Post-Pancreatectomy Hemorrhage

Klinisch les 16-01-2018
Joachim Geers
Definition PPH

- 2007

Postpancreatectomy hemorrhage (PPH)—An International Study Group of Pancreatic Surgery (ISGPS) definition

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Definition PPH

• Time of onset
  – Early (<24 hours postop)
  – Late (>24 hours)

• Location
  – Intraluminal
  – Exstraluminal
Definition PPH

• Severity of Hemorrhage
  – Mild
    • Small – medium blood loss (<3 g/dL Hb)
    • Mild clinical impairment of the patient, no therapeutic consequence
    • No need for reintervention
  
  – Severe
    • Large volume blood loss (≥ 3 g/dL)
    • Clinical significant impairment, >3 units PC
    • Need for invasive treatment
## Definition PPH

<table>
<thead>
<tr>
<th>Grade</th>
<th>Time of onset, location, severity and clinical impact of bleeding</th>
<th>Clinical condition</th>
<th>Diagnostic consequence</th>
<th>Therapeutic consequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Early, intra- or extraluminal, mild</td>
<td>Well</td>
<td>Observation, blood count, ultrasonography and, if necessary, computed tomography</td>
<td>No</td>
</tr>
<tr>
<td>B</td>
<td>Early, intra- or extraluminal, severe</td>
<td>Often well/intermediate, very rarely life-threatening</td>
<td>Observation, blood count, ultrasonography, computed tomography, angiography, endoscopy†</td>
<td>Transfusion of fluid/blood, intermediate care unit (or ICU), therapeutic endoscopy,† embolization, relaparotomy for early PPH</td>
</tr>
<tr>
<td>C</td>
<td>Late, intra- or extraluminal, severe</td>
<td>Severely impaired, life-threatening</td>
<td>Angiography, computed tomography, endoscopy†</td>
<td>Localization of bleeding, angiography and embolization, (endoscopy† or relaparotomy, ICU</td>
</tr>
</tbody>
</table>
Incidence PPH

• Post-pancreaticoduodenectomy complications
  – Mortality <5%
  – Morbidity 30-50%
    • Delayed Gastric Emptying
    • Postoperative Pancreatic Fistula
    • Intra-abdominal abcess
    • Hemorrhage
      – 2.5 – 20.2% incidence
      – 8– 60% mortality rate
Anatomy

• Right-sided pancreatic resections
  – GDA-stump
  – VP-HPA
  – VSM-ASM
  – PJ-(PG)
  – Gall bladder fossa
  – EE
  – GE
  – Retroperitoneum
Anatomy

• Left pancreatic resections
  – Pancreas-stump
  – SA
  – Splenic hilus (spleen preservation)
  – SV
  – Area of resection
Causes PPH

• Early hemorrhage
  – Technical failure
    • 30% - 60% of relaparotomies for PPH showed surgical error

• Delayed/late hemorrhage
  – Ulcer
  – Pseudo-aneurysm
  – Eroded vessel
  – ‘Local sepsis’
    • Pancreatic fistula
    • Biliary fistula
    • Intra-abdominal abscess

Three biggest lies are “I will respect you in the morning”, “the check is in the mail” and “it was dry when we closed”.
- Lee J Skandalakis
Pathophysiology PPH

- ‘Injury’ to the vasculature
  - Skeletonization for lymphadenectomy
  - Too tight ligation of the stump
  - Digestion of the arterial wall
    - Pancreatic leak (trypsin, elastase)
    - Infection

=> acute arterial bleeding
=> main arterial pseudoaneurysm formation
Risk factors PPH


2013 SSAT POSTER PRESENTATION

Postpancreatectomy Hemorrhage—Incidence, Treatment, and Risk Factors in Over 1,000 Pancreatic Resections

U. F. Wellner · B. Kulemann · H. Lapshyn · J. Hoeppner · O. Sick · F. Makowiec · D. Bausch · Ulrich Theodor Hopt · T. Keck
### Risk factors PPH grade C

<table>
<thead>
<tr>
<th>Multivariate analysis</th>
<th>$p$</th>
<th>Odds ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPH in all pancreatic resections</td>
<td>0.000</td>
<td>0.174</td>
<td>0.067 – 0.452</td>
</tr>
<tr>
<td>Time period 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.005</td>
<td>1.058</td>
<td>1.018 – 1.100</td>
</tr>
<tr>
<td>Male sex</td>
<td>0.012</td>
<td>3.484</td>
<td>1.320 – 9.198</td>
</tr>
<tr>
<td>BMI</td>
<td>0.003</td>
<td>1.163</td>
<td>1.053 – 1.284</td>
</tr>
<tr>
<td>Preop biliary drainage</td>
<td>0.013</td>
<td>0.264</td>
<td>0.092 – 0.758</td>
</tr>
<tr>
<td>Intraop transfusion</td>
<td>0.008</td>
<td>0.222</td>
<td>0.073 – 0.674</td>
</tr>
<tr>
<td>Portal venous resection</td>
<td>0.001</td>
<td>4.677</td>
<td>1.822 – 12.006</td>
</tr>
<tr>
<td>Multivisceral resection</td>
<td>0.013</td>
<td>3.166</td>
<td>1.273 – 7.874</td>
</tr>
<tr>
<td>POPF</td>
<td>0.000</td>
<td>8.432</td>
<td>3.279 – 21.684</td>
</tr>
</tbody>
</table>
Risk factors PPH grade C

<table>
<thead>
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<th>Multivariate analysis</th>
<th>$p$</th>
<th>Odds ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPH in pancreaticoduodenectomy</td>
<td>0.002</td>
<td>0.185</td>
<td>0.064 – 0.532</td>
</tr>
<tr>
<td>Time period 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.033</td>
<td>1.049</td>
<td>1.004 – 1.095</td>
</tr>
<tr>
<td>BMI</td>
<td>0.008</td>
<td>1.175</td>
<td>1.043 – 1.322</td>
</tr>
<tr>
<td>Preop biliary drainage</td>
<td>0.003</td>
<td>0.187</td>
<td>0.062 – 0.561</td>
</tr>
<tr>
<td>Intraop transfusion</td>
<td>0.008</td>
<td>0.189</td>
<td>0.055 – 0.650</td>
</tr>
<tr>
<td>Portal venous resection</td>
<td>0.005</td>
<td>3.934</td>
<td>1.507 – 10.274</td>
</tr>
<tr>
<td>POPF</td>
<td>0.001</td>
<td>5.589</td>
<td>2.120 – 14.737</td>
</tr>
</tbody>
</table>
Risk factors

• Grade B & C
  – POPF

– Bile leakage
  • Activates pancreatic enzymes

Original Article

HEMORRHAGE AFTER MAJOR PANCREATIC RESECTION: INCIDENCE, RISK FACTORS, MANAGEMENT, AND OUTCOME

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Sentinel bleed

- Discrete but evident blood loss
  - Via abdominal drains
  - Via nasogastric tubes
  - Hematemesis
  - Melena

- Decrease of Hb concentration $\leq 1.5$ g/dL

- Spontaneous cessation of hemorrhage without need for transfusion

- Rehemorrhage after a symptom-free time frame $\geq 12$ hours
Sentinel bleed - importance

• Incidence
  – Present in majority of delayed PPH

• Predictive value
  – In patients with established POPF
    • High index of suspicion

• Prognostic value
  – Mortality?
Diagnostics

• (Angio) CT-abdomen

• Endoscopy

• Diagnostic angiography
Treatment

• Conservative
  – Grade A

• Endoscopy
  – Clipping
  – Epinephrine

• Endovascular treatment

• Surgery

“All bleeding eventually ceases.”
- Guy de Chauliac, 1300 - 1368
Treatment

• Algorithms

- Gastrointestinal hemorrhage
  - Endoscopy
    - Localization possible
    - Localization impossible
      - milk-injection via Volker-drain
      - x-ray imaging of the pancreatic anastomosis
    - previously or newly diagnosed anastomotic dehiscence
      - with signs of hemorrhage
        - Observation incl. x-ray imaging of the pancreatic anastomosis
        - no signs of hemorrhage
          - Observation incl. x-ray imaging of the pancreatic anastomosis
        - Angiography incl. interventional embolization
      - without signs of hemorrhage
        - Relaparotomy
          - if necessary incl. clamping procedure to localize the source of bleeding
          - revision of the pancreatico-jejunoanostomy in case of evolve bleeding following a pancreatic leak
          - recurring hemorrhage
    - Operative field hemorrhage
  - Endoscopic hemostasis
    - successful
      - Observation
    - failed

UZ LEUVEN
Treatment

- Algorithms
Treatment

• Algorithms
Treatment

- Algorithms

- Early PPDB (<1st postoperative day)
  - Intraluminal
    - Endoscopy
      - PPDB control
      - PPDB not control
        - Angiography
          - PPDB control
          - PPDB not control
            - Surgery
Treatment

• Algorithms

Late PPDB (after 1st postoperative day)

Intraluminal

Endoscopy

PPDB control

PPDB not control

Angiography

PPDB control

PPDB not control

Surgery

Extraluminal (either sentinel or massive)

Angiography

Bleeder visualizable

TAE or covered stent

Covered stent at GDA stump if highly suspected

Bleeder not visualizable

Surgery
Treatment

- Algorithms

Fig. 1. Algorithm for the management of DPPAB in Beijing Cancer Hospital.
Treatment

• Algorithms
Treatment

- Algorithms

Fig. 1 Proposed treatment algorithm for postpancreatectomy hemorrhage. Dotted arrows denote secondary treatment options in case of primary treatment failure. Abbreviations: HD hemodynamically, POPF postoperative pancreatic fistula
Treatment

• Algorithms
Treatment

• Endovascular
  – Coiling
  – Stenting

• Surgical
  – (Re-)Laparotomy
    • Ligature - Oversewing pancreatic stump
    • Packing
    • Completion pancreatectomy (controversial)

“The last man to see the necessity for re-operation is the man who performed the operation”

- Mark M. Ravitch, 1910 - 1989
Treatment

- Endovascular treatment
Prognosis

- Early PPH
  - Better prognosis

- Delayed PPH
  - Higher mortality (2x early in 2nd postoperative week)
Prevention

• Long GDA-stump

• Subtotalization of pancreas; left-sided PJ to avoid contact with adjacent vessels

• Pancreaticogastrostomy vs. pancreaticojejunostomy?

• Wrapping?
  – Omental wrap at pancreatic anastomosis
  – Round ligament around common hepatic artery

• Fibrin sealants?
Prevention

- PG vs. PJ?
Wrapping in pancreatic surgery: a systematic review

Jose M. Ramia, Roberto de la Plaza, Farah Adel, Carmen Ramiro, Vladimir Arteaga and Jorge Garcia-Parreño
HPB Surgical Service, Department of Surgery, University Hospital of Guadalajara, Guadalajara, Spain

Abstract

Background: Wrapping in pancreatic surgery involves the use of the omentum or falciform ligament (FL) to wrap the local retroperitoneal vessels, the pancreaticojejunal anastomosis or the pancreatic section of distal pancreatectomy. However, there is no clear evidence that wrapping in fact provides benefits. We have performed a systematic review of the literature about this topic.

Methods: We conducted a literature search in the PubMed/MEDLINE database (1966–2012) for any language using various combinations of the following terms: wrapping, omental, omentum, pancreas, pancreatectoduodenectomy and falciform ligament.

Results: We selected 12 articles. Among five series that included a control group, only one obtained a statistically significant reduction in pancreatic fistula (PF) in the wrapping group and other series showed a lower percentage of post-operative haemorrhage in the wrapping group. In the seven series without control groups, a slight decrease in the rate of post-operative bleeding and PF was observed.

Conclusions: On the basis of the literature available at present, we cannot recommend the use of wrapping with omentum and/or FL in pancreatic surgery. Prospective randomized studies applying a systematic wrapping technique are needed in order to establish whether its use should be generalized.


Prevention

• Fibrin sealants?

REVIEW ARTICLE

Systematic review and meta-analysis of fibrin sealants for patients undergoing pancreatic resection

Lorenzo A. Orci, Graziano Oldani, Thierry Berney, Axel Andres, Gilles Mentha, Philippe Morel & Christian Toso

Division of Visceral and Transplantation Surgery, Department of Surgery, Geneva University Hospitals, Geneva, Switzerland

Abstract

Introduction: Post-operative pancreatic fistula (POPF) is a common complication after partial pancreatic resection, and is associated with increased rates of sepsis, mortality and costs. The role of fibrin sealants in decreasing the risk of POPF remains debatable. The aim of this study was to evaluate the literature regarding the effectiveness of fibrin sealants in pancreatic surgery.

Methods: A comprehensive database search was conducted. Only randomized controlled trials comparing fibrin sealants with standard care were included. A meta-analysis regarding POPF, intra-abdominal collections, post-operative haemorrhage, pancreatitis and wound infections was performed according to the recommendations of the Cochrane collaboration.

Results: Seven studies were included, accounting for 897 patients. Compared with controls, patients receiving fibrin sealants had a pooled odds ratio (OR) of developing a POPF of 0.63 [95% confidence interval (CI): 0.6–1.14], P = 0.245. There was a trend towards a reduction in post-operative haemorrhage (OR = 0.43 [95%CI: 0.18–1.0], P = 0.05) and intra-abdominal collections (OR = 0.52 [95%CI: 0.25–1.06], P = 0.073) in those patients receiving fibrin sealants. No difference was observed in terms of mortality, wound infections, reinterventions or hospital stay.

Conclusion: On the basis of these results, fibrin sealants cannot be recommended for routine clinical use in the setting of pancreatic resection.
Prevention

• LMWHs?

ORIGINAL ARTICLE

Predicting the risks of venous thromboembolism versus post-pancreatectomy haemorrhage: analysis of 13 771 NSQIP patients

Ching-Wei D. Tzeng, Matthew H. G. Katz, Jeffrey E. Lee, Jason B. Fleming, Peter W. T. Pisters, Jean-Nicolas Vauthey & Thomas A. Aloia

Department of Surgical Oncology, The University of Texas MD Anderson Cancer Center, Houston, TX, USA
Prevention

Figure 1: Venous thromboembolism (VTE) events outnumber post-operative bleeding transfusions (post-pancreatectomy hemorrhage > 4 units in first 72 h after surgery) and return to the operating room (ROR) with bleeding transfusions. There is no difference in the rates of bleeding or thrombotic events between a pancreaticoduodenectomy and a distal pancreatectomy.
References (1)


References (2)