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CONGENITAL HYPERINSULINISM – SURGICAL TREATMENT AND COMPLICATIONS

Running head: Congenital Hyperinsulinism

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Abstract

Congenital hyperinsulinism is a common cause of persistent hypoglycaemia in neonates. Cases resistant to medicamentous therapy require surgical treatment, where the greatest challenge is to differentiate focal from diffuse forms of the disease and to localize the focal lesion. PET-scan, selective arterial stimulation and venous sampling (ASVS) and intraoperative frozen sections examination are used to determine the type. Partial pancreatectomy for focal forms has lower complication rate and diabetes mellitus development than radical near-total pancreatectomy for diffuse forms. We report a case of a 6-month-old boy with focal form of CHI with special emphasis on surgical complications of pancreas resection together with their management.

Keywords

hyperinsulinism, hypoglycaemia, pancreatectomy, partial pancreatectomy, choledochal obstruction, choledochal lesion

Introduction

Congenital hyperinsulinism is a common cause of persistent hypoglycaemia in neonates [1]. It occurs in 1:50000 live births. A defect in β-cell K-ATP channel leads to uncontrolled oversecretion of insulin causing resistant hypoglycaemia which, if not recognized and promptly treated, can cause permanent brain damage [2]. When episodes of hypoglycaemia cannot be medicamentously controlled, surgical treatment is considered. The greatest challenge for the surgeon is to differentiate focal from diffuse forms of the disease and to localize the focal lesion. Partial pancreatectomy for focal forms has a lower complication rate and diabetes mellitus development than radical near-total pancreatectomy for diffuse forms. The use of PET-scan and ASVS preoperatively and frozen sections examination intraoperatively gives the best results in the differentiation of these two types. We report a case of a 6-month-old boy with focal form of CHI, detected by the PET-scan and confirmed on intraoperative frozen sections, partial pancreatectomy was performed. He also developed two surgical complications in both early and late

postoperative period which were successfully solved. Current surgical options for CHI treatment, as well as surgical complications of pancreas resection together with their management, are reported here.

Case report

A 6-month-old boy with persistent neonatal hypoglycaemia was treated since birth at our pediatric department. The first symptoms of the disease were seizures observed in the early neonatal period. After work-up the diagnosis of CHI was made. Intensive medicamentous therapy could not maintain normal blood glucose levels so surgical therapy was considered. To determine whether it was a focal or diffuse form of the disease, PET scan using 18 F-L-DOPA (Picture 1) was performed and revealed an elevated pathologic activity in the projection of the head of the pancreas so we decided to perform a partial pancreatectomy. During the procedure the whole pancreas appeared normal and the tumor could not be macroscopically detected so we had to do eight intraoperative biopsies which guided us through the procedure. The head of the pancreas, uncinate processus and a part of the body were resected until the margins on the biopsy specimen came negative. It was followed by Roux-en-Y pancreaticojejunostomy. While excising the pancreatic head, we managed to preserve the choledochal duct (confirmed by intraoperative biligraphy taken through the cystic duct after cholecystectomy) (Picture 2). Guided by the pathologist, the resection had to be extended so we divided the pancreatic tissue from the area around papilla Vateri and ligated the main pancreatic duct. The pancreatic tissue within the C-loop of duodenum had also been removed and, although we were very careful, some of the duodenal external circulation was probably damaged and the duodenum seemed a bit livid at the and of the procedure.

The early postoperative period was very good, glucose levels were normal from the second day on without any medicamentous therapy. The first complication was observed when we started peroral nutrition. The patient developed signs of high (duodenal or jejunal) obstruction. Barium swallow excluded mechanical stop, and we assumed that the stop was functional and that the duodenum still hasn't recovered from partial devascularisation. On conservative therapy the symptoms completely resolved after two weeks.

Forty days after the procedure liver enzymes were found to be elevated with bilirubin at 30 μmol/L, the bile ducts were slightly dilated on ultrasound examination. Choledochal stenosis was suspected and with boy being well and with normal coloured stools, we decided to be expectative. Unfortunately, liver enzymes continued to grow (but not blood levels of bilirubin) with signs of hepatomegaly and by excluding other possible causes of liver lesion, choledochal stenosis had to be managed. Our first idea was to perform ERCP with stent placing through the papilla. On endoscopy performed by an experienced invasive gastroenterologist, papilla of Vateri was clearly shown and appearing normal but attempts to put a stent through it failed. With intrahepatal bile ducts up to 8-9 mm wide, an invasive radiologist perfomed PTCA and managed to put the tube into the confluens of the left and the right hepatic ducts, but the attempt to place it through the papilla also failed. After PTCA, however, the boy's condition improved, liver enzymes started to fall and liver growth stopped. At last, with high-output biliary fistula and with still unsolved biliary obstruction we decided to perform a surgical procedure. After adhesiolysis we found a dilated choledochal duct (about 1 cm wide) (Picture 3) and performed side-to-side choledocho-jejunal anastomosis with previously formed Roux limb. The postoperative period was without complications, blood levels of liver enzymes and bilirubin fell to normal values, and hepatomegaly resolved. Three months after the procedure the boy is at home and doing well.

Discussion

The greatest surgical challenge in the treatment of CHI is to separate diffuse from focal forms of the disease. These two forms cannot be differentiated by clinical or biochemical investigations. It has been shown during the last decade that the percentage of focal forms is significantly higher (>60%) than previously reported (20%). Subtotal and near-total pancreatectomy for diffuse forms and partial pancreatectomy for focal forms are the surgical options [3].

The PET scan and arterial stimulation with venous sampling give the best results in localising focal lesions preoperatively. Although very precise,

ASVS is a technically challenging procedure and should be limited to experienced radiologists and centres [4]. The PET scan can provide similarly good results and is a non-invasive method [5]. How can we be sure that we have removed the lesion by partial pancreatectomy? Inspection and palpation of pancreas has only about 60% accuracy in identifying the lesion even if performed by an experienced and highly specialized surgeon. A pathologist can differentiate, by examining intraoperative frozen sections, focal from diffuse forms, find the lesion and inspect the margins of the resected specimen [6, 7].

Combining these methods together with surgical experience is necessary to determine the extent of surgical resection, which results in a cure and prevents unnecessary hyperglycaemia or diabetes mellitus in later life.

Surgical resections of the pancreas (both partial and near-total), however, have several complications. Unfortunately, we have encountered two of them in our case.

The most probable cause of our first complication, partial, temporary duodenal obstruction, was a partial lesion of the external vascular supply – superior et inferior pancreatico-duodenal artery. After two weeks the symptoms resolved, that period was probably enough for intramural vascular supply to enhance and take over.

Biliary obstruction was the second complication and was solved as described above. We have recognized two possible pathologic mechanisms. While dividing the pancreatic tissue, the delicate vascularisation net of the choledochal duct can be damaged and ischaemia can lead to stenosis. The other point of surgical procedure where obstruction could take place was transection and ligation of the main pancreatic duct near papilla Vateri. Scar tissue that was formed later in that area could have caused stenosis. We assume both of these mechanisms caused obstruction in our case. It is hard to tell, with the intact choledochal duct, was it safer and possible to recognize these mechanisms and assume biliary stenosis and perform biliodigestive anastomosis at first operation to avoid complications.

In the end we would like to point out that surgical procedures on the pancreas are rare [8] in childhood, but when needed, careful planning, capability to solve possible complications and multidisciplinary management are obligatory to achieve success.

Figure 1. PET-scan revealing intense activity in the pancreatic head

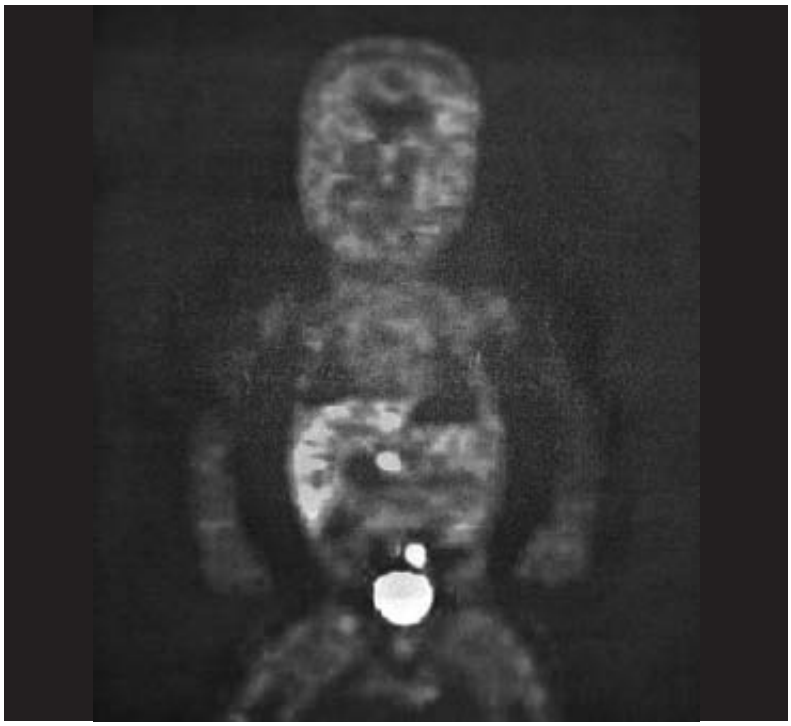


Figure 2. Intraoperative biligraphy taken through the cystic duct after cholecystectomy shows an intact choledochal duct

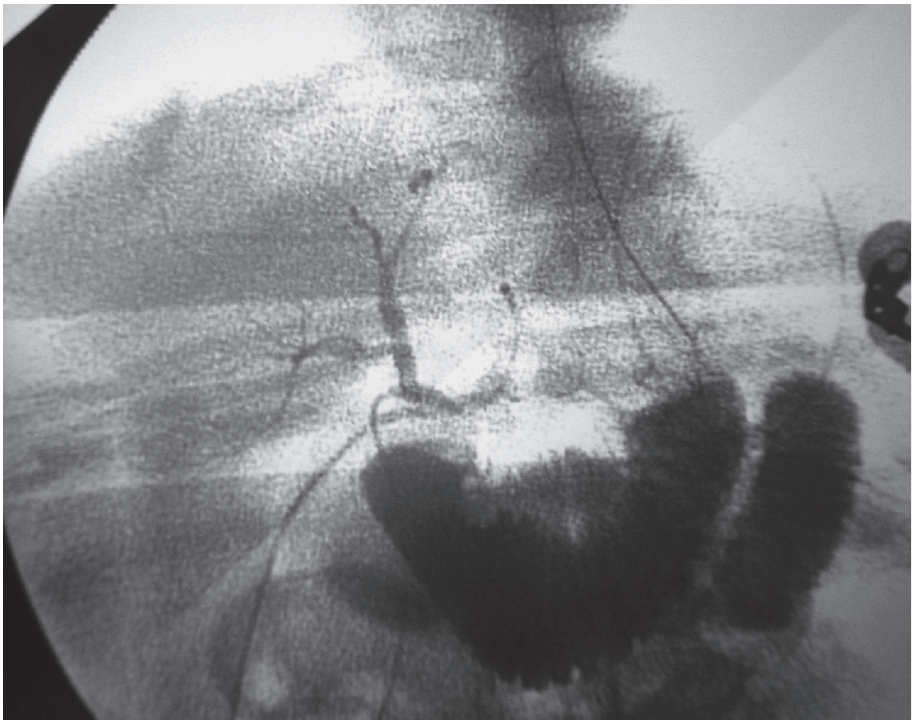
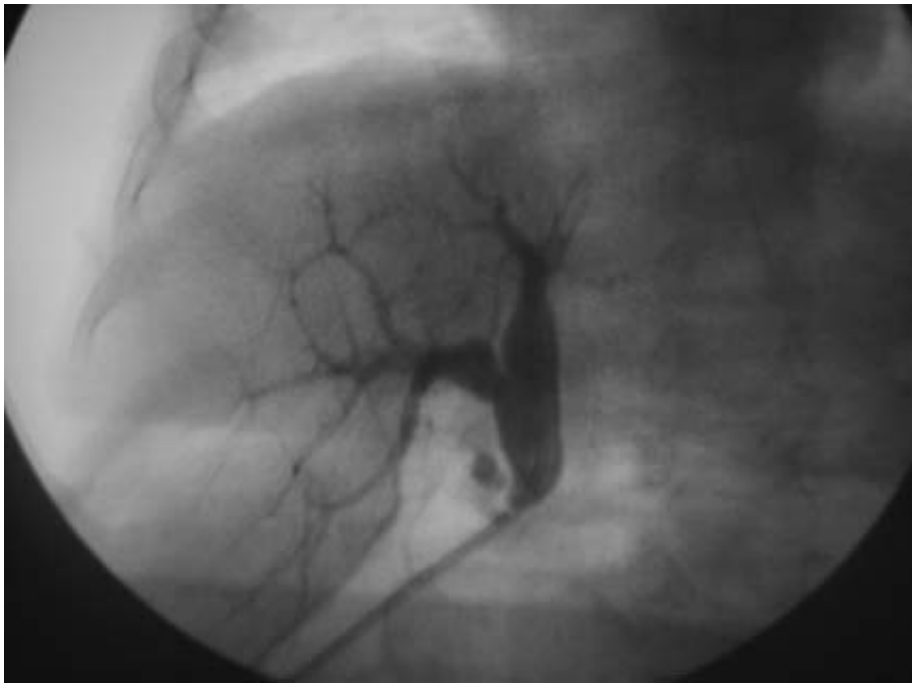


Figure 3. Intraoperative biligraphy taken through choledochotomy at second procedure shows dilated choledochal and intrahepatic bile ducts



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