



# Gallstones, CBD stones and CBD duct injury: the gastroenterologist ?

Ad Masclee, gastroenterologist MUMC+

**Maastricht UMC+**





# Gallstones, CBD stones and CBD duct injury: the endoscopist ?

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# MAGMA

SCHRIFT VAN DE NEDERLANDSE VERENIGING  
MAAG-DARM-LEVERARTSEN

RGANG 16 / NUMMER 4 / DECEMBER 2010



**TOEKOMST MDL-SPECIALIST:  
MEER CHIRURG DAN ARTS**

# MAGMA

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**TOEKOMST MDL-SPECIALIST:  
MEER CHIRURG DAN ARTS**

# GE-ist and surgeon ?



# Outline

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- Gallstones
- CBD stones
- CBD injury
- Case based

# Gallstones

- Gallstones
  - 75% - 95% cholesterol
    - +++ cholesterol
    - --- bile acids / phospholipids
  - 5% - 25% black or brown pigment stones (bilirubin)
    - Associated with hemolysis or infection

# Gallstones

- Risk factors
  - Age
  - Female
  - Obesity
  - Weight loss
  - Family history
  - Pregnancy
- Medication
  - OAC
  - Somatostatin analogs
  - TPN



# Gallstones, obesity

- Weight reduction: 3%/week stone formation
  - intake < 7 gram fat per 24 uur
  - more than 1.5 kg /week weight loss
- RYGB en sleeve gastrectomy:
  - risk gallstones ↑
  - prophylaxis ursodeoxycholic acid
  - prophylactic cholecystectomy: no

# Gallstones

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- Prevalence gallbladder stones: 13-22%
  - age 20-70 yrs : 13%
  - male : female ratio 1:2
  - female and age >70 : 22%

# Gallstones

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Percentage becoming symptomatic in 10 yrs ?

- 10%
- 20%
- 30%
- 40%
- 50%

# Gallstones

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– 20%

– 30%

– 40%

– 50%

Festi et al. 2010, cohort

# Gallstones

Percentage women (20-70jr) becoming symptomatic in 10 yrs ?

- 20%
- 30%
- 40%
- 50%

# Gallstones

Percentage women (20-70jr) becoming symptomatic in 10 yrs ?

- 20%
- 30%
- 40%
- 50%

Angelico 2010, cohort

# Gallstones

Asymptomatic gallstones: therapy not indicated

Prevention :

- weight loss < 1.5 kg /week
- fat intake > 7-10 g/day
- urso prophylaxis

Urso vs placebo for 24 months

Gallstone formation 8 % vs. 30%

Cholecystectomy 3% vs. 10%

# CBD stones

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# Case 1

- Man, 72 yrs
- Medical history
  - Symptomatic gallbladder stones
  - Cholecystectomy planned
- Recurrent RUQ pain, colics
- Since two days: pain ↑↑ , colics ++
- Jaundice, no fever
- Murphy's sign negative

# Case 1

| Lab results       | 28.08 | 03.09 |        |
|-------------------|-------|-------|--------|
| AF                | 77    | 558   | U/L    |
| GGT               | 99    | 857   | U/L    |
| ASAT              |       | 322   | U/L    |
| ALAT              | 27    | 610   | U/L    |
| Bilirubine        | 9     | 161   | Umol/L |
| Bilirubine direct |       |       |        |
| Lipase            |       | 32    | U/L    |
| CRP               | 4     | 24    | U/L    |

# Next step ?

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A: Abdominal ultrasound

B: MRCP

C: EUS

D: ERCP

# MUMC:

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- ERCP, no other modality
- EPT+ stone removal

# Case 2

- Man, 32 years old
- Medical history
  - Cholecystolithiasis, cholecystectomy planned
  - 2 weeks ago: mild biliary pancreatitis while in USA
- Recurrent RUQ pain
- No jaundice, no fever
- No abd. tenderness, murphy's sign negative

# Case 2

| Lab results       | 22.08 | 17.09 |        |
|-------------------|-------|-------|--------|
| Alk Phosph        | 80    | 277   | U/L    |
| GGT               | 37    | 1290  | U/L    |
| ASAT              | 18    | 248   | U/L    |
| ALAT              | 23    | 348   | U/L    |
| Bilirubin         | 7     | 39.8  | Umol/L |
| Bilirubine direct |       |       |        |
| Lipase            | 22    | 82    | U/L    |
| CRP               | 4     | 8     | U/L    |

# Case 2

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- Abdominal US:
  - Galbladder: cholelithiasis
  - Common Bile Duct: normal
  - Slightly prominent intra-hepatic bile ducts

# Next step ?

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A: EUS

B: MRCP

C: ERCP

D: Cholecystectomy + ....



# MUMMC

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- MRCP: no CBD stones
- Cholecystectomy 1 week later

# Choledocholithiasis in gallstone disease

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In patients with symptomatic gallbladder stones:

- 15% also has bile duct stones

Risk stratification is essential for :

- prevention of recurrent colics, pancreatitis and cholangitis

# Choledocholithiasis: predictors

- Laboratory tests
  - Cholestasis
- Normal lab
  - Neg Pred Value 97%
- Abdominal US
  - CBD stones
  - CBD diameter
- Normal CBD
  - Neg Pred Value 96%

# Choledocholithiasis: predictors

| Indicator         | LR + | 95% CI   |             |
|-------------------|------|----------|-------------|
| Cholangitis       | 18.3 | 9-37     | Very Strong |
| CBD stones on US  | 13.6 | 7.5-25   |             |
| Preop jaundice    | 10.1 | 7.3-13.9 |             |
| Dilated CBD on US | 6.9  | 5.6-8.6  | Strong      |
| Bilirubin         | 4.8  | 4.4-5.3  |             |
| Alk Phosphatase   | 2.6  | 2.4-6.9  | Moderate    |
| Pancreatitis      | 2.1  | 1.6-2.7  |             |
| Cholecystitis     | 1.6  | 1.4-1.9  |             |
| Amylase           | 1.5  | 1.1-2.1  |             |

High risk  
>50%

- CBD stone on US
- Cholangitis
- Bilirubin >68 umol/L
- CBD>6mm + bilirubin >30

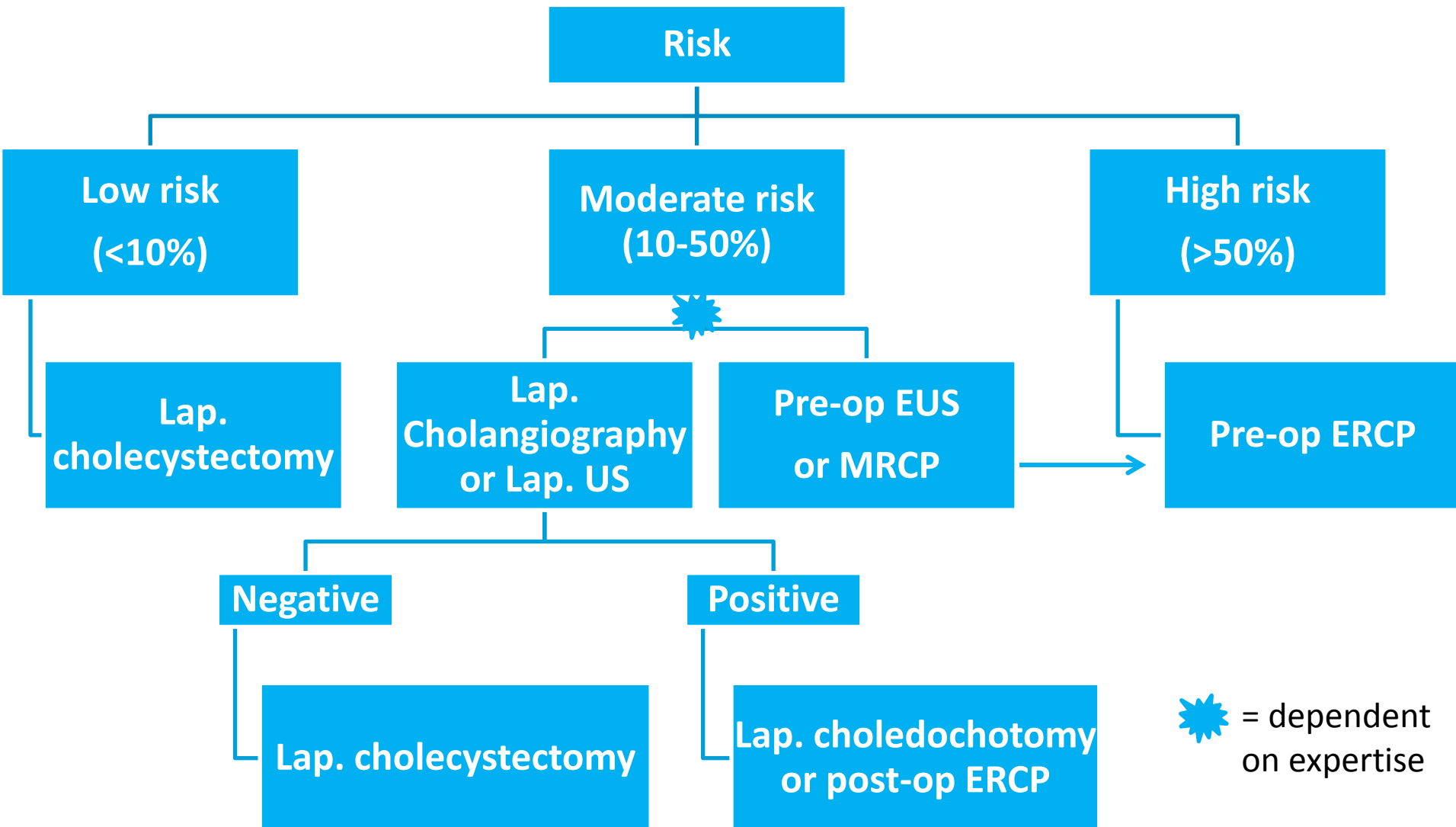
Moderate risk  
10-50%

- CBD>6mm                    ...or...
- Bilirubin >30 - <68
- Abnormal liver tests
- Biliaire pancreatitis

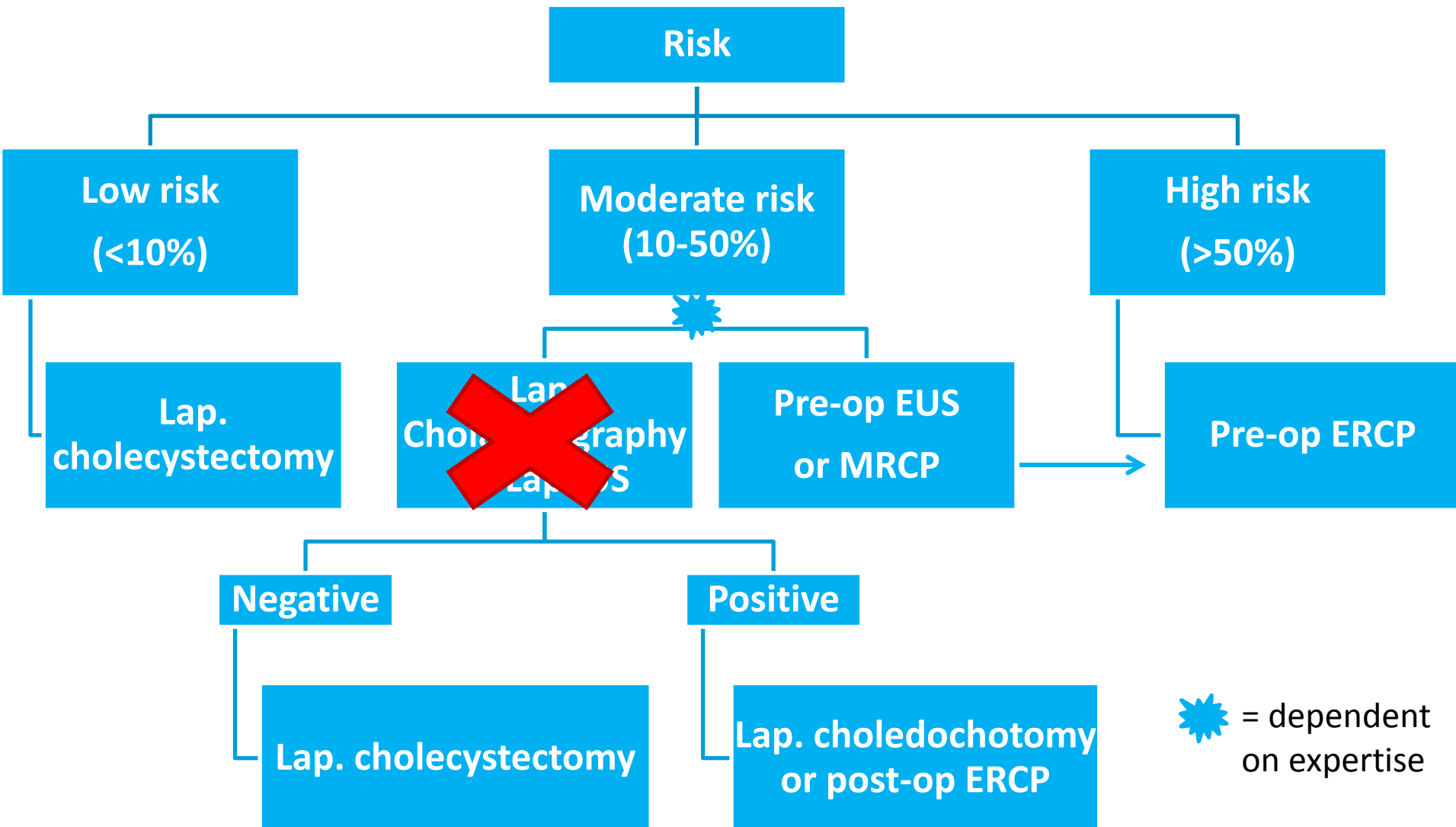
Low risk  
<10%

- No risk factors

# Algorhythm



# Algorhythm



# Non-endoscopic imaging

| Method                           | CBD stones | Sensitivity | Specificity | Remarks                           |
|----------------------------------|------------|-------------|-------------|-----------------------------------|
| Abdominal US                     | CBD stone  | 22-55%      | 100%        |                                   |
|                                  | CBD >6mm   | 77-87%      | 96%         | NPV 96-100%                       |
| MRCP                             | CBD stone  | 85-95%      | 93-97%      | <6mm stones<br>sensitivity 33-71% |
| CT-scan                          | CBD stone  | 65-88%      | 73-97%      | Costs, radiation                  |
| Intra-operative<br>cholangiogram | CBD stone  | 59-100%     | 93-100%     | Costs, success 88-100%            |
| Intra-operative<br>lap. US       | CBD stone  | 71-100%     | 96-100%     | Costs, success 88-100%            |



# Endoscopic imaging

|                          |           | Sensitivity | Specificity | Remarks   |
|--------------------------|-----------|-------------|-------------|---|
| EUS                      | CBD stone | 89-94%      | 94-95%      | Microlithiasis ++<br>0.1-0.3% complications   |
| ERCP                     | CBD stone | 89-93%      | 100%        | Complication risk ↑<br>-pancreatitis 1-6%<br>-infection 0.6-5%<br>-bleeding 0.3-2%<br>-perforation 0.1-1.1% |
| ERCP +<br>intraductal US | CBD stone | 97-100%     |             | Comparable to<br>cholangiogram<br>Costs , expertise   |

# Choledocholithiasis: MRCP vs. EUS

|      | Sensitivity | Specificity | Pro   | Con  |
|------|-------------|-------------|---|--|
| MRCP | 85-95%      | 93-97%      | -Non-invasive<br>-Availability<br>-Less performer dependent | -<6mm stenen<br>sensitivity 33-71%<br>-false-pos in post-EPT<br>- metal devices<br>- claustrofobia |
| EUS  | 89-94%      | 94-95%      | -Microlithiasis ++  | -0.1-0.3%<br>complications   |

- Meta-analysis: MRCP vs. EUS
- 7 studies, n=405

# EUS *before* ERCP

Moderate risk for choledocholithiasis:

- RCT's (n=4): EUS+ERCP vs. ERCP
  - 27-40% EUS : choledocholithiasis ++
    - 60-73% of ERCP's are preventable !
    - EUS: high NPV :
      - Negative EUS: only 0-4% symptoms in 2 yrs follow-up
  - EUS+ERCP -> less complications !!

# Cost effectiveness EUS *prior* to ERCP

- Prospective study, n=485
- Two sessions
- EUS findings: choledocholithiasis in 51%
- In 46% ERCP was not necessary
- Costs of EUS (+ ERCP) vs ERCP: Euro 374 vs 443
- Combined session : even more profitable

# Post-cholecystectomy

## Evaluation:

- Lab: liver tests
- Abdominal US: CBD width ↑
- ERCP: 33-43% choledocholithiasis → moderate risk → MRCP/EUS
- ERCP not as first step !

# Case 1

- Male, 72 yrs
- History: symptomatic cholecystolithiasis
- Waiting list for cholecystectomy
- Bilirubine 161  $\mu\text{mol/L}$
  
- → ERCP

High risk  
>50%

- CBD stone on US
- Cholangitis
- Bilirubin >68 umol/L
- CBD>6mm + bilirubin >30

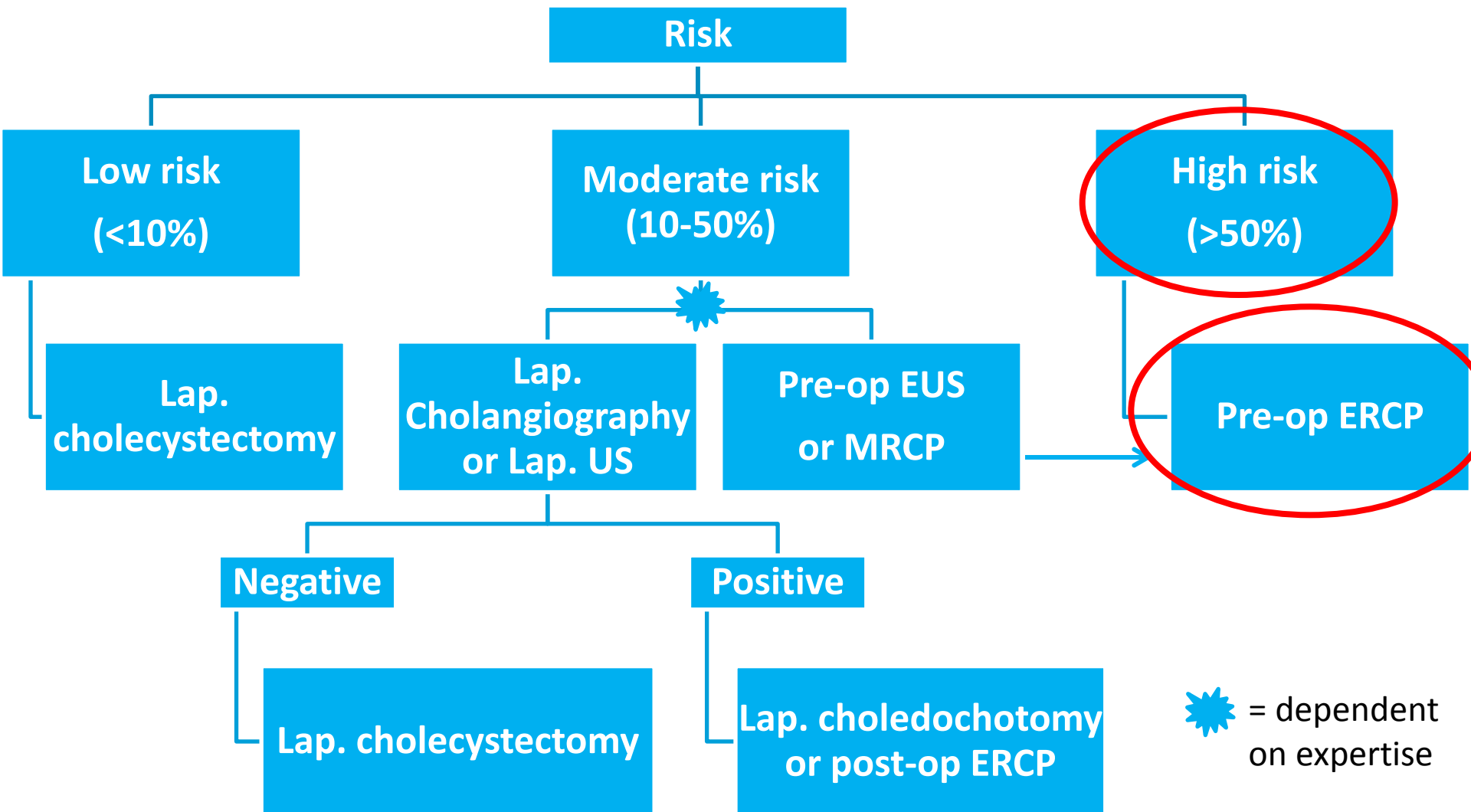
Moderate risk  
10-50%

- CBD>6mm                    ...or...
- Bilirubin >30 - <68
- Abnormal liver tests
- Biliaire pancreatitis

Low risk  
<10%

- No risk factors

# Algorhythm



★ = dependent on expertise



# Case 2

- Man, 32 yrs
- History: cholecystolithiasis, biliary pancreatitis
- Bilirubin 39.8  $\mu\text{mol/L}$
- US: normal CBD duct
  
- → MRCP

High risk  
>50%

- CBD stone on US
- Cholangitis
- Bilirubin >68 umol/L
- CBD>6mm + bilirubin >30

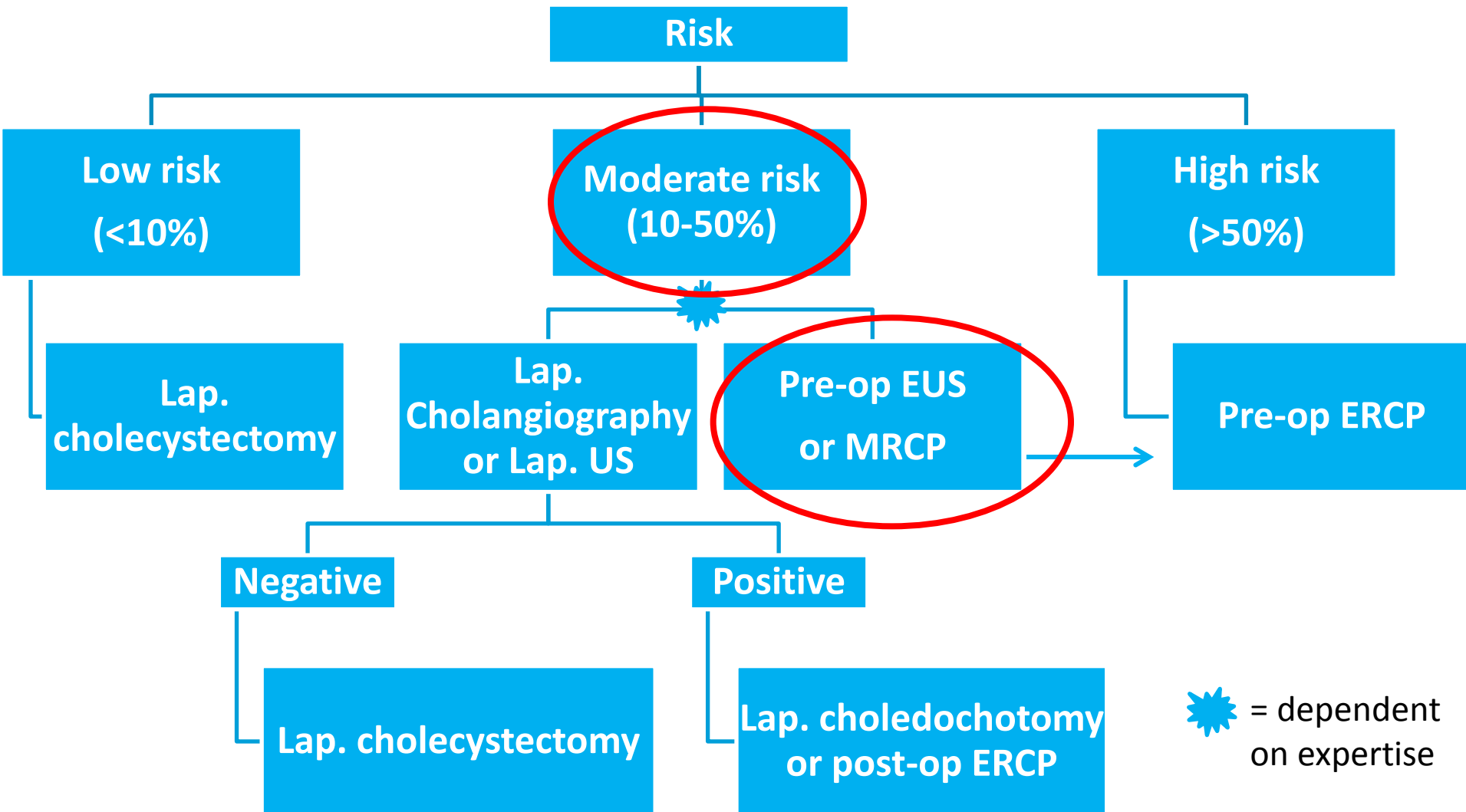
Moderate risk  
10-50%

- CBD>6mm                      *...or...*
- Bilirubin >30 - <68
- Abnormal liver tests
- Biliaire pancreatitis

Low risk  
<10%

- No risk factors

# Algorhythm



# Acute cholangitis

- ERC vs Surgery

- morbidity 34% vs 66%

- mortality 10 % vs 32%

*Lay et al 1992*

- ERC + EPT

- mortality 3-10%

*Kimura 2013*

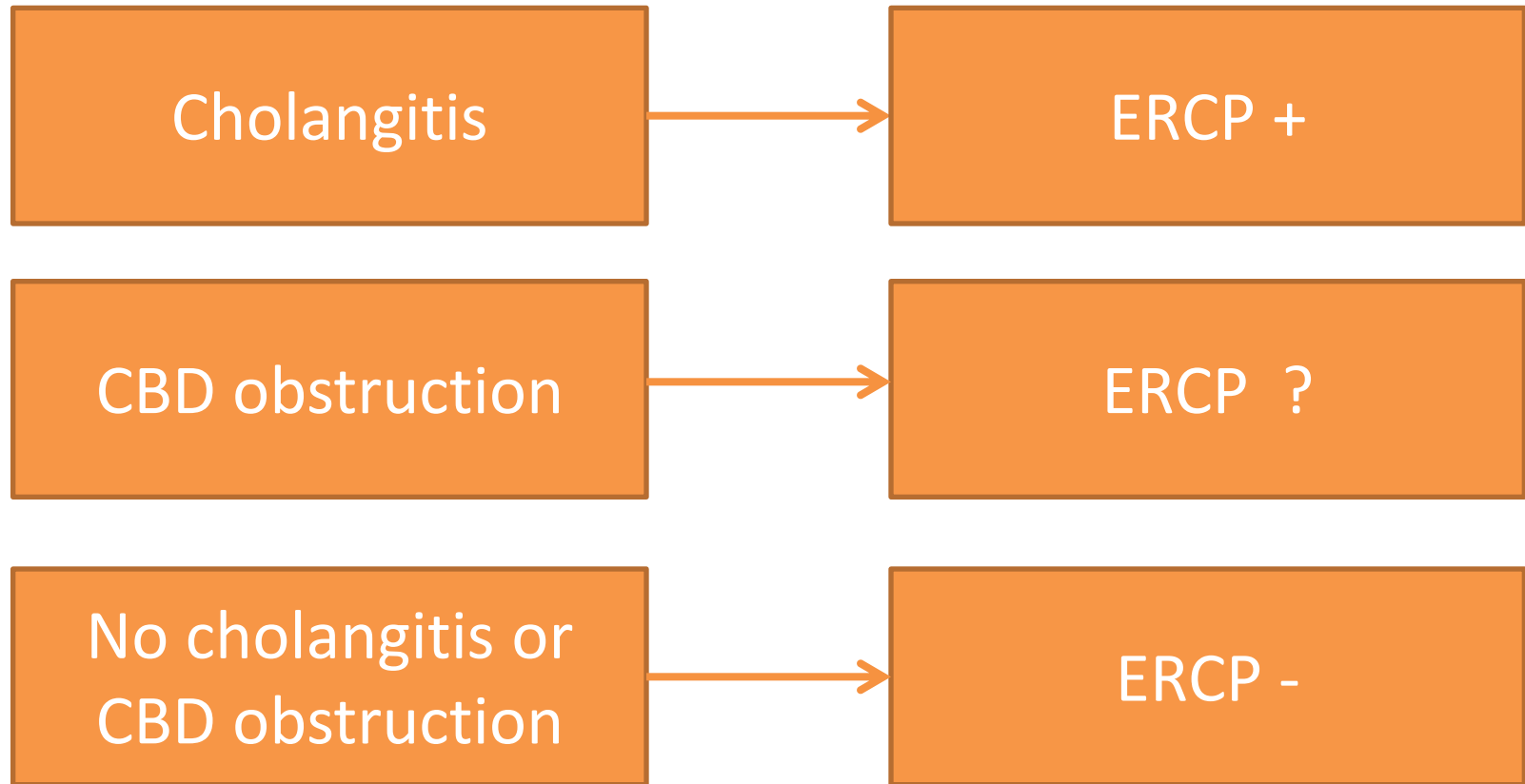
- EPT even in absence of stones

- ERC or PTC : no RCT's

# Acute biliary pancreatitis

- Non invasive markers for CBD (stones) less reliable
- ERCP in pancreatitis with cholangitis: ++ Level A
- ERCP in severe pancreatitis without cholangitis:  
?APEC trial
- Mild pancreatitis → lap. chol < 3 days Level A

# ERCP in biliary pancreatitis



Independent of severity of pancreatitis



# Bile duct injury

**Maastricht UMC+**



Maastricht University

# Case, this week .....

- Male, 51 yrs old
- Recurrent biliary colics ( 2x)
- Emergency room: 3rd episode colics
- LFT , lipase: normal range
- US: hydropic GB, wall thickness > 8 mm, stones, CBD normal : acute cholecystitis
- Lap cholecystectomy, conversion to open procedure
- Biliary drain: production + , bilirubin > 250 umol/L  
lab: CRP ++



# Biliary leakage ? next step ?

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- MRCP
- EUS
- Surgical intervention
- ERCP

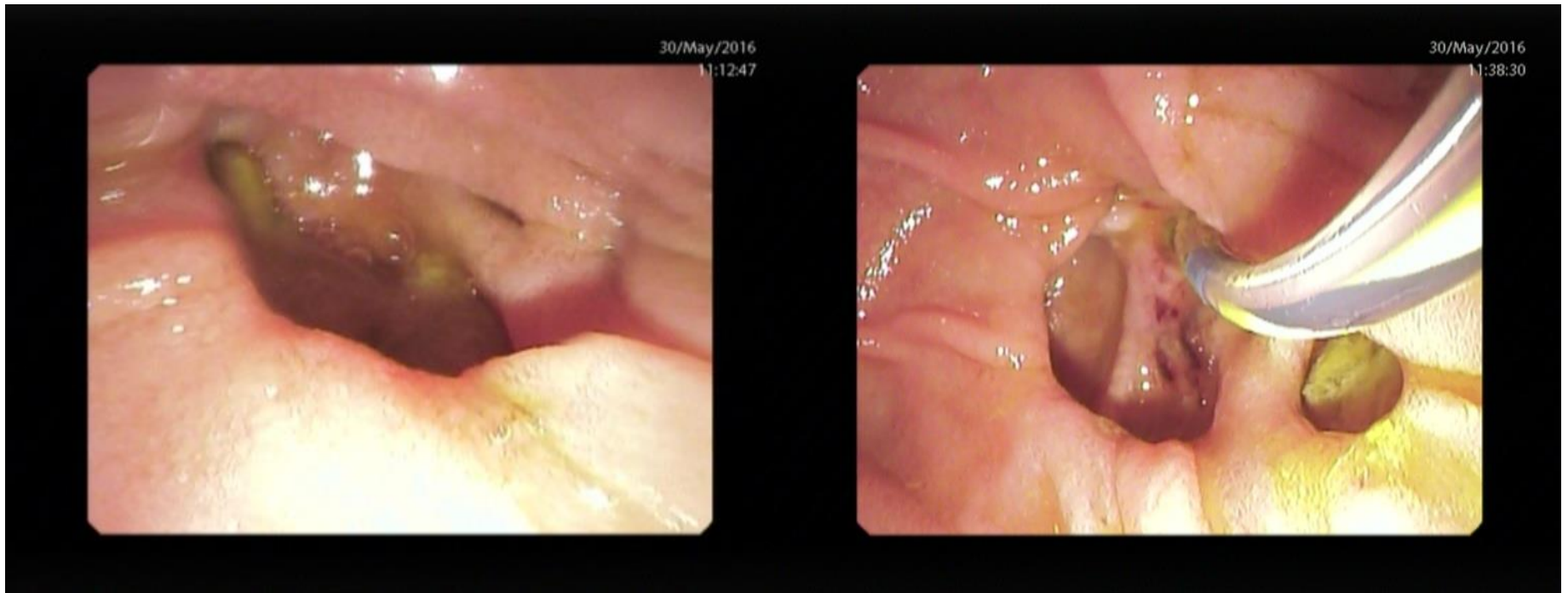
# Biliary leakage ? next step ?

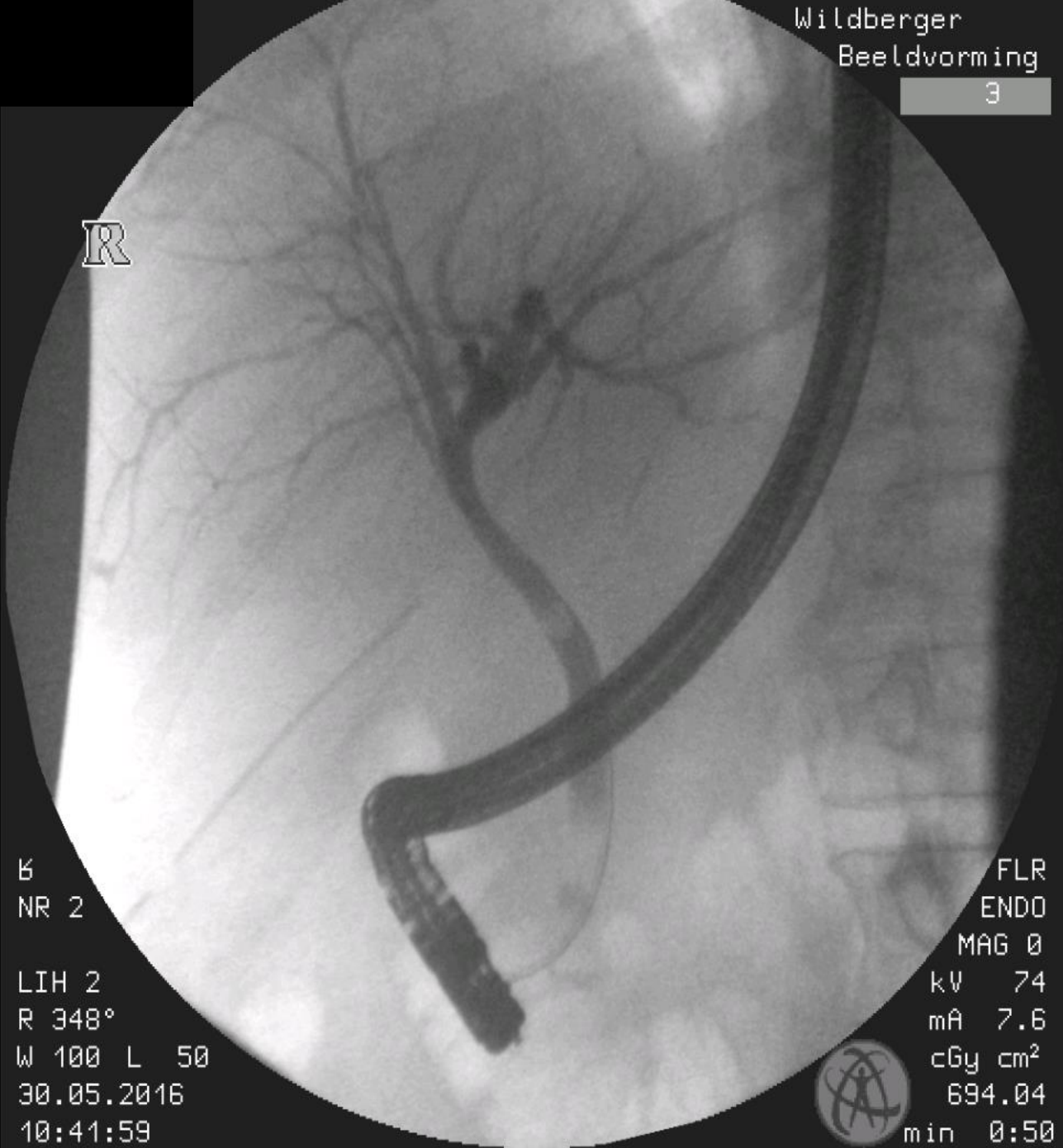
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- MRCP
- EUS
- Surgical intervention
- ERCP urgent or elective?

# MUMMC :

- Elective ERCP on Monday morning





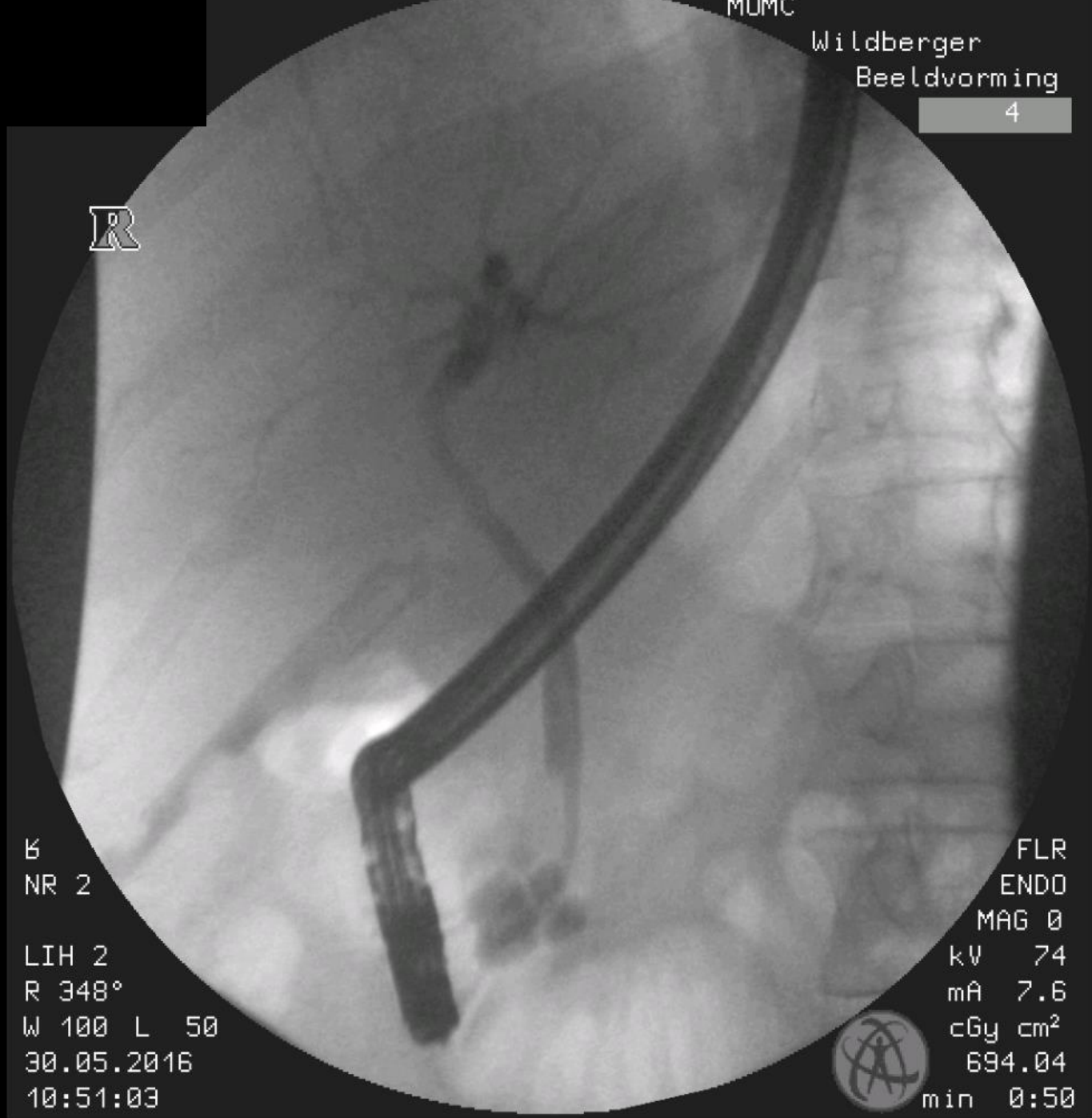
R

K  
NR 2  
  
LIH 2  
R 348°  
W 100 L 50  
30.05.2016  
10:41:59

FLR  
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MAG 0  
kV 74  
mA 7.6  
cGy cm<sup>2</sup>  
694.04  
min 0:50



R



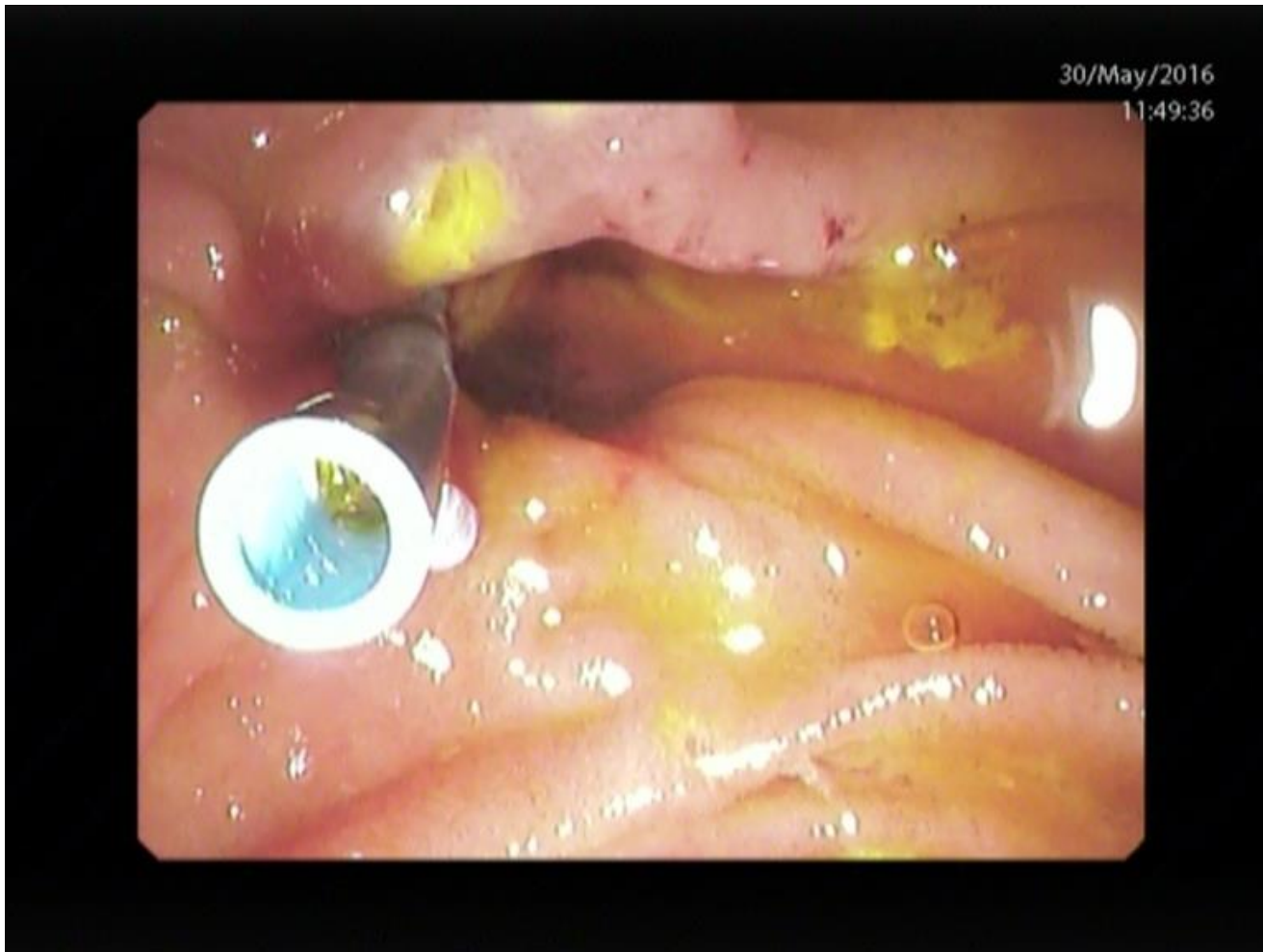
B  
NR 2

LIH 2  
R 348°  
W 100 L 50  
30.05.2016  
10:51:03

FLR  
ENDO  
MAG 0  
kV 74  
mA 7.6  
cGy cm<sup>2</sup>  
694.04  
min 0:50



# EPT, stone extraction, stent



# Bile duct injury

## Incidence:

- Lap. cholecystectomy: 0.04 - 1.5%
- Open cholecystectomy: 0.0 - 0.5%

## Diagnosis:

- Lab: Leucocytosis, LFT
- US: collection, dilated bile ducts
- MRCP, ERC, PTC
- ERC : 90% , Intra-op Cholangiogram: 80%

# Bile duct injury

## Amsterdam classification

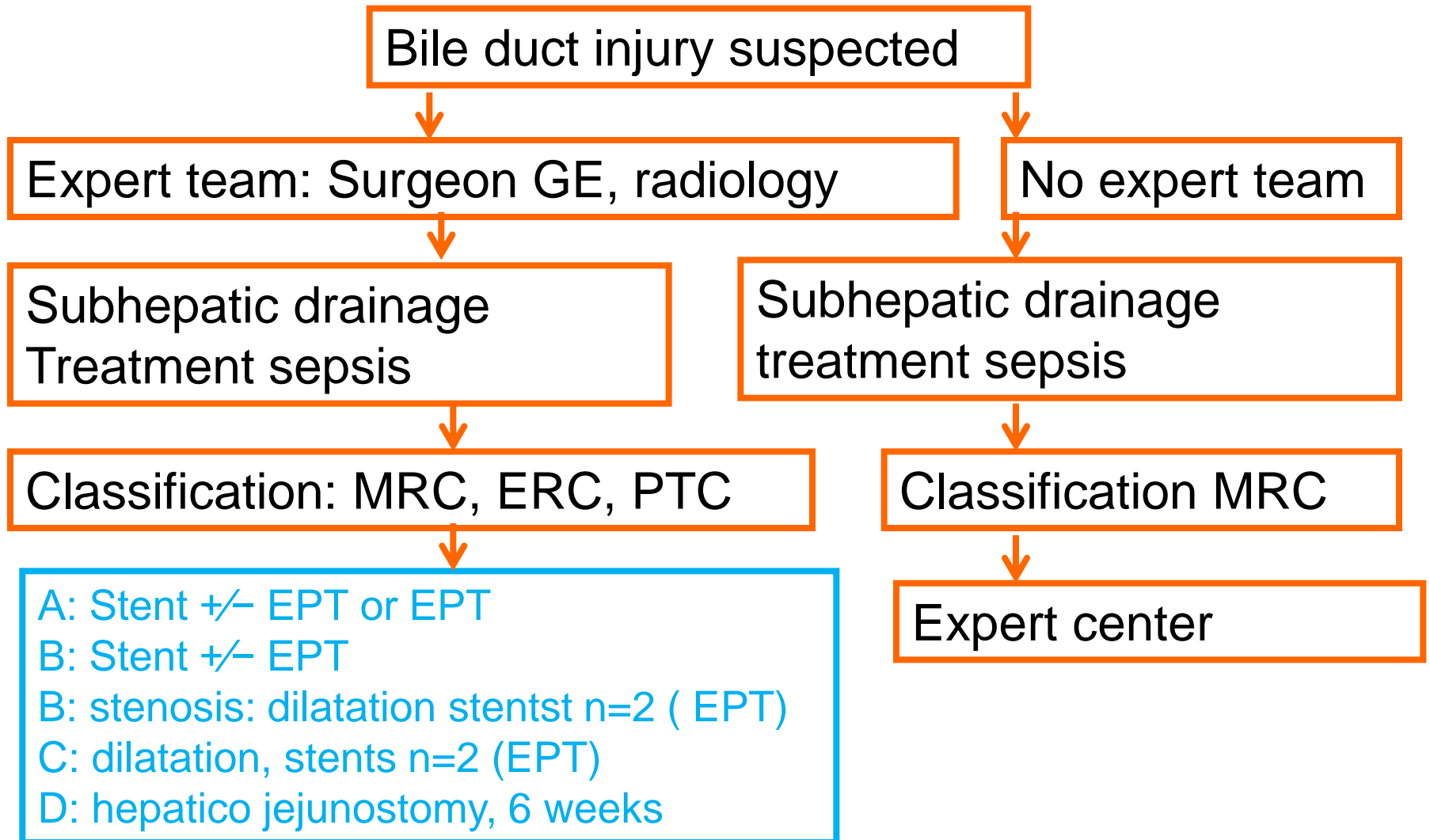
- A: Leakage cystic or Luschka's duct
- B: Leakage CBD +/- stenosis
- C: stricture without leakage
- D: CBD transsection



# Bile duct injury

| Amsterdam classification              | Therapy                 | Succes rate ERC |
|---------------------------------------|-------------------------|-----------------|
| A: cystic duct or Luschka's duct leak | ERC , stent, drain, EPT | ERC: 95%        |
| B: Leakage CBD +/- stenosis           | ERC: stent, dilatation  | ERC: 80-90%     |
| C: Stricture without leakage          | ERC Stent, dilatation   | ERC: 50%        |
| D: CBD transsection                   |                         | Surgery         |

# Algorithm



# Conclusions

- Treatment of gallstone diseases and complications is teamwork !
- Expertise centres
- Gastroenterologist/endoscopist support by ERCP, EUS : *timing and expertise*
- Best practice: Combined Abdominal UNIT !  
MUMC: starting second half of 2016

# Biliary leakage therapy

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- Sub hepatic drainage and antibiotics
- Amsterdam A : ERC+ EPT, stent, drain
- Amsterdam B,C: ERC , stent , dilatation
- Amsterdam D: Surgery