

Laparoscopic Ultrasonography for Localization of a Retained Appendicolith After Appendectomy

Seung Woo Lee, MD, Joon Seok Lim, MD, Woo Jin Hyung, MD, Mi-Suk Park, MD, Myeong-Jin Kim, MD, Seoung-Whan Cha, MD, Hyung Sik Yoo, MD, Ki Whang Kim, MD

Laparoscopy is becoming the preferred approach for various abdominal surgeries. The main limitation of laparoscopic surgery is difficult localization of lesions because of the loss of the surgeon's tactile sensation.¹ Since the development of laparoscopic ultrasonography (LUS) probes that can be inserted through laparoscopic ports, LUS has been introduced to compensate for this limitation in various laparoscopic abdominal surgeries.¹⁻³

Although the laparoscopic removal of appendicoliths is recommended in patients with retained appendicoliths after appendectomy for minimally invasive treatment,⁴ localization of the spilled appendicolith may be also an obstacle to surgeons using a laparoscopic approach. Appendicoliths are usually small, often surrounded by a necrotic rind of tissue, and sometimes located in inaccessible recesses of the peritoneum, making laparoscopic localization and removal technically difficult.⁵

In this report, we describe the use of LUS to facilitate intraoperative localization and removal of an appendicolith during laparoscopic abscess removal.

Case Report

A 25-year-old man was admitted to our institution with chief symptoms of right flank pain and pleuritic pain. Physical examination confirmed mild tenderness in these locations. Four months earlier, the patient had undergone laparoscopic appendectomy for perforated appendicitis at an outside hospital. After surgery, an intra-abdominal abscess repeatedly had developed, despite the insertion of a pigtail catheter used to drain the abscess twice. The patient was transferred to our institution because of recurrent abscess formation. Percutaneous abdominal ultrasonography and computed tomography (CT) showed a 3.6-cm abscess pocket containing a small, calcified stone (Figure 1, A and B). Laparoscopic surgery was performed for minimally invasive treatment. Careful inspection through the laparoscope revealed a severe adhesion in the peritoneal cavity

Abbreviations

CT, computed tomography; LUS, laparoscopic ultrasonography

Received June 30, 2006, from the Departments of Diagnostic Radiology (S.W.L., J.S.L., M.-S.P., M.-J.K., S.-W.C., H.S.Y., K.W.K.) and Surgery (W.J.H.) and Institute of Gastroenterology (J.S.L., M.-S.P., M.-J.K.), Yonsei University College of Medicine, Seoul, Korea. Manuscript accepted for publication July 10, 2006.

Address correspondence to Joon Seok Lim, MD, Department of Diagnostic Radiology, Yonsei University College of Medicine, 134 Shinchon-dong, Seodaemun-ku, Seoul 120-752, Korea.

E-mail: jslim1@yumc.yonsei.ac.kr

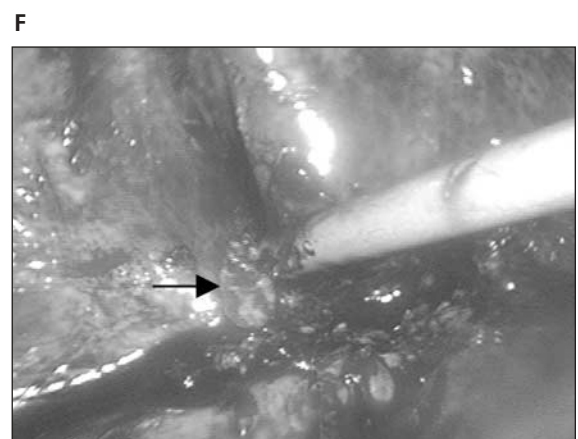
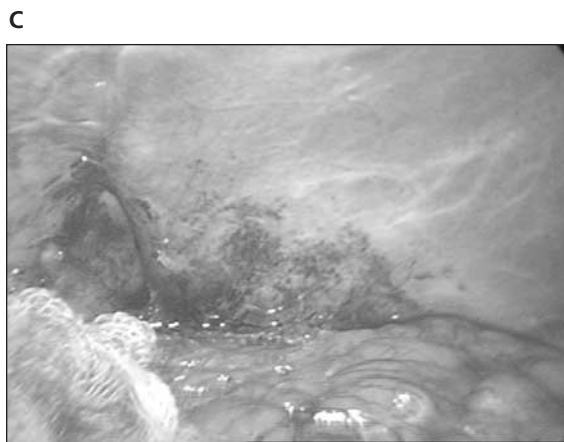
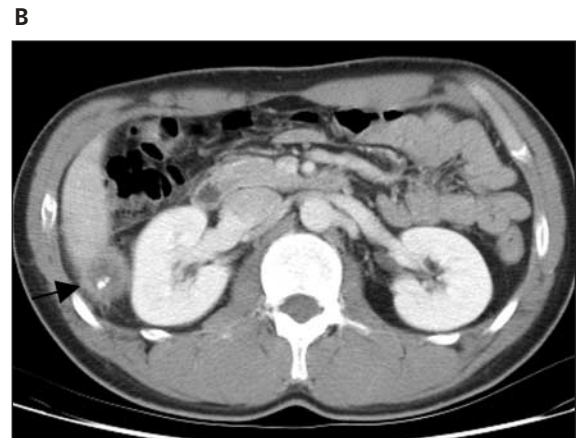
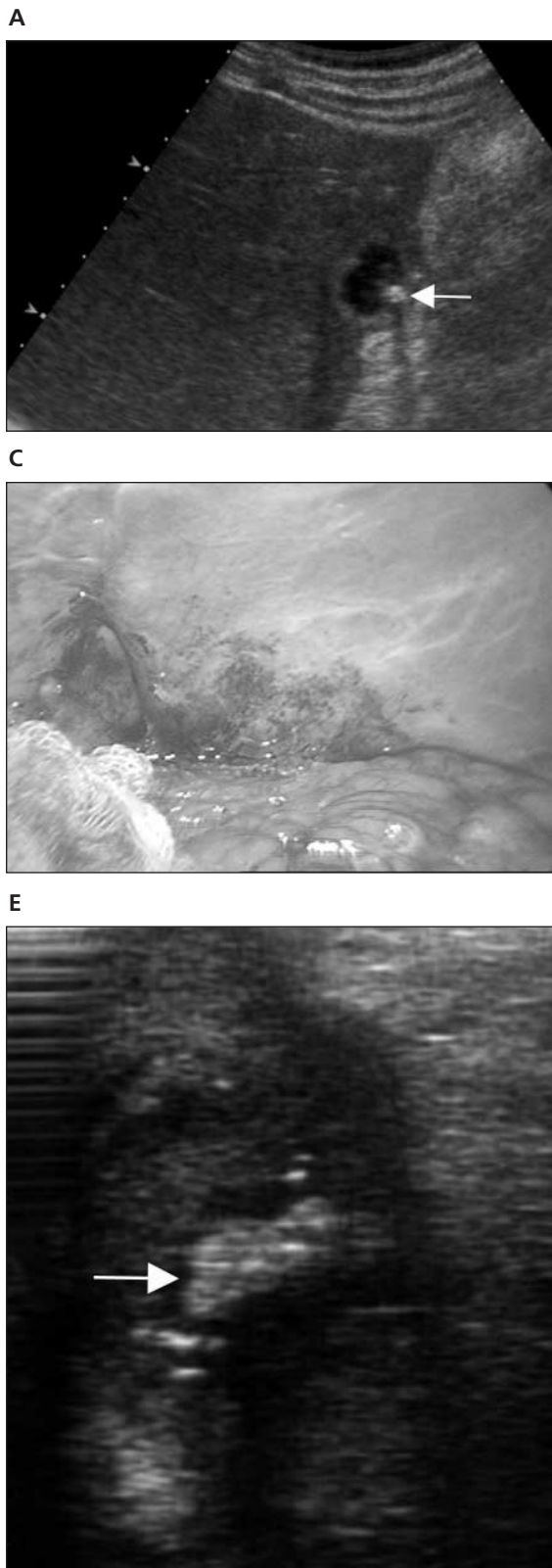


Figure 1. Appendicolith in a right subhepatic abscess in a 25-year-old man who had undergone laparoscopic appendectomy. **A** and **B**, Percutaneous transabdominal ultrasonography (**A**) and CT (**B**) show the retained appendicolith (0.8 cm) (arrows) in an abscess pocket (3.6 cm) at the right hepatorenal fossa. **C**, On laparoscopy, a severe peritoneal adhesion is shown in the right subhepatic space. This makes surgical localization of an appendicolith difficult because the right hepatorenal fossa is obscured. **D**, The LUS probe is searching the appendicolith in the right subhepatic space. **E**, An LUS image shows a hyperechoic stone with posterior acoustic shadowing in the abscess pocket (arrow). **F**, Removal of the appendicolith (arrow) after aspiration of pus.

(Figure 1C). This made it difficult to localize the abscess pocket in the right hepatorenal fossa, where it was seen on the CT scan. Therefore, a laparoscopic probe with a flexible tip fitted with a 7.5-MHz linear transducer (Aloka Co, Ltd, Tokyo, Japan) was introduced through the right paramedian port to reach the right subhepatic space for localization of an appendicolith (Figure 1D). Laparoscopic ultrasonographic examination allowed visualization of the abscess pocket and an appendicolith (Figure 1E).

After localization, abscess drainage and removal of the appendicolith were successfully performed. During the procedure, yellowish pus was aspirated, and a stone was removed (Figure 1F). The LUS probe was then reintroduced into the surgical field to confirm that no remaining appendicolith was left behind. No appendicolith was found with LUS. Histologic examination revealed that the foreign body consisted of plant fibers, compatible with a fecalith. After 20 days, a follow-up CT scan was performed. No calcified stone or foreign material was found. The patient was discharged and remained symptom free for 1 year.

Discussion

Removal of an appendicolith is necessary because the stone acts as an infected foreign body, which cannot be sterilized by antibiotics or with simple drainage alone.^{5,6} This postoperative complication may occur after laparoscopic and open appendectomy.^{6,7} Minimally invasive techniques have been preferred to open surgery for removal of appendicoliths. Several reports described the removal of retained appendicoliths by a percutaneous or laparoscopic approach.^{4,8} Here, we describe laparoscopic removal of an appendicolith with the use of LUS.

For preoperative localization of an appendicolith, Lossef⁵ introduced CT-guided Kopans hook wire placement. This procedure may be effective if open surgery is planned to remove an appendicolith, but percutaneous needle localization into an abscess pocket may be ineffective for a laparoscopic approach. Furthermore, the needle localization procedure requires an anesthetic procedure in the CT suite, and the insertion of a long hook wire may be very invasive and time-consuming. In our case, LUS allowed easy localization of the appendicolith and its subsequent laparoscopic removal. This technique may be

helpful for localizing a small appendicolith that is buried in fibrotic and necrotic tissue and avoiding time-consuming adhesiolysis to localize an appendicolith.

In summary, localization of a retained appendicolith can be readily performed with intraoperative LUS. Precise LUS localization may facilitate laparoscopic removal of the appendicolith.

References

1. Bezzi M, Merlino P, Orsi F, et al. Laparoscopic sonography during abdominal laparoscopic surgery: technique and imaging findings. *AJR Am J Roentgenol* 1995; 165:1193–1198.
2. Brunt LM, Bennett HF, Teefey SA, Moley JF, Middleton WD. Laparoscopic ultrasound imaging of adrenal tumors during laparoscopic adrenalectomy. *Am J Surg* 1999; 178:490–495.
3. Hyung WJ, Lim JS, Cheong JH, Lee YC, Noh SH. Tumor localization using laparoscopic ultrasound for a small submucosal tumor. *J Surg Oncol* 2004; 86:164–166.
4. Smith AG, Ripepi A, Stahlfeld KR. Retained fecalith: laparoscopic removal. *Surg Laparosc Endosc Percutan Tech* 2002; 12:441–442.
5. Lossef SV. CT-guided Kopans hookwire placement for preoperative localization of an appendicolith. *AJR Am J Roentgenol* 2005; 185:81–83.
6. Strathern DW, Jones BT. Retained fecalith after laparoscopic appendectomy. *Surg Endosc* 1999; 13:287–289.
7. Mulder M. Retained fecalith as late complication of appendectomy. *JAMA* 1973; 225:639.
8. O'Shea SJ, Martin DF. Percutaneous removal of retained calculi from the abdomen. *Cardiovasc Intervent Radiol* 2003; 26:81–84.