Prevention and management of complications

Endoscopic retrograde cholangiopancreatography (ERCP)

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Endoscopic retrograde Cholangio-pancreaticography (ERCP)

Diagnoses and therapy

- Papillary diseases
- Biliary diseases
- Pancreatic diseases
Most investigations are therapeutic
<table>
<thead>
<tr>
<th>Year</th>
<th>ERCP/PTC</th>
<th>Diagnosis</th>
<th>Therapy</th>
<th>EST</th>
</tr>
</thead>
<tbody>
<tr>
<td>1977</td>
<td>190</td>
<td>90 %</td>
<td>10 %</td>
<td>19</td>
</tr>
<tr>
<td>1987</td>
<td>1145</td>
<td>46.9 %</td>
<td>53.1 %</td>
<td>607</td>
</tr>
<tr>
<td>1997</td>
<td>1185</td>
<td>22.1 %</td>
<td>77.9 %</td>
<td>352</td>
</tr>
<tr>
<td>2005</td>
<td>1342</td>
<td>18.8 %</td>
<td>81.2 %</td>
<td>252</td>
</tr>
</tbody>
</table>

ERCP 1976 – 2005
n=28280 (9692 EST)
ERCP includes a high risk compared with other endoscopic procedures
Complications

Pancreatitis
Bleeding
Infection (Cholangitis)
Perforation
Sedation
Others
How to detect complications?
Early diagnoses and therapy

During procedure
Pain, endoscopic findings, radiologic signs

Early follow up
Symptoms (2-12 h after ERCP)
Laboratory tests (Amylase / Lipase 2-5 h after ERCP)
Imaging diagnostic

Interdisciplinary cooperation
Onset of complications

within 3 days
73% of symptoms
80% of severe complications

Christensen 2004, GIE; 60: 721-731
Rate and severity of complications
## EST Results

<table>
<thead>
<tr>
<th></th>
<th>Success</th>
<th>Complications</th>
<th>Procedure related mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>96.6 – 97.1%</td>
<td>97.3%</td>
</tr>
<tr>
<td><strong>Success</strong></td>
<td>97.3%</td>
<td>9,5%</td>
<td></td>
</tr>
<tr>
<td><strong>Complications</strong></td>
<td>4.0 – 15.7%</td>
<td>6.1%</td>
<td></td>
</tr>
<tr>
<td>Pancreatitis</td>
<td>1.3 – 5.4%</td>
<td>1.5%</td>
<td></td>
</tr>
<tr>
<td>Bleeding</td>
<td>0.8 – 2.3%</td>
<td>1.1%</td>
<td></td>
</tr>
<tr>
<td>Cholangitis</td>
<td>0.9 – 2.1%</td>
<td>0.4%</td>
<td></td>
</tr>
<tr>
<td>Perforation</td>
<td>0.2 – 0.6%</td>
<td>0.4%</td>
<td></td>
</tr>
</tbody>
</table>

Freeman et al. 1996 (n=2347), Loperfido et al. 1998 (n=2769), Rabenstein et al. 2000 (n=438), Zinsser et al 1999 (n=861), 1 Schmidt, Schulz 2001
## Severity of complications

<table>
<thead>
<tr>
<th>complication</th>
<th>severity of complication</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mild</td>
</tr>
<tr>
<td>Pancreatitis</td>
<td>3.4%</td>
</tr>
<tr>
<td>Bleeding</td>
<td>1.1%</td>
</tr>
<tr>
<td>Cholangitis</td>
<td>0.4%</td>
</tr>
<tr>
<td>Perforation</td>
<td></td>
</tr>
<tr>
<td>others</td>
<td></td>
</tr>
<tr>
<td>total</td>
<td>4.9%</td>
</tr>
</tbody>
</table>
ERCP-complications
causes

Papillary anatomy
• variations
• diseases
• posttherapeutic changes

Technique – Endoscopist – Assistance

Patient related risk
Are ERCP complications avoidable?
ERCP-complications
Risk factors

- low experience / training of the endoscopist
- small centre (≤ 150 ERCP / year)
- repeated cannulation / opacification of pancreatic duct
- precut, (fistulotomy)
- no increased risk -> in experienced hands (Precut-frequency > 10 %)

multivariate analyses – different results \(^1\), several factors → increasing complications \(^3\)

Post-ERCP-pancreatitis is one of the most feared ERCP-complication
Post-ERCP-pancreatitis
1 – 40 % (6,1 %)\(^1\)

Definition
(prospective) Diagnostic
Patient-related factors
Procedure-related factors

1) Schmidt, Schulz; 2001
Post-ERCP-Pancreatitis
Diagnostic as risky as therapeutic

Freeman, GIE 2001
Post-ERCP-pancreatitis
Definition

Symptoms (pain)
Amylase/lipase > 3 x N / 24h
Hospitalisation > 1d or unplanned
- mild (2 - 3 days)
- moderate (4 - 10 days)
- severe (> 10 days, ICU, Necrosis, Pseudocysts, endosc. / percutaneous / surg. intervention, death)

Cotton et al. GI Endosc. 1991; 37: 383-391
Post-ERCP-pancreatitis

The mechanism is not clearly understood

- trauma / thermal injury: papillary edema, SO-spasm
- infection: contamination by bacterial proteases
- hydrostatic: overinjection of pancreatic duct
- chemical: contrast medium

trigger intracellular activation of trypsinogen

→ pancreatic acinar cell damage and local inflammation
   (systemic inflammatory response with multiorgan involvement)
Post-ERCP-pancreatitis Prevention

Restricted ERCP indication
(Symptoms, Laboratory, Sonography, MRCP/Endosonography)

Avoidance of unnecessary ERCP
Post-ERCP-pancreatitis Prevention

Identification of risk factors
  Patient-related risk factors
  Procedure-related risk factors

Endoscopic protection

Pharmacologic intervention
## Post-ERCP-pancreatitis
### Risk factors

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Incidence ERCP</th>
<th>Incidence control</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SO – Dysfunction</td>
<td>10.31%</td>
<td>3.87%</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Female gender</td>
<td>4.04%</td>
<td>2.07%</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Previous pancreatitis</td>
<td>6.71%</td>
<td>3.78%</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Precut</td>
<td>5.28%</td>
<td>3.10%</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Pancreatic duct injection</td>
<td>3.27%</td>
<td>1.66%</td>
<td>&lt; 0.021</td>
</tr>
</tbody>
</table>

Metaanalysis Masci 2003, Endoscopy; 35: 830-834
Post-ERCP-pancreatitis
Risk factors

Metaanalyses Masci 2003, Endoscopy; 35: 830-834
Post-ERCP-pancreatitis
 Risk factors

- Female gender: RR 2.2 (P < 0.001)
- Previous pancreatitis: RR 2.7 (P < 0.001)
- Precut: RR 2.4 (P < 0.001)
- Pancreatic duct injection: RR 2.2 (P < 0.001)

Metaanalyses Masci 2003, Endoscopy; 35: 830-834
Post-ERCP-pancreatitis
Risk factors are cumulative

female gender

Bilirubin < 1mg%

SOD

difficult cannulation

Freeman 2001, Gastrointest Endosc
POST-ERCP PANCREATITIS: risk factors are cumulative

adjusted risk of pancreatitis (%)
Post-ERCP-pancreatitis Prevention

Restricted indication
(Symptoms, Laboratory, Sonography, MRCP/Endosonography)

Carefull technique
(pure cut current?)

Pancreatic–Stent
(SOD, Papillectomy)

Chemoprevention

Elta et al, GIE 1998; 47:149-153
Post-ERCP-pancreatitis Prevention

Pancreatic-stents in high risk ERCP

decreased risk of pancreatitis

no severe pancreatitis

Freeman et al, GIE 2004; 59: 8-14
Post-ERCP-pancreatitis Prevention

Panceatic stents after biliary EPT in SOD

n = 80  26%  vs  7%  (p = 0.03)^1

n = 76  28%  vs  5%  (p < 0.005)^2

no moderate / severe pancreatitis after successful stenting

5 F-Stents/tubes, 5.7% failure

1) Tarnasky 1998, Gastroenterology; 115: 1518-1524
2) Fazel 2003, GI Endosc.; 57: 291-294
Prevention of Post-ERCP-pancreatitis
Pancreatic-stents in high risk ERCP

may be technically difficult (failure 4.6-10.4 %)

failure may be worse than no attempt

high risk of Post-ERCP-pancreatitis (40 - 67 % ¹ ²)

new wires (0.018, 0.025) required

new stents (3F, 4F, 5F) required

documentation of stent migration (x-ray) / Stent extraction

may cause duct damage

Post-ERCP-pancreatitis
Chemoprevention

Somatostatin
Octreotid
Steroide
Interleukin 10
Gabexate
Heparin
Allopurinol
Nifedipin
Diclofenac
Glycerol-Trinitrat-Pflaster
Sekretin
Antibiotika
# Post-ERCP-pancreatitis Chemoprevention

<table>
<thead>
<tr>
<th>Effective</th>
<th>Possible Effect</th>
<th>Ineffective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gabexate&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Sekretin</td>
<td>non-ionic contrast</td>
</tr>
<tr>
<td>Somatostatin&lt;sup&gt;2&lt;/sup&gt;</td>
<td>NSAIDs&lt;sup&gt;3&lt;/sup&gt;</td>
<td>Octreotid</td>
</tr>
<tr>
<td></td>
<td>TNG</td>
<td>PAF-inhibitors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Steroids</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Allopurinol</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Heparin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IL - 10</td>
</tr>
</tbody>
</table>

1. 200-1000 mg > 12h (6.5h)
2. 250 µg/h > 12h
3. 100 mg Diclofenac Supp nach Untersuchung
Post-ERCP-pancreatitis
Chemoprevention

Gabexate Mesilate¹

1,6 % vs. 6,5 %
NNT 27

1 200-1000 mg > 12h (6.5h)

Somatostatin²

5,6 % vs. 13,5 %
NNT 13

2 250 µg/h > 12h

Andriulli 2000, GIE; 51: 1-7
Post-ERCP-pancreatitis
Chemoprevention
Diclofenac

<table>
<thead>
<tr>
<th></th>
<th>Diclofenac</th>
<th>Control</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Patients</td>
<td>7/100 (5.4%)</td>
<td>17/110 (15.4%)</td>
<td>0.049a</td>
</tr>
<tr>
<td>EPT</td>
<td>2/53 (3.8%)</td>
<td>12/63 (19.0%)</td>
<td>0.021a</td>
</tr>
<tr>
<td>no SOD</td>
<td>4/84 (4.8%)</td>
<td>12/83 (15.7%)</td>
<td>0.036a</td>
</tr>
<tr>
<td>SOD</td>
<td>3/26 (11.5%)</td>
<td>4/27 (14.8%)</td>
<td>NS</td>
</tr>
</tbody>
</table>

100 mg Diclofenac Supp or Placebo immediately after endoscopy

Murray 2003, Gastroenterology; 124: 1786-1791
Complications

- Pancreatitis
- Bleeding
- Infection (Cholangitis)
- Perforation
- Sedation
- Others
POST EST Bleeding (0.8 – 2.3 %)

Variants in vascular anatomy

**Incision**

- longer
- uncontrolled

**Risk factors**

- coagulopathy before EPT
- Cholangitis before EPT
- Antikoagulation after EPT (≤ 3d)
- Bleeding during EPT
- Low case volume

Freeman 1999, Gastrointest Endosc 49: 580-86
EST- Bleedings
Therapy

immediately
after EST

mild
no therapy

moderate
\[ \leq 4 \text{ U}, \text{Endoscopy} \]
no radiologic intervention
no operation

severe
\[ > 4 \text{ U}, \text{radiologic intervention} \]
operation

delayed
for hours or several days

Post-ERCP-Infection / Cholangitis (0.9 – 2.1 %)

Lack of drainage
Infected bile (stricture / stone obstruction)
Infected pancreatic pseudocysts

mild
Temp. > 38°C

moderate
Fever/sepsis
> 3 d hospital treatment
Endoscopic / percutaneous intervention

severe
Septic shock / surgery
Perforation (0.2 – 0.6 %)

Diagnosis

Symptoms
- skin emphysema
- abdominal pain
- x-ray abdomen
- retroperitoneal air
- intraperitoneal air
- chest x-ray
- mediastinal emphysema
- pneumopericardium

CT
POST EST-Perforation

mild
no / small leak
conservative treatment < 3 d
(iv-fluids, nasogastric function)

moderate
definite perforation leak
non-operative treatment > 4d

severe
non-operative treatment > 10 d
operation

Sedation / Others

Cardiac complications 0.9 %
Respiratory complications 1.5 %
Thromboembolic / ischemic episodes 0.7 %

Christensen 2004, GIE; 60: 721-731
ERCP / EST – Risk Reduction

Restricted Indication
alternative imaging

adequate technique (education / training)
notice the local Anatomy
avoid unnecessary risks
perform effective EST / Drainage
Desinfektion / Sterilisation
chemoprevention / endoscopic prophylaxis

Risk-patients in endoscopic centers