ORIGINAL ARTICLE

Pancreatic injury due to blunt trauma on CT: does retropancreatic fat tissue reduce the severity of pancreatic injury?

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ABSTRACT

BACKGROUND: Pancreatic injuries from blunt abdominal trauma have a high mortality rate, often accompanied by injuries to adjacent organs. This study aims to investigate the relationship between the size of retropancreatic adipose tissue and the severity of pancreatic and adjacent organ injuries in patients with pancreatic trauma.

METHODS: We retrospectively screened computed tomography (CT) images of 34 patients (25 males, nine females, aged 13-69 years) and 34 controls (28 males, six females, aged 15-66 years) who suffered blunt abdominal trauma. The area of adipose tissue located posterior to the pancreatic body was measured in the axial plane for all subjects. The severity of pancreatic injury was assessed in terms of the injury site, the retropancreatic adipose tissue area, and the degree of other organ injuries.

RESULTS: Pancreatic injuries were located in the head for 16 patients (23.5%), in the body for four patients (5.9%), and in the tail for 14 patients (20.6%). The retropancreatic fat area was found to be significantly smaller in patients with pancreatic trauma compared to controls ($p<0.0001$). Furthermore, the ratio of the retropancreatic fat area to the vertebral corpus area differed significantly between patients with and without pancreatic injuries ($p=0.014$).

CONCLUSION: Retropancreatic adipose tissue protects the pancreatic body from the impacts of blunt abdominal trauma. An increased amount of retropancreatic adipose tissue is associated with a reduced rate of pancreatic injury.

Keywords: Pancreas; trauma; lipase; amylase; abdominal injuries; computed tomography.

INTRODUCTION

Pancreatic injuries resulting from blunt abdominal trauma are associated with a mortality rate of 30% when accompanied by other injuries.[1] Today, traffic accidents involving motor vehicles are the most common cause of blunt pancreatic trauma.[2] In instances of blunt abdominal trauma, computed tomography (CT) is the primary modality for evaluating any injuries accompanying the pancreatic injury. CT boasts up to 80% sensitivity and specificity in diagnosing pancreatic injuries and is instrumental in investigating and monitoring complications that may lead to morbidity and mortality.[3-5] The surgical classification system proposed by the American Association for the Surgery of Trauma (AAST) facilitates the grading of pancreatic injuries. According to this classification, damage to the pancreatic duct, the most significant cause of morbidity, escalates the severity of pancreatic injury.[6,7]

The pancreas is divided into five parts: the head, neck, body, tail, and the uncinate process. The superior mesenteric vein, portal vein, and duodenum, which may be major causes of mortality in cases of pancreatic injury, are situated in close

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proximity to the pancreas.[8] Retropancreatic adipose tissue is located posterior to the pancreatic body between the superior mesenteric artery (SMA) and the celiac artery planes. It is hypothesized that pancreatic injury occurs due to the impact of the pancreas against the vertebrae following an abdominal blow. In cases of pancreatic injury, the body of the pancreas is most commonly affected. Injuries to the tail and head are often accompanied by injuries to nearby organs and are less frequent than injuries to the body of the pancreas.[9]

Although serum amylase and lipase levels tend to rise in patients with pancreatic trauma, these markers are not reliable indicators of pancreatic injury.[10] Data indicate that amylase levels can be within normal ranges in some patients with pancreatic injuries. Additionally, serum amylase levels may be elevated in patients with injuries to the non-pancreatic intestinal tract. In contrast, an elevation in serum lipase levels is a more specific indicator of pancreatic damage.[11]

The aim of this study was to investigate the relationship between the size of retropancreatic adipose tissue and the severity of injuries to the pancreas and adjacent organs in patients with pancreatic trauma.

MATERIALS AND METHODS

Study Group

Between June 2019 and June 2022, we retrospectively screened contrast-enhanced CT images of patients who presented to the Pamukkale University Faculty of Medicine Hospital Emergency Radiology with multiple traumas, including pancreatic injuries. The CT images of patients with extensive artifacts, penetrating abdominal trauma, a history of abdominal surgery, gastrointestinal system perforation, chronic alcoholism, and neoplastic diseases were excluded from the study. The CT images of 34 patients with pancreatic injuries resulting from blunt abdominal trauma (25 males and nine females, aged 13-69 years, with a mean age of 39.59±17.59 years) were retrospectively evaluated. The control group comprised CT images from 34 patients with blunt abdominal trauma but no pancreatic injury (28 males and six females, aged 15-66 years, with a mean age of 38.24±14.02 years). Two radiologists, one with 13 years of experience and the other with 18 years of experience, evaluated the CT images of the study group as inter-observers. Information on the clinical course, duration of intensive care and ward stay, treatment process, and in-hospital mortality rate for the study group was obtained from the hospital's medical archives.

Computed Tomography

CT examinations were conducted using a 128-detector array multislice CT scanner (Ingenuity 128, Philips Healthcare, USA) and a 64-detector array multislice CT scanner (GE LightSpeed VCT 64 Slice CT Scanner, WI, USA). The imaging parameters for the 128-detector CT scanner were as follows: tube voltage of 100 kV; tube current of 150-200 mAs; slice thickness of 1.5 mm; collimation of 3 x 1.5 mm; matrix size of 512 x 512; rotation time of 0.4 seconds; and a field of view (FOV) of 500 mm. The imaging parameters for 64-detector CT were as follows: tube voltage of 100 kV; tube current of 150-200 mAs; slice thickness of 1.5 mm; collimation of 3 x 1.5 mm; matrix size of 512 x 512; rotation time of 0.8 seconds; and a FOV of 500 mm. For patients with no contraindications to iodinated contrast media in their CT scans, 50-100 ml of nonionic contrast material (300 mg/ml of iodine) was administered intravenously at a rate of 3.5-4 ml/s through the antecubital vein. All CT scans were evaluated at the workstation using abdominal (WW: 350, WL: 50), lung (WW: -600, WL: 1600), and bone (WW: 2500, WL: 480) window settings in axial, sagittal, and coronal planes.

Image Analysis

Pancreatic injuries resulting from blunt trauma, as well as accompanying liver and spleen injuries, were graded according to the AAST classification for patients in this study.[6] The location and size of each injury were measured. Additionally, CT images were examined for the presence of hematomas associated with the pancreatic injury.

The area of adipose tissue in the axial plane, located between the SMA and the celiac trunk planes posterior to the pancreatic body section, was measured (Fig. 1). Furthermore, the area and dimensions of the vertebral corpus at the same level were assessed in the axial plane. Distances measured included from the pancreas to the skin at the level of the body section, from the posterior aspect of the pancreas to the vertebral corpus at the body section level, and from the posterior aspect of the pancreas to the back (Fig. 2). The area of fat posterior to the pancreatic body section was proportional to the vertebral corpus area in all patients.

The relationship between the degree of pancreatic injury and the injury site, the area of retropancreatic adipose tissue, and the severity of injuries to other organs was evaluated. Distances from the pancreas to the skin and vertebrae were compared between patients with and without pancreatic injuries.

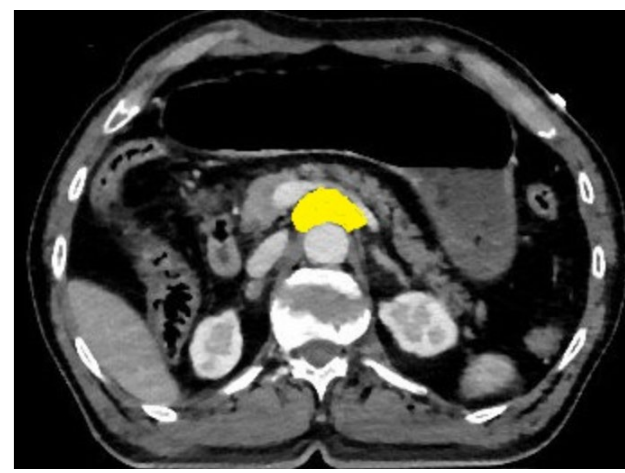

Figure 1. Area of the adipose tissue in the axial plane, located posterior to the section of the pancreatic body (marked in yellow).

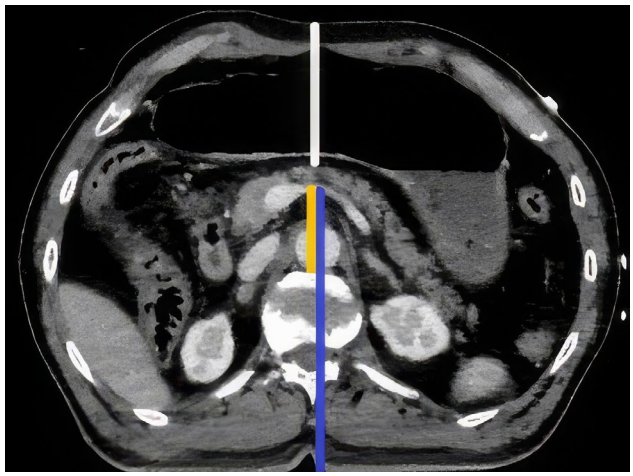

Figure 2. Distances measured: from the pancreas to the skin at the level of the body section (white line); from the posterior side of the pancreas to the vertebral corpus at the level of the body section (yellow line); and from the posterior side of the pancreas to the back (blue line).

In all patients, abdominal circumference was measured on CT sections at the level of the umbilicus using the workstation. These measurements were then compared with the area of retropancreatic fat, as well as the presence and severity of pancreatic injury.

Laboratory Analysis

The levels of pancreatic amylase and lipase in patients with pancreatic injuries from blunt trauma and in the control group were recorded upon admission to the emergency department of the hospital (within 0-1 hour). The normal ranges are 28-100 U/L for pancreatic amylase and 13-60 U/L for pancreatic lipase. The amylase and lipase levels of the patients were compared based on the AAST classification of organ injuries and the areas of retropancreatic adipose tissue.

Statistical Analysis

Data analysis was conducted on a personal computer using the Statistical Package for the Social Sciences software (SPSS version 21 for Windows, Chicago, IL). Descriptive statistics were presented as mean ± standard deviation for continuous variables and as percentages for categorical variables. The chi-squared test and Fisher's exact test were used for categorical variables. For independent variables, the independent sample t-test and a one-way analysis of variance (ANOVA) were applied. A p-value of <0.05 was considered statistically significant. An interobserver reliability analysis was conducted to assess the consistency among the radiologists' evaluations. Intraclass correlation coefficient (ICC) scores with 95% confidence intervals (CIs) were calculated. For the interobserver analysis, measurements of the retropancreatic fat area and other CT metrics were taken from the same CT slice by each radiologist.

RESULTS

Patients with blunt abdominal trauma resulting from traffic accidents constituted 63.3% of the study group (68 patients). The clinical course for five patients in the study group ended in death in the emergency department due to injuries other than pancreatic injury. The mean Glasgow Coma Score for patients admitted to the emergency department with blunt trauma was 12.93±4.13. The organ injury scores for patients in the study group, as determined by the AAST classification, are presented in Table 1.

The pancreatic injury was located in the head for 16 patients (23.5%), the body for four patients (5.9%), and the tail for 14 patients (20.6%). According to the AAST classification, 19 patients (27.9%) had Grade 1 pancreatic injuries, 14 patients (20.6%) had Grade 2 injuries, and one patient (1.5%) had a Grade 3 injury (Fig. 3). In patients with pancreatic injuries, a concomitant hematoma was observed in six cases (8.8%) involving the head and in another six cases (8.8%) involving the tail.

Retropancreatic Fat Area and Pancreatic Injury

The mean retropancreatic fat area was 435.93±188.44 mm² (range 122-1109 mm²) in the study group. The retropancre-

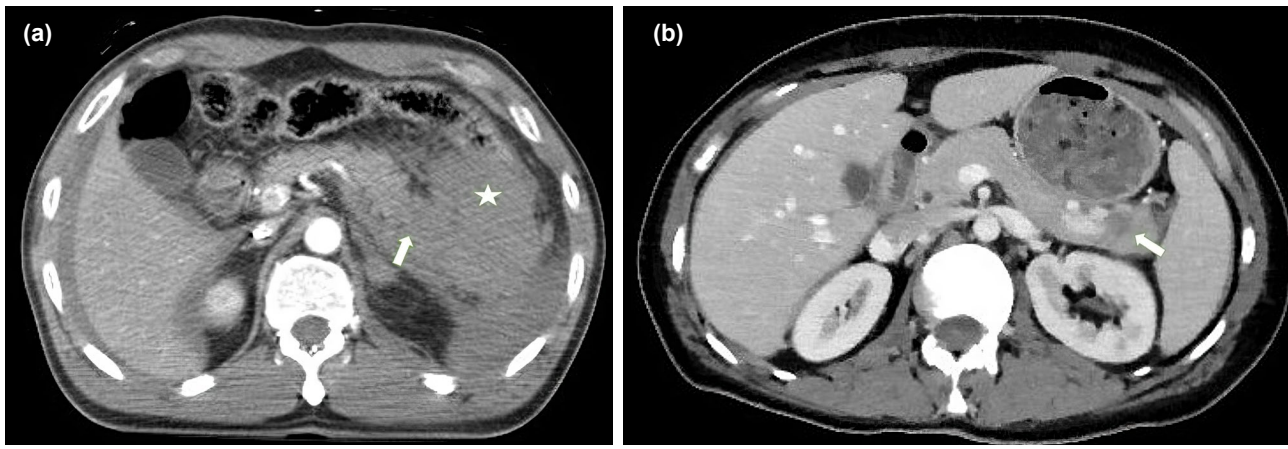

Figure 3. (a) Pancreatic injury located in the tail section (indicated by a white arrow) alongside a concomitant hematoma (marked with a white star). **(b)** Grade 1 pancreatic injury located in the tail section of the pancreas (indicated by a white arrow).

Table 1. Clinical process of the study group, types of trauma, and abdominal organ injuries according to AAST classification

GCS	12.93±4.13
Hospital Service	7.15±5.8 days
ICU	7.79±12.52 days
Type of Trauma	
IVTA	27 (39.7%)
PTA	5 (7.4%)
Motorcycle Accident	11 (16.2%)
Fall from Height	20 (29.4%)
Other	5 (7.3%)
AAST Classification	
Liver Injury	
Grade 1	9 (13.2%)
Grade 2	20 (29.4%)
Grade 3	12 (17.6%)
Grade 4	4 (5.9%)
Grade 5	0
Spleen Injury	
Grade 1	11 (30.9%)
Grade 2	16 (23.5%)
Grade 3	8 (11.8%)
Grade 4	6 (8.8%)
Grade 5	6 (8.8%)
Pancreas Injury	
Grade 1	19 (27.9%)
Grade 2	14 (20.6%)
Grade 3	1 (1.5%)
Grade 4	0
Grade 5	0

AAST: American Association for the Surgery of Trauma; GCS: Glasgow Coma Score; ICU: Intensive Care Unit; IVTA: In-Vehicle Traffic Accident; PTA: Pedestrian Traffic Accident.

atic fat area was significantly lower in patients with pancreatic trauma compared to those without pancreatic trauma ($p<0.0001$) (Fig. 4). The ratio of the retropancreatic fat area to the vertebral corpus area significantly differed between patients with and without pancreatic injuries ($p=0.014$) (Table 2).

The CT images showed no statistically significant differences between patients with and without pancreatic injuries in terms of the distances from the pancreatic body segment to the abdominal skin, from the pancreas body to the vertebral corpus, and from the pancreatic body to the posterior skin.

There was no statistically significant difference in abdominal circumference measurements with respect to the severity of pancreatic injury or the presence of pancreatic injury ($p=0.570$, $p=0.483$). In addition, there was no significant difference between the measurements of abdominal circumference and the area of retropancreatic adipose tissue ($p=0.361$).

Amylase and Lipase Levels in Patients with Pancreatic Trauma

Serum amylase and lipase levels were higher in patients with pancreatic injuries than in those without. Among patients with pancreatic injury, lipase levels were significantly higher in 33 patients (97.1%) and amylase levels were significantly higher in 14 patients (41.2%) compared to the control group ($p<0.0001$). No significant difference in amylase and lipase values was observed between patients with liver or spleen injuries, based on the presence of a pancreatic injury. Lipase levels were elevated in all patients with injuries to the pancreatic body, whereas amylase was elevated in only two patients. Amylase elevation was detected in five patients with head injuries and in seven patients with tail injuries. With the exception of one patient, all patients with pancreatic injuries had elevated lipase levels, regardless of the anatomical location of the injury.

Interobserver Agreement

Interobserver agreement was found to be excellent for the

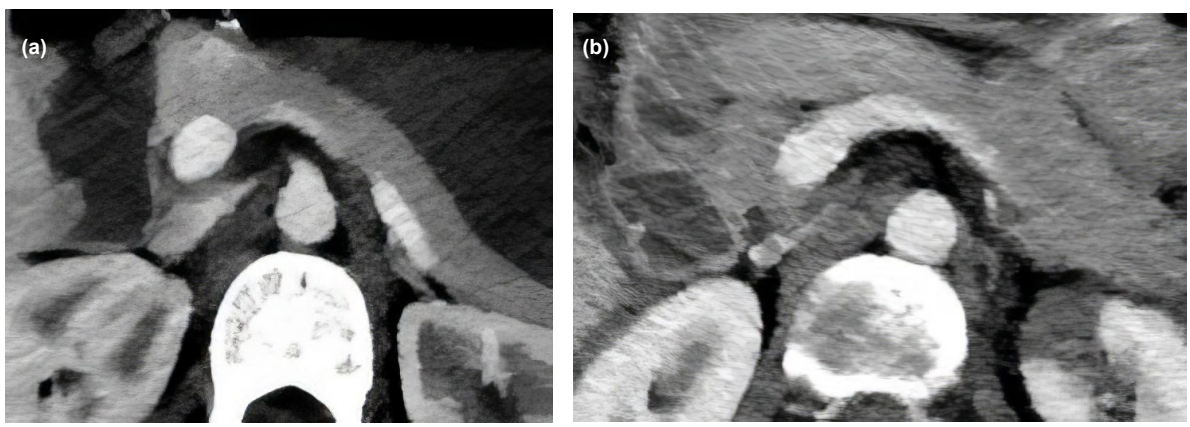

Figure 4. (a) Retropancreatic fat area in a patient with pancreatic trauma. **(b)** Retropancreatic fat area in a patient without pancreatic trauma.

Table 2. Comparison of retropancreatic fat area, pancreatic localization measurements, and amylase/lipase values in patients with and without pancreatic injury

Pancreatic Injury	No	Yes	ICC Score	p
Retropancreatic Fat Area (mm^2)	483.88±170.15	387.97±195.97	0.963	<0.0001
Anterior Skin Distance from the Pancreatic Body (mm)	70.05±17.89	69.35±14.57	0.990	0.859
Distance Between the Pancreatic Body and the Vertebrae (mm)	40.2±9.67	38.17±11.67	0.995	0.437
Distance Between the Pancreatic Body and Posterior Skin (mm)	134.35±17.07	133.55±18.31	0.984	0.854
Retropancreatic Fat Area/Vertebral Corpus Area	0.347±0.104	0.282±0.106		0.014
Amylase	58.38±18.0	99.21±38.60		<0.0001
Lipase	43.56±27.39	163.41±127.07		<0.0001

Table 3. Relationship between amylase and lipase values and organ injuries in patients with blunt abdominal trauma

	Amylase		Lipase	
	Within Reference Value	Over Reference Value	Within Reference Value	Over Reference Value
Pancreatic Injury				
No	34 (100%)	0	30 (88.2%)	4 (11.8%)
Yes	20 (58.8%)	14 (41.2%)	1 (2.9%)	33 (97.1%)
p	<0.0001	<0.0001		
Spleen Injury				
No	19 (90.5%)	2 (9.5%)	13 (61.9%)	8 (38.1%)
Yes	35 (74.5%)	12 (25.5%)	18 (38.3%)	29 (61.7%)
p	0.197	0.113		
Liver Injury				
No	18 (78.3%)	5 (21.7%)	10 (43.5%)	13 (56.5%)
Yes	36 (80%)	9 (20%)	21 (46.7%)	24 (53.3%)
p	1.000	1.000		

measurements of retropancreatic fat area and pancreatic location, with an ICC score of 0.963-0.995 (95% CI).

DISCUSSION

Pancreatic injuries due to blunt trauma are rare, owing to the deep location of the pancreas in the human body, making them difficult to diagnose and treat. The mortality rate for patients with concomitant injuries to the pancreas is between 10-30%.[1,12] In the present study, the clinical courses of five patients resulted in death. During the study period, the frequency of pancreatic injuries due to blunt trauma could not be reliably determined due to curfews and other measures associated with the Coronavirus Disease 2019 (COVID-19) pandemic. Moreover, the incompatibilities of patients admitted to the emergency department due to trauma shock, disorders in patient hemodynamics, movement artifacts on CT scans, and the lack of laboratory data in the emergency department were the most common difficulties in diagnosing patients with pancreatic injuries.

CT scanning is primarily performed in cases of blunt pancreatic trauma. It offers 80-85% sensitivity in detecting pancreatic injuries due to blunt trauma, a rate that is increasing with further advancements in technology.[4,13,14] Streaking of the peripancreatic adipose tissue is the primary indirect sign of a pancreatic injury on a CT scan. Direct signs include edema, contusion, hematoma, laceration, and fracture.[15,16] An injury to the pancreatic canal marks a critical point at which morbidity rates increase. However, due to improvements in CT technology, injuries to the pancreatic canal can be evaluated, and complications associated with pancreatic injuries (such as pseudocysts, abscesses, fistulas, etc.) can be diagnosed and monitored.[4]

Blunt pancreatic trauma in adults is most commonly caused by motor vehicle accidents, with other causes including falls from a height and blunt blows to the abdominal area. Among

children, apart from motor vehicle accidents, bicycle injuries and falls from a height are common causes. It has been reported that the impact of the steering wheel or seatbelt against the abdomen during motor vehicle accidents and the impact of the bicycle handlebar against the abdomen during bicycle accidents are the mechanisms of injury.[2,17-20] In our study, 63.3% of the group consisted of patients with blunt abdominal trauma due to a motor vehicle accident. In other patients, blunt abdominal trauma was due to falls from a height (20 cases), work accidents (three cases), and direct attacks to the abdomen (two cases).

Abdominal organ injuries, including pancreatic injuries, are assessed using the grading system established by the AAST. According to this system, contusions or lacerations that do not involve ductal injury are classified as Grade 1 and 2 injuries. Distal transections with ductal injury are classified as Grade 3 injuries, while parenchymal injuries or proximal transections that involve the ampulla are classified as Grade 4 injuries. Massive transections of the pancreatic head are classified as Grade 5 injuries.[6] In the current study, one patient sustained a Grade 3 injury, while the remaining 33 patients suffered from Grade 1 to 2 pancreatic injuries. There were no cases of Grade 4 or Grade 5 injuries reported. Pancreatic injury as a result of blunt trauma is often associated with other intra-abdominal organ injuries, ranging from 50% to 98% of cases. Scaglione et al. observed injuries to the liver (46.8%), stomach (42.3%), major vascular structures (41.3%), spleen (28%), and duodenum (19.3%) in conjunction with pancreatic injuries.[21] Similarly, in the current study, organ injuries accompanying pancreatic injuries were observed in the liver (66.1%) and spleen (83.8%).

Daly et al. described how traumatic force compresses the pancreas against the vertebrae, affecting the area to the left of the pancreatic neck-body junction.[20] Forces from the left side lead to injuries in the pancreatic tail, spleen, and stomach, while forces from the right side cause injuries to the pancreatic head, as well as the liver and spleen.[22] In this study, pancreatic injuries were predominantly found in the head and tail, with accompanying liver and spleen injuries. However, injuries to the pancreatic body were observed in only four patients. This contrasts with the findings of Melamud et al., who reported that pancreatic body as the most frequently injured part (65%), with fewer injuries observed in the head and tail.[9] Additionally, our study found that the retropancreatic fat area was significantly reduced in patients with pancreatic injuries compared to controls. Furthermore, a comparison of the retropancreatic fat and vertebral corpus areas in each patient revealed lower values among those with pancreatic injuries. Besides the deep location of the pancreas, the area of retropancreatic fat may serve as a protective factor against injuries to the pancreas body, potentially reducing the frequency of such injuries.

In the study conducted by Docimo et al., the researchers compared the body mass index and the ratio of abdominal visceral fat volume to abdominal subcutaneous adipose tissue volume in obese trauma patients. They reported that obese patients with a higher visceral-to-subcutaneous fat ratio experienced an increased rate of complications.[23] Obesity has been identified as an independent risk factor for trauma patients, associated with an increased risk of hyperglycemia.[24] In our research, we measured abdominal circumference at the umbilical level using CT scans to assess abdominal obesity in severe traumatized patients presenting to the emergency department. According to physical examination data, the waist circumference norms for Türkiye have been reported as 89.72 cm for women and 93.57 cm for men, while for Europe and the Eastern Mediterranean regions, the norms are set at 80 cm for women and 94 cm for men.[25] In our study, 38.2% of patients with pancreatic injuries exhibited a higher abdominal circumference than that observed in the general population. However, no significant difference was found regarding the occurrence of pancreatic trauma. Furthermore, we did not find a significant correlation between abdominal obesity and the presence or severity of pancreatic injury, nor with the retropancreatic fat area in the study group.

Hosseininejad et al. reported that elevated serum amylase and lipase levels could be useful biomarkers for necessitating laparotomy or CT imaging in patients with blunt pancreatic trauma.[26] Our findings revealed elevated amylase and lipase levels in patients with pancreatic injuries. Specifically, the amylase levels of 20 patients and the lipase level of one patient with pancreatic injuries were within normal ranges. No significant difference was observed in the elevation of amylase and lipase levels considering the anatomical location of the pancreatic injury. Mahajan et al.'s study found that combined serum amylase and lipase levels exhibited 100% sensitivity and 85% specificity in diagnosing pancreatic injuries in 33 patients, showing significant increases in cases of high-grade pancreatic injuries. Additionally, serum lipase levels were notably higher in patients with pancreatic injuries, irrespective of the presence of intestinal injury.[11] In our study, lipase levels in patients with low-grade pancreatic injuries were also found to be elevated beyond the reference values.

This study has some limitations. Firstly, the sample size was small, attributed to the reduced admission of trauma patients to the emergency department during the study period due to curfews and preventative measures implemented amidst the COVID-19 pandemic. Moreover, the low incidence of pancreatic injury, along with diagnostic difficulties such as CT artifacts and discrepancies in laboratory data, further limited patient inclusion. Secondly, follow-up data on amylase and lipase levels for most patients with pancreatic injuries were unavailable, as were control CT images for some patients. Control CT images were only obtainable for a small number of patients presenting with peripancreatic hematomas, pseudocysts, and injuries to other organs. Additionally, in certain instances, the volume of adipose tissue could not be measured due to the spread of retropancreatic adipose tissue into

the retroperitoneum and variations in the celiac artery/SMA. Therefore, area measurements were performed in the same plane for all patients. Finally, the group of patients with pancreatic injuries in our study exhibited mild pancreatic injuries. The most important determining factor in pancreatic injury is pancreatic duct injury. Studies involving more severe pancreatic injuries will emphasize the protective importance of retropancreatic adipose tissue, as demonstrated in our study.

CONCLUSION

Pancreatic injuries due to blunt trauma are often observed in the head or tail of the pancreas, accompanied by injuries to adjacent organs. Retropancreatic fat tissue plays a protective role in pancreatic trauma, ensuring that the body of the pancreas is less affected by blunt abdominal trauma. In patients with low-grade pancreatic injuries, levels of pancreatic lipase significantly exceed the reference values.

Ethics Committee Approval: This study was approved by the Pamukkale University Non-invasive Clinical Research Ethics Committee (Date: 28.06.2022, Decision No: E-60116787-020-228585).

Peer-review: Externally peer-reviewed.

Authorship Contributions: Concept: V.C.; Design: V.C., D.H.; Supervision: V.C., D.H.; Resource: V.C.; Materials: V.C.; Data collection and/or processing: V.C., A.O., M.O.; Analysis and/or interpretation: V.C., D.H., P.C.; Literature search: V.C., D.H., A.O., M.O.; Writing: V.C., P.C.; Critical reviews: G.G., P.C., A.O., M.O.

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REFERENCES

1. Holalkere NS, Soto J. Imaging of miscellaneous pancreatic pathology (trauma, transplant, infections, and deposition). Radiol Clin North Am 2012;50:515–28. [CrossRef]
2. Kumar A, Panda A, Gamanagatti S. Blunt pancreatic trauma: A persistent diagnostic conundrum? WorldJ Radiol 2016;8:159–73. [CrossRef]
3. Vasquez M, Cardarelli C, Glaser J, Murthi S, Stein D, Scalea T. The ABC's of Pancreatic Trauma: Airway, Breathing, and computerized tomography Scan? Mil Med 2017;182:66–71. [CrossRef]
4. Moschetta M, Telegrafo M, Malagnino V, Mappa L, Ianora AA, Dabbicco D, et al. Pancreatic trauma: The role of computed tomography for guiding therapeutic approach. WorldJ Radiol 2015;7:415–20. [CrossRef]
5. Kawinwongkowit K, Kaewlai R, Kasemassawachanont A, Chatpuwaphat J, Kumthong N, Somcharit L. Value of contrast-enhanced arterial phase imaging in addition to portovenous phase in CT evaluation of blunt abdominopelvic trauma. Eur Radiol 2023;33:1641–52. [CrossRef]
6. Coccolini F, Kobayashi L, Kluger Y, Moore EE, Ansaloni L, Biffl W, et al. WSES-AAST Expert Panel. duodeno-pancreatic and extrahepatic biliary tree trauma: WSES-AAST guidelines. World J Emerg Surg 2019;14:56. [CrossRef]
7. Morell-Hofert D, Primavesi F, Fodor M, Gassner E, Kranebitter V, Braunwarth E, et al. Validation of the revised 2018 AAST-OIS classification and the CT severity index for prediction of operative management and survival in patients with blunt spleen and liver injuries. Eur Radiol 2020;30:6570–81. [CrossRef]
8. Bashir MR, Gupta RT. MDCT evaluation of the pancreas: nuts and bolts. Radiol Clin North Am 2012;50:365–77. [CrossRef]
9. Melamud K, LeBedis CA, Soto JA. Imaging of pancreatic and duodenal trauma. Radiol Clin North Am 2015;53:757–71. [CrossRef]
10. Adamson WT, Hebra A, Thomas PB, Wagstaff P, Tagge EP, Othersen HB. Serum amylase and lipase alone are not cost-effective screening methods for pediatric pancreatic trauma. J Pediatr Surg 2003;38:354–7.
11. Mahajan A, Kadavigere R, Sripathi S, Rodrigues GS, Rao VR, Koteshwar P. Utility of serum pancreatic enzyme levels in diagnostics blunt trauma to the pancreas : A prospective study with systematic review. Injury 2014;45:13849–3. [CrossRef]
12. Moren AM, Biffl WL, Ball CG, de Moya M, Brasel KJ, Brown CVR, et al. Blunt pancreatic Trauma : A Western Trauma Association Critical Decisions Algorithm. J Trauma acute Resort Surg 2023;94:455–60.
13. Iacobellis F, Laccetti E, Tamburrini S, Altiero M, Iaselli F, Di Serafino M, et al. Role of multidetector computed tomography in the assessment of pancreatic injuries after blunt trauma: a multicenter experience. Gland Surg 2019;8:184–96. [CrossRef]
14. Gordon RW, Anderson SW, Ozonoff A, Rekhi S, Soto JA. Blunt pancreatic trauma: evaluation with MDCT technology. Emerg Radiol 2013;20:259–66. [CrossRef]
15. Panda A, Kumar A, Gamanagatti S. Evaluation of diagnostic utility of multidetector computed tomography and magnetic resonance imaging in blunt pancreatic trauma: a prospective study. Acta Radiol 2015;56:387–96. [CrossRef]
16. Debi U, Kaur R, Prasad KK, Sinha SK, Sinha A, Singh K. Pancreatic trauma: a concise review. World J Gastroenterol 2013;19:9003–11. [CrossRef]
17. Duchesne JC, Schmieg R, Islam S, Olivier J, McSwain N. Selective nonoperative management of low-grade blunt pancreatic injury: are we there yet? J Trauma 2008;65:49–53. [CrossRef]
18. Arkovitz MS, Johnson N, Garcia VF. Pancreatic trauma in children: mechanisms of injury. J Trauma 1997;42:49–53. [CrossRef]
19. Sivit CJ, Eichelberger MR, Taylor GA, Bulas DI, Gotschall CS, Kushner DC. Blunt pancreatic trauma in children: CT diagnosis. AJR Am J Roentgenol 1992;158:1097–100. [CrossRef]
20. Daly KP, Ho CP, Persson DL, Gay SB. Traumatic retroperitoneal Injuries: Review of Multidetector CT Findings. Radiographics 2008;28:1571–90.
21. Scaglione M, Romano L, Bocchini G, Sica G, Guida F, Pinto A, et al. Multidetector computed tomography of pancreatic, small bowel, and mesenteric trauma. Semin Roentgenol 2012;47:362–70. [CrossRef]
22. Linsenmaier U, Wirth S, Reiser M, Körner M. Diagnosis and classification of pancreatic and duodenal injuries in emergency radiology. Radiographics 2008;28:1591–602. [CrossRef]
23. Docimo S Jr, Lamparello B, Cohen MF, Kopatsis A, Vinces F. Utilizing quantitative measures of visceral adiposity in evaluating trauma patient outcomes. Int J Surg 2015;21:51–6. [CrossRef]
24. Oh JS, Ssentongo AE, Ssentongo P, Dykes T, Keeney L, Armen SB, et al. Image-based assessment of sarcopenic obesity predicts mortality in major trauma. Am J Surg 2022;223:792–7. [CrossRef]
25. Ural D, Kılıçkap M, Göksülük H, Karaaslan D, Kayıkçıoğlu M, Özer N, et al. Data on prevalence of obesity and waist circumference in Turkey: Systematic review, meta-analysis and meta regression of epidemiological studies on cardiovascular risk factors. Turk Kardiyol Dern Ars 2018;46:577–90. [CrossRef]
26. Hosseininejad SM, Bozorgi F, Assadi T, Montazar SH, Jahanian F, Hoseini V, et al. The predictive role of amylase and lipase levels on pancreas injury diagnosis in patients with blunt abdominal trauma. Horm Mol Biol Clin Investig 2020;41:1–9. [CrossRef]

ORİJİNAL ÇALIŞMA - *ÖZ*

BT'de künt travmaya bağlı pankreas yaralanması: retropankreatik yağ dokusunun pankreas hasarını azaltmada etkisi varmı?

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AMAÇ: Künt karın travmasına bağlı pankreas yaralanmaları eşlik eden yaralanmalarla birlikte yüksek mortalite oranına sahiptir. Bu çalışmanın amacı, pankreas travmalı hastalarda retropankreatik yağ dokusu büyüklüğü ile pankreas ve komşu organ yaralanmalarının şiddeti arasındaki ilişkiyi araştırmaktır.

GEREÇ VE YÖNTEM: Künt karın travması olan 34 hastanın (25 erkek, 9 kadın, 13-69 yaş) ve 34 kontrolün (28 erkek, 6 kadın, 15-66 yaş) bilgisayarlı tomografi görüntüleri (BT) retrospektif olarak tarandı. Pankreas gövdesinin arka tarafında yer alan retropankreatik yağ dokusunun alanı tüm hastalar için aksiyel düzlemde ölçüldü. Pankreas yaralanmasının derecesi yaralanma yeri, retropankreatik yağ dokusu alanı ve diğer organ yaralanma dereceleri açısından değerlendirildi.

BULGULAR: Pankreas yaralanması 16 hastada (%23.5) baş kesiminde, dört hastada (%5.9) gövde kesiminde, 14 hastada (%20.6) kuyruk kesimi yerleşimliydi. Retropankreatik yağ alanı pankreas travmalı hastalarda, kontrollere göre anlamlı derecede düşük bulundu (<0.0001). Retropankreatik yağ alanının vertebral korpus alanının oranı, pankreas yaralanması olan ve olmayan hastalar arasında anlamlı farklılık gösterdi (p=0.014).

SONUÇ: Retropankreatik yağ dokusu pankreas gövdesinin künt karın travmasından daha az etkilenmesini sağlar ve retropankreatik yağ dokusu miktarındaki artış daha düşük pankreas hasarı oranları ile ilişkilidir.

Anahtar sözcükler: Amilaz; bilgisayarlı tomografi; karın yaralanmaları; lipaz; pankreas; travma.

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