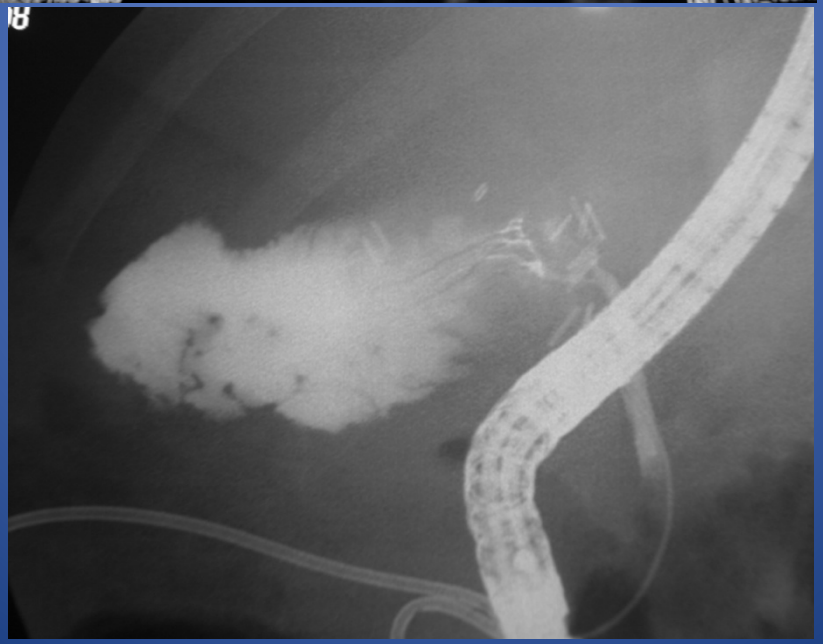
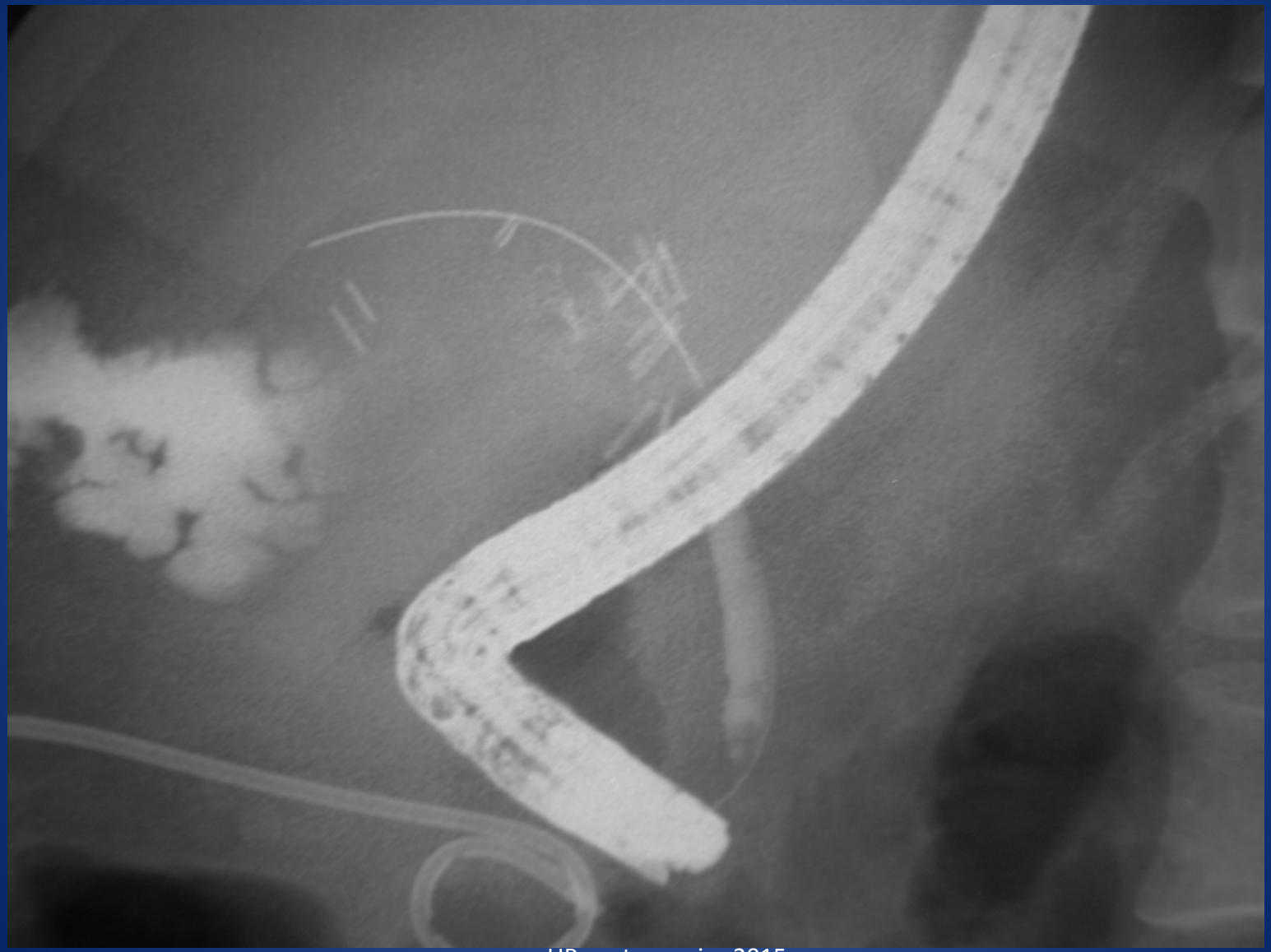
MRCP

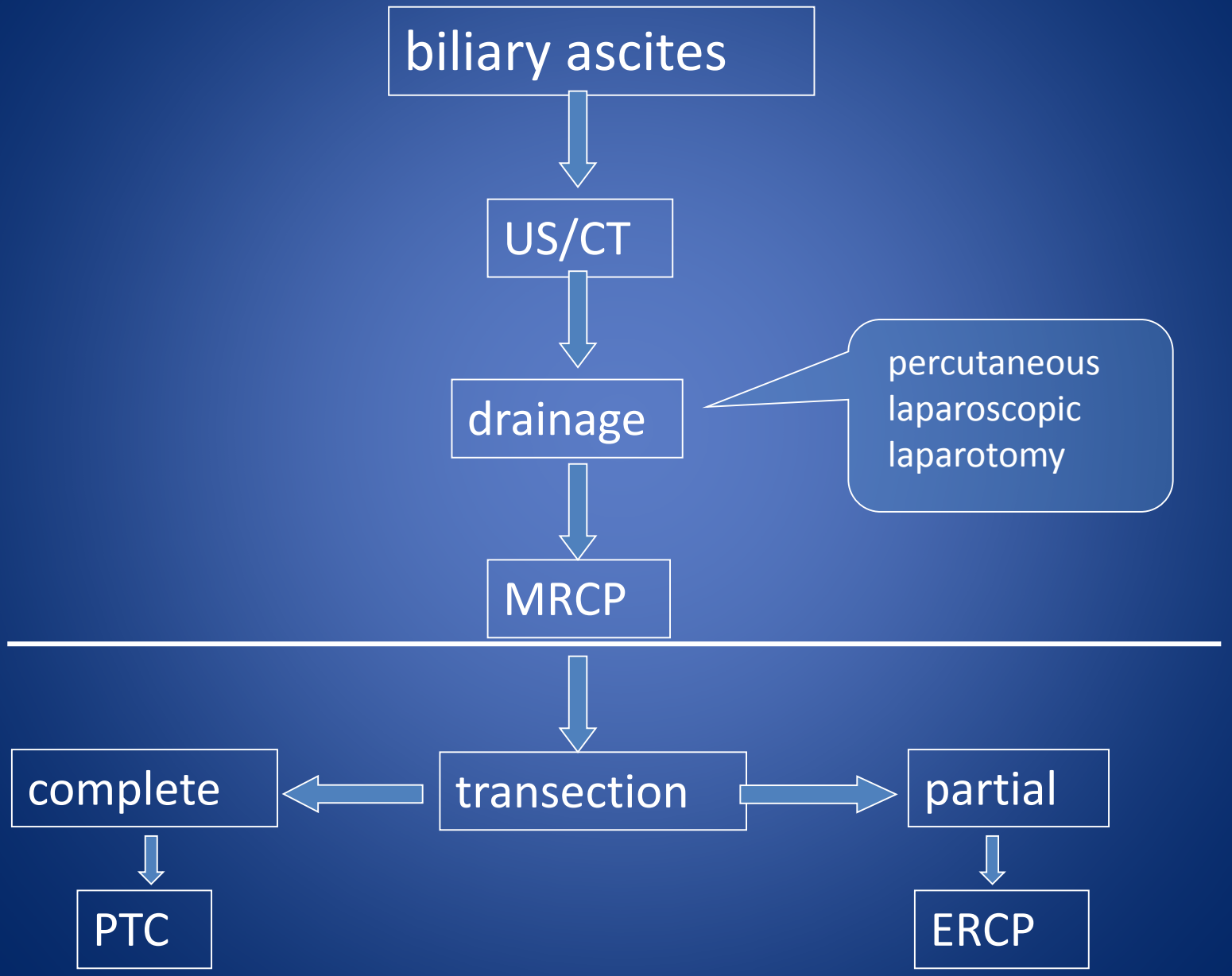
ERCP

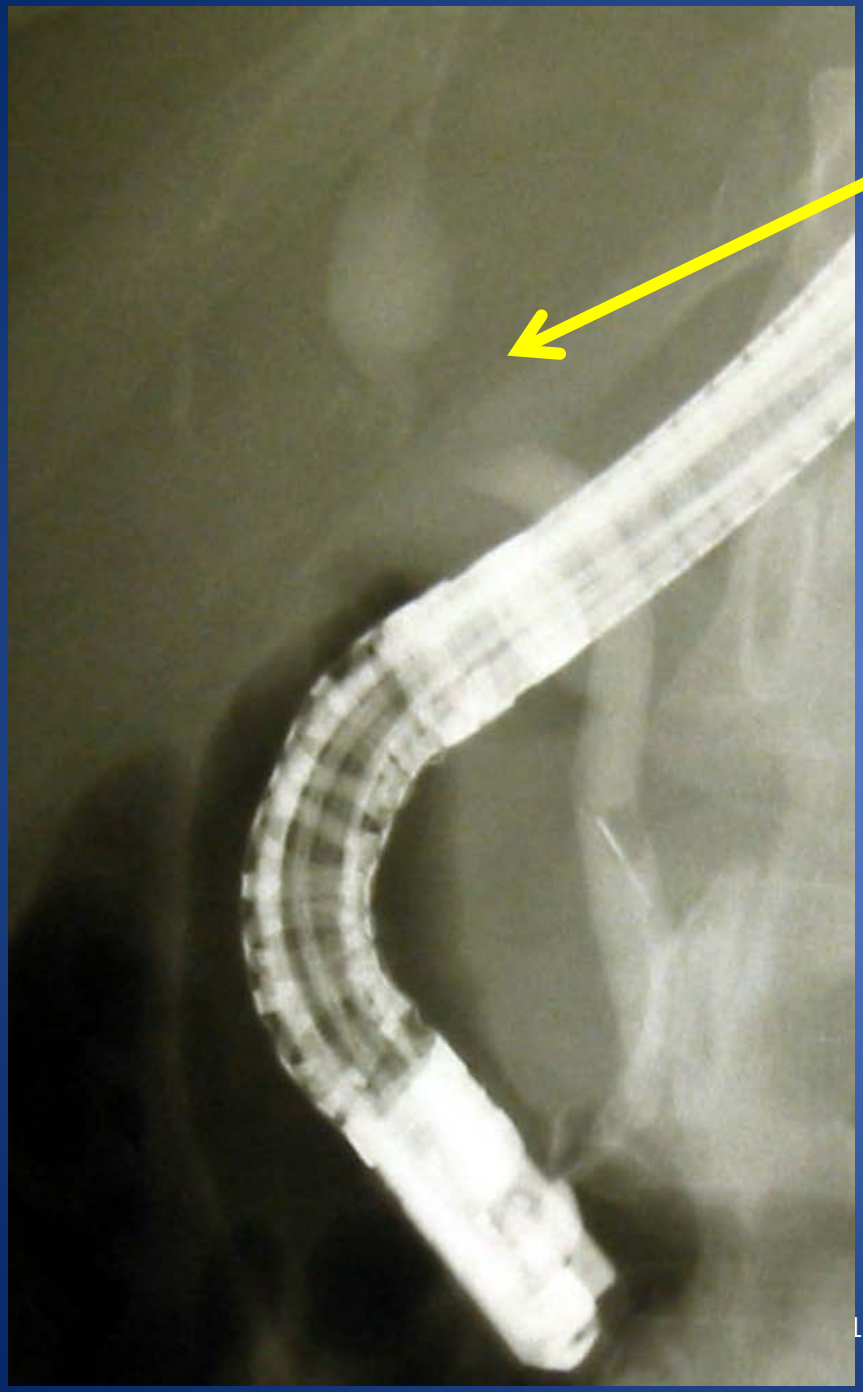


multiple clips = complete transection



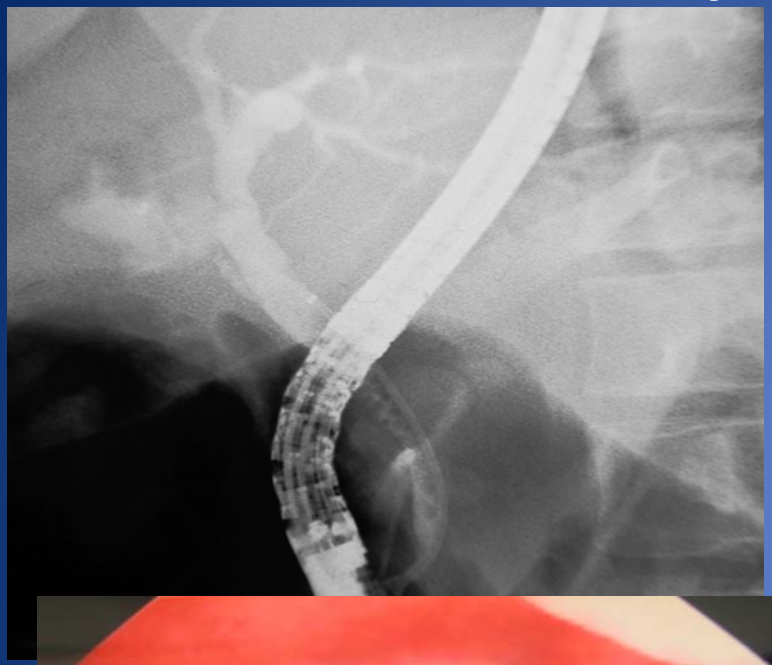
management of bile duct injury

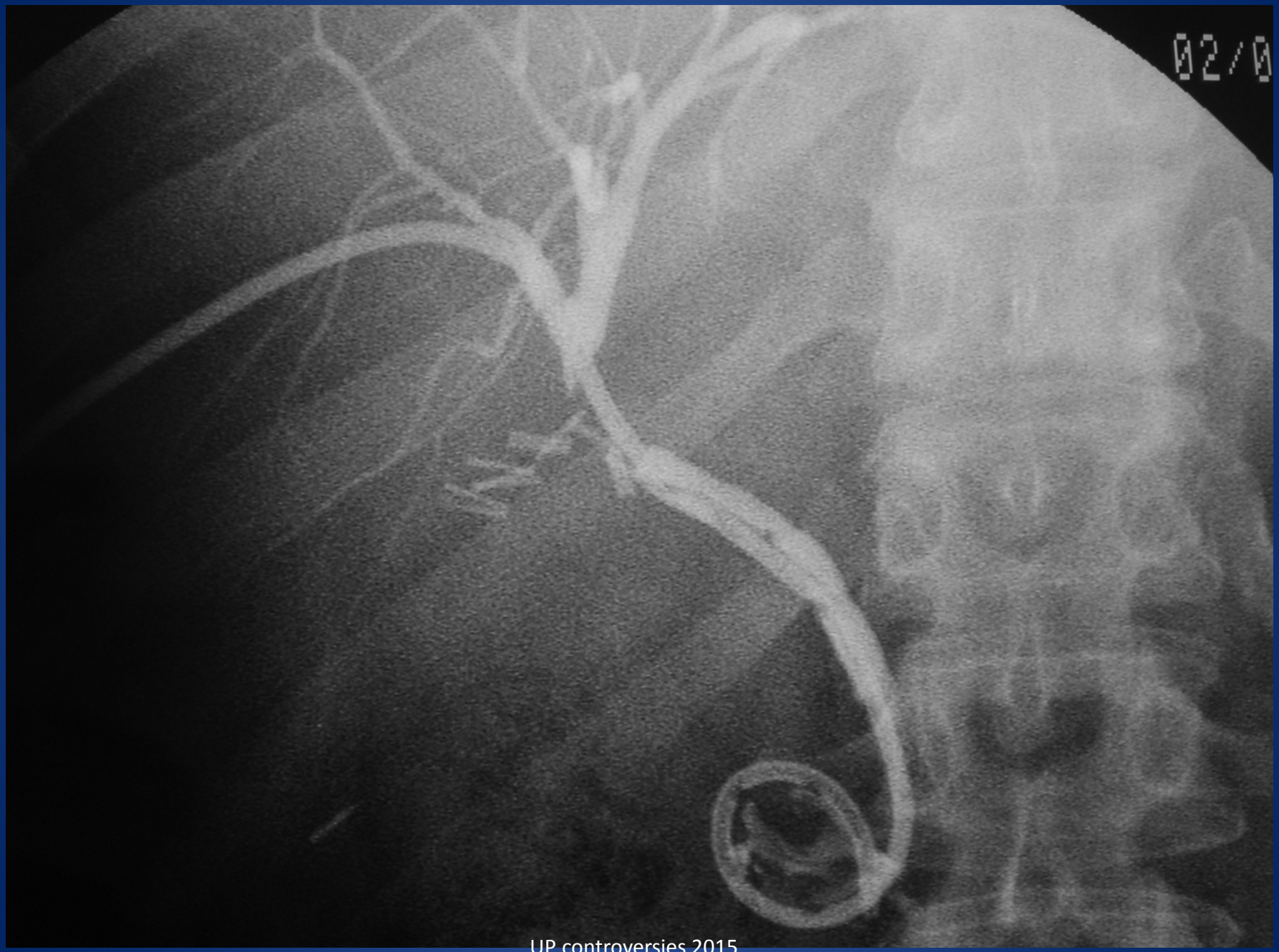




Partial transection with persistent leak

Incomplete Injury

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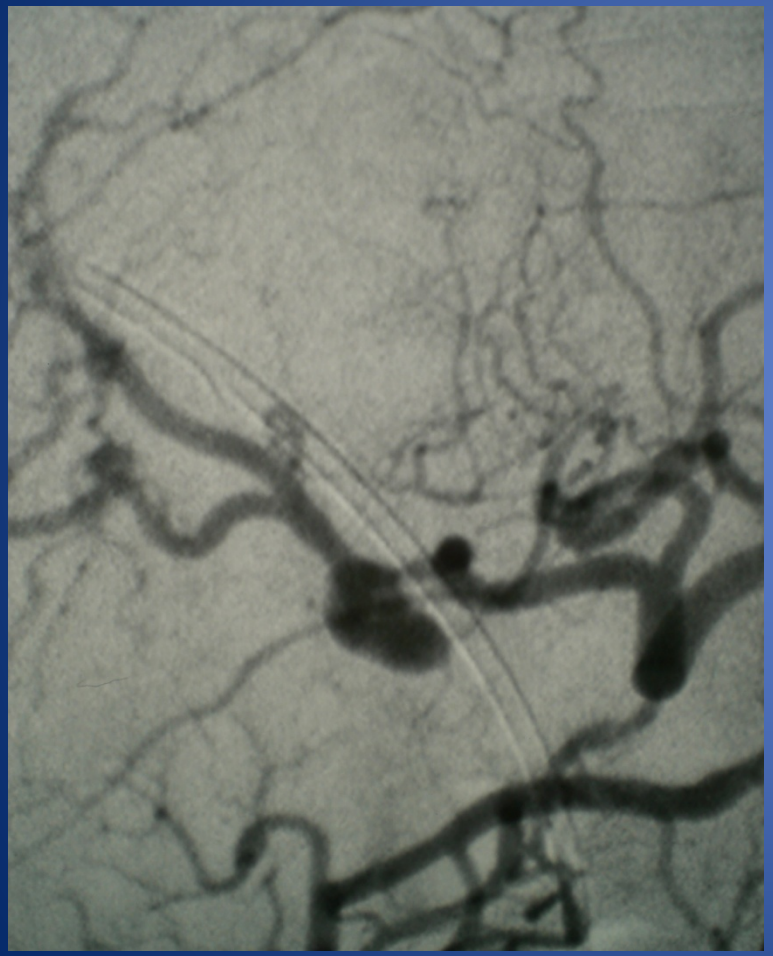
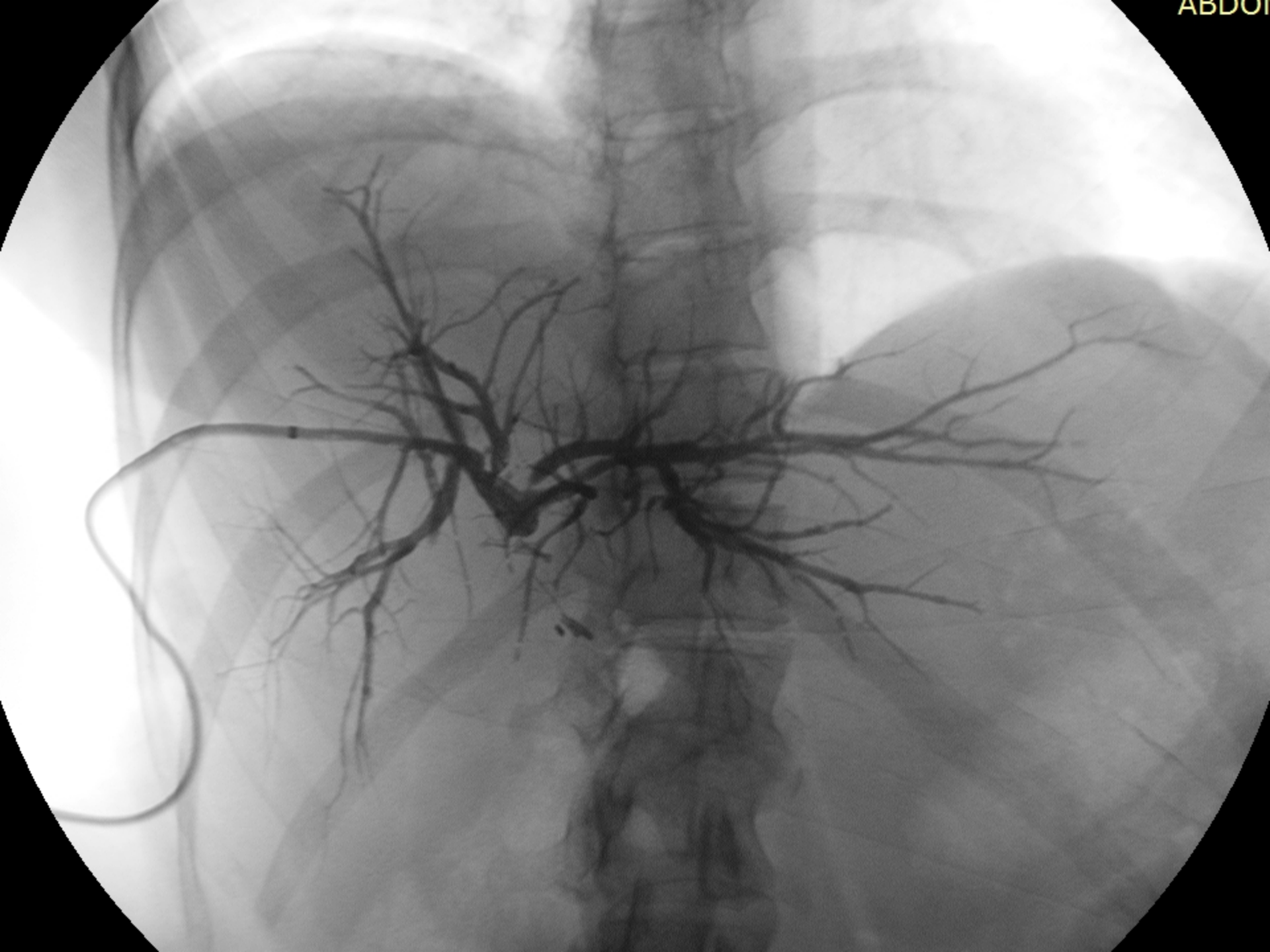
major bleeding

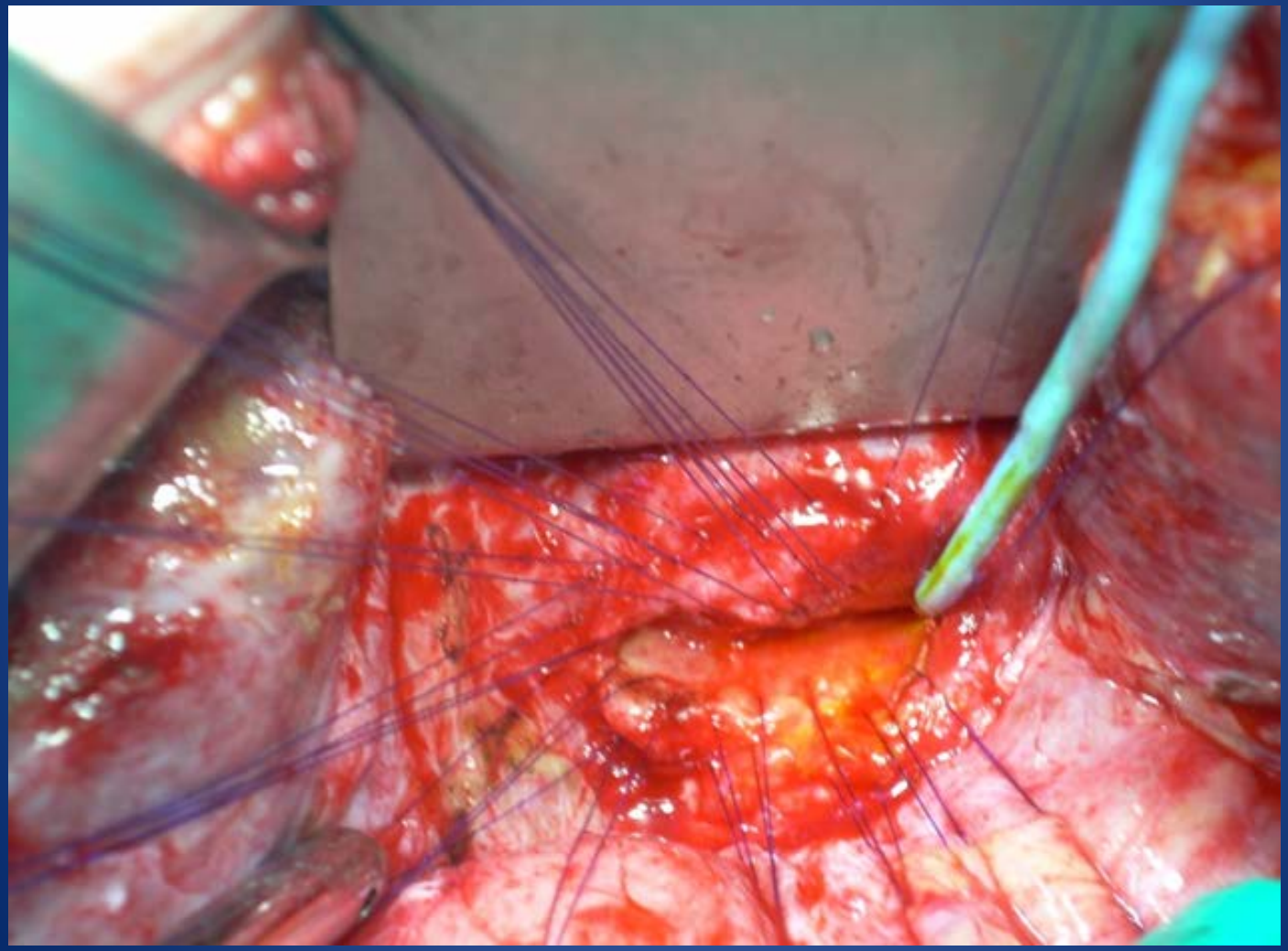
selective angiography

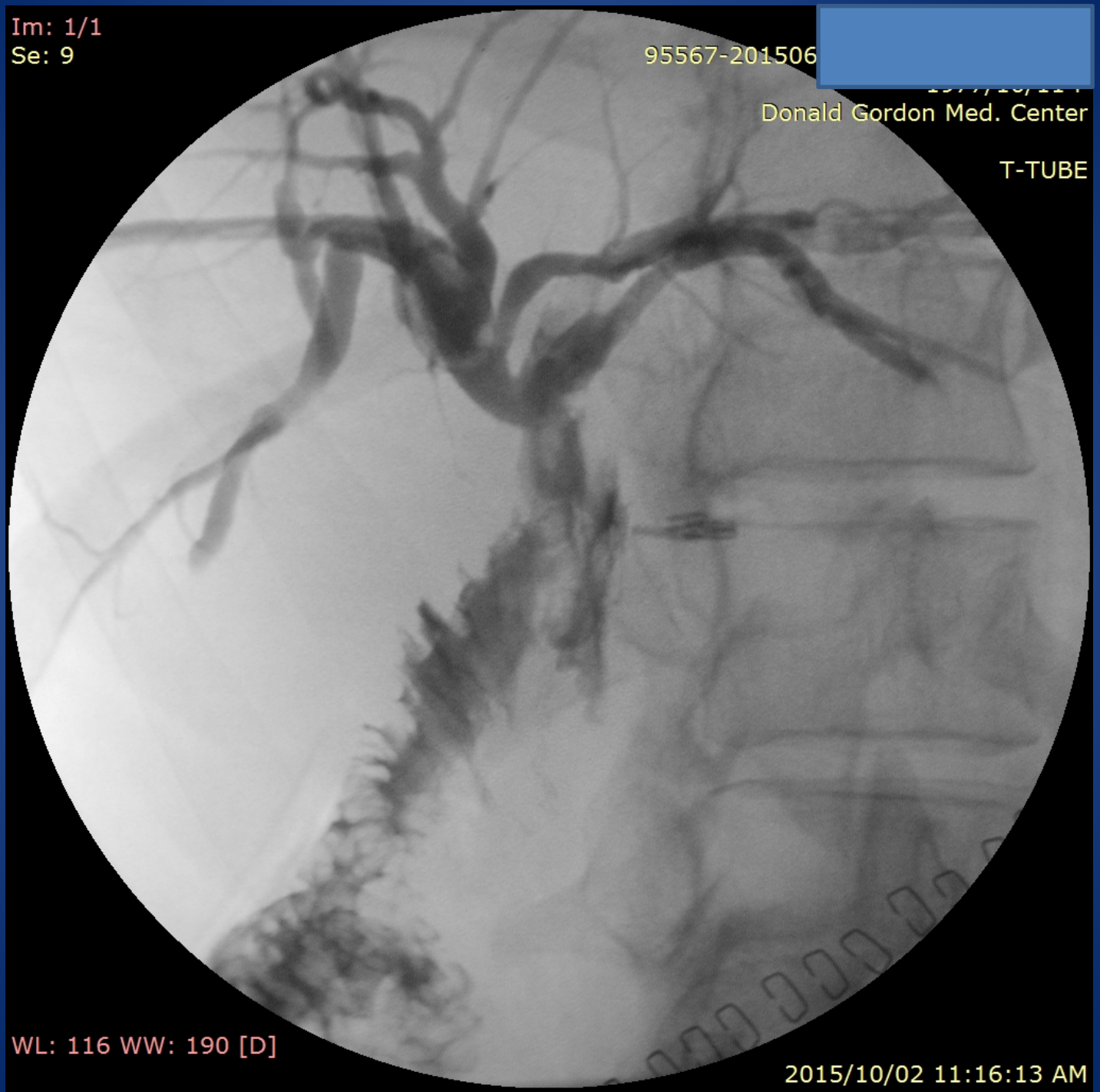


embolization


ABDOI

Hepatico-jejunostomy

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Timing of definitive bile duct repair

protagonists for early repair (< 1-2 weeks)

- shorter duration of treatment
- less costly
- improve QOL
- equivalent results to delayed repair

Specialised HPB units

Steward and Way Arch Surg 1995
Boerma et al Ann Surg 2001
Sicklick et al Ann Surg 2005
Thomson et al Br J Surg 2006

Early repair (< 1-2 weeks)

contraindicated

- sepsis not under control
- confluence and vascular injury
- significant diathermy injury
- surgical expertise not available

Recognition and management of bile leak and bile duct injury : take home message

- intra-operative suspicion of BDI; “call a friend”
- unwell patients > 48 hrs = bile leak
- over rather than under investigate
- early referral to specialized centre
- attention to detail in the consenting process
- make careful notes in anticipation of a law suit