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Sphincter-preserving procedure for penetrating pancreato-duodenal-biliary injury in a child
(Case report and review of the literature)

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Summary

A procedure descrebing the repair in a child of an extensive intra-abdominal injury due to a bullet is reported. The initial operative approach involved preservation of the common bile duct, the sphincter of Oddi, and the superior mesenteric vein, an antroduodenectomy and a distal pancreato-jejunostomy. The postoperative course was complicated by repeated upper GI bleeding which was controlled by a truncal vagectomy, subtotal gastrectomy, revision of the pancreato-jejunostomy and required a suture-ligation of the distal end of the severed main pancreatic duct. Follow-up examination one year later revealed that the child was thriving, having no jaundice, no pancreatic pseudocysts and no abdominal pain, but required supplementary amounts of pancreatic anzmyes. A review of the English literature did not reveal a case with a similar injury that underwent a comparable successful management.

Key words: Abdominal trauma, pancreatic trauma, duodenal trauma, biliary trauma, modified Whipple pancerato-duodenectomy

Introduction

Penetrating trauma to the pancreato-duodeno-biliary area presents a challenge to the surgeon, particularly when the trauma incolves a young victim and is associated with a major vascular injury. The long-term follow-up children requiring the standard Whipple pancreato-duodenectomy is not without problems [2,4,7,11,12,13,28]. In injuries to the main pancreatic duct, it is belived that surgical closure of the proximal end of the distal fragment results in pancreatitis and pseudocysts.

The present report demonstrates the feasibility and value of preserving the intergrity of the sphincter of Oddi in a child bile duct(CBD), head and body of the pancreas, superior mesenteric vein(SMV), and right kidney. This case supports the experience of others who reported that a complete of the distal pancreatic duct may be a safe practice in the absence of infection [3,8,25].

A description of a similar sphincter of Oddi-pereserving operation for injuries involving the duodenum, pancreas, and CBD was not evident on review of the English literature [1,6,10,14,17,19,20,21,27]. This procedure will be referred to hereafter as the sphincter-preserving procedure(SPP). In our experience with war injuries at the American University of Beirut Medical Center (AUB MC), the present case is unique regarding its surgical management.

Case Report

AT, a seven-year old boy, was admitted on May 19,1986, to the American University of Beirut Medical Center in a state of shock within one-half hour after his abdomen was penetrated by a stray

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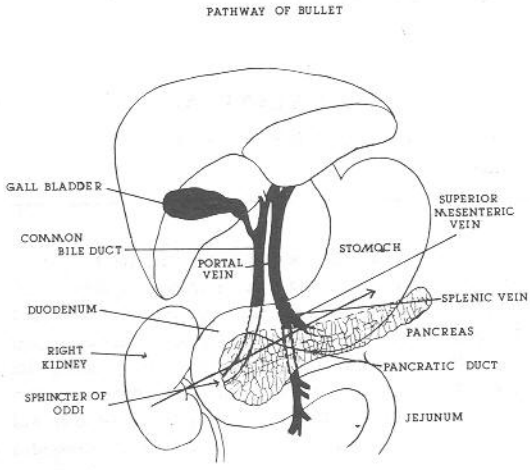

Fig. I. Organs and structures penetrated by bullets are indicated by arrow. Sequentially, they were: right kidney, duodenum common bile duct, pancreas, superior mesentric vein, stomach. Entry wound was in right flank and the bullet treminated in the stomach.

bullet. The entry wound was in the right flank and was discharging bloody fluid. There was nlo exit wonud. On admission, lactated Ringer's solution was started intravenously in the upper ewtremity. Nasogastric intubation yielded blood. Hematuria was present on microscopic examination. By plain radiography, the bullet was seen in the left upper quadrant of abdomen.

An emergency laporotomy was dene thorugh a midline incision and revealed the following injuries (Fig. I): a cortical laceration of the anterior aspect of the right kidney, a trough and through laceration of the second part of duonedum about one inch above the level of the ampulla of Vater, a subtotal transection of the para-pancreatic segment of the distal end of the CBS, a laceration of the SMV, an avulsion-laceration of the pancreas at the junction of its head with the body and a perforation of the posterior wall of the gastric fundus where the bullet eventually rested. The abdominal cavity contained a large amonut of free blood.

The injuries were managed surgically in the following sequential manner (Fig. II): The bleeding form the SMV was controlled rapidly by atraumat-

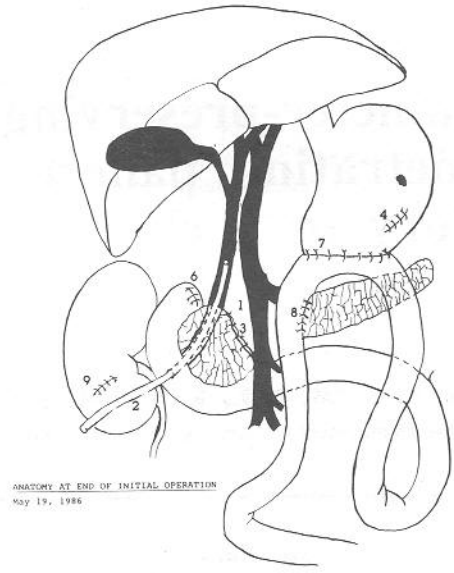

Fig. II. The method of initial repair of the injured organs and structures are shown: (1) Primary repair of common bile duct over a trans-ampullary stent (2) which exited from the duodenum; (3) suture closure of pancreas separating head from body; (4) primary repair of wound in posterior wall of body of stomach; (5) superior mesenteric vein (not enumerated in illustration); (6) closed duodenal stump after antro-duodenectomy (7) gastroenterostomy of Polya type; (8) pancreatojejunostomy of telescoping type; (9) suture-repair of renal cortical laceration.

ic clamps, after which the vein was repaired with 6-0 prolene sutures. After a reassessment of the extent of injury, it was decided to adopt a"conservative" attitude for repair. The bleeders from the pancreatic avulsion-laceration were electro-coagulated and suture-ligated. The tear in the duodenum was completed and suture-ligated. The tear in the duodenum was completed circumferentially. The ampulla was identified and cannulated with an 8 French multiholed catheter that was inserted to the level of the common hepatic duct, after which the CBD laceration was brought out through a stab duodenostomy from the right flank. The avulsion of the pancreas was completed and the cut margin of its separated head was suture-closed with 3-0 silk. The kidney laceration was repaired with chromic catgut sutures. The pre-ampullary segment of the duodenum was closed in two layers using pyloro-duodenal area which was resected. The bullet was recorvered from the gastric cavity and the hole in the posterior wall of the fondus was sutures-closed. The GI. continuity (G-J) in two layers using chromic catgut and silk. As the distal pancreatic duct could not be visualized, a telescoping pancreato-jejunostomy was performed suturing the cut margin of the body of pancreas to the efferent jejunal loop [5]. A sump drain was left in the lesser sac and exited from the right flank. A vagotomy was not attempted at that time in view of the general critical state of the patient and the complexity of the lesions. On the

sixth postoperative day, he was re-operated for massive upper GI. bleeding, which, on exploration through an anterior gastro-tomy, was found to be originating from the G-J suture line. This was reinforced with another continuous suture of catgut. An abdominal truncal vagotomy was done concomitantly. Six days later, he was again re-explored for another episode of massive upper GI. bleeding which started one day earlier, did not respond to conservative measures and was not associated with a coagulopathy. Using the previous site of exploratory gastrotomy, the GJ. was re-inspected and again found to be source of bleeding. This was controlled with figure-of-eight sutures of 2-0 prolene. Six days after the third laparotomy, he was re-operated for a recurrent upper GI. bleeding which was arising from the anterior exploratory gastro-tomy site. Accordingly, a subtotal gastrectomy was performed, including in the specimen the previous pancerato-jejunostomy. As the pancreatic end of thes anastomosis looked fibrotic, and in order to avoid a difficult and risky resection of the pancreatic body and tail with possible subsequent injury to the spleen, a suture-reinforcemnt of the cut margin of the pancreatic body was done with silk sutures without an attempt to rejoin it to the intestinal tract. The GI. continuity was subsequently established by a Roux-en-Y, Hoffmeister G-J (Fig. III).

After this 4th procedure, the child had a relatively smooth recovery and was discharged three weeks later in stable condition, anicteric, weighing 16.5 kg, having normal blood glucose levels, receiving frequent small oral feedings and requiring the use of supplementary pancreatic enzyme to regulate the consistency, frequency and volume of this stools. Initially, he had symptoms of dumping which disappeared within two months after operation. The removed without clinical complications or deterioration of liver function. At one year follow-up examination, the patient weighed 21.5 kg, was asymptomatic and was exercising normal activities for his age, but continuing to require smaller doses of panceratic enzymes orally. An ultrasound examination of the abdomen at this time revealed the liver to be normal in size and echotexture, the gall bladder to be normally distended without evidence of gallstones, and the CBD to be normal in size throughout its visualized portions of the pancreas appeared unremarkable without signs of cyst formation.

Discussion

The pancreatic injury encountered in our patient belongs to the Class IV of the Lucas grading system [16] and represents one of the most severe types combined pancreato-duodenal one of the most severe types combined pancreato-duodenal injury that carries with it a significant intra-

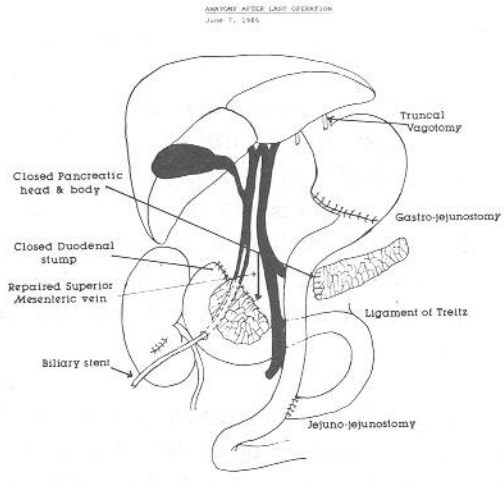

Fig. III. The revised methods of repair as employed 19 days after the initial injury: resection of previous gastro-jejunostomy and pancreato-jejunostomy; Hoffmeister, Roux-en-Y gastro-jejunostomy, jejuno-jejunostomy, truncal vagectomy, and suture closure of body of pancreas.

operative and postoperative mortality. The associated lacerations of the SMV and the CBD are per se life-threatening and present a challenge in their operative management. The risk with this constellation of injuies in the yo-ung victim are also related to the hemodynamic state of the patient on admission and the intensity and nature of the measures used for resuscitation [24].

The objectives that guided us in the management of this patient consisted of [23]:

1. An early control and restoration of the circulating blood volume,
2. The preservation of the normal sphincter mechanism between the biliary and enteric tracts,
3. The conservation of a maximal amount of pancreatic tissue, and
4. The preservation of the spleen and its vascular integrity.

Pancreato-duodenectomy were another therapeutic option for our patient [18,24]. However, this procedure has its inherent immediate and late complications [15,18,21,22,26,29]. The fate of children undergoing a Whipple procedure is not without problems, particularly with reference to the bi-

liary and pancreatic anastomoses. We were satisfied to find that at a one year follow-up examination, our patient was gaining weight, had no evidence of biliary stricture, had a normal liver and spleen, a normal blood glucose, and a pancreas that was free of cysts despite the complete surgical closure of the main pancreatic duct. The enzymes from the pancreatic head were insufficient to cope with the needs for normal intestinal digestion.

The major GI. bleeding that our patient witnessed on three occasions on the 5th-6th postoperative day may be explained on the basis of premature loosening of the catgut used for the inner layer of the G-J anastomosis, and an inadequate control of the submucosal gastric bleeders. This complication emphasizes the importance of securing individually these bleeders by ligatures before the anastomosis is started, a practice which was not followed in our patient. Noteworthy, a bilateral truncal vagectomy did not prevent the recurrence of GI. bleeding. On the subsequent exploratory laparotomies, there was to no bleeding from the pancreato-jejunostomy (P-J), a complication that was reported by others after P-J [21, 25]. As the letter anastomosis was close to the resected G-J and as the pancreas to the jejunum but we elected to suture-close the distal pancreatic stump as reported by other [3,8]. The one year follow-up on this child favors the validity and safety of this procedure, and contributed to the preservation of his spleen [9].

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