

## Case Report

## Complex gastro-colo-cutaneous fistula secondary to a gunshot injury, management and literature review

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### Summary

A 34-year-old man known schizophrenic sustained a through and through Thoraco-abdominal gunshot injury which resulted in a penetrating injury to the splenic flexure, a shattered stomach, transected pancreas and a diaphragmatic injury with a chest wall wound. He underwent a laparotomy with repair of all his hollow viscus injuries, splenectomy, distal pancreatectomy with drainage. His condition was later complicated with feculent discharge through the anterior chest wall bullet wound once he started oral intake. CT abdomen confirmed the presence of a gastro-colo-cutaneous fistula which was managed with drainage of a peri-pancreatic fluid collection and supportive care. He responded well and his fistula closed up without further complications.

### Background

Gastro-colo-cutaneous fistulas are abnormal communications that can be benign or malignant. Benign fistulas could be secondary to diseases like peptic ulcer disease or iatrogenic most commonly after PEG tube placement and migration [1]. We are reporting a case of a gastro-colo-cutaneous fistula as a complication of gunshot wound leading to multiple hollow viscus injuries and pancreatic transection.

### Case presentation

A-34-years old gentleman, known to have schizophrenia on four anti-psychotic medications, was brought to the Emergency Department (ED) of a level one trauma center with a through and through gunshot wound in the left thoracoabdominal region. The patient was managed according to the Advanced Trauma Life Support protocols. A left side hemothorax was detected for which an intercostal drainage tube was inserted and drained 400 mL of blood. A 2 × 3 cm non-bleeding wound was detected in the anterior aspect of left chest, 3 cm below the level of nipple, medial to midclavicular line with omentum protruding through it. Another 2 × 4 cm wound was found over the left posterior lumbar region which was actively bleeding.

He was taken to the Operating Room (OR) for exploratory laparotomy.

Intraoperatively, he was found to have a Large amount of hemoperitoneum, with an injury to the left kidney, a 1.5 cm injury in the descending colon close to the splenic flexure area, injury to the transverse colon mesentery, shattered stomach along the greater curvature with copious bleeding from multiple ruptured short gastric arteries, a transected pancreas through the body with significant bleeding from its bed as well as multiple scattered rib fragments from the left lower chest wall and a diaphragmatic injury with an anterior chest wall defect filled with omentum. The bleeding was controlled, and the colonic injury was primarily sutured. The bleeding from the stomach was controlled with mass closure and both ends of the transected pancreas were sutured to control the bleeding. A Large left diaphragmatic laceration was detected and repaired primarily. Drains were kept in the left paracolic gutter and

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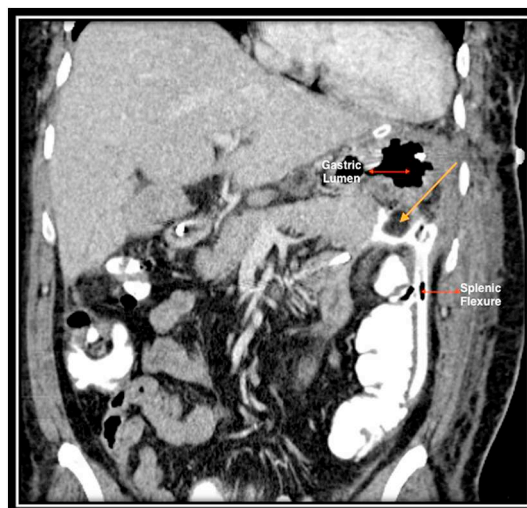


Fig. 1. Coronal reformatted image shows abnormal leakage of rectal contrast at splenic flexure (arrows).

around the pancreatic bed. The Abdomen was closed temporarily with a vacuum system, and the patient was further resuscitated and stabilized in the Intensive Care Unit (ICU). He was taken back 36 h later for re-look laparotomy, where he was found to have ischemic distal pancreas and spleen as well as an ischemic segment of the distal stomach along the previous repair line. He underwent distal pancreatectomy with splenectomy, closure of the pancreatic stump with omentum fixation, a wedge resection of the necrotic distal stomach. The chest wall wound was debrided and left for healing by secondary intention. The abdomen was closed in a third re-look surgery where no further intervention was done. He was managed in the ICU after that with supportive care including Total parenteral nutrition (TPN), antibiotics and blood products. He underwent CT scan of the abdomen later which revealed a 10 cm fluid collection at the splenic fossa which was drained under US guidance.

Once the drain output was minimal, CT scan was repeated, which showed resolution of the previous intra-abdominal collections. He remained hemodynamically within normal with overall improvement.

On day 22 of admission, intestinal content was noticed through the gunshot wound. The impression was a gastro-cutaneous fistula which was demonstrated by injecting Methylene blue through the NGT which leaked immediately through the anterior gunshot wound. The plan was to insert a naso-jejunal tube (NJT) to bypass the fistula and feed the patient, however once that was done fecal matter started draining through the same anterior wound.

## Investigations

His laboratory work showed WBC of 21.6, Neutrophils of 16.4 and Hemoglobin of 8.1.

A CT scan abdomen with rectal and IV contrast demonstrated leaking of the rectal contrast through a 5 mm wide defect in the lateral wall of descending colon close to splenic flexure [Fig. 1]. Along its track, the leaked contrast was seen closely associated with

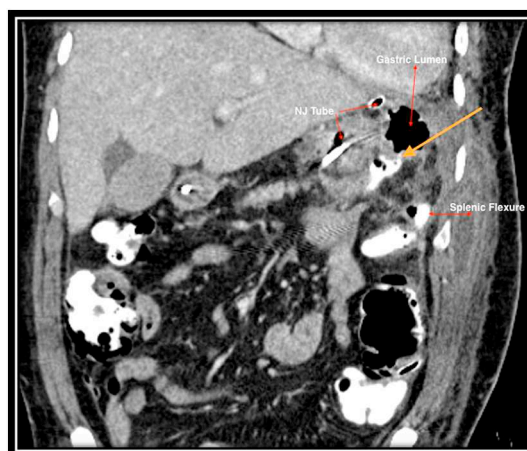
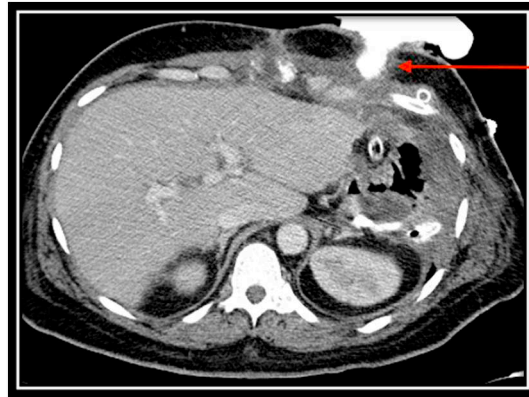


Fig. 2. Coronal reformatted image reveals hyperdense rectal contrast within the gastric lumen around the NJ tube (arrow).



**Fig. 3.** Axial image shows rectal contrast opacifying the irregular soft tissue tract extending from gastric lumen to anterior abdominal wall entry wound (arrows).

stomach wall and is seen branching and entering the stomach through a very small defect with minimal contrast seen in the stomach around the NJ tube [Fig. 2].

The leaked contrast was seen tracking cranially along the drainage catheter in left paracolic gutter to reach the splenic fossa. From the left paracolic gutter, it was seen extending medially along the anterior pararenal space, and then anteriorly along the bullet track to the skin through the entry wound [Figs. 3–5].

#### Differential diagnosis

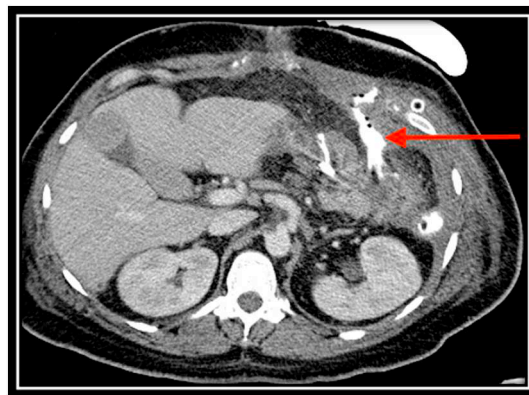
Based on the CT images the previous diagnosis of gastro- cutaneous fistula vs colo-cutaneous fistula was now upgraded into a complex gastro-colo-cutaneous fistula.

#### Treatment

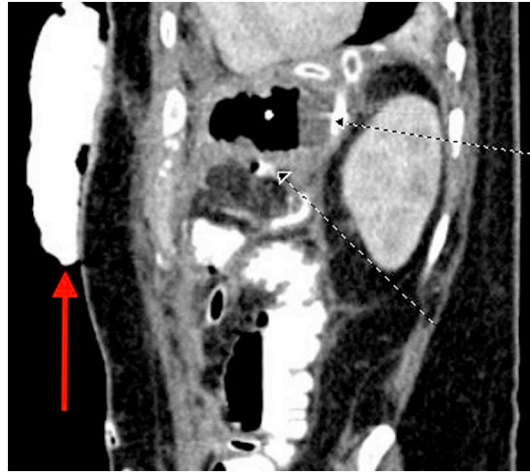
The patient was treated conservatively with nasogastric tube (NGT) drainage, Total parenteral nutrition (TPN) and antibiotic therapy. The TPN was a standard mix bag of around 2200 Kcal (calculated for his weight). The antibiotics choice was discussed with infectious disease team and based on his cultures. The output of the fistula was around 200 cc per day. The patient remained stable throughout this time and was responding well to the conservative management as his output was decreasing progressively. The fistula stopped draining within 20 days of conservative management. A repeated CT at this time showed persistent colonic cutaneous tract with no output. He was started on oral feeds which he tolerated well with no active fistula discharge.

#### Outcome and follow-up

The patient was discharged in stable condition and was seen in the out-patient department (OPD) a month later. He was tolerating oral feeds with no discharge. His chest wall wound closed by secondary intention with no residual defect.



**Fig. 4.** Axial image shows rectal contrast opacifying the irregular soft tissue tract extending from gastric lumen to anterior abdominal wall entry wound (arrows).



**Fig. 5.** Sagittal reformatted image demonstrates abnormal fistulous communication between colon-stomach-anterior abdominal wall with collection of rectal contrast within stoma bag (arrows).

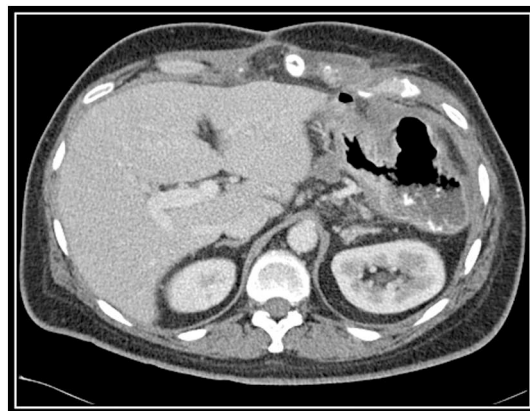
A repeated CT scan showed no contrast seen along the previously described CGCF tract. No significant intra-abdominal collections were found. The fistula has healed completely with no further complications. The patient was discharged from the OPD [Fig. 6].

## Discussion

Gunshot wounds with transperitoneal trajectories are associated with a 98% incidence of significant intra-abdominal injuries and mandate exploratory laparotomy [2]. Hollow viscus injuries from penetrating injury to the abdomen are common. The small bowel, colon, liver, vascular structures, and stomach have been the most commonly injured organs in recent large series of abdominal gunshot wounds [3]. Gastro-colo-cutaneous fistula (GCCF) is not commonly reported as a complication of gunshot injuries.

A fistula is an abnormal communication between two epithelized surfaces. It can occur anywhere in the gastrointestinal tract. In gastrocolic fistulas the tract usually connects the greater curvature of the stomach and the distal half of the transverse colon. Gastrocolic fistula was first described in 1755 as a complication of gastric carcinoma by Albrecht von Haller, while Douglas Firth described the first case in English bibliography in 1920, as a complication of gastric ulcer disease [1]. A gastro-colic fistula in adults could be classified as benign or malignant. Other available classifications in the literature are primary vs secondary as well as congenital vs acquired. Benign fistulas could be the result of disease like peptic ulcer disease or iatrogenic most frequently secondary to migration of Percutaneous Feeding Gastrostomy (PEG) tube or post gastric surgery [4]. In the West most malignant fistulas are secondary to adenocarcinoma of the colon, while in Japan, adenocarcinoma of the stomach is the most frequent cause [1]. More complicated fistulas could be between more than two organs. In our case, the patient developed a GCCF after a penetrating gunshot wound. The pathophysiology in this case is probably a combination of the penetrating injury to the bowel and the persistent pancreatic fluid collection secondary to the active pancreatic enzyme leakage from the transected body of pancreas.

Most case reports describe gastrocolic fistulas rather than gastro-colo-cutaneous fistulas. In the limited number of cases reports



**Fig. 6.** Contrast enhanced CT scan abdomen with IV contrast; axial image shows complete healing of gastro-cutaneous tract without any residual collection.

that described GCCF it was usually the result of a migrating PEG tube. No case reports of such fistulas as a complication of a gunshot injury was found in a Medline or Cochrane library search.

Patients with gastrocolic fistula usually present with a classical triad of feculent vomiting, diarrhea and weight loss. The leakage of colon content through the gastrocolic fistula into the stomach causes feculent vomiting and the reverse condition leads to diarrhea containing food particles [5]. In our case, the patient's main symptoms were gastric content discharge and feculent discharge from the anterior gunshot wound secondary to the cutaneous communication.

GCCF diagnosis requires a careful history and physical examination, however, studies like barium enema, CT, endoscopy and fistulogram are needed to confirm the diagnosis. Barium enema is the most reliable diagnostic method as it confirms the diagnosis in 90 to 100% of all gastro colic fistula cases [1]. Fistulogram and CT are useful in defining the fistula tract, moreover, CT can be used to identify the cause of the fistula. The routine use of contrast through the stoma at the time of diagnostic CT is a safe way to define both gastrocolic and colo-cutaneous tracts and are useful in ruling out intraperitoneal extravasation [6]. Endoscopies are useful in cases where histological examination is required for example to rule out inflammatory bowel disease or malignancy as an underlying cause of the fistula. In our case, the fistula was diagnosed clinically and was confirmed by CT.

Most of the literatures concluded that conservative management is considered the first line approach for patients with GCCF. Nutritional optimization such as Supportive parenteral nutrition should be provided to all patients to improve their general condition [7]. Sepsis control with antibiotics as well as drainage of any underlying collections if needed, and relieving any distal obstruction are key components to expedite the closure of any fistula. Fluid management and electrolytes correction is very important especially in high output fistulas and proximal fistulas. With such management some of these fistulas could close spontaneously. In patients with complicated fistulas, severe symptoms or with failure of best supportive management other treatment modalities should be considered.

There are multiple endoscopic options for managing such fistulas such as Endoscopic injection of the fistulous tract with fibrin sealant [8]. Other options include the usage of hemoclips for small fistulas, and the usage of detachable snare with clips, over the scope clip and cardiac septal defect closure device for large fistulas [9].

Surgical intervention is warranted when the symptoms become worse, when the endoscopic management fails (or is unavailable) or in the case of peritonitis [10,11]. En-bloc resection of the involved stomach and segment of the colon was the procedure of choice until the 1930s; and gastroenteric continuity was re-established using a Billroth I or Billroth II anastomosis. The above procedure had many complications, including re-perforation and severe peritonitis. With advancement of laparoscopy the intervention is becoming more acceptable and it includes the resection of the fistulas tract, closure of the defect if needed and interposition with healthy tissue like omentum [4]. It is well documented that octreotide, a long-acting somatostatin analog has been used successfully to prevent postoperative complications, in fistulae that involve the pancreas. Parenteral administration seems to reduce significantly the output in both internal and external fistulae, but it does not participate to the closure of the fistulae. Its optimal dosage and duration of use depends on the fistula itself [12]. In our case the patient was managed conservatively as he had no signs of peritonitis and the fistula had a low output; therefor he was kept fasting on TPN and antibiotics. His fistula closed without complications and he had a full recovery. Surgical intervention like resection of the fistula tract was differed in his case as the underlying pancreatic collection from the transected pancreas could have complicated any early surgical intervention. The collection was drained and once that healed, the fistula closed spontaneously.

### Take home messages

1. Gunshot wounds can result in many abdominal complications and a fistula is one of them.
2. Gastro-colo-cutaneous fistulas are usually secondary to PEG tube insertion.
3. Multiple available treatment options are available including supportive, endoscopic and surgical intervention.

### Declaration of competing interest

No conflict of interest.

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