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Hem-o-lok clip migration to the common bile duct after laparoscopic common bile duct exploration: A case report

Da-Ren Liu, Jin-Hong Wu, Jiang-Tao Shi, Huan-Bing Zhu, Chao Li

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Abstract

BACKGROUND

Laparoscopic cholecystectomy (LC) and laparoscopic common bile duct exploration (LCBDE) has been widely used for management of gallbladder and common bile duct (CBD) stones. Post-operative clip migration is a rare complication of laparoscopic biliary surgery, which can serve as a nidus for stone formation and cause recurrent cholangitis.

CASE SUMMARY

A 59-year-old female was admitted to hospital because of fever and acute right upper abdominal pain. She has a history of LC and had a LCBDE surgery 2 mo ago. Physical examination revealed tenderness in the upper quadrant of right abdomen. Computed tomography scan demonstrated a high-density shadow at the distal CBD, which was considered as migrated clips. The speculation was confirmed by endoscopic retrograde cholangiopancreatography examination, and two displaced Hem-o-lok clips were removed with a stone basket. No fever or abdominal pain presented after the operation. In addition to the case report, literature regarding surgical clip migration after laparoscopic biliary surgery was reviewed and discussed.

CONCLUSION

Incidence of postoperative clip migration may be reduced by using clips properly and correctly; however, new methods should be explored to occlude cystic duct and vessels. If a patient with a past history of LC or LCBDE presents with features of sepsis and recurrent upper quadrant pain, clip migration must be considered as one of the differential diagnosis.

Key Words: Laparoscopic cholecystectomy; Laparoscopic common bile duct exploration; Surgical clip; Postoperative migration; Case report

Core Tip: Surgical clip migration is a rare complication of laparoscopic biliary surgery. Herein, we report a case of Hem-o-lok clip migration into the common bile duct after laparoscopic cholecystectomy and laparoscopic common bile duct exploration operation which were removed by a basket in endoscopic retrograde cholangiopancreatography. Furthermore, literature regarding clip migration post-laparoscopic biliary surgery were reviewed. We suggest that the incidence of postoperative clip migration may be reduced by using clips properly and correctly; however, new methods should be explored to occlude cystic duct and vessels.

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INTRODUCTION

Gallbladder stone combined with common bile duct (CBD) stone is a common disease in developed countries, with a prevalence ranging from 8% to 18%[1]. Laparoscopic cholecystectomy (LC) and laparoscopic common bile duct exploration (LCBDE) are widely used procedures for the treatment of cholelithiasis combined with choledocholithiasis. Clearly dissecting the Carlo's triangle and properly closing the cystic artery and cystic duct are the key steps of this surgery. Hem-o-lok clips are commonly used to ligate gallbladder blood vessels and cystic ducts. Complications of LCBDE include bile leakage, stone recurrence, infection, bleeding, and postoperative clip migration.

Postoperative clip migration is a rare but well-established complication of laparoscopic biliary surgery. The clip may migrate to CBD[2-12], T-tube sinus wall[11,13], duodenum[8,14], or the pulmonary artery[15]. Herein, we report a case of clip migration after LC and LCBDE and review cases of clip migration reported in literatures after LC or LCBDE, hoping to draw lessons from these cases.

CASE PRESENTATION

Chief complaints

A 59-year-old woman presented to the emergency department of our hospital complaining of fever and right upper abdominal pain for 3 d.

History of present illness

The patient's symptoms started 3 d ago with fever and acute right upper abdominal pain, which had worsened in the last 24 h.

History of past illness

The patient had a history of LC and LCBDE surgery 2 mo ago.

Personal and family history

The patient has no personal and family history.

Physical examination

The patient's temperature was 38.9 °C, heart rate was 93 bpm, respiratory rate was 18 breaths per minute, blood pressure was 105/60 mmHg, and oxygen saturation in room air was 99%. Physical examination revealed that the abdomen was soft, but tenderness was present in the right upper quadrant of abdomen without rebound tenderness.

Laboratory examinations

Laboratory examination showed aspartate aminotransferase 639 U/L, alanine aminotransferase 681 U/L, and total bilirubin 74 μmol/L. Blood routine examination showed a white cell count of 16.1×10^9 /L, a neutrophil percentage of 89%, and a hemoglobin of 135 g/L.

Imaging examinations

Computed tomography scan demonstrated a slightly dilated common bile duct with a high-density shadow at the distal CBD, which was considered as migrated clips (Figure 1). Therefore, endoscopic retrograde cholangiopancreatography (ERCP) was performed, which confirmed that Hem-o-lok clips migrated into the CBD (Figure 2A).

FINAL DIAGNOSIS

Acute cholangitis caused by migrated Hem-o-lok clips applied in the LC and LCBDE surgery.

TREATMENT

Two displaced Hem-o-lok clips were removed by stone basket after sphincterotomy through ERCP (Figure 2B and C).

OUTCOME AND FOLLOW-UP

No fever or abdominal pain was presented after the operation, and the patient was discharged 3 d later in a stable condition. There was no abdominal pain, jaundice, abdominal pain, or other discomfort during the follow-up period.

DISCUSSION

Choledocholithiasis is a common disease, with an incidence increasing year by year. Comparing to open surgery, the LCBDE is safe, effective, minimally invasive, and has an faster recovery rate[16]. Advances in laparoscopy have made LC and LCBDE a widely accepted strategy for patients with gallstones and choledocholithiasis. In our practice, the Carlo's triangle was initially dissected to expose cystic duct and cystic artery, and they were separated and clipped with three and one Hem-o-lok clips, respectively. Secondly, the CBD was exposed, and the anterior aspect wall of CBD was cut with electroacupuncture 1 cm below the confluence of cystic duct and CBD, and the cholesterol crystals were removed by basket under direct view. Thirdly, a 24# Silicone T-tube was placed into the CBD, which was then sutured with a 4-0 Vicryl. Finally, the gallbladder was resected using electroacupuncture, and T-tube was set on the right abdominal through the incision of rectus abdominis. Postoperative clip migration is a rare complication of laparoscopic cystic and biliary operation, which has been occasionally presented as case report. Migrated clips in the bile duct may function as a nidus for gallstone formation, leading to biliary obstruction, acute pancreatitis, duodenal ulcer, biliary-colonic fistula, and subdiaphragmatic abscess. Any type of surgical clip has a risk of migration. If a patient with a history of receiving LC or LCBDE presents with features of recurrent upper quadrant pain, with or without sepsis or liver function test derangement, clip displacement must be considered as one of the differential diagnosis.

We searched through MEDLINE, PubMed, Scopus, Web of Science, Google Scholar, and the CNKI databases using the keywords 'clip migration and laparoscopic cholecystectomy (LC) or clip migration and laparoscopic common bile duct exploration (LCBDE)' from 1990 to 2021. A total of 14 articles including 36 cases about clip migration after LC or LCBDE have been reported[2-15] (Table 1). Twenty-five cases received LC and LCBDE (69.4%) and 11 cases received LC (30.6%) as previous laparoscopic surgery. The age of patients ranged from 31-years-old to 83-years-old. Symptoms occurred from 1 mo to 7 years after laparoscopic surgery. Nineteen patients remained asymptomatic that were mainly diagnosed by choledochoscopy through T-tube sinus tract. The most common manifestations due to clip migration were abdominal pain, fever, and jaundice, which were similar to those of non-iatrogenic choledocholithiasis. In 27 cases, the clips wedged into the CBD (75%), while the clips became a part of T-tube sinus in 6 cases (16.7%) and the clips migrated into duodenum in 2 cases (5.6%). The types of clips include Hem-o-lok (61.1%), metallic (16.7%), and absorbable (8.3%). Initial treatment included removing clips by basket in ERCP, endoscopic removal, and observation, while surgical treatment was required in 6 cases.

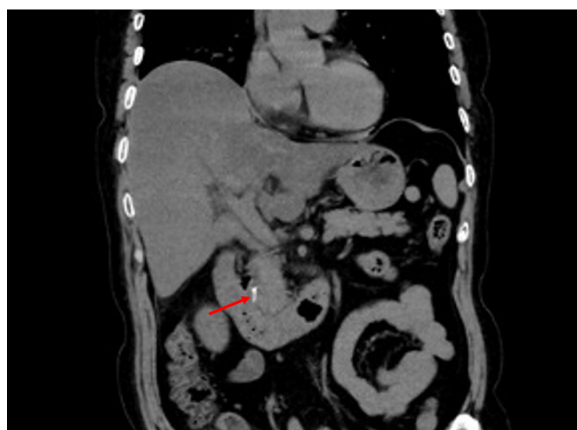
The mechanism of postoperative clip migration remains controversial; however, some possible hypotheses of pathogenesis were suggested. Firstly, inappropriate application of surgical clips, including improper placement of clips and incomplete closure of cyst duct may lead to the formation of biloma, which would be reabsorbed later into the bile duct and leave the clips behind[2]. Secondly, the compression of clips to the bile duct wall caused by the surrounding structures or a pulled cystic duct during operation may result in clip corroding into the lumen of CBD[17]. Additionally, the number of

Table 1 Summary of cases of surgical clips migration after laparoscopic biliary surgery

Ref.	Case number	Age in yr	Sex	Operation	Clips	Migrated site	Duration of migration in mo	Finding approach	Clinical manifestation	Treatment
Raoul <i>et al</i> [2], 1992	4	34-65	F	LC	NA	CBD	5-10	NA	Abdominal pain, fever, jaundice	Removed by ERCP
Alberts <i>et al</i> [3], 1999	1	52	M	LC + LCBDE	Metallic clips	CBD	24	CT	Abdominal pain	Removed by ERCP
Ammann <i>et al</i> [15], 2000	1	32	F	LC + laparotomy	Metallic clips	Pulmonary artery	18	CT	Dyspnea	NA
Wang <i>et al</i> [13], 2009	2	42-73	NA	LC + LCBDE	Metallic clips	T-tube sinus	1	Found in drainage bag	Asymptomatic	Drained by T-tube
Wang <i>et al</i> [13], 2009	1	42-73	NA	LC + LCBDE	Metallic clips	Wall of T-tube sinus	1	T-tube choledochoscopy	Asymptomatic	Observation
Liu <i>et al</i> [4], 2012	8	35-76	6 M2 F	LC + LCBDE	H	CBD	2-3	T-tube choledochoscopy	Asymptomatic	Removed by choledochoscopy
Tsai <i>et al</i> [5], 2013	1	66	F	LC	NA	CBD	84	CT	Abdominal pain, fever	Removed by ERCP
Seyyedmajidi <i>et al</i> [14], 2013	1	41	F	LC	H	Duodenum	8	EDG	Abdominal pain	Removed by grasping forceps
Rawal [6], 2016	1	38	F	LC	Metallic clips	CBD	4	Ultrasonography	Abdominal pain, fever, jaundice	Removed by ERCP
Qu <i>et al</i> [7], 2017	1	54	F	LC + LCBDE	H	CBD	12	MRCP	Abdominal pain	Removed by ERCP
Zheng <i>et al</i> [8], 2018	1	NA	M	LC + LCBDE	H	Duodenum	4	EDG	Abdominal pain	Observation
Zheng <i>et al</i> [8], 2018	2	NA	NA	LC + LCBDE	H	CBD	27, 50	NA	Jaundice	Laparotomy operation
Zheng <i>et al</i> [8], 2018	3	NA	NA	LC + LCBDE	Absorbable clips	CBD	6	T-tube choledochoscopy	Asymptomatic	Removed by choledochoscopy
Barabino <i>et al</i> [9], 2019	1	65	M	LC	H	CBD	3	CT	Fever and abdominal pain	Roux-en-Y choledochojejunostomy
Roh <i>et al</i> [10], 2019	1	65	M	LC	H	CBD	13	CT	Abdominal pain and fever	Removed by ERCP
Pang <i>et al</i> [11], 2019	3	31-83	F	LC + LCBDE	H	Wall of T-tube sinus	3-6	T-tube choledochoscopy	Asymptomatic	Removed by choledochoscopy
Pang <i>et al</i> [11], 2019	1	61	F	LC	H	CBD	NA	Ultrasound	Jaundice, abdominal pain	Roux-en-Y choledochojejunostomy
Pang <i>et al</i> [11], 2019	1	72	F	LC + LCBDE	H	CBD	18	CT	Abdominal pain	Laparotomy bile duct exploration
Pang <i>et al</i> [11], 2019	1	64	F	LC + LCBDE	H	CBD	4	T-tube cholangiography	Jaundice, fever	PTBD and stent implantation
Kihara <i>et al</i> [12], 2021	1	80	M	LC	H	CBD	36	CT + MRCP	Asymptomatic	Laparoscopic bile duct resection and reconstruction

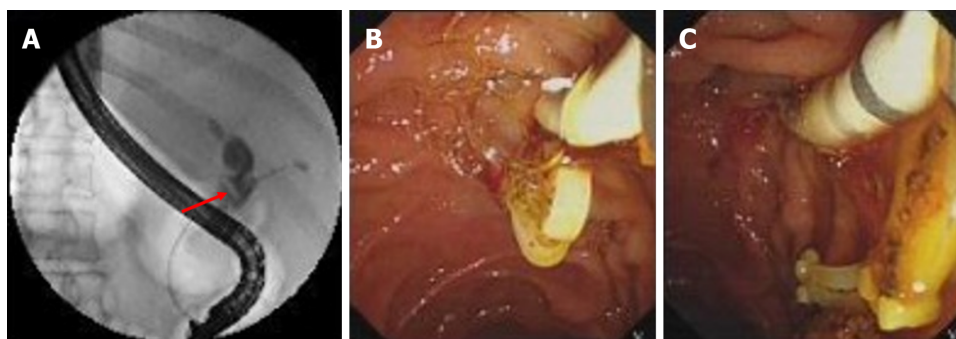
CBD: Common bile duct; CT: Computed tomography; EDG: Esophagogastroduodenoscopy; F: Female; H: Hem-o-lok clips; LC: Laparoscopic cholecystectomy; LCBDE: Laparoscopic common bile duct exploration; M: Male; MRCP: Magnetic resonance cholangiopancreatography; NA: Not available; PTBD: Percutaneous transhepatic biliary drainage.

clips used in surgery is also an important factor[5,18]. Thirdly, bile leakage caused by an intraoperative bile tract injury and the subsequent inflammation make surrounding tissues brittle, which may induce clips to invade into the biliary tract through the incision of CBD mechanically[17]. In addition, the



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Figure 1 Abdominal computed tomography demonstrated hyperdense material in the common bile duct corresponding to the migrated Hem-o-lok clips.



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Figure 2 Migrated Hem-o-lok clips were detected and removed by endoscopic retrograde cholangiopancreatography. A: Endoscopic retrograde cholangiopancreatography (ERCP) showed the filling-defect in the common bile duct corresponding to the migrated Hem-o-lok clips (red arrow); B and C: Hem-o-lok clips were removed by stone basket by ERCP.

pressure exerted from abdominal organ movements accelerates the process of clip migration[10,18]. Finally, the rejection response by the immune system to clips as a foreign body may also contribute to the displacement of surgical clips[4].

In order to reduce the incidence of postoperative clip migration, all technical factors in surgery should be considered. During the operation, the relationship of Calot's triangle should be carefully confirmed, and the placement of surgical clips should not be too close to the CBD; the number of clips should be minimized, and unnecessary surgical procedures should be avoided, such as the blind application of clips to control bleeding[19]. It has also been suggested that the risk of postoperative clip migration can be lowered by using absorbable clips when compared with non-absorbable clips; however, reports about absorbable clip migration still exists[4,8], including a report by Cetta *et al*[20], which suggested that absorbable clips could also cause postoperative clip migration and be a nidus of stone formation. Furthermore, new vessel and duct sealing technologies such as a Harmonic scalpel can be applied as an alternative to clips in laparoscopic operation. The Harmonic scalpel is well accepted as a reasonable alternative for closure of cystic duct, which occupies the advantages of shorter operation time, fewer complications, and avoiding clip migration[21].

CONCLUSION

In summary, although postoperative clip migration is rare, it is a well-recognized phenomenon and cannot be ignored. Any type of surgical clip has a risk of displacement. Using clips properly and correctly, as well as exploring new methods to occluded cystic duct may help to reduce the incidence of postoperative clip migration. If patients with a past history of LC with or without CBD exploration present with features of sepsis and recurrent upper quadrant pain, with or without derangement of liver function test, clip migration may be considered as one of the differential diagnoses.

FOOTNOTES

Author contributions: Liu DR, Wu JH, and Shi JT were the patient's surgeons, reviewed the literature, and drafted the manuscript (contributed equally to this article); Zhu HB and Li C reviewed the literature and contributed to manuscript drafting; Liu DR and Li C were responsible for the revision of the manuscript for important intellectual content; All authors issued final approval for the version to be submitted.

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