Unusual complications of laparoscopic cholecystectomy: A case series
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ABSTRACT
Introduction: Laparoscopic cholecystectomy, the gold standard treatment for symptomatic cholelithiasis, has also brought to light a new range of uncommon complications unheard with open cholecystectomy. Case Series: This case series is a compilation of five rare complications unique to laparoscopic cholecystectomy. Conclusion: Knowledge about such complications and application of preventive measures would make laparoscopic cholecystectomy safer.

Keywords: Cholecystectomy, Laparoscopy, Complications

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INTRODUCTION
Laparoscopic cholecystectomy has replaced open cholecystectomy as the gold standard treatment for symptomatic cholelithiasis [1–6]. Unlike its numerous advantages it has also brought to light a new range of uncommon complications which were unheard with open cholecystectomy. This case series describes five rare complications unique to laparoscopic cholecystectomy.

CASE SERIES
A summary of all the cases is given in Table 1.
Case 1: A 26-year-old female patient was admitted for scheduled laparoscopic cholecystectomy. Her base line investigations were within normal limits. Abdominal sonography revealed distended gall bladder packed with calculi. Wall thickness of gall bladder was .34 mm. Common duct was of normal caliber without calculi. At operation Calot’s triangle was clear without any adhesions. Cystic duct and cystic artery were dissected and clipped with 300 size liga clips. While dissecting the gall bladder from the liver bed, the thin walled gall bladder ruptured leading to spillage of the entire gall bladder contents into the peritoneal cavity. Stones of numerous sizes were scattered in the peritoneal cavity. An organ retrieval bag was inserted and majority of the stones could be removed. Peritoneal lavage was given and the specimen of gallbladder along with the stones was extracted through the epigastric port. A wide 32 bore drain of 32 F was placed in the hepatorenal pouch. Post operative recovery was uneventful with minimal collection in the drain and the patient was discharged on the third post-operative day. The patient came for follow-up and stitches were removed on the seventh postoperative day. Histopathology of gall bladder specimen revealed chronic calculous cholecystitis. The patient returned six months following the procedure with complains of passing watery fluid and stones through the umbilical port. She brought with her three such stones of different sizes. There were no other complain. Examination of
the abdomen was normal except the umbilical port. A serosanguinous, nonodorous fluid was seen coming out through the umbilical port. The patient was readmitted. The fluid was sent for culture. A complete hemogram, liver function test and sonography of the abdomen was advised. Hematological investigations were within normal limits. Sonography of the abdomen did not reveal any free fluid or loculated collection inside the peritoneal cavity. Common duct was normal without any stones. Culture of the umbilical fluid revealed growth of Staphylococcus Aureus sensitive to a host of antibiotics including linezolid. The patient was put on linezolid, ursodeoxycholic acid. She was kept on observation for two weeks. Gradually the umbilical port healed and she was discharged and asked to come for follow-up monthly. Now at two years follow-up the patient is well without any further history of passage of stones.

Case 2: A 36-year-old female presented with a history of right hypochondrial pain. She admitted to having a history of gallstones but had previously declined surgery. On clinical examination, the patient had mild right hypochondrial tenderness. Ultrasound of the hepatobiliary system revealed the presence of several gallstones. The patient underwent interval laparoscopic cholecystectomy. Operative findings were of a chronically inflamed gallbladder containing multiple black pigmented stones. During extraction, the gallbladder ruptured at the epigastric port with several stones entrapped at the port site without peritoneal spillage. Almost all were recovered. Postoperative recovery was uncomplicated and the patient was discharged. Pathological diagnosis was of chronic cholecystitis. The patient presented again six months postoperatively with a one month history of epigastric pain. On clinical examination, she had a 6x3x2 cm midline epigastric mass, firm, tender and mobile. High resolution ultrasonography of the mass revealed an inflammatory mass with calcification within it measuring 0.9 mm in diameter lying within the two layers of rectus sheath. CT abdomen confirmed the USG finding (Figure 1). Upper GI endoscopy detected no abnormalities. The patient subsequently underwent local wound exploration and excision of the mass. On gross examination, the mass had a fibrotic wall which when incised, revealed a pigmented gallstone surrounded by necrotic material. The findings were consistent with that of a gallstone granuloma. Postoperative recovery was uncomplicated.

Case 3: A 29-year-old female patient presented to the outpatient department with recurrent upper abdominal pain suggestive of biliary colic. She had undergone laparoscopic cholecystectomy six months ago. There was no history of jaundice. General survey of the patient was within normal limits. Her vitals were stable. Examination of the abdomen revealed four small scar marks of previous laparoscopic surgery. Abdomen was soft, non-tender without any mass. Hematological examination including liver function test was normal.

Ultrasoundography of whole abdomen demonstrated a dilated cystic structure at the site of gall bladder containing a 17 mm solitary calculus suggestive of residual gall bladder or dilated cystic duct. Magnetic resonance cholangiography confirmed the USG findings and the structure was identified as the residual gall bladder with calculus inside (Figure 2). Re-laparoscopy
was planned. Open umbilical port was made. Other ports as for standard laparoscopic cholecystectomy were made under vision. Omentum was found adherent at gallbladder fossa. On adhesiolysis multiple clips were visible near the fundic end of gallbladder remnant. Standard dissection of callot’s triangle was done. Cystic duct and artery were clipped separately. Specimen containing a solitary cholesterol calculus was removed. Specimen was sent for histology. Post operative period was uneventful. On follow up patient is asymptomatic till date. Histopathology was suggestive of chronic cholecystitis.

**Case 4:** A 36-year-old male was scheduled for an elective laparoscopic cholecystectomy. During the creation of pneumoperitoneum, the anesthesiologist reported a rise of airway pressure from an initial value of 29–56 cm H₂O and drop in systolic blood pressure from 130–57 mmHg. Oxygen saturation decreased from 100–70%. Air entry was markedly reduced over the left chest. The anaesthesia circuit was checked immediately. Inspired oxygen was increased to 100% and the pneumoperitoneum released with marked improvement in the patient’s condition. A portable chest roentgenogram confirmed a right pneumothorax and a chest tube was inserted (Figure 3). Once his condition stabilized, it was decided to continue with the procedure. However, upon recreation of pneumoperitoneum, airway pressure again increased to 48 cm of water and the blood pressure decreased. Gas bubbling was visible from the chest tube. The procedure was converted to an open cholecystectomy. After completion of the procedure a thorough search was made to notice any diaphragmatic defects but none could be detected. The patient was extubated and shifted to the recovery room. A chest X-ray was performed. This revealed mild pneumothorax towards the apex and chest drain in situ. The patient was maintaining near normal saturation and stable vitals. He remained under close observation during his hospitalization, and was discharged on the 8th postoperative day after stitch and chest drain removal. A repeat chest X-ray revealed a fully expanded lung and clear costophrenic angle on the right side. The patient is absolutely normal at three years follow up.

**Case 5:** A 45-year-old woman underwent scheduled standard four port laparoscopic cholecystectomy for symptomatic cholelithiasis. Her preoperative general physical, hematological, electrocardiographic and radiologic parameters were within normal limits.

The procedure went smoothly and her postoperative recovery was uneventful. She was discharged on the third postoperative day after removal of abdominal drain. Three days after discharge she returned with complaints of cough, exertional dyspnoea and mild fever. She was passing normal stool and urine. A through clinical examination revealed a temperature of 99° F with normal general parameters. Her pulse rate was 90/min and she was normotensive. Abdominal examination was within normal limits with normal bowel sounds and no definite areas of tenderness except over the port sites. The area of liver dullness was felt at the right 4th intercostals space. Auscultation of the chest revealed diminished breath sound on the right lung base with occasional crepitations. Other areas of the chest had normal bronchovesicular breath sounds. Her heart sounds were normal. She was admitted and full hematological examination including liver function test, chest radiograph, ECG and ultrasonography whole abdomen was advised. She was put on intravenous antibiotics and oxygen inhalation. She strongly resisted oxygen nasal prongs due to irritation and complained that she was better without it. She even resisted oxygen mask as it was more suffocating. She maintained oxygen saturation of 96% without oxygen support. Oxygen support was withdrawn and she was kept on close observation. Her investigation reports were normal except a total leucocyte count of 9.8x10³/mm³ (N-78%, L-20%, M-1%, E-1%) and chest radiograph depicting a raised right hemidiaphragm compared to her preoperative status (Figure 4). A chest physician was

![Figure 3: Peroperative chest rhoentgenogram of pneumothorax and resolution following chest drain age (Case 4).](image1)

![Figure 4: A) Chest rhoentgenogram showing elevated right hemidiaphragm at admission and, B) Prior to discharge (Case 5).](image2)
consulted who advised a computed tomography scan of the chest. The scan report was normal except a small amount of effusion in the right hemithorax. The effusion fluid was sent for analysis and was found to be sterile transudative in nature. Subsequent broncoscopic examination did not reveal any abnormality suggesting right hemidiaphragmatic elevation. She was advised chest physiotherapy. Forty-eight hours after admission her temperature and breathing abnormality subsided. A repeat blood count revealed normal leucocyte count (5.6×10^3/mm³) and normal chest X-ray. She was kept for observation for another two days and was discharged in stable condition. Her histology report of gall bladder was consistent with chronic cholecystitis. She was diagnosed as having idiopathic transient right phrenic nerve palsy. At six months follow-up she is completely symptom free with normal chest radiograph.

DISCUSSION

The development of a new surgical technique is greeted with complications, the most common in the first few months and the rarer ones over the years. Laparoscopic cholecystectomy is no exception. Initially complications related to open cholecystectomy were weighed against laparoscopic cholecystectomy but with passage of time newer unique complication were unfolded [1]. Since its inception in the late 1980’s two decades have passed and with every passing year newer uncommon complication are being reported. In general, complications of laparoscopic cholecystectomy has been classified as: a) complications of any surgical procedure, b) specific complications related to cholecystectomy, and c) specific complications related to laparoscopy and laparoscopic cholecystectomy [1, 2].

Laparoscopic complications have been sub-classified into: 1) early, and 2) late. While considerable attention has been addressed to early postoperative complication (Clavien classification 1–IV), late complication remain unreported [1–3]. Peritoneal gall stone spillage following laparoscopic cholecystectomy was overlooked for a considerable period till serious complications were reported. The incidence of splint gall stones following laparoscopic cholecystectomy is 0.1 % to 20% [3]. Of these, successful retrieval was possible in 63% and 20% of the left over stones developed complications [3]. Factors responsible for gall stone spillage were: 1) gall bladder perforation during diathermy, 2) dissection from the liver bed, 3) gall bladder extraction through the port, and 4) slippage of endo-clip during dissection [3]. The natural history of spilled gall stones is inflammatory response leading to walling of by omentum and local fibrosis. This is intense for infected and pigmented stones, less for cholesterol stones. The risk of complications are higher with: 1) spilled stones more than 15 in number, 2) stones greater than 1.5 cm, and 3) elderly patients [3]. The window period to development of complications range from three months to as long as 20 years [3]. Intrapерitoneal complications include abscess formation (0.08–0.3%, commonest complication), stone migration leading to organ perforation and fistula formation. Extraperitoneal stone migration may lead to cholelithiophtysis (expectoration of gallstones), cholelithorrhrea (spontaneous expulsion of spilled gallstones through laparoscopic ports) and gall stone granuloma [3]. Symptoms of sepsis and inflammatory signs following laparoscopic cholecystectomy together with high index of suspicion supplemented with ultrasonography and computed tomography of the abdomen is diagnostic. Therefore every effort should be made to retrieve spilled gall stones either by laparoscopic spoon or endobag. Specific late complication would dictate appropriate management [3].

The incidence of recurrence of antecedent symptoms following cholecystectomy is 5% to 30% in reported series [4]. Possibility of non-biliary and biliary causes should be entertained. Biliary causes include retained calculi in the cystic duct stump or remnant gall bladder (5%) [4]. This unusual complication predates laparoscopic cholecystectomy but occurs more often after the procedure. The commonest cause being failure to identify the obscure anatomy of the Calot’s particularly in patients with acute cholecystitis. Fundamental attention to accurate identification of the gallbladder - cystic duct junction and operative cholangiography is all that is needed to prevent such complication [4].

Abdominal sonography supplemented with endoscopic or magnetic retrograde cholangiopancreatography (MRCP) is diagnostic. Completion cholecystectomy either by open or laparoscopic approach is the treatment of choice [4]. Spontaneous pneumothorax is a potentially life threatening complication of laparoscopic pneumoinsufflation with a reported incidence of 0.01%–0.4% [5]. The exact mechanism of pneumothorax is unknown. The postulated hypothesis is leakage of carbon dioxide gas under high pressure via anatomical communications around the aorta or oesophagus or through a congenital pleuroperitoneal canal that had normally been occluded by loose adherence of its walls [5]. Absence of subcutaneous emphysema rules out the possibility of iatrogenic pneumothorax due to verees needle or trocar injury. Per-operative detection in the absence of physical signs is challenging. A high index of suspicion together with raised airway pressure, hypoxia, hypercarbia, diminished air entry and hemodynamic instability should arouse suspicion. Injury recognized in the early stages of the operation requires tube thoracostomy whereas injury detected at the end of the operation requires completion of the operation as the pneumothorax spontaneously regresses as the gas is absorbed after deflation of the abdomen [5]. Though organ and vessel damage following laparoscopy have been reported, nerve injury in extremely rare. Only a single case of thermal neuropraxia to long thoracic nerve has been reported [6]. Transient unilateral phrenic nerve injury has never been reported before. Though there was no incidence of thermal damage in this case, a probable hypothesis could be overzealous
pneumoperitoneum causing stretching of the phrenic nerve causing transient neuropaxia or inadvertent thermal damage from diathermy hook [6]. Similar incidence may go unnoticed as majority of unilateral phrenic nerve palsy are asymptomatic. High index of suspicion along with chest radiograph, CT, MRI, fluoroscopy assisted sniff test, nerve conduction and electromyographic studies may be diagnostic [7]. Asymptomatic patients usually recover spontaneously unless there is neoplastic involvement [7].

CONCLUSION

To conclude, the introduction of laparoscopic cholecystectomy has unearthed unique complication other than the prevalent complications of open cholecystectomy. This case series is an attempt to help surgeons to be aware of such complications and prevent undesirable outcome.

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Author Contributions
Utupal De – Substantial contributions to conception and design, acquisition of data, Drafting the article, revising it critically for important intellectual content, Final approval of the version to be published
Dhritiman Maitra – Substantial contributions to conception and design, Drafting the article, Final approval of the version to be published
Mrityunjay Mukhopadhyay – Substantial contributions to conception and design, Drafting the article, revising it critically for important intellectual content, Final approval of the version to be published

Guarantor
The corresponding author is the guarantor of submission.

Conflict of Interest
Authors declare no conflict of interest.

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REFERENCES