Endoscopic Retrograde Cholangiopancreatography (ERCP) in Elderly Patients

Piera Barbisoni
<table>
<thead>
<tr>
<th>Anno</th>
<th>ERCP (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>13</td>
</tr>
<tr>
<td>2008</td>
<td>12</td>
</tr>
<tr>
<td>2009</td>
<td>30</td>
</tr>
<tr>
<td>2010 (4 mesi)</td>
<td>14 (&gt;40)</td>
</tr>
</tbody>
</table>
• Introduction

• Indications, contraindications and complications (ASGE guideline)

• Antibiotic prophylaxis for GI endoscopy (ASGE and ESGE guideline)

• Antithrombotic agent for endoscope procedures (ASGE guideline)

• Conclusions
Pancreaticobiliary tract disease is common in the elderly (increasing prevalence of cholelithiasis, choledocholithiasis, and malignancy).

Common bile duct stones and cancer account for more than 70% of cases of jaundice in patients over the age of 75.

Biliary tract disease is the most common indication for abdominal surgery in the elderly.

In octogenarians, biliary tract surgery carries mortality as high as 9.5% and a complication rate as high as 63%.

In the view of the high mortality-morbidity of this surgical procedure in the elderly, endoscopic alternatives should be preferred for the management of certain biliary tract disorders.
ERCP is an invasive procedure. It is one of the most technically complicated procedures done by gastroenterologists, and is associated with the highest risk of complications of any procedures that they do (morbidity and mortality rates of 5% to 10%, and 0.1% to 1% respectively).
ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY IN ELDERLY PATIENTS

Wen-Hsiung Chang¹,²*, Wei-Yi Lei¹,²

¹Division of Gastroenterology, Department of Internal Medicine, Mackay Memorial Hospital, and
²Mackay Medicine, Nursing and Management College, Taipei, Taiwan.

International Journal of Gerontology | June 2007
Since its introduction in 1968, ERCP has become a commonly endoscopic procedure for evaluating biliary and pancreas disease.

ERCP has evolved from a diagnostic procedure to an almost exclusively therapeutic procedure (endoscopic sphincterotomy in 1974).

There have been publications documenting the safety of ERCP in elderly patients from the age of 65 to 85 years. Recent studies have also shown that ERCP is safe and effective in those aged 90 years and older.

Outcomes of ERCP in terms of success and complication rates are similar to those in young patients.

The decision to undergo ERCP should be determined by clinical need, and age alone should not be a contraindication to endoscopic intervention.
E’ un esame combinato endoscopico-radiologico.

Si esegue mediante l’introduzione del duodenoscopio (endoscopio a visione laterale che consente una visione frontale della papilla del Vater) attraverso la bocca, nel paziente sedato, in posizione prona e a digiuno.

In vicinanza della papilla (sbocco coledoco e Wirsung), all’interno dell’endoscopio viene fatta passare una “cannula” che viene inserita nel dotto pancreatico o nel coledoco. La cannula consente di iniettare all’interno dei dotti un liquido di contrasto che opacizza i dotti stessi permettendo la visualizzazione tramite radiografia di eventuali stenosi, ostruzione, dilatazione (ERCP diagnostica: 10-15%; non raccomandata se solo diagnostica).

Successivamente alla “contrastografia” possono essere praticate, sempre per via endoscopica, tecniche terapeutiche quali la sfinterotomia (apertura della papilla), la rimozione dei calcoli, la litoressia (frammentazione), la protesizzazione o tecniche diagnostiche quali lo studio citologico o istologico dei dotti pancreatici o epatici.
La sfinterotomia o papillotomia è il taglio della la papilla effettuato con uno strumento dotato di un filo metallico attraverso cui passa corrente (sfinterotomo standard/pre-cut). Il taglio viene fatto per allargare l’apertura della papilla. Ciò consente vari trattamenti attraverso il dotto biliare e quello pancreatico. Eccezionalmente la papillotomia si rende necessaria per raggiungere la via biliare a scopo diagnostico.
La *rimozione di calcoli* è il trattamento che più frequentemente viene fatto attraverso l’ERCP. Dopo la sfinterotomia i calcoli possono essere rimossi attraverso vari strumenti (catetere a palloncino, cestello di Dormia, ecc).

Un altro intervento che può essere effettuato in corso di ERCP è il *posizionamento di protesi* (plastica-metallo autoesespandibili) per superare restringimenti (stenosi cicatriziale, neoplastica) o drenare la via biliare in caso di calcoli non completamente estratti (stent biliare temporaneo).
ASGE guideline: the role of ERCP in diseases of the biliary tract and the pancreas
INDICAZIONI ALLA ERCP

A. paziente itterico in cui si sospetti una ostruzione biliare
B. presenza di dati clinici, biochimici o di imaging che pongono il sospetto di una malattia biliare o pancreatica
C. presenza di segni o sintomi sospetti per una lesione maligna del pancreas quando i risultati della diagnostica per immagini (ecografia, TAC, RMN) siano equivoci o normali.
D. Pancreatite ad eziologia sconosciuta
E. Valutazione preoperatoria in paziente con pancreatite cronica e/o pseudocisti
F. Valutazione monometrica dello sfintere di Oddi
G. Sfinterotomia endoscopica per:
   1. coledocolitiasi
   2. stenosi papillare o disfunzione dello sfintere di Oddi
   3. Posizionamento di stent biliare o dilatazione pneumatica
   4. sump syndrome
   5. coledococele
   6. carcinoma ampollare nei pazienti non candidati alla chirurgia
   7. accesso al dotto pancreatico
H. inserimento di stent in pazienti con patologie benigne o maligne, fistole, spandimenti biliari post-operatori, calcoli giganti
I. dilatazione pneumatica di stenosi duttali
J. posizionamento di sondini naso-biliari
K. drenaggio di pseudocisti
L. prelievo di tessuto dai dotti pancreatici o biliari
M. terapia delle malattie pancreatiche

(Am J Gastroenterol 2006;101:892–897)
BILIARY TRACT DISEASES

CHOLEDOCHOLITHIASIS

Patients with biliary colic, obstructive jaundice, cholangitis or pancreatitis; sensitivity and specificity of ERCP for detecting stones is over 95%; sphincterotomy and stone extraction is successful in more than 90% of cases (short-term use of biliary stent to ensure adequate biliary drainage in patients with common bile duct stone that have not been extracted).

MALIGNANT BILIARY OBSTRUCTIONS

Biopsies, brushings and fine needle aspiration; biliary stent placement as palliation or short-term stent before surgery.

BENIGN BILE-DUCT STRICTURES

Congenital abnormalities, post-operative complications → dilatation with hydrostatic balloons or a graduated catheter passed over a guidewire.
PANCREATIC CANCER (TC, RMN but biopsy and brush cytology; sensitivity rate for ERCP-directed brush cytology or biopsy is 30-50%, with a combination achieving sensitivity rates of 65-70%)

CHRONIC PANCREATITIS (treatment of symptomatic stones, strictures → pancreatic sphyncterotomy and stone removal; dilatation and stent)

RECURRENT ACUTE PANCREATITIS (sphyncterotomy and stent placement)

PANCREATIC FLUID COLLECTION (acute pseudocysts, chronic pseudocysts, and pancreatic necrosis) (drainage via transpapillary approach if communication with pancreatic duct or transgastric/transduodenal approach in noncommunicating fluid collection)
CONTRAINDICATIONS

Potential contraindications to endoscopic retrograde cholangiopancreatography

Intestinal obstruction
Suspected perforated viscus
High risk patients in whom the potential benefit does not justify the risk
Insufficient endoscopic skills

Situations in which endoscopic retrograde cholangiopancreatography is generally not indicated

Obscure pain without objective clinical findings or laboratory data to suggest biliary or pancreatic disease
A single episode of acute pancreatitis without suggestion of biliary tract disease or neoplasm
Evaluation of pancreatic carcinoma where other tests are diagnostic and there is no evidence of biliary obstruction
Evaluation of the gallbladder without evidence of bile duct disease
ASGE guideline: modifications in endoscopic practice for the elderly
Indication and Contraindication

The indications of ERCP among the elderly are largely the same as those for adults.

The absolute and relative contraindications are similar to middle-age or young adults, without respect to age.
Pre-procedural Preparation

The preparation of elderly undergoing ERCP is similar to that used for upper gastrointestinal endoscopy:

• No solid food for at least 6h and no liquid for at least 4h before the procedure.
• Informed consent should be obtained and documented.
• Pharyngeal anesthesia (lidocaina spray) is often administered.
• Patients undergoing ERCP sphincterotomy should have INR performed no more than 72h prior to procedure.
Sedation and Analgesia

Because of the longer duration and more potential discomfort of the ERCP procedure, “moderate sedation” with IV benzodiazepines (midazolam or diazepam) and frequent addition of analgesic opiates (meperidine or fentanyl) are usually necessary.

Drugs used for sedation in the elderly population should have a short half-life, limited side effects, and be administered at a slower rate and with a reduced total dose.

While midazolam and narcotics are commonly used in younger patients, fentanyl has a quicker onset of action and shorter half-life, and is safer than meperidine in the elderly.
Monitoring and Procedural Care

Appropriate attention to elderly patients monitoring before, during and after procedure, will help to minimize complications as well as to detect early signs of distress, so that resuscitation measures can be instituted.

Parameters for monitoring include significant changes in pulse, blood pressure, oxygen saturation, cardiac rhythm, and clinical and neurologic status.
Complications of ERCP

- **ERCP-INDUCED PANCREATITIS**: 1.0%-7.0%
- **CHOLANGITIS**: 1.0%
- **CHOLECISTITIS**: 0.2%-0.5%
- **G.I. HEMORRHAGE**: 0.7%-2.0%
- **PERFORATION**: 0.3%-0.6%
- **CARDIOPULMONARY COMPLICATIONS**: < 1%
- **MORTALITY**: 0.2%-0.4%
Acute pancreatitis is the most common and serious complication of ERCP (rate 1%-7%).

Although transient elevation of serum pancreatic enzymes is extremely common, such as elevation does not necessarily constitute pancreatitis.

The consensus definition for acute post-procedure pancreatitis is as follows:

- New or worsened abdominal pain with
- A serum amylase that is 3 or more times the upper limits of normal 24 hours after the procedure.
ERCP-INDUCED PANCREATITIS

It has three grades of severity:

**MILD:** requiring hospitalization of 2-3 days

**MODERATE:** hospitalization of 4-10 days

**SEVERE:** hospitalization of more than 10 days, or hemorrhagic pancreatitis, pseudocyst, or required intervention (percutaneous drainage or surgery)
Numerous factors have been found to correlate with the development of pancreatitis.

Operator-related factors
- Inadequate training
- Lack of experience

Patient-related factors
- Younger age
- Female sex
- Normal serum bilirubin
- Recurrent pancreatitis
- Prior ERCP-induced pancreatitis
- Sphincter of Oddi dysfunction

Procedure-related factors
- Difficult cannulation
- Pancreatic duct injection
- Sphincter of Oddi manometry
- Precut sphincterotomy
- Pancreatic sphincterotomy
- Minor papilla sphincterotomy

Many of these variables can be assessed before the examination and should be accounted for when considering ERCP.
Endoscopists who perform ERCP should have appropriate training and expertise (performance of at least 200 ERCPs, including 40 sphincterotomies, and 10 stent replacement).
Patient selection: careful patient selection is probably the most important method for reducing ERCP-induced pancreatitis (“avoid unnecessary ERCP”).

Pharmacologic prophylaxis: several methods of pharmacologic prophylaxis have been proposed, but randomized trials have not consistently shown a clinical benefit. No drug is currently recommended for routine prevention of ERCP-pancreatitis.

Somatostatin and octreotide reduce pancreatic secretion and therefore may limit pancreatic duct hypertension, allopurinol, nifedipien, IL-10, nitroglycerin, heparin, nonionic contrast agents, corticosteroids.
Infection is one of the most serious complications of ERCP, including ascending cholangitis, liver abscess, acute cholecystitis, infected pancreatic pseudocyst, infection following perforation of a viscus, endocarditis, and endovasculitis.

The most frequent is **ascending cholangitis** (1%) from incomplete stone clearance and inadequate drainage of obstructed biliary system.

**Mild cholangitis**: TC >38°C for 24-48h

**Moderate cholangitis**: febrile or septic illness requiring >3 days of hospital treatment or endoscopic or percutaneous intervention

**Severe cholangitis**: Septic shock or surgery

The major risk factors are **biliary obstruction, a history of previous cholangitis, pancreatic pseudocystis and the use of a contaminated ensodcope or contrast media** (damage the duct epithelium, which may become susceptible to infection).
Organism commonly cultured are: Pseudomonas aeruginosa, Klebsiella spp. E.coli, Enterococci, Bacteroides, coagulase negative Staphylococci and Serratia marcescens.

The elderly are more susceptible to infection with middle-aged or young adults; natural decline in the immune status may contribute to increased infection-related morbidity and mortality with age.

Thus, the administration of prophylactic antibiotics before ERCP in patients with biliary tract obstruction is necessary, especially in the elderly, and antibiotics should be continued if drainage is incomplete or fails.
Antibiotic prophylaxis should be considered before an ERCP in patients with known or suspected biliary obstruction, in which there is a possibility that complete drainage may not be achieved at ERCP.

Antibiotic prophylaxis is not recommended in patients with biliary obstruction when it is likely that an ERCP will accomplish complete biliary drainage.

Antibiotic prophylaxis is recommended before an ERCP in patients with communicating pancreatic cystis or pseudocystis and before transmural drainage.
Postprocedural antibiotics

When biliary drainage is incomplete despite an ERCP, continuation of antibiotics after the procedure is recommended.

When biliary drainage is complete, continuation of antibiotics is not recommended.
Updated guidelines for antibiotic prophylaxis were published in 2007 and 2008 by the American Heart Association (AHA) and the American Society of Gastrointestinal Endoscopy (ASGE), respectively.

Both guidelines no longer consider any GI procedure high risk for bacterial endocarditis and therefore do not recommend routine use of endocarditis prophylaxis, even in patients with the highest risk cardiac conditions.

Infections following endoscopic procedures are rare and are the result of bacteremia induced during the procedure or the result of inoculation with bacteria during procedure (pancreatic cyst aspiration).

The concern with regard to bacteremia is that the bacteria may colonize a remote site, such as a diseased heart valve or an orthopedic prosthetic implant, resulting in infection. However, it is likely that is not a significant problem with regard to GI procedures.
Antibiotic regimens: risks related to specific procedures

HIGH-RIK PROCEDURES:

Dilatation of esophageal strictures (12-22%)
Treatment of esophageal varices (sclerotherapy: 15%) (variceal ligation: 9%)
ERCP (absence of bile obstruction: 6%) (presence of bile obstruction: 18%)
EUS-FNA (4-6%)

LOW-RIK PROCEDURES: routine upper endoscopy, colonoscopy and sigmoidoscopy (4.4% for gastroscopy without biopsy and colonoscopy and 0-1% for sigmoidoscopy)
HIGH-RISK CONDITIONS:
Prosthetic valve
History of endocarditis
Systemic-pulmonary shunt
Complex cyanotic congenital heart disease

MODERATE RISK CONDITIONS:
Most other congenital abnormalities
Acquired valvular dysfunction (rheumatic heart disease)
Hypertrophic cardiomyopathy
Mitral valve prolapse with regurgitation

LOW RISK CONDITIONS:
Other cardiac conditions (CABG, mitral valve prolapse without valvular regurgitation, rheumatic fever without valvular dysfunction, PM, implantable defibrillators, physiologic-functiona-innocent heart murmurs)
<table>
<thead>
<tr>
<th>Patient condition</th>
<th>Procedure contemplated</th>
<th>Antibiotic prophylaxis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High risk:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prosthetic valve</td>
<td>Stricture dilation</td>
<td>Not recommended</td>
</tr>
<tr>
<td>History of endocarditis</td>
<td>Variceal sclerotherapy</td>
<td></td>
</tr>
<tr>
<td>Systemic-pulmonary shunt</td>
<td>ERCP/obstructed biliary tree</td>
<td></td>
</tr>
<tr>
<td>Complex cyanotic congenital heart disease</td>
<td>Other endoscopic procedures, including EGD and colonoscopy (with or without</td>
<td>Not recommended</td>
</tr>
<tr>
<td></td>
<td>biopsy/polypectomy, variceal ligation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Moderate risk:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most other congenital abnormalities</td>
<td>Esophageal stricture dilation</td>
<td>Not recommended</td>
</tr>
<tr>
<td></td>
<td>Variceal sclerotherapy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other endoscopic procedures, including EGD and colonoscopy (with or without</td>
<td>Not recommended</td>
</tr>
<tr>
<td></td>
<td>biopsy/polypectomy, variceal ligation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Low risk:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other cardiac conditions (CABG, repaired septal defect or patent ductus, mitral</td>
<td>All endoscopic procedures</td>
<td>Not recommended</td>
</tr>
<tr>
<td>valve prolapse without valvular regurgitation, isolated secundum atrial septal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>defect, physiologic/functional/innocent heart murmurs, rheumatic fever without</td>
<td></td>
<td></td>
</tr>
<tr>
<td>valvular dysfunction, pacemakers, implantable defibrillators)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obstructed bile duct without cholangitis</td>
<td>ERCP with complete drainage</td>
<td>Not recommended</td>
</tr>
<tr>
<td>Obstructed bile duct with cholangitis</td>
<td>ERCP with anticipated incomplete drainage</td>
<td>Recommended (continue antibiotics after procedure)</td>
</tr>
<tr>
<td>Pancreatic cystic lesion</td>
<td>ERCP, EUS-FNA</td>
<td>Recommended</td>
</tr>
<tr>
<td>Cirrhosis acute gastrointestinal bleed (required for patients with or without</td>
<td>All endoscopic procedures</td>
<td>Recommended</td>
</tr>
<tr>
<td>endoscopic procedures)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ascites, immunocompromised patient</td>
<td>Stricture dilation</td>
<td>No recommendation</td>
</tr>
<tr>
<td></td>
<td>Variceal sclerotherapy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other endoscopic procedures, including EGD and colonoscopy (with or without biopsy/</td>
<td></td>
</tr>
<tr>
<td></td>
<td>polypectomy, variceal ligation</td>
<td></td>
</tr>
<tr>
<td>All patients</td>
<td>Percutaneous endoscopic feeding tube placement</td>
<td>Recommended (parenteral cephalospirin or equivalent)</td>
</tr>
<tr>
<td>Vascular graft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prosthetic joints</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Antibiotic regimens: Prophylaxis for endoscopic procedures

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Condition(s)</th>
<th>Antibiotic and dose*</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEG placement</td>
<td>MRSA risk absent</td>
<td>Cefazolin 1 gram (pediatric dose 50 mg/kg) IV within thirty minutes before procedure. IF penicillin or cephalosporin hypersensitivity: Clindamycin 600 mg (pediatric dose 20 mg/kg) IV within 30 minutes before procedure. Pre-procedural MRSA screening and attempt decolonization. (If successful decolonization not completed: Vancomycin 1 gram [pediatric dose 15 mg/kg] IV infused over 60 to 90 minutes to conclude within 30 minutes prior to procedure.)</td>
</tr>
<tr>
<td></td>
<td>MRSA risk present</td>
<td></td>
</tr>
</tbody>
</table>
| ERCP                          | - Biliary obstruction AND cholangitis  
- Biliary obstruction unlikely to be successfully drained at ERCP (including malignant hilar obstruction and primary sclerosing cholangitis)  
- Inadequate biliary drainage following ERCP | Ciprofloxacin 500 mg (pediatric dose 15 mg/kg†) orally given 30 to 60 minutes prior to procedure or 400 mg (pediatric dose 15 mg/kg†) IV within 30 minutes prior to procedure  
OR  
Amoxicillin-clavulanate 1750 mg (pediatric dose 45 mg/kg) oral given 1 to 2 hours prior to procedure or ampicillin-sulbactam 3 grams (pediatric dose 50 mg/kg ampicillin component) IV within 30 minutes prior to procedure  
OR  
Ampicillin 2 grams (pediatric dose 50 mg/kg) IV plus gentamicin 1.5 mg/kg (maximum 120 mg) IV 30 minutes prior to procedure. IF penicillin hypersensitivity: Substitute vancomycin 1 gram (pediatric dose 15 mg/kg) IV infused over 60 to 90 minutes to conclude within 30 minutes prior to procedure plus gentamicin 1.5 mg/kg IV (maximum 120 mg) 30 minutes prior to procedure. |
| ERCP or EUS-FNA of cystic and solid lesion(s) | - Sterile pancreatic cysts  
- Cysts outside pancreas (excluding solid lesions in upper GI tract) | Ciprofloxacin 500 mg orally (pediatric dose 15 mg/kg†) 30 to 60 minutes prior to procedure or 400 mg (pediatric dose 15 mg/kg†) IV given within 30 minutes prior to procedure. Continue 3 to 5 days post-procedure. |
| All endoscopic procedures with high risk of bacteremiaΔ | - Immunocompromised patients  
- Cirrhosis with ascites  
- Synthetic vascular graft during first six months after graft placements (antibiotic prophylaxis is NOT recommended for nonvalvular cardiovascular devices) | Amoxicillin 2 grams (pediatric dose 50 mg/kg) orally 30 to 60 minutes before procedure  
OR  
Ampicillin 2 grams (pediatric dose 50 mg/kg) IV or IM within 30 minutes prior to procedure. IF penicillin hypersensitivity: Clindamycin 600 mg (pediatric dose 20 mg/kg) orally 30 to 60 minutes before procedure or IV within 30 minutes prior to procedure. |

PEG: percutaneous endoscopic gastrostomy; MRSA: methicillin resistant Staphylococcus aureus; ERCP: endoscopic retrograde cholangiopancreatography; EUS-FNA: endoscopic ultrasound-guided fine-needle aspiration; GI: gastrointestinal.  
* For additional information, see "Prevention and control of methicillin resistant Staphylococcus aureus in adults" section on Decolonization.  
+ Pediatric dose should generally not exceed adult dose.  
△ For specific procedures see topic section "Rates of bacteremia and infection, High-risk procedures".  
★ In patients with cirrhosis and upper gastrointestinal bleeding, antibiotics are indicated even if endoscopy is not planned (see "General principles of the management of variceal hemorrhage").  
§ American Heart Association recommendation only. Antimicrobial prophylaxis for synthetic vascular grafts is not recommended by the American Society for Gastrointestinal Endoscopy (ASGE) even if recent (<6 months) graft placement.  
◊ See topic section "Antibiotic regimens for general prophylaxis" for additional antibiotic options for patients who are allergic to penicillin.  
† Use fluoroquinolones cautiously in children.
Procedure: ERCP

Conditions:
- Biliary obstruction and cholangitis
- Biliary obstruction unlikely to be successfully drained at ERCP (including malignant hilar obstruction and primary sclerosing cholangitis)
- Inadequate biliary drainage following ERCP

Antibiotics should cover enteric gram-negative organism and enterococci

Ciprofloxacin 500 mg orally given 30 to 60 minutes prior to procedure or 400 mg IV within 30 minutes prior to procedure
OR
Amoxicillin-Clavulate 875 mg orally 30 to 60 minutes prior to procedure or Ampicillin-Sulbactam 3 grams IV within 30 minutes prior to procedure
OR
Ampicillin 2 grams IV plus Gentamicin 1.5 mg/kg (maximum 120 mg) IV 30 minutes before procedure.

If penicillin hypersensitivity:
Vancomycin 1 gram IV infused over 60 to 90 minutes to conclude within 30 minutes prior to procedure plus Gentamicin 1.5 mg/kg IV (maximum 120 mg) 30 minutes before procedure.

ALL above regimens are discontinued post-procedure when drainage is established.
Procedure: ERCP or EUS-FNA of cystic and solid lesion(s)

**Conditions:**
- Sterile pancreatic cysts
- Cysts outside pancreas (excluding solid lesions in upper GI tract)

**Ciprofloxacin 500 mg** orally given 30 to 60 minutes prior to procedure or **400 mg** IV within 30 minutes prior to procedure. Continue 3 to 5 days post-procedure.

Procedure: all endoscopic procedures with high risk bacteremia

**Conditions:**
- Immunocompromized patients
- Cirrhosis with ascites
- Synthetic vascular graft during first 6 months after graft placement (antibiotic prophylaxis is not recommended for nonvalvular cardiovascular devices)

**Amoxicillina 2 grams** orally 30 to 60 minutes before procedure

OR

**Ampicillina 2 grams** IV or IM within 30 minutes prior to procedure. If penicillin hypersensitivity:

**Clindamicina 600 mg** orally 30-60 min before procedure or IV within 0 min prior to procedure.
ESGE
EUROPEAN SOCIETY OF GASTROINTESTINAL ENDOSCOPY

GUIDELINES

ANTIBIOTIC PROPHYLAXIS FOR GASTROINTESTINAL ENDOSCOPY
12/1/98

Working group:
J.F. Rey (St. Laurent du Var)
A. Budzynska (Katowice)
A. Axon (Leeds)
A. Kruse (Aarhus)
A. Nowak (Katowice)
The prevention of:
- Infective endocarditis
- Symptomatic bacteraemia
- Colonisation of orthopaedic and other non-cardiac prostheses
- Pancreato-biliary sepsis following ERCP
- Wound infection after endoscopic percutaneous gastrostomy

Table 1. Application of antibiotic prophylaxis in gastrointestinal endoscopy.

- Oesophageal stricture dilation
- Endoscopic sclerotherapy for oesophageal varices
- Laser therapy in upper gastrointestinal tract
- Endoscopic placement of percutaneous feeding tube
- Endoscopic retrograde cholangiopancreatography for known biliary obstruction or pancreatic pseudocyst

Table 2. Endoscopic procedures associated with higher risk of infectious complications
- **High risk:**
  - Prosthetic heart valve.
  - Previous endocarditis.
  - Surgically constructed systemic-pulmonary shunt or conduit.
  - Synthetic vascular graft less than 1 year old.
  - Severe neutropenia (neutrophils < 1G/l)

- **The moderate, low or theoretical risk with:**
  - Mitral valve prolapse with insufficiency.
  - Rheumatic valvular or congenital cardiac lesion.
  - Hypertrophic cardiomyopathy.

  - Ventriculo-peritoneal shunt.
  - Heart transplant.
  - Moderate neutropenia (neutrophils 1-5G/l)

- **And no increased risk with:**
  - Mitral valve prolapse without insufficiency.
  - Uncomplicated secundum atrial septal defect.
  - Cardiac pacemaker.
  - Coronary artery bypass graft.
  - Implanted defibrillator.
  - All other patients.

Table 3. Conditions associated with a risk of endocarditis or symptomatic bacteraemia.
1. Recommendation of antibiotic prophylaxis according to the procedure:

(\textit{Table 4})

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Patients Risk Group</th>
<th>Antibiotic Prophylaxis</th>
</tr>
</thead>
<tbody>
<tr>
<td>\textbf{High Risk Procedures:}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>oesophageal dilation</td>
<td>severe neutropenia</td>
<td>regimen A or B plus C</td>
</tr>
<tr>
<td>variceal sclerosis</td>
<td>moderate risk patients</td>
<td>not necessary</td>
</tr>
<tr>
<td>laser therapy in upper GI</td>
<td></td>
<td>regimen A or B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>may be considered</td>
</tr>
<tr>
<td></td>
<td>low or average risk patients</td>
<td>not recommended</td>
</tr>
<tr>
<td>\textbf{Low Risk Procedures:}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>high risk patients</td>
<td></td>
<td>regimen A or B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>may be considered</td>
</tr>
<tr>
<td></td>
<td>moderate or low risk patients</td>
<td>not recommended</td>
</tr>
<tr>
<td>ERCP</td>
<td>all patients with:</td>
<td>regimen C</td>
</tr>
<tr>
<td></td>
<td>biliary occlusion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>pancreatic pseudocyst</td>
<td></td>
</tr>
<tr>
<td></td>
<td>previous cholangitis or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>therapeutic ERCP</td>
<td></td>
</tr>
<tr>
<td>PEG</td>
<td>all patients</td>
<td>regimen D</td>
</tr>
</tbody>
</table>

\textit{Table 4. Recommendations of the antibiotic prophylaxis according to the procedure.}
A. Patients not allergic to penicillin.
Adults:
1g amoxycillin intramuscularly in 2.5ml 1% lignocaine hydrochloride plus 120 mg gentamicin intramuscularly just before start of the procedure, followed by 500 mg amoxycillin orally 6 hours later.

Children under 10 years:
500 mg amoxycillin intramuscularly in 2.5ml 1% lignocaine hydrochloride plus 2 mg/kg body weight gentamicin intramuscularly, followed by 250 mg (children 5-9 years) or 125 mg (children 0-4 years) amoxycillin orally 6 hours later.

B. Patients allergic to penicillin or who have had penicillin more than once in the previous month.
Adults:
1g vancomycin in slow intravenous infusion over 100 minutes followed by 120 mg gentamicin intravenously 15 minutes before the procedure or 400 mg teicoplanin intravenously followed by 120 mg gentamicin 15 minutes before the procedure.

Children under 10 years:
20 mg/kg vancomycin by slow intravenous infusion followed by 2 mg/kg gentamicin intravenously or 6 mg/kg teicoplanin intravenously followed by 2 mg/kg gentamicin intravenously.

C. Prior to biliary procedures.
750 mg ciprofloxacin orally 60-90 minutes before the procedure or 120 mg gentamicin intravenously just before the procedure or a parenteral quinolone, cephalosporin or ureidopenicillin just before the procedure.

D. Prior to percutaneous endoscopic gastrostomy
2 g cefotaxime (or equivalent) parenterally 30 minutes before the procedure or 4 g piperacillin/0.5 g tazobactam parenterally or 1 g amoxycillin/clavulanic acid intravenously

E. Patients with severe neutropenia
Adults:
Add 7.5 mg/kg metronidazole intravenously to any of the above regimens

Children:
Add 7.5 mg/kg metronidazole intravenously to any of the above regimens
Cholecystitis complicates approximately 0.2% to 0.5% of ERCP.

The risk appears to be correlated with the presence of stones in the gallbladder and possibility filling of the gallbladder with contrast during the examination.

There are no clear means for preventing post-ERCP cholecystitis other than cholecystectomy.
It is primarily a complication related to sphincterotomy rather than diagnostic ERCP. Clinical significant hemorrhage may be defined as the presence of melena, hematochezia, or hematemesis associated with a hemoglobin decrease of at least 2 g/dl or the need of blood transfusion.

The incidence ranges from 0.7% to 2.0%. The risk of severe hemorrhage (i.e. ≥2 units of blood, surgery, or angiography) is estimated to be 0.1%-0.5%.

**Risk factors for hemorrhage include:**

• Coagulopathy at the time of examination
• The use of anticoagulant within 72h of the sphincterotomy
• The presence of acute colangitis or papillary stenosis
• The use of precut sphincterotomy
• Low case volume of the endoscopist
Reported perforation rates for ERCP are 0.3% to 0.6%.

Risk factors include:

- Presence of Billroth II partial gastrectomy
- The performance of a sphincterotomy
- The intramural injection of contrast
- Duration of procedure
- Biliary strictures/dilatation
Three distinct types of perforations have been described:

1. Guidewire-induced perforation
2. Periampullary perforation during sphincterotomy
3. Perforation at a side remote from the papilla

Prompt recognition of periampullary perforation and treatment with aggressive biliary and duodenal drainage (by means of nasobiliary and nasogastric tubes) coupled with broad-spectrum antibiotics can result in clinical resolution without the need for operative intervention in up 86% of patients.
Significant cardiopulmonary complications are rare (<1%); however, they constitute a leading cause of death from ERCP.

Complications may arise because of cardiac arrhythmia, hypoventilation, or aspiration. These may be due to underlying premorbid disease (known or occult) or problems related to medications used for sedation and analgesia.

Such complications might be reduced by careful preoperative evaluation and collaboration with anesthesiologist for high-risk or difficult-to-sedate patients.
The overall mortality rate after diagnostic ERCP is roughly 0.2%. Death rates after therapeutic ERCP are twice as high (0.4%-0.5%). Death may occur from any of the complications described above.
The aim of this study was to describe the possible diversity of ERCP findings in older people in different age cohort. The frequency of and risk factors related to post ERCP complications and early mortality (30-days) were also compared.

Retrospective study ; 345 patients aged 65 and older (YO, 65-74; OO, 75-84, VO, ≥85) between 2004-2007 (Taiwan).

The findings and incidences of complication of ERCP in different elderly cohorts were similar.

30-day mortality (sepsis and MOF) in the three groups was similar (2.4%, 2.0%, 2.6%; p=1.00) and was related to unseerdlying malignant disease.
Table 1. Characteristics of Different-Age Patients, Clinical Presentations, and Concomitant Chronic Diseases

<table>
<thead>
<tr>
<th>Variable</th>
<th>Young-Old (65–74)</th>
<th>Old-Old (75–84)</th>
<th>Very-Old (≥85)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Patient characteristic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age, average</td>
<td>69.1</td>
<td>79.0</td>
<td>89.3</td>
<td></td>
</tr>
<tr>
<td>Patients, n</td>
<td>143</td>
<td>88</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Procedures, n</td>
<td>164</td>
<td>101</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>Male/female, n/n</td>
<td>59/84</td>
<td>42/46</td>
<td>8/25</td>
<td>.06</td>
</tr>
<tr>
<td>Previous cholecystectomy, n (%)</td>
<td>42 (25.6)</td>
<td>29 (28.7)</td>
<td>11 (28.9)</td>
<td>.83</td>
</tr>
<tr>
<td><strong>Clinical presentation, n (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBD obstruction or dilation*</td>
<td>100 (61.0)</td>
<td>70 (69.3)</td>
<td>24 (63.2)</td>
<td>.39</td>
</tr>
<tr>
<td>Acute (biliary) pancreatitis</td>
<td>27 (16.5)</td>
<td>11 (10.9)</td>
<td>7 (18.4)</td>
<td>.37</td>
</tr>
<tr>
<td>Acute cholangitis</td>
<td>58 (35.4)</td>
<td>47 (46.5)</td>
<td>16 (42.1)</td>
<td>.19</td>
</tr>
<tr>
<td>Concomitant chronic disease, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>56 (39.2)</td>
<td>14 (15.9)</td>
<td>8 (24.2)</td>
<td>.001</td>
</tr>
<tr>
<td>Cardiovascular disease</td>
<td>74 (51.7)</td>
<td>41 (46.5)</td>
<td>19 (57.6)</td>
<td>.53</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>14 (10.0)</td>
<td>7 (8)</td>
<td>6 (18.2)</td>
<td>.25</td>
</tr>
<tr>
<td>Pulmonary disease</td>
<td>4 (2.8)</td>
<td>11 (12.5)</td>
<td>6 (18.2)</td>
<td>.002</td>
</tr>
<tr>
<td>Chronic renal insufficiency</td>
<td>18 (12.6)</td>
<td>19 (21.6)</td>
<td>5 (15.2)</td>
<td>.19</td>
</tr>
<tr>
<td>Liver cirrhosis</td>
<td>22 (15.4)</td>
<td>10 (11.4)</td>
<td>4 (12.1)</td>
<td>.67</td>
</tr>
<tr>
<td>Other</td>
<td>12 (8.4)</td>
<td>5 (5.7)</td>
<td>2 (6.1)</td>
<td>.71</td>
</tr>
<tr>
<td>None</td>
<td>28 (19.6)</td>
<td>23 (26.1)</td>
<td>9 (27.3)</td>
<td>.41</td>
</tr>
</tbody>
</table>

* Including definite visualization of common bile duct (CBD) stones.

Table 2. Endoscopic Retrograde Cholangiopancreatography (ECRP) and Other Findings in Older Patients of Different Age Cohorts

<table>
<thead>
<tr>
<th>Finding</th>
<th>Young-Old (65–74)</th>
<th>Old-Old (75–84)</th>
<th>Very-Old (≥85)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ERCP findings</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gallbladder stones</td>
<td>28 (17.1)</td>
<td>23 (22.8)</td>
<td>6 (15.8)</td>
<td>.45</td>
</tr>
<tr>
<td>CBD stones</td>
<td>85 (51.8)</td>
<td>63 (62.4)</td>
<td>22 (57.9)</td>
<td>.24</td>
</tr>
<tr>
<td>CBD dilation</td>
<td>112 (68.3)</td>
<td>79 (78.2)</td>
<td>27 (71.1)</td>
<td>.22</td>
</tr>
<tr>
<td>Sphincter of Oddi dysfunction</td>
<td>7 (4.3)</td>
<td>6 (5.9)</td>
<td>1 (2.6)</td>
<td>.73</td>
</tr>
<tr>
<td>Juxtapapillary diverticula</td>
<td>31 (18.9)</td>
<td>33 (32.7)</td>
<td>9 (23.7)</td>
<td>.04</td>
</tr>
<tr>
<td>Malignancy</td>
<td>24 (14.6)</td>
<td>9 (8.9)</td>
<td>4 (10.5)</td>
<td>.36</td>
</tr>
<tr>
<td>Cholangiocarcinoma</td>
<td>7 (29.2)</td>
<td>1 (11.1)</td>
<td>1 (25.0)</td>
<td>.73</td>
</tr>
<tr>
<td>Cancer of ampulla</td>
<td>2 (8.3)</td>
<td>0 (0.0)</td>
<td>2 (50.0)</td>
<td>.06</td>
</tr>
<tr>
<td>Vater</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pancreatic cancer</td>
<td>13 (54.2)</td>
<td>5 (55.6)</td>
<td>0 (0.0)</td>
<td>.17</td>
</tr>
<tr>
<td>Metastasis liver tumor</td>
<td>2 (8.3)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>1.00</td>
</tr>
<tr>
<td>Gallbladder cancer</td>
<td>0 (0.0)</td>
<td>1 (11.1)</td>
<td>1 (25.0)</td>
<td>.12</td>
</tr>
<tr>
<td>Duodenal cancer</td>
<td>0 (0.0)</td>
<td>2 (22.2)</td>
<td>0 (0.0)</td>
<td>.12</td>
</tr>
<tr>
<td>Failure</td>
<td>4 (2.4)</td>
<td>4 (4.0)</td>
<td>4 (10.5)</td>
<td>.10</td>
</tr>
</tbody>
</table>

CBD = common bile duct.
no difference was noted in post ERCP complication rate in the 3 groups
The aims of this study were to retrospectively examine the differences between octogenarians and non-octogenarians with respect to success and complications of diagnostic and therapeutic ERCP.

A total of 2,606 patients (628 octogenarians; mean age: 83.5y) underwent ERCP during the 10-year study period.

- ERCP in the elderly carries a high degree of success with a low complication rate.
- The mix of complications in the elderly reveals a lower risk of pancreatitis, while the risk of bleeding and perforation is similar.
- ERCP for pancreaticobiliary disorders should remain the therapeutic option of choice in octogenarians.
Success rates for ERCP were high in both group. ERCP was successfully completed in 98.3% of the planned procedures from non-octogenarian group and in 96.6% from octogenarian group (p 0.004).
EUS and ERCP Complication Rates Are Not Increased in Elderly Patients

Mark E. Benson · Siobhan Byrne · Donald J. Brust ·
Bradley Manning III · Patrick R. Pfau · Terrence J. Frick ·
Markreichelderfer · Deepak V. Gopal

Received: 2 November 2009 / Accepted: 3 February 2010
© Springer Science+Business Media, LLC 2010

Retrospective study: 1000 patients who underwent ERCP or EUS, divided in 2 cohorts (≤75y; >75y)

Conclusion  Advanced age is not a contraindication for advanced endoscopic procedures. There is no significant increase in the rate of overall procedure-related complications seen with either ERCP or EUS in elderly patients; however, elderly patients have a higher risk of bleeding. Less procedure-related sedation medication is required for elderly patients.
Table 1: Comparison of overall and specific complication rates, as well as sedation medication doses, between the elderly and nonelderly cohorts

<table>
<thead>
<tr>
<th></th>
<th>Elderly (≥75 years)</th>
<th>Nonelderly (&lt;75 years)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients</td>
<td>184</td>
<td>816</td>
<td></td>
</tr>
<tr>
<td>Mean age (range), years</td>
<td>79.8 (75–95)</td>
<td>58.6 (13–74)</td>
<td></td>
</tr>
<tr>
<td>ERCP complication rate</td>
<td>10%</td>
<td>10.6%</td>
<td>1.0</td>
</tr>
<tr>
<td>EUS complication rate</td>
<td>4.8%</td>
<td>3.1%</td>
<td>0.49</td>
</tr>
<tr>
<td>Overall complication rate</td>
<td>7.6%</td>
<td>7.6%</td>
<td>1.0</td>
</tr>
<tr>
<td>Specific complications</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiopulmonary</td>
<td>1.6%</td>
<td>1.1%</td>
<td>0.47</td>
</tr>
<tr>
<td>Pancreatitis</td>
<td>0%</td>
<td>1.0%</td>
<td>0.36</td>
</tr>
<tr>
<td><strong>Bleeding</strong></td>
<td>3.3%</td>
<td>0.8%</td>
<td>0.02</td>
</tr>
<tr>
<td>Perforation</td>
<td>0.5%</td>
<td>0.2%</td>
<td>0.09</td>
</tr>
<tr>
<td>Abdominal pain</td>
<td>0%</td>
<td>1.5%</td>
<td>0.14</td>
</tr>
<tr>
<td>Infection</td>
<td>0%</td>
<td>1.3%</td>
<td>0.23</td>
</tr>
<tr>
<td>Admission/observation</td>
<td>2.7%</td>
<td>1.0%</td>
<td>0.07</td>
</tr>
<tr>
<td>Death</td>
<td>0.005%</td>
<td>0%</td>
<td>0.18</td>
</tr>
<tr>
<td>Mean procedure medication</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Droperidol</td>
<td>1.4 mg</td>
<td>3.8 mg</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Fentanyl</td>
<td>172.6 mcg</td>
<td>212.0 mcg</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Midazolam</td>
<td>5.9 mg</td>
<td>7.8 mg</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
Endoscopic Retrograde Cholangiopancreatography Is Safe and Effective in Patients 90 Years of Age and Older

Robert Michael Stephen Mitchell, M.B., B.Ch., Frank O’Connor, M.D., and William Dickey, M.D., Ph.D.

Retrospective analysis of 23 ERCPs performed on patients ≥90 years (14 women and 9 men) between 1987-2000 in Northern Ireland.

Procedure related complication rates from elective and emergency ERCP have been reported to be similar to that of a younger population, despite a higher prevalence of comorbidity.

Age, per se, should not be a contraindication to endoscopic intervention.
Antithrombotic agents include anticoagulants (warfarin, heparin, low molecular weight heparin) and antiplatelet agents (aspirin, nonsteroidal anti-inflammatory drugs (NSAIDs), thienopyridines (clopidogrel and ticlopidine), and glycoprotein IIb/IIIa receptor inhibitors.
## Management of antithrombotic agents for endoscopic procedures

### TABLE 2. Antithrombotic drugs: duration of action and routes for reversal

<table>
<thead>
<tr>
<th>Drug class</th>
<th>Specific agent(s)</th>
<th>Duration of action</th>
<th>Routes for reversal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antiplatelet agents</td>
<td>Aspirin</td>
<td>10 days</td>
<td>Elective: NA, Urgent: Transfuse platelets</td>
</tr>
<tr>
<td></td>
<td>NSAIDs</td>
<td>Varies</td>
<td>Elective: NA, Urgent: Transfuse platelets</td>
</tr>
<tr>
<td></td>
<td>Dipyridamole</td>
<td>2-3 days</td>
<td>Hold: Transfuse platelets</td>
</tr>
<tr>
<td></td>
<td>Thienopyridines (clopidogrel, ticlopidine)</td>
<td>3-7 days</td>
<td>Hold: Transfuse platelets ± desmopressin if overdose</td>
</tr>
<tr>
<td></td>
<td>GP IIB/IIA inhibitors (tirofiban, abciximab, eptifibatide)</td>
<td>Varies</td>
<td>Elective: NA, Urgent: Transfuse platelets; in case of overdose, some agents can be removed with dialysis</td>
</tr>
<tr>
<td>Anticoagulants</td>
<td>Warfarin</td>
<td>3-5 days</td>
<td>Hold: FFP ± vitamin K, consider protamine sulfate*</td>
</tr>
<tr>
<td></td>
<td>Unfractionated heparin</td>
<td>4-6 h</td>
<td>Hold: Hold or consider protamine sulfate*</td>
</tr>
<tr>
<td></td>
<td>LMWH</td>
<td>12-24 h</td>
<td>Hold: Hold or consider protamine sulfate*</td>
</tr>
</tbody>
</table>

NA, Not applicable; NSAID, nonsteroidal anti-inflammatory drug; GP, glycoprotein; FFP, fresh frozen plasma; LMWH, low molecular weight heparin.

*Caution: Can cause severe hypotension and anaphylaxis.
Before performing endoscopic procedures on patients taking antithrombotic medications, one should consider the urgency of the procedure and the risks of:

• Bleeding related solely to antithrombotic therapy
• Bleeding related to an endoscopic intervention performed in the setting of antithrombotic medication use
• A thromboembolic event related to interruption of antithrombotic therapy

The potential thromboembolic events that may occur with withdrawal of medications can be devastating, whereas bleeding after high-risk procedures, although increased in frequency, is rarely associated with any significant morbidity or mortality.
PROCEDURE RISKS FOR BLEEDING
- low-risk procedures
- higher risk procedures

CONDITION RISKS FOR THROMBOEMBOLIC EVENT
- low-risk conditions
- higher risk conditions
Management of antithrombotic agents for endoscopic procedures

<table>
<thead>
<tr>
<th>Higher-risk procedures</th>
<th>Low-risk procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polypectomy</td>
<td>Diagnostic (EGD, colonoscopy, flexible sigmoidoscopy) including biopsy</td>
</tr>
<tr>
<td>Biliary or pancreatic</td>
<td>ERCP without sphincterotomy</td>
</tr>
<tr>
<td>sphincterotomy</td>
<td>EUS without FNA</td>
</tr>
<tr>
<td>Pneumatic or bougie dilation</td>
<td>Enteroscopy and diagnostic balloon-assisted enteroscopy</td>
</tr>
<tr>
<td>PEG placement</td>
<td>Capsule endoscopy</td>
</tr>
<tr>
<td>Therapeutic balloon-assisted</td>
<td>Enteral stent deployment (without dilation)</td>
</tr>
<tr>
<td>enteroscopy</td>
<td></td>
</tr>
<tr>
<td>EUS with FNA</td>
<td></td>
</tr>
<tr>
<td>Endoscopic hemostasis</td>
<td></td>
</tr>
<tr>
<td>Tumor ablation by any</td>
<td></td>
</tr>
<tr>
<td>technique</td>
<td></td>
</tr>
<tr>
<td>Cystogastrostomy</td>
<td></td>
</tr>
<tr>
<td>Treatment of varices</td>
<td></td>
</tr>
</tbody>
</table>
The probability of a thromboembolic complication related to the temporary interruption of antithrombotic therapy depends on the preexisting condition that resulted in the use of antithrombotic therapy. These conditions may be divided into low- and higher risk groups based on the associated risk of thromboembolic events.
RISK OF BLEEDING FROM SPECIFIC PROCEDURES WHILE TAKING ANTITHROMBOTIC AGENTS

**DIAGNOSTIC ENDOSCOPY:** There are no clinical trials demonstrating an increased incidence of bleeding in patients who have undergone upper or lower endoscopy with and without biopsy while taking aspirin or clopidogrel. There is evidence that continuing therapeutic anticoagulation with warfarin during the periendoscopic period has a low risk of bleeding in such low-risk procedures.

**COLONSCOPY POLIPECTOMY:** Large retrospective studies did not find any association between antiplatelet therapy (aspirin and NSAIDs) and postpolipectomy bleeding. Although the data are limited, postpolipectomy bleeding risk seems to be increased for patients taking warfarin or heparin within 1 week after polipectomy.
RISK OF BLEEDING FROM SPECIFIC PROCEDURES WHILE TAKING ANTITHROMBOTIC AGENTS

SPHINCTEROTOMY: the overall risk of postsphyncterotomy bleeding is 0.3% to 2.0%. Withholding aspirin or NSAIDs even 7 days before sphincterotomy does not seem to reduce the risk of bleeding. However, anticoagulation with warfarin or IV heparin within 3 days after has been shown to increase the risk of postsphyncterotomy bleeding.

PEG: the risk of bleeding for PEG palcement in patients receiving antithrombotic therapy is unknown.
We recommended that aspirin and/or NSAIDs may be continued for all endoscopic procedures in the absence of a preexisting bleeding disorder.

When high bleeding risk procedures are planned, clinicians may elect to discontinue aspirin and/or NSAIDs for 5 to 7 days before procedure, depending on the underlying indication for antiplatelet therapy.
**Low bleeding risk procedures**: no adjustment in the antiplatelet regime need to be made.

**High bleeding risk procedures**: these medications should be discontinued for approximately 7-10 days before procedures. Because of the slow onset of action, it may be appropriate to restart the drug the following day.

→ In patients who receive clopidogrel plus aspirin, consider reversion to a single agent (preferably aspirin) before elective endoscopy.
Management of antithrombotic agents for endoscopic procedures

**ELECTIVE PROCEDURES**

Low bleeding risk procedures: no adjustment in anticoagulation need be made, irrespective of the underlying condition. However, elective procedures should be avoided when the level of anticoagulation is above the therapeutic range.

High bleeding risk procedures: discontinue warfarin 3 to 5 days before the procedure and concomitantly begin administering LMWH (e.g. enoxaparin 1 mg/kg sc every 12 hours). Discontinue LMWH for at least 8 hours before the therapeutic endoscopy.

Administration of low dose heparin should not be considered a contraindication to biliary sphyncterotomy,
There is no consensus as to the optimal timing for resumption of antithrombotic therapy after endoscopic interventions.

In patients at high risk of thromboembolic events, we suggest that UFH or LMWH be restarted as soon as safely possible and that warfarin (bridging therapy) be restarted on the day of the procedure unless there is significant concern for bleeding. UFH may be restarted 2 to 6 hours after a therapeutic procedure. The optimal time to restart LMWH after endoscopy has not been determined.

In patients with a low risk of thromboembolic events, we suggest that warfarin be restarted on the evening of the endoscopy unless procedural circumstances suggest a high risk of post procedure bleeding. Bridging therapy in patients with a low thromboembolic risk is not necessary.
Patients with acute GIB (life-threatening or serious bleeding) taking antiplatelet agents should have these medications withheld until hemostasis is achieved. Administration of platelets may be appropriate.

Patients with acute GIB (life-threatening or serious bleeding) taking anticogulation therapy should have these medications withheld until hemostasis is achieved. The decision to use FFP and or vitamin K (10 mg by slow IV administration) should be individualized. High dose vitamin K not be given routinely in patients with mechanical valves because hypercoagulable condition → FFP or low-dose vitamin K (1-2 mg) with or without FFP may be appropriate.
To ERCP or not to ERCP? That is the question
CONCLUSIONS

ERCP is safe and effective in elderly patients, even in those aged 90 years and older.

ERCP should be performed for an appropriate indication and in patients in whom the clinician is confident an intervention will be required (therapeutic ERCP).

Outcomes of diagnostic and therapeutic ERCP in terms of success and complication rates are similar to those in younger patients.

The decision to undergo ERCP should be determined by clinical need, and age alone should not be a contraindication to endoscopic procedure.