Practice Variability in the Management of Pediatric Pancreatic Trauma

Bindi Naik-Mathuria, MD

and members of the Pediatric Trauma Study Group

Texas Children’s Hospital

Baylor College of Medicine
Background

• Non-operative management of other blunt solid organ injuries (spleen/liver/kidney) is now considered standard of care in pediatric trauma

• The pancreas however, remains an organ of debate...

To Operate?  Not To Operate?

That IS the Question
### AAST CT Grading Scale for Pancreatic Trauma

<table>
<thead>
<tr>
<th>Grade</th>
<th>Type of Injury</th>
<th>Description of Injury</th>
<th>Surveillance Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Hematoma</td>
<td>Minor contusion without duct injury</td>
<td>Observation</td>
</tr>
<tr>
<td></td>
<td>Laceration</td>
<td>Superficial laceration without duct injury</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>Hematoma</td>
<td>Major contusion without duct injury or tissue loss</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Laceration</td>
<td>Major laceration without duct injury or tissue loss</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>Laceration</td>
<td>Distal transection or parenchymal injury with duct injury</td>
<td>Observation? Distal Pancreatectomy?</td>
</tr>
<tr>
<td>IV</td>
<td>Laceration</td>
<td>Proximal transection or parenchymal injury involving ampulla</td>
<td>Observation vs. Complex Operative Management</td>
</tr>
<tr>
<td>V</td>
<td>Laceration</td>
<td>Massive disruption of pancreatic head</td>
<td></td>
</tr>
</tbody>
</table>
EAST Trauma Management Guidelines (2009)

• Level III evidence:
  • Grade I and II injuries can be managed by drainage alone
  • Grade III injuries should be managed with resection and drainage

• “Management of pediatric injuries seems to follow many of the same principles as those for adults, albeit with key exceptions in the potential role for non-operative management.”
Journal of Pediatric Surgery

Volume 22, Issue 12, December 1987, Pages 1110-1116

Blunt injury to the pancreas in children: Selective management based on ultrasound *

Arkadi Gorenstein ¹, Dara O'Halpin ¹, David E. Wesson ¹, Alan Daneman ¹, Robert M. Filler ¹

Toronto, Ontario, Canada
<table>
<thead>
<tr>
<th>First Author, Year of Publication</th>
<th>Study Type/Number of Patients</th>
<th>Level of Evidence</th>
<th>AAST grades</th>
<th>Management Strategies</th>
<th>Summary of Results (NOM vs OM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keller, 1997</td>
<td>Two centers + NPTR (n=154)</td>
<td>3</td>
<td>Grades I &amp; II: 123 Grades III-V: 31</td>
<td>NOM: 112 OM: 42</td>
<td>No difference in mortality</td>
</tr>
<tr>
<td>Mattix, 2007</td>
<td>Multi-center (7) (n=173)</td>
<td>3</td>
<td>Grades III to V</td>
<td>NOM: 83 OM: 23</td>
<td>NOM had higher pseudocyst formation OM had longer days on TPN</td>
</tr>
<tr>
<td>Paul, 2011</td>
<td>Multi-center (9) (n=43)</td>
<td>3</td>
<td>Grades II or III</td>
<td>NOM: 23 OM: 20</td>
<td>NOM had higher pseudocyst rate OM had higher reoperation rate LOS similar</td>
</tr>
<tr>
<td>Cuenca, 2012</td>
<td>Three centers (n=79)</td>
<td>3</td>
<td>All grades</td>
<td>NOM: 47 OM: 32</td>
<td>No difference in LOS or complications</td>
</tr>
<tr>
<td>Beres, 2013</td>
<td>Two center (n=79)</td>
<td>3</td>
<td>Grades III&amp;IV: 39</td>
<td>NOM: 24 OM: 15</td>
<td>NOM had longer LOS, more days on TPN, more complications, more interventions</td>
</tr>
<tr>
<td>Iqbal, 2014</td>
<td>Multi-center (14) (n=167)</td>
<td>3</td>
<td>Grades II and III</td>
<td>NOM:95 OM: 57</td>
<td>NOM had higher pseudocyst formation OM had shorter time to feeds OM in patients with main duct injury had shorter LOS and time to resolution of symptoms NOM had more interventions</td>
</tr>
<tr>
<td>Englum, 2014 (unpublished)</td>
<td>NTDB review 2007-11 (n=674)</td>
<td>3</td>
<td>Grades III or higher</td>
<td>NOM: 514 OM: 160</td>
<td>NOM had higher ISS and higher mortality OM had higher wound infection and LOS</td>
</tr>
</tbody>
</table>
Variable Clinical Management in NOM?

- When to feed?
- How to feed?
- Pseudocyst management?
- Role of ERCP?

- Time on TPN
- Length of hospital stay
- Number of interventions
To Operate?  

That is STILL the Question

Not To Operate?
PTS Pancreatic Trauma Study Group
Purpose

• To prove the hypothesis that practice variability exists among pediatric trauma surgeons regarding high-grade pancreatic injuries

• Preference for OM or NOM

• Clinical management of NOM

• To assess feasibility of a prospective, randomized, controlled trial comparing outcomes of OM and NOM
Survey of interested centers in Pancreatic Trauma Study Group (PTSG)

1. How many high-grade pancreatic injuries (not involving pancreatic head) have been treated at your center in the past 3 years?
   a. Grade II ____  b. Grade III ____  c. Grade IV ____  d. Grade unclear ____

2. Of the grade III+ or suspected grade III+ injuries, how many were initially managed:
   a. Non-operatively __________
   b. Operatively __________
      # open ______  # laparoscopic ______

3. Of all the non-operatively managed injuries, how many failed and ended up requiring partial pancreatectomy? __________

4. Approximately how many distal pancreatectomies have been performed at your center in the past 3 years for reasons other than trauma? ______

5. Would all the surgeons that take trauma call at your center be interested in randomizing patients to either an operative or non-operative strategy?
   a. Yes ____  b. No ____  c. Mixed* (please elaborate) ________________
      *If this is the case, could another surgeon take over case? Y ____ N ____

6. Which are the primary management strategies for non-operative patients used at your center:
   a. NPO until amylase/lipase normal
   b. NPO until epigastric tenderness improves
   c. NPO until epigastric tenderness has resolved AND labs normal
   d. NPO until epigastric tenderness has resolved OR labs normal
   e. NPO until acute fluid collection/pseudocyst has resolved
   f. Early jejunal feeds
   g. Early ERCP with/without ampullary stent
   h. Percutaneous drain for early fluid collection/pseudocyst
Results

- Data collected from 19 centers

- 123 injuries (> grade 1) reported over the past 3 years
  - Median 6 per center
  - Range 1-22 per center

- 75 duct injury/suspected
  - Median 1 per center
  - Range 0-8 per center

Pancreatic Injuries at 20 Pediatric Trauma Centers (3 years)
Results

- 5 centers used NOM for all cases
- 2 centers used OM for all cases
- 12 centers (63%) used both approaches

21% were laparoscopic

41% OM

59% NOM
Clinical Management of NOM Cases

“Which are the primary management strategies for non-operative patients used at your center?”

- NPO until amylase/lipase normal
- NPO until epigastric tenderness improved
- NPO until labs normal AND tenderness improved
- NPO until labs normal OR tenderness improved
- NPO until pseudocyst resolved
- Early jejunal feeds
- Early ERCP with/without stent
- Percutaneous drain for pseudocyst
- ERCP only if pseudocyst develops

50%
Results

• MRCP is available at 89% of centers

• MRCP is considered standard of care at 68% of centers

• ERCP is utilized by 73% of centers

• 63% of centers are willing and 26% may be willing to randomize patients to either NOM or OM strategy
Conclusions

• Practice variability exists among pediatric surgeons regarding the management of high-grade pancreatic injuries

• Most centers surveyed use both the NOM and OM approaches (equipoise)

• NOM varies too widely to make meaningful retrospective comparisons of outcomes among centers

• A prospective trial to compare outcomes is feasible
Limitations

• Population surveyed had already expressed interest in comparing outcomes of OM and NOM

• Only pediatric trauma centers were surveyed
Future Directions

• Prospective, multicenter, controlled trial to compare outcomes of OM and NOM

• Develop best practice management guidelines for NOM to limit variability

bnaik@texaschildrens.org
Thank You!