CASE REPORT

Non-operative management algorithm in a case of grade II pancreatic, grade IV splenic, and renal injury due to blunt abdominal trauma

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ABSTRACT

Blunt abdominal trauma most often results from high-energy mechanisms such as motor vehicle accidents. The spleen and kidneys are the organs most commonly injured in such cases, whereas pancreatic injuries are rare. Concomitant involvement of the pancreas along with splenic and renal injuries is particularly uncommon. We report the successful non-operative management (NOM) of a 24-year-old male patient who sustained grade IV splenic and left renal injuries, a grade II pancreatic injury, and widespread pulmonary contusions following a motorcycle accident. During follow-up, expansion of the retroperitoneal hematoma, perisplenic fluid collection, and left-sided pleural effusion were observed. Interventional radiology procedures, including abdominal and thoracic drainage, were performed. The presence of high levels of amylase and lipase in the abdominal catheter output indicated the development of a pancreatic fistula, for which conservative treatment was initiated. Following catheter repositioning and administration of a somatostatin analogue, the fistula resolved spontaneously. Although left renal atrophy was detected on long-term follow-up, the patient remained clinically stable. This case highlights that even in the presence of multiple high-grade solid organ injuries, favorable outcomes may be achieved without surgical intervention through NOM. Supported by advanced imaging modalities and interventional radiology, NOM represents a safe and effective therapeutic strategy that can minimize surgical complications in hemodynamically stable patients.

Keywords: Blunt abdominal trauma; non-operative management; splenic injury; renal injury; pancreatic fistula.

INTRODUCTION

There are many causes of blunt abdominal trauma, such as falls from height, traffic accidents, motorcycle accidents, and others.[1] In recent years, due to high rates of surgical complications, there has been a shift toward non-operative management (NOM) of blunt abdominal trauma in hemodynamically stable patients.[2]

Blunt pancreatic trauma is a rare condition, accounting for less than 1% of all abdominal traumas. Blunt abdominal trauma resulting in both pancreatic and splenic injury is even rarer. These types of cases usually lead to surgical treatment and postoperative complications.[2]

In this case study, we present the successful NOM of a patient with blunt abdominal trauma due to a motorcycle accident, who sustained a grade IV splenic injury, grade IV kidney injury, and grade II pancreatic injury, as well as widespread contusions to the lungs. Informed consent was obtained from the patient after the nature of the procedures had been fully explained.

CASE REPORT

The patient was a 24-year-old male who presented with blunt abdominal trauma after crashing into a car door while riding his motorcycle. Initial evaluation showed that he was conscious and oriented to time and place, with a Glasgow Coma Scale (GCS) score of 15. His pupils were isochoric and responsive to light, all four extremities were mobile, there

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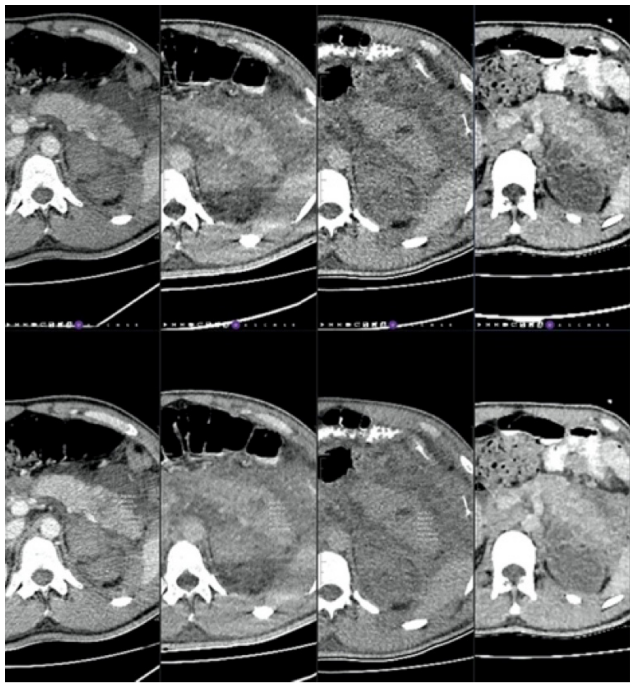

Figure 1. Serial contrast-enhanced computed tomography (CT) images of the upper abdomen obtained weekly, demonstrating a grade II laceration in the pancreatic tail. The sequence shows the lesion from the early post-trauma stage through progressive healing, with complete regression in the final image. The lower row illustrates the calculated laceration area (cm^2) at each time point.

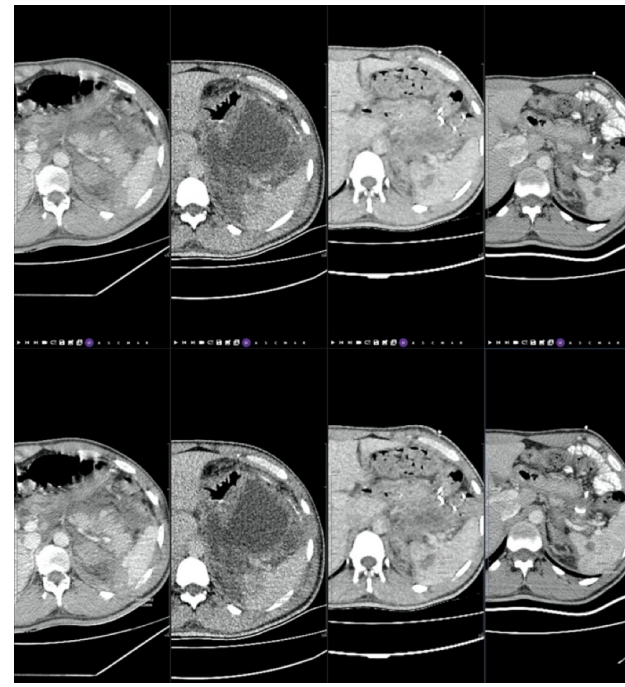

Figure 2. Serial contrast-enhanced computed tomography (CT) images showing splenic and renal injuries. A laceration in the lower medial pole of the spleen gradually decreased in size during follow-up. Renal injury is also demonstrated, with the final image revealing a cystic degenerative area. The lower row illustrates area-based quantification of injury (cm^2) at different time points.

was no spinal tenderness on palpation, and no neuromuscular deficits were detected. Bilateral lung auscultation revealed normal breath sounds, and the abdomen was nontender, with no rebound or guarding. Placement of a Foley catheter revealed 400 ml of grossly hemorrhagic urine. Vital signs were as follows: blood pressure (BP), 122/70 mmHg; oxygen saturation (SpO_2), 97%; pulse rate, 97 beats per minute (bpm). Laboratory values were as follows: white blood cell count (WBC), 27,000/mm^3; hemoglobin, 14.5 g/dL; creatinine, 1.17 mg/dL; aspartate aminotransferase (AST), 119 U/L; alanine aminotransferase (ALT), 87 U/L; amylase, 481 U/L; and lipase, 401 U/L.

A contrast-enhanced computed tomography (CT) angiogram of the abdomen and head was performed. No neurological pathology or fractures were detected. Bilateral pulmonary contusions were present, but no hemothorax or pneumothorax was detected. A hematoma was observed in the splenic area, and a laceration extending from the superior to the posterior pole of the spleen, reaching the hilar area and resulting in >25% devascularization. According to the American Association for the Surgery of Trauma (AAST) classification, this splenic injury was classified as grade IV. A 3 cm retroperitoneal hematoma was noted adjacent to the left adrenal gland. The left renal parenchyma showed no contrast enhancement, and the upper and middle branches of the left renal artery were not visualized; only the lower branch was patent, supplying approximately 10% of the renal parenchyma. This renal injury was classified as grade IV according to AAST criteria. In addition, a laceration of the pancreatic tail was detected, with preservation of the Wirsung duct and no parenchymal tissue loss, corresponding to a grade II pancreatic injury according to the AAST classification (Figs. 1 and 2).

Intravenous fluid resuscitation was initiated in the emergency department, and the patient was subsequently admitted to the intensive care unit (ICU). Two hours after admission, his hemoglobin level was 12.1 g/dl; BP was 180/77 mmHg; SpO_2 was 97%; and he reported left flank pain radiating to the left upper quadrant. His pulse rate ranged between 104-107 bpm. During the three-day ICU stay, his pulse rate remained between 97-107 bpm, and he required transfusion of 5 units of packed red blood cells (PRBC), bringing the total to 8 units within 82 hours. During this period, the lowest recorded hemoglobin value was 9.8 g/dl. No fresh frozen plasma was administered during the course of treatment.

In the following days, a repeat CT scan demonstrated enlargement of the hematoma in the left retroperitoneal space. Minimal fluid was noted in the perihepatic region and pelvis, and no free intraperitoneal air was detected. The patient did not develop signs of an acute abdomen. Daily urologic examinations showed that the urine had become clear by the 28th hour after admission. His daily urine output was approximately 2000 ml, and serum creatinine was 1.44 mg/dL.

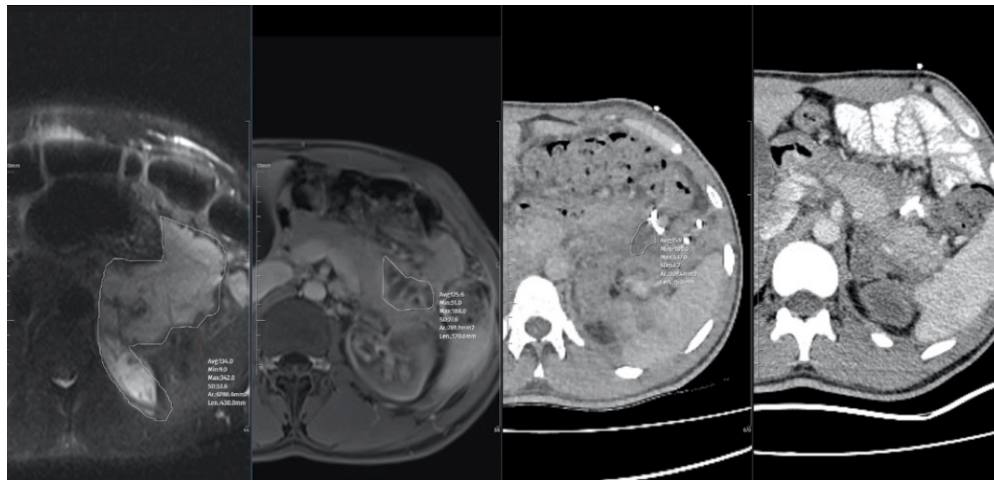

Figure 3. Imaging findings of a pancreatic fistula-associated loculated cystic fluid collection. On fat-suppressed T2-weighted magnetic resonance imaging (MRI), the collection appears hyperintense. Following placement of a drainage catheter, contrast-enhanced fat-suppressed T1-weighted MRI demonstrates a reduction in the size of the rim-enhancing loculated collection. Subsequent serial follow-up contrast-enhanced abdominal computed tomography (CT) scans (third and fourth images) show further decrease in the size of the collection, with complete regression in the final image. The drainage catheter is visible as a hyperdense tubular structure on CT.

BP measurements were typically within the range of 180/60-80 mmHg. From the first day of treatment, serum amylase and lipase levels remained between 400 and 500 U/L, WBC count between 22,000 and 26,000 mm^3, and C-reactive protein (CRP) levels between 300 and 370 mg/L. After three days of treatment, his pulse rate was 95 bpm and BP was 160/80 mmHg. A subsequent CT scan revealed a fluid collection measuring 122×121 mm between the stomach and spleen. In addition, pleural effusion measuring 6 cm on the left side and 1 cm on the right side was identified. The patient was consulted by infectious disease specialists, cardiothoracic and vascular surgeons, and pulmonologists, and low-molecular-weight heparin (LMWH) therapy was initiated. A pleural drainage catheter was placed in the left pleural space, yielding 800 ml of clear fluid. It was removed after five days when the effusion had completely resolved. An abdominal drainage catheter was also inserted to evacuate the perisplenic fluid located between the stomach and spleen.

The abdominal catheter drained 1100 ml of light brown, non-purulent fluid during the first 24 hours. After seven days, the daily drainage volume had decreased to approximately 200 ml, and the fluid had become completely clear. Laboratory parameters also improved, with a WBC count of 14,000 mm^3 and a CRP level of 82 mg/L. Analysis of the catheter fluid revealed markedly elevated amylase (42,000 U/L) and lipase (13,000 U/L) levels, while urea and creatinine values were within normal limits. These findings were interpreted as consistent with a pancreatic fistula.

The patient was initially kept nil per os for four days, after which he was able to tolerate a clear liquid diet, followed by puréed foods and soups, all of which were well tolerated. After 10 days of ICU stay, his vital signs and ultrasound findings were stable, and his condition had improved sufficiently to allow transfer to the surgical ward. During the ICU stay, the patient developed fever on only two occasions.

On the second day in the surgical ward, repeat CT imaging demonstrated a significant reduction of the left adrenal/retroperitoneal hematoma to 12 mm, non-enhancement of approximately 90% of the left kidney, and a decrease in the perisplenic fluid collection between the stomach and spleen. The patient was discharged with his abdominal catheter in place, which was draining approximately 200 ml of clear fluid daily. Renal artery Doppler ultrasonography and renal scintigraphy confirmed left kidney atrophy with only 5% residual functional. Prior to discharge, the patient was evaluated by the urology, cardiothoracic, and vascular surgery teams, all of whom recommended continued outpatient observation.

During outpatient follow-up, abdominal magnetic resonance imaging (MRI) demonstrated a minimal fluid collection at the pancreatic tail (Fig. 3). The abdominal catheter was draining approximately 100 ml of clear fluid daily, which was considered higher than expected. The patient was readmitted to the surgical ward, and the catheter was repositioned to avoid direct contact with the pancreatic tail in order to minimize local irritation. Octreotide was initiated at a dose of 0.1 mg three times daily, and dietary adjustments were made. Within 24 hours, the drainage decreased to 70 ml/day, and by the third day it had further declined to 30 ml/day.

On the fourth day, no fluid was collected from the catheter, and abdominal ultrasonography confirmed the absence of free fluid in the peritoneal cavity. The catheter was removed. Laboratory results at that time were as follows: WBC, 7,000/

mm^3; AST, 42 U/L; ALT, 34 U/L; CRP, 8 mg/L; amylase, 216 U/L; and lipase, 372 U/L.

The patient was discharged the following day with instructions to return for a repeat abdominal ultrasound after three days. Follow-up ultrasonography demonstrated no free intra-abdominal fluid, and serum amylase and lipase levels were within the normal range. Urologists recommended outpatient follow-up. Imaging showed left renal atrophy, and serum creatinine levels ranged between 1.2 and 1.44 mg/dL. At the two-month follow-up, abdominal MRI revealed no pathological findings in the pancreas or spleen (Figs. 1-3). At the eight-month follow-up, the patient was found to have a 4 cm cystic lesion in the pancreatic tail, consistent with post-traumatic sequelae. Serum amylase and lipase levels ranged between 200–300 U/L during follow-up. The left kidney remained atrophic, with only 5% residual renal function on static renal scintigraphy, while the spleen demonstrated a homogeneous parenchymal structure without new pathology.

DISCUSSION

Simultaneous injury to multiple organs in blunt abdominal trauma is not uncommon; however, concomitant injuries to the spleen, pancreas, and kidneys are relatively rare. Such injuries typically result from high-energy mechanisms, including motor vehicle accidents, falls from significant heights, or severe blunt force trauma. Among intra-abdominal organs, the liver and spleen are the most frequently injured, followed by the small intestine. Less commonly injured organs include the kidneys, stomach, gallbladder, urinary bladder, and pancreas.[3]

Precise statistics on the frequency of simultaneous injuries to the spleen, pancreas, and kidney are lacking in the literature; however, available studies suggest that the incidence of such cases is low, estimated at less than 1%.[2] In the management of these trauma patients, surgical intervention is often associated with serious morbidity and complications, prompting the development of alternative strategies. The high rate of surgical complications observed in hemodynamically stable trauma patients has led to a paradigm shift from operative management toward non-operative management.[4-5] Over the past two decades, numerous successful case reports have been published, and NOM has become an accepted treatment protocol for hemodynamically stable solid organ injuries. Several studies have also demonstrated that the NOM approach provides a significant reduction in hospital stay and morbidity compared to operative treatment.[6]

The widespread availability of high-resolution CT imaging and interventional radiology, together with the capacity for close patient monitoring in specialized centers such as the ICU, has facilitated the establishment of NOM as a widely accepted management protocol for solid organ injuries in hemodynamically stable patients with blunt abdominal trauma.[7-8]

With the publication of many successful case reports over the last 20 years, NOM has been accepted as one of the standard management protocols for hemodynamically stable solid organ injuries. In this context, Raza et al.[7] reported on 1,071 hemodynamically stable patients with blunt trauma to the liver, spleen, kidney, and pancreas who were treated non-operatively regardless of the severity of single or multiple blunt injuries; 89.98% of these patients were successfully managed with NOM. Lu et al.[9] recently reported that in 98 patients with blunt pancreatic injury, outcomes were comparable between those treated operatively and those managed non-operatively, further supporting the safety of NOM in selected patients.

In a study on blunt abdominal trauma, it was reported that hemodynamically stable splenic injuries can be managed conservatively regardless of injury grade, and that NOM is successful in more than 90% of cases of renal trauma.[10-11] Similarly, Raza et al.[7] showed that radiological severity and injury grade are not contraindications to NOM. Podda et al.[12] also demonstrated that NOM can be applied even in high-grade (III-IV) splenic lesions. On the other hand, several researchers have identified risk factors for NOM failure in splenic trauma, including age >55 years, associated liver injury, arterial-phase contrast extravasation, and the need for ≥4 units of erythrocyte suspension transfusion.[13,14]

The findings of Vanderviles et al.[6] are consistent with those of Raza et al.,[7] supporting our case report by demonstrating that NOM can be successfully implemented in centers equipped with advanced imaging methods, an ICU, and interventional radiology, thereby preventing unnecessary laparotomies. Furthermore, Feng Jian et al.[15] highlighted the role of percutaneous catheter drainage as an effective minimally invasive strategy in the initial conservative treatment of grade III–IV blunt pancreatic injuries, underscoring the importance of interventional radiology techniques in pancreatic trauma management. In our case, which involved grade IV splenic and renal injuries according to AAST, a grade II pancreatic injury, and diffuse pulmonary contusions, management was continued using multimodal imaging and minimally invasive drainage procedures performed by interventional radiologists. Subsequent follow-up of the pancreatic injury and fistula was conducted with serial ultrasonography and MRI.

According to the literature, the complication rate after pancreatic trauma ranges from 20% to 40%, with pancreatic fistula (10-35%), pancreatic abscess (10-25%), hemorrhage (10%), pseudocyst formation (5%), and pancreatitis being the most frequently reported sequelae.[16-17] In our case, a pancreatic fistula developed secondary to pancreatitis and was successfully managed with our treatment strategy. Although pseudocyst formation was anticipated during long-term follow-up, this complication was not observed on subsequent MRI examinations.

In the literature, external drainage methods have been emphasized as the standard approach for pancreatic contusions or minor parenchymal injuries. Conversely, surgical resection

should be considered in cases of pancreatic duct injury. In situations where the integrity of the pancreatic duct is shown to be intact by endoscopic retrograde cholangiopancreatography (ERCP), surgical treatment is not required.[18-19] In our case, MRI revealed a grade II injury in the distal pancreas without evidence of pancreatic duct injury. The volume of pancreatic fluid drained through the catheter progressively decreased and ultimately resolved after the catheter was retracted by 2 cm. We attributed this improvement to relief of local irritation caused by direct contact between the catheter tip and pancreatic tissue. Had the fluid output not decreased with this strategy, our next step would have been ERCP to confirm ductal integrity and, if necessary, perform stent placement. Surgical intervention was reserved as a last resort.

CONCLUSION

Non-operative management is a safe and effective treatment strategy for patients with blunt abdominal trauma who are hemodynamically stable and exhibit no signs of peritonitis. Excluding definitive indications for laparotomy, NOM can be applied regardless of the degree of solid organ trauma, provided that appropriate radiological imaging and interventional procedures are available and the patient remains hemodynamically stable. This approach protects patients from the risks associated with surgical complications. In our case, successful recovery was achieved through NOM in a patient who, according to AAST classification, presented with diffuse pulmonary contusions, grade IV splenic and renal injuries, and a grade II pancreatic injury.

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OLGU SUNUMU - *ÖZ*

Künt batın travması nedenli pankreas grade 2, dalak ve böbrek grade 4 hasarlı hastada non-operatif tedavi algoritmamız

Künt abdominal travma, motorlu taşıt kazaları gibi yüksek enerjili olaylardan kaynaklanabilir. Dalak ve böbrekler, künt abdominal travmada sıklıkla yaralanan organlar olmakla birlikte, pankreas yaralanmaları nadirdir, özellikle pankreasın dalak ve böbrek yaralanmalarıyla birlikte oluşması daha da nadirdir. Bu olgu sunumu, bir motosiklet kazası sonucu grade 4 dalak ve böbrek yaralanmaları, grade 2 pankreas yaralanması ve yaygın akciğer kontüzyonları yaşayan 24 yaşındaki bir erkeğin başarılı nonoperatif yönetimini (NOM) sunmaktadır. Takip sürecinde, retroperitoneal hematomun büyüdüğü, dalak etrafında sıvı koleksiyonu geliştiği ve sol plevral efüzyon oluştuğu izlenmiştir. Girişimsel radyoloji tarafından abdominal ve plevral kateterler yerleştirilmiş; plevral sıvı başarıyla drene edilmiştir. Abdominal kateterden yüksek amilaz ve lipaz düzeylerine sahip sıvı gelmesi üzerine pankreatik fistül geliştiği değerlendirilmiş ve hastaya konservatif tedavi uygulanmıştır. Kateterin pozisyonunun düzeltilmesi ve somatostatin analoğu ile tedavi sonrası fistül spontan olarak kapanmıştır. Sol böbrekte uzun dönem takiplerde atrofi saptanmış; ancak hasta stabil seyretmiştir. Pankreatik fistül ve plevral effüzyonun drenajı dahil konservatif yönetimle, hastanın tedavisi başarılı olmuştur. Batın içi solid organ travması çoklu olması ve tomografide yüksek derecede sınıflandırılmasına rahmen hastanın yönetiminde ilk planda cerrahi yerine NOM tercih edilerek bu hastanın tedavisi yönetilmiştir. Bu vaka, NOM'un, ileri görüntüleme ve girişimsel radyolojiyle desteklendiğinde, hemodinamik olarak stabil hastalarda cerrahi gereksinimi önleyerek komplikasyonları azaltan etkili bir strateji olduğunu vurgulamaktadır.

Anahtar sözcükler: Künt abdominal travma; non-operatif yönetim; dalak yaralanması; böbrek yaralanması;s pankreatik fistül.

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