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Case Report

"Target sign" from dropped gallstones after laparoscopic cholecystectomy ☆,☆☆,★

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ABSTRACT

Isolated case reports and small series in radiologic and surgical literature relay the different modes of clinical presentation that arise secondary to spillage of gallstones during surgery. We report a case of a 70-year-old female who presented with a 2-week history of right-sided abdominal pain. CT (computerized tomography) imaging findings demonstrated multiple peripherally enhancing hypoattenuating lesions in the right subphrenic space abutting the hepatic dome, concerning for abscesses. The lesions were found to have a characteristic central hyperattenuating focus (Target Sign) consistent with gallstones, as identified on a pre-cholecystectomy CT, resulting in the early diagnosis and treatment of dropped gallstones from prior laparoscopic cholecystectomy approximately 1 year prior to presentation.

Introduction

Leakage of gallstones into the abdominal cavity is referred to as "dropped gallstones" and are a known complication of laparoscopic cholecystectomy [1]. Inadvertent perforation of the gallbladder during the procedure results in a reported incidence of dropped gallstones occurring in nearly 30% of patients [1–8]. Typically, spilled gallstones remain clinically silent and are considered harmless [1,2]. However, they may result in complications such as localized or systemic infection, fibrosis, adhesions, fistulization, or abscess formation [1–14]. The non-specific clinical symptoms of abdominal pain and fever along with variable time in presentation may result in delayed diagnosis [1,2,6]. In addition, the radiologic appearance of stones located near abdominal viscera may mimic those of abscesses and tumors [2]. The potential for complications with dropped gallstones necessitates prompt diagnosis and treatment. It is important for radiologists to be aware of patient history and the differential diagnosis of dropped gallstones as a complication of laparoscopic cholecystectomy in order to make an accurate diagnosis [2,9].

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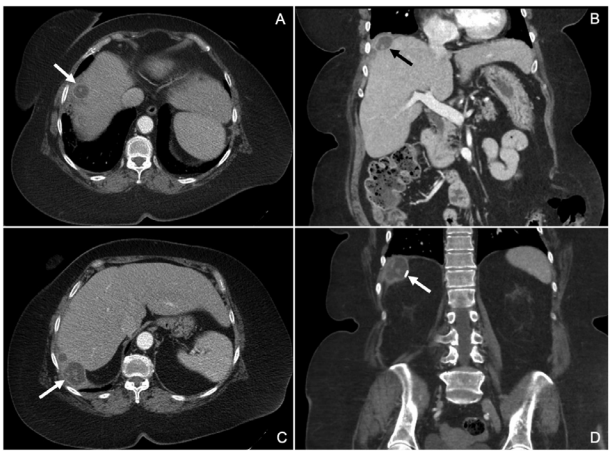

Fig. 1 – shows axial and coronal CT images at the level of the hepatic dome (A, and B) and posteriorly at the level of segment VII (C and D). Peripherally enhancing fluid attenuating lesions are seen in both sites (arrows) along with a central hyper attenuating focus (Target sign). The coronal image D also shows a linear hyperdensity (a migrated cholecystectomy clip) abutting the wall of the cystic lesion. This abscess measured 4.2 cm in the largest dimension. Image B also shows a left bowel loop containing abdominal wall hernia

Case report

A 70-year-old female with a past medical history significant for recurrent non-obstructive hernias, and laparoscopic cholecystectomy about 1-year prior, presented to the emergency department with a 2-week history of right upper quadrant (RUQ) pain. The pain was moderate in severity, waxing and waning in character, and occurred intermittently. Also, the patient reported occasional nausea and vomiting. She had no other associated abdominal symptoms including no change in bowel movements. She also had not noticed any weight change and denied fevers or chills. On physical exam, she was afebrile and tender in the right side of the abdomen and the epigastrium. Laboratory studies were significant for an elevated white blood cell count of 12.9 $\times$ $10^3/\mu L$. Computed Tomography (CT) of the abdomen and pelvis was performed with IV contrast.

Upon arrival to the ED, the patient underwent a contrast enhanced CT of the abdomen and pelvis showing multiple peripherally enhancing fluid attenuating lesions, each with a central hyperattenuating focus, located in the right subphrenic space, abutting the hepatic dome, with the largest measuring up to 4.2 cm (Fig. 1). Due to the acute presentation and presence of leukocytosis in this patient with a history of a prior cholecystectomy, the diagnosis of post-operative intra-abdominal abscesses from dropped gallstones was made. Additionally, the resemblance between the hyperattenuating foci within the fluid collections and the gallstones seen on prior pre-cholecystectomy abdominal CT further reinforced the diagnosis (Fig. 2).

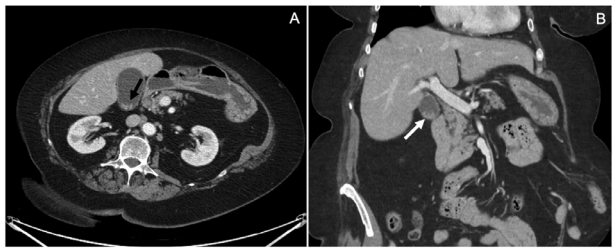

Fig. 2 – shows images from a CT scan acquired before cholecystectomy. Axial and coronal images (A and B) at the level of the gallbladder show dependent hyperdense stones just like the hyperdensity seen in the center of the abscesses on the follow up post-cholecystectomy CT

After consulting the surgery and IR (Interventional Radiology) teams, recommendations were made for CT guided percutaneous drainage without any surgical intervention. Subsequently, patient was admitted, given empirical IV antibiotics and underwent a CT guided percutaneous placement of a 10 French catheter into the largest perihepatic abscess with drainage of 40 ml of purulent fluid. After 3 days, her symptoms improved, and drain flushes yielded clear non-purulent fluid without any residual daily drainage of fluid from her drain. Subsequently, she was discharged after drain removal with 10-day course of oral antibiotics, and a plan to follow up with surgery clinic.

Discussion

Laparoscopic cholecystectomy is the procedure of choice for gallbladder removal in patients with uncomplicated gallstones [1,2,6,9-11,14,15]. The laparoscopic approach is preferred to the open surgical approach because it has fewer complications and lower mortality in the perioperative period along with reduced length of stay in the hospital [9]. However, there are two complications that occur with greater frequency in the laparoscopic approach: injury to the bile duct with bile leakage, or late infection as the result of dropped gallstones [4,6,10,11]. Gallstone spillage into the abdominal cavity during laparoscopic cholecystectomy can occur frequently as a result of perforation of the gallbladder from laparoscopic instruments or during gallbladder dissection from the hepatic bed [3,4]. If gallstones do spill into the peritoneal cavity, retrieval of the stones should be attempted to avoid future complications [4,5].

Perforation of the gallbladder during laparoscopic cholecystectomy has resulted in a reported incidence of dropped gallstones occurring in nearly 30% of patients [1–8]. A majority of dropped gallstones are retrieved intraoperatively; however, stones may become fragmented, inaccessible, or overlooked with a reported incidence of unretrieved stones in 2.4% of laparoscopic cholecystectomies [12,16]. Initially, dropped stones were considered harmless, but abscess and fistula formation are now well recognized complications of retained stones [1]. A dropped stone is a foreign body, acting as an inflamma-

tory nidus initiating a low-grade inflammatory response [3]. This is particularly true for pigmented bilirubinate stones because these stones may contain viable infectious pathogens [3,11,16]. In most cases, the inflammatory response will result in a benign granulomatous deposit that may be identified on cross-sectional imaging. However, in rare instances, the inflammatory response can persist contributing to the development of abscesses and/or fistulas [16].

Most dropped stones are clinically silent; however, complications such as abscess formation have been estimated to occur in 0.08%-0.3% of patients [3,10,11]. These complications present at variable times with nonspecific symptoms of abdominal pain and fever. Development of abscesses secondary to dropped stones demonstrates significant temporal variability, with an estimated average onset of four months to ten years post cholecystectomy [9,10]. Due to the vague and delayed presentation of symptoms, the diagnosis of dropped gallstones can be overlooked. It is important for radiologists to be aware of this potential complication in order to diagnose and effectively treat the patient.

When present, dropped gallstones are commonly found near the liver, in Morrison's pouch, the gallbladder fossa, or within the pelvis [1,7,8]. The radiologist plays a critical role in identifying the complications of dropped gallstones, and therefore familiarity with the imaging characteristics is necessary. Ultrasound is a commonly used first-line modality in assessing abdominal pain, and can adequately detect an abscess or other inflammatory response caused by the stone. On ultrasound, stones can be identified as hyperechoic foci with posterior acoustic shadowing that demonstrate mobility upon saline solution injection [1,2]. Ultrasound is also better suited for detection of non-calcified stones, as these can be difficult to detect on CT [2]. However, ultrasound may have difficulty in assessing deeper abscesses due to limited beam penetration [3].

The use of unenhanced CT scan aids in the detection of low-calcium-density tiny gallstone fragments, as contrast enhanced CT scan can obscure calcium attenuation by adjacent inflammatory enhancement [3]. On contrast-enhanced CT, the abscess related to dropped gallstones can be seen as a complex multiloculated fluid collection. When the dropped stone is calcified, it will appear as a high attenuation focus within the collection, making the diagnosis straightforward. In contrast, if the dropped stone within the abscess is non-calcified, such as pure cholesterol gallstones, it can easily be overlooked, leading to failure to relate the abscess to a dropped stone. Although the presence of calcification favors the diagnosis of dropped stone-associated abscess, some mucin producing tumors, such as tumors from the ovary and colon, can mimic and confound imaging diagnosis of non-calcified dropped stones, which may unfortunately delay proper treatment and cause unnecessary anxiety to the patient due to a wrong diagnosis [1,3,8]. Therefore, it is important for radiologists to be aware of patient history when reviewing images to improve diagnostic accuracy.

MRI is sometimes used in the assessment of dropped gallstones. On MRI, a dropped gallstone abscess is seen as a fluid collection with foci of low T2 signal intensity corresponding to the dropped stones. Pigmented stones may show hyperintense signal on T1, while other stones are usually hypointense on T1 [1]. Lack of contrast enhancement is necessary for making the correct diagnosis. However, limited resolution on MR imaging impedes the detection of stone fragments and it is difficult to differentiate calcification from gas in a heterogeneous abscess cavity [3]. Despite the shortfalls of the varying modalities mentioned above, the diagnosis of dropped gallstones can be made using at least one of them in correlation with patient history.

Some authors have described modified techniques in detecting radiolucent stones such as saline injection into the abscess cavities under ultrasound guidance and document rolling echogenic foci with posterior acoustic shadowing as a useful confirmatory test. Others used percutaneous injection of contrast material into abscess cavities before doing CT to effectively delineate the stones as filling defects within the abscess cavity [2,3]. Comparing the imaging appearance of intraperitoneal gallstones with gallbladder stones from prior scans is one of the most effective diagnostic methods in these cases. In our patient, the stones were small and not heavily calcified. Reviewing the prior images demonstrated similar size and CT attenuation of the gallstones and the structures inside the intra-abdominal abscesses, which increased our confidence in diagnosing dropped stones associated abscesses.

Reaching the correct diagnosis by identifying the dropped stone within the abscess in any of the above-mentioned modalities is essential in guiding the patient's management. The treatment of stone related abscess formation can differ from that of other intra-abdominal abscesses. Simple drainage of the abscess and treatment of with antibiotics is not sufficient for abscesses secondary to dropped stones [1,5,8,16]. Removal of the stone is imperative as the stone is a foreign body acting as a nidus for recurrent infection resulting in worsening morbidity if not retrieved [1,8]. Drainage of the abscess and retrieval of the stones can be done via a percutaneous, open, or laparoscopic approach [10]. Ultrasound or CT can be used in performing minimally invasive percutaneous drainage and retrieval of small stones in abdominal wall or intrabdominal abscesses requiring superficial drainage [3,10]. Larger stones >1 cm may require fragmentation before retrieval through ultrasonic lithotripsy and rigid endoscopy for stones located in superficial abscesses, and electrohydraulic lithotripsy and flexible endoscopy for stones located in deeper abscesses [3]. When percutaneous techniques cannot be performed or prove to be unsuccessful, laparoscopy can be done to retrieve the dropped gallstones [3]. In our patient, successful CT guided percutaneous drainage was performed as a minimally invasive technique with aspiration of purulent fluid and without complications. Patient was informed to follow-up with surgery for definitive stone extraction given its difficult location for percutaneous retrieval since it was located in the subdiaphragmatic space.

Conclusion

Dropped gallstones are a common complication of laparoscopic cholecystectomy. Stones may act as a nidus for infection resulting in an inflammatory response in the patient. Non-specific symptoms and delayed presentation of compli-

cations from the stones may delay diagnosis and treatment. It is important for radiologists to be aware of patient history and image characteristics of dropped gallstones on different imaging modalities in order to accurately diagnose and treat the patient. Percutaneous drainage and retrieval of stones is the recommended treatment to prevent recurrence of complications.

Authorship

The authors declare that this is their original work and they all approve the content of this manuscript. They confirm that this manuscript has not been published previously, in any language, in whole or in part, and is not currently under consideration elsewhere.

Ethical Clearance

This project did not involve any research and no ethical clearance was required.

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