Summary

There are still diagnostic problems and variety of opinions about tactics in the treatment of blunt pancreatic injuries. The methods of surgery treatments are more and more replacing the methods of endoscopy and conservative therapy. There is a remarkable difference in the tactic of treatment between adults and children because of the anatomical physiological reasons. Delayed diagnosis of this wounding is connected with heightened morbidity and mortality.

Handlebars injury is the most frequent mechanism of the trauma. The most determinant role in the diagnostics has active examination tactic and arsenal of visual diagnostics methods. Therapy approach must be individualized depending from the hemodynamic status, seriosity of injury, existence of associated injuries and the experience in the institution. After traumatic pseudocysts can be successfully drained in US control or endoscopic to stomach. Children with such injuries must be concentrated if possible in the specialized centers.

Key words: children, blunt abdominal trauma, pancreatic trauma, posttraumatic pancreatis, diagnosticēs, treatment, complications.


INTRODUCTION

Although more than 180 years have already passed since the injury of the pancreas in case of a blunt abdominal cavity trauma has been described for the first time (Travers, 1827), there are still faced difficulties in diagnostics and diversity in opinions on treatment tactics. In the literature worldwide the opinions on the necessity for a surgical activity still differ (Stringer, 2005; Mattix, 2007; Wood, 2010); however, conventional surgical treatment methods are more and more frequently substituted by endoscopic methods and conservative therapy due to broader application of progressive visual diagnostics technologies and development of laboratory examination methods (Loungnarath, 2001; Kouchi, 2009). Significant differences in treatment tactics between adults and children have anatomically physiological background. Many researches clearly indicate that the reaction of a child's body to an injury differs from the reaction of an adult’s body (Gaines, 2009; Jobst, 2009).

A majority of children pancreatic injuries are minor and do not affect the pancreatic duct. In comparison to adults children more frequently have an isolated pancreatic trauma, which probably indirectly indicates greater vulnerability of pancreatic tissues. Probably the fact that children in general lack primary pathology of the pancreas has a crucial role in reaching better treatment results at the child age.

At the child age a blunt abdominal trauma is a leading reason for the injury of the pancreas, on the contrary, adults more often have a penetrating trauma. The pancreas is located retroperitoneal to the spinal column, thus 2/3 of the injury is localized in the body of the pancreas. The vulnerability of child’s pancreas has a significant role due to softer tissues and weaker anatomic protection by the anterior abdominal wall and other organs.

Diagnosis

Clinical symptoms: abdominal pain, nausea, vomiting are not specific to the injury of the pancreas and do not correlate with the gravity of the injury (Bosboom, 2006). Laboratory examinations helping to diagnose (amilasis, lipasis) are non–specific and their indicators significantly
differ depending on the time of taking samples. Although there are described cases of adult traumas, when amilasis have been normal having complete rupture of the pancreas and in some situations the indicators have been very high having slight contusions of the pancreas, the patients at the child age practically in 100% of cases have increased these laboratory indicators 2–3 hours after the injury (adults in 50–80% of cases) (Wittendorff, 2002; Matsuno, 2009). For children having a blunt abdominal trauma the increase of the serum amilasis level above 200 and the lipasis level above 1800 can indicate the injury of the pancreatic duct, the data about the increasing dynamics of these indicators can be especially useful (Nadler, 1999; Mayer, 2002; Adamson, 2003). Overall we consider that the available laboratory examinations cannot be applied for the gradation of the gravity of the injury; moreover, they cannot determine the therapeutic tactics, however, increased indicators of amilasis and lipasis can be considered as an indicator of possible pancreatic injury in case of a blunt abdominal trauma. The current researches on cytokines and oxidative stress (Pereda, 2006; Caronna, 2009; Escobar, 2009) can significantly increase surgeon’s rely on laboratory examinations in the selection of tactics for treatment in the future.

Although in the literature significant attention is devoted to the latest US examination methods by application of contrasting, and they definitely remain as irreplaceable screening for any blunt abdominal trauma (Chirdan, 2007; Valentine, 2009), CT has a leading role in diagnostics of children intra–abdominal injuries by its 80% sensitivity and specificity (Ruszinko, 200). If CT is performed early (<12 hours after the trauma), the obtained results can be insufficient because time is needed to visualize the changes of soft tissues (Smith, 1996; Wittendorff, 2002). Direct indications of CT to the pancreatic injury are rupture or transection. It is often possible to visualize communication of fluid collections such as hematomas, pseudo–cysts, abscesses with the location of the pancreatic injury. The injury of the pancreas can be indicated by fluid in the lesser sac, extraperitoneal fluid, pancreatic edema or hematoma, thickening of anterior renal fascia or fluid in anterior pararectal space, and fluid between splenic vein and pancreas (Visrutaratna, 2008). However, the precision of CT is not always sufficient to diagnose the injury of the pancreas duct; quite often in CT there are described injuries of the pancreas duct, which are not confirmed by ERCP contrast examination. Obviously the main drawback of CT is children’s exposure to substantial radiation.

Timely identification of the injuries of the pancreas duct is very important among adult patients, where more active surgical tactics is needed. In this case MR and ERCP shall be applied. ERCP identifies the duct injury or may preclude surgery if the ductal system is intact; its use is controversial. ERCP disposes patients to the risk of increasing morbidity (pancreatitis 3–14%, intra–abdominal fluid collection infection risk 10%) (Putnam, 1991; Brown, 1993; Rescorla, 1995).

Management
Children’s pancreas injury therapy must be individual depending on the status of hemodynamics, gravity of injury, existence of associated injuries, as well as diagnostic and therapeutic equipment available at the institution, amased experience must be taken into consideration as well (Fig.1., Table 1).

Fig. 1. The diagnostic approach to the patient with a suspected pancreatic injury

Table 1. Treatment according to pancreatic injury severity grade (AAST)

<table>
<thead>
<tr>
<th>Grades</th>
<th>Injury</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Minor contusion or laceration without ductal injury</td>
<td>Do not require surgical</td>
</tr>
<tr>
<td>II</td>
<td>Major contusion or laceration without a ductal injury</td>
<td>intervention</td>
</tr>
<tr>
<td>III</td>
<td>Distal transection or parenchymal injury with ductal injury</td>
<td>May be treated nonoperative</td>
</tr>
<tr>
<td>IV</td>
<td>Proximal transection or injury involving duct or ampulla</td>
<td>May be surgically managed by distal pancreatectomy and drainage</td>
</tr>
<tr>
<td>V</td>
<td>Massive disruption of the pancreatic head</td>
<td>Enteric drainage, or wide external drainage; however, nonoperative management has also been described with acceptable outcomes</td>
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</table>

Nonoperative management of low–grade pancreatic injury is widely accepted. Management of major pancreatic parenchymal or ductal injury in children remains controversial.

The key to successful conservative treatment of a severe pancreatic injury among children is percutaneous
Antibacterial therapy shall be started for the patients without priory identified increased risk of infection (non–performed invasive manipulations, non–identified injuries of other organs, satisfactory intestinal passage) when inflammatory markers increase (leucytosis, CRP). There is still a discussion on prophylactic usage of antibiotics or their usage upon clinical indications (Pederzoli, 1993; Powell, 1998; Parakh, 2009). Early enteral probe feeding (jejunum) has a crucial role in prevention of septic complications due to an opportunity to create high concentration in pancreatic tissues and necroses (Pederzoli, 1993; Powell, 1998; Parakh, 2009). Early enteral

1. Pancreatic injuries resulting from a blunt abdominal trauma are rare among children. The most frequent trauma mechanism is a bump to the bicycle handlebar.

2. In case of a blunt abdominal trauma active examination tactics and visual diagnostic methods arsenal have a significant role as one cannot forget about possible pancreatic injuries. The US method becomes standard screening; however, CT with intravenous contrasting has a crucial role as it is needed not only for the gradation of the gravity degree of the injury, but also for successful identification of the injuries of other organs and control of the effectiveness of therapy in dynamics.

3. The therapy of children pancreatic injuries shall be individual depending on the status of hemodynamics, gravity of injury, existence of associated injuries and experience of the institution. A majority of pancreatic injuries of I–IV degree of gravity among children can be treated conservatively. Overall the problems, which have appeared, can be successfully solved by application of a laparoscopic method. The need for a conventional surgery is determined to a large extent by unstable hemodynamics and serious injuries of other organs. Broad resections shall be avoided as much as possible. Surgical manipulations in case of pancreatic injuries shall be performed having antibacterial background.

4. Conservative treatment of more serious pancreatic injuries can associate with development of post–traumatic pseudo–cysts, which can resorb spontaneously or be successfully treated by transcutaneous drainage under US control or be endoscopically drained to the stomach.

5. Individual surgeon’s experience in treatment of children pancreatic injuries might be insufficient, thus successful examination and treatment tactics shall be based on the material summarized in publications. Children having such injuries shall be concentrated in specialized centers, which can provide high quality care in children intensive therapy unit and permanent monitoring of experienced children surgeons.
REFERENCES


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