

## CASE REPORT

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# Sequential CT Evaluation of Isolated Non-Penetrating Pancreatic Trauma

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### ABSTRACT

**Context** Isolated pancreatic injuries resulting from non-penetrating trauma are rare. CT is currently the modality of choice in evaluating pancreatic injury. Delay in recognizing patients who need immediate surgery is an important cause of increased morbidity due to specific pancreatic complications.

**Case report** A 47-year-old man with blunt abdominal trauma after a car accident underwent a CT scan. Initial CT findings included diffuse pancreatic enlargement suggestive of isolated grade 1 pancreatic injury. A follow-up CT scan 3 days later revealed a fracture line at the pancreatic body. Subsequent surgical exploration confirmed the suspicion of concomitant duct transection. Seven months after surgery, a pseudocyst had formed adjacent to the site of the injury.

**Conclusions** This case demonstrates the potential importance of serial CT scans in the diagnosis, grading and management of isolated pancreatic injury.

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### INTRODUCTION

Injuries of the pancreas occur in 2-12% of patients with blunt abdominal trauma [1]. Accurate and early diagnosis is imperative

because these injuries are associated with high morbidity and mortality, especially if diagnosis is delayed. Computed tomography (CT) is currently the modality of choice in evaluating pancreatic injury in patients suffering abdominal trauma but who do not require immediate exploration [2].

This report describes a case of isolated blunt pancreatic injury of underestimated severity on initial computed tomography and detection of pancreatic fracture at a follow-up CT scan.

### CASE REPORT

A 47-year-old man was the driver in a car accident. The clinical evaluation revealed slight tenderness on palpation of the upper abdomen and no rebound. Initial hematocrit and hemoglobin levels, serum and urine amylase values and liver function tests were normal. The patient underwent contrast-enhanced multislice abdominal CT. A diffuse pancreatic enlargement with peripancreatic fluid collections was initially visualized, suggesting pancreatic injury (Figure 1). There was no obvious pancreatic fracture line to suggest partial or complete fracture. According to the injury scale of Moore *et al.*, it was classified as a grade 1 injury [3]. All other abdominal organs were intact.

Since the patient was hemodynamically stable and there was no clear evidence of pancreatic duct disruption, he was initially managed



**Figure 1.** A CT scan performed after abdominal trauma showing diffuse pancreatic enlargement and was interpreted as suspicious for pancreatic injury. (Grade 1 injury).

nonoperatively. Close clinical observation during the initial three days after transfer included repeated physical examinations and laboratory testing. There was a gradual decrease in hematocrit and hemoglobin values and an increase in serum amylase levels (Table 1). A follow-up CT scan on the third day revealed a fracture line at the pancreatic body (Figure 2). Subsequent surgical exploration confirmed the suspicion of concomitant duct transection.



**Figure 2.** Follow-up CT scan 3 days after abdominal trauma revealing a tear of the pancreatic body.



**Figure 3.** A CT scan performed 7 months after surgery showing the presence of a pseudocyst adjacent to the point of injury.

Thereafter, recovery was uneventful and the patient was discharged without symptoms and with normal laboratory values. Although he was advised to have a CT scan 2 months later, he presented to the radiology department 7 months later. In the meantime, he had been asymptomatic and serum amylase values were normal. A CT scan was carried out and showed the presence of a pseudocyst adjacent to the site of injury (Figure 3). The pseudocyst was not large or symptomatic and was treated conservatively.

## DISCUSSION

Isolated pancreatic injuries resulting from non-penetrating trauma are rare. Less than 10% of all major trauma events include injury of the pancreas. Nearly 75% of pancreatic injuries result from penetrating trauma and the majority of them are associated with other solid organ injuries. Several series report a range of 1.6 to 4.5 associated injuries per patient. Occasionally, as in our case, the pancreas was the sole organ injured [2, 4, 5]. If the patient is stable enough to undergo imaging, the test of choice is a CT scan,

**Table 1.** Serum amylase, hematocrit and hemoglobin values during the initial three days after abdominal trauma.

	Amylase (IU/L)	Hematocrit (%)	Hemoglobin (g/dL)
1 <sup>st</sup> day	159	39.8	12.8
2 <sup>nd</sup> day	225	37.3	11.7
3 <sup>rd</sup> day	498	34.6	10.5
Reference range	0-110	40-52	13.2-16.2

performed with intravenous contrast. The findings on CT which may indicate pancreatic injury are: 1) intra- and extra-peritoneal fluid, fluid in the lesser sac; b) pancreatic hematoma or laceration; c) diffuse gland enlargement with pancreatitis or focal edema at the site of injury; d) thickening of the left anterior renal fascia. These findings are unusual and often subtle and patients with pancreatic injury rarely exhibit more than one finding [6]. CT findings can also suggest disruption of the pancreatic duct. However, the ability of CT to indicate these findings depends on the degree of parenchymal injury [7]. The presence of a complete fracture is usually associated with a concomitant duct transection [1]. Occasionally, the pancreas may have almost normal morphologic features on CT despite the presence of duct disruption [8].

One finding which is easy to recognize, and in the proper clinical setting directs attention to additional subtle findings of pancreatic injury, is the presence of fluid interdigitating between the pancreas and the splenic vein. [9] This finding is seen on CT scans in 90% of cases. Nevertheless, peripancreatic retroperitoneal fluid may be observed in the absence of pancreatic injury, pancreatitis or pancreatic disease [10].

One CT grading scheme which has recently been suggested parallels the surgical classification of Moore, without including direct evaluation of pancreatic duct integrity [8]: grade A, pancreatitis or superficial laceration (less than 50% pancreatic thickness); grade B1, deep laceration (greater than 50% pancreatic thickness) of the pancreatic tail; grade B2, transection (entire thickness) of the pancreatic tail; grade C1, deep laceration of the pancreatic head; and grade C2, transection of the pancreatic head.

The difficulties involved in initial CT scan grading of pancreatic injury highlight the need to proceed with great caution if a non-operative path is taken. False negative results or underestimation of initial CT scan grading may be associated with unopacified bowel loops adjacent to the pancreas, motion and streak artifacts, as well as suboptimal bolus enhancement. In grade B or C injuries, the

pancreatic fracture line is not easily detected when the separation of the fractured pancreatic fragments is minimal or nonexistent [1]. Furthermore, overestimation on CT could occur in grade C injuries because deep lacerations though the proximal pancreas are sometimes not associated with disruption of the proximal main duct, and transections through the proximal pancreas may merely disrupt the minor duct [8].

CT scans can also be useful in demonstrating complications such as abscesses, fistulae, pancreatitis and pseudocysts. There seems to be a strong trend in the frequency of pancreatic-specific complications in patients requiring delayed surgical intervention versus continued observation [11]. Therefore, delay in establishing the diagnosis of pancreatic duct injury is an important cause of increased morbidity from blunt pancreatic trauma [12]. The main reasons for the delay in diagnosis and treatment of isolated pancreatic trauma include: a) the fact that it can be symptom-free (in up to 20% of patients there is neither abdominal pain nor tenderness [11]) and, moreover, cases of blunt abdominal trauma of minimal severity with concomitant isolated pancreatic injury have been reported [13]; b) the fact that laboratory findings are often non-specific (in particular, initial serum amylase levels may be normal in about 25% of patients [11]); c) the underestimation of the severity of pancreatic injury on the initial computed tomogram, as in this case [14].

Initially, it is important to separate the patients into two groups: those who need immediate surgery and those who need non-operative observation. While non-operative management of other solid organs (spleen, liver) is an accepted practice, non-operative management of pancreatic injuries is controversial. The integrity or disruption of the pancreatic duct is the principal determinant in the management of pancreatic injuries. Because prompt surgical intervention is usually undertaken in patients with penetrating injuries or multiple organ involvement, delay in the diagnosis of a pancreatic duct injury most commonly occurs in patients with blunt abdominal trauma

exclusively involving the pancreas. Some authors claim that CT grading of the degree of severity of blunt pancreatic trauma can be useful in predicting ductal integrity or disruption [7]. Nevertheless, CT has not emerged as a clinically reliable method and CT predictions of ductal injury cannot be relied on in an individual patient [11, 15]. To our knowledge, the potential usefulness of sequential CT evaluation immediately after admission has not yet been studied systematically.

In the case of an isolated pancreatic injury, such as that reported here, serial physical examinations and repeated CT scans may be determinant in the diagnosis and grading of pancreatic injury if non-operative management is to be undertaken. Because the incidence of pancreatic injury is low, the experience of any single institution, radiologist or surgeon is limited [2]. It would be of interest to keep in mind that the initial CT scan will sometimes miss or underestimate pancreatic injuries which require operative treatment and may allow a false sense of security and delay of surgery. Therefore, proper implementation of the CT technique and accurate film reading are mandatory, and normal or minimal findings on initial scan should not be relied upon to exclude significant pancreatic trauma.

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