

Imaging of Abdominal and Pelvic Surgical and Postprocedural Foreign Bodies



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KEYWORDS

- Surgical foreign bodies • Iatrogenic complication • Iatrogenic injury • Implanted devices
- Postprocedural complications • Computed tomography

KEY POINTS

- An intraoperative radiograph obtained to diagnose or exclude a retained foreign object should be carefully scrutinized with particular attention to objects partially visualized at the periphery of the film.
- Radiologists must familiarize themselves with the imaging findings of surgical materials to recognize them as such and raise suspicion of unintentionally retained objects in the appropriate setting.
- Imaging plays a critical role in assessing the proper positioning and function of a wide array of implanted medical devices.
- Postprocedural imaging is useful in the setting of suspected complications stemming from implanted devices.
- Appropriate knowledge of the underlying device in question, including route of placement and expected appearance, is vital when assessing for potential complications.

INTRODUCTION

Every form of medical and surgical treatment, even the most trivial one, carries with it some chance of complications. This risk is usually small, and the benefit of the treatment should clearly outweigh the risk. Treatment-related complications may occur, however, presenting either soon after the intervention or remote from it. In the latter case, the challenge of diagnosing a complication is significant because presenting symptoms are often nonspecific and clinical suspicion of a treatment-related complication is low. It is then the task of the radiologist to recognize such complications, and this can only be achieved if he/she is familiar with the spectrum of normal and abnormal

imaging findings pertaining to the treatment the patient had undergone. In this review, the focus is on imaging findings of surgical materials used in abdominal surgery, and of a wide array of implanted abdominal devices. The pertinent complications of these devices and of retained surgical objects are highlighted and illustrated.

SURGICAL FOREIGN BODIES AND MATERIALS

Abdominopelvic surgery makes use of materials such as sponges, needles, and instruments. Many of these remain in the abdominal cavity only temporarily and are removed before its closure. However, some materials or devices are placed in the abdominal cavity for therapeutic

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purposes during surgery and remain there. Radiologists may encounter such items on imaging examinations performed postoperatively and must familiarize themselves with the characteristic findings of these paraphernalia. The first part of this review focuses on imaging findings of surgical objects retained unintentionally in the abdominal cavity. The second part highlights the surgical objects placed there on purpose, with therapeutic intention.

Unintended Retained Surgical Foreign Objects

The unintended retention of a foreign object in a patient after surgery is one of the most devastating errors that affect both patients and health professionals. It is associated with significant morbidity and mortality for the former and with malpractice risk for the latter.^{1,2} The exact incidence of such an event has not been determined, but estimates suggest that it occurs in 1 of every 1000 to 1500 intra-abdominal operations.¹ Reports of the most frequently retained items reveal that sponges, followed by instruments, top the list.^{1,3}

The current approach to the prevention of a retained foreign object (RFO) relies on a standardized counting protocol of surgical items. However, counting procedures have limitations. One study found that a final count was erroneously thought to be correct in 88% of cases wherein RFOs were detected.¹ Various technological innovations (bar-code scanning, radiofrequency identification detection) may serve to improve or replace the standard sponge-counting protocol and reduce

the risk of RFOs. However, these techniques are still undergoing development and evaluation and are not yet widely implemented.

The radiologist may become involved in the detection of a RFO in 2 completely different situations: at the time of surgery and remote from surgery, as discussed below in detail.

The intraoperative, acute phase

When retention of a foreign object is suspected at the end of surgery, a radiograph of the operative site is obtained, and the radiologist is requested to rule out an RFO. This request is most frequently triggered by a mismatch between the preoperative and postoperative sponge/instrument count; that is, when not all materials are accounted for (**Fig. 1**).

Some institutions (eg, Mayo Clinic College of Medicine, Rochester, MN, USA) have implemented the routine screening of all patients who undergo operations involving a body cavity with a postoperative radiograph. The screening takes place in a dedicated radiography suite, before the patients enter the recovery room.³ However, this procedure has not become common practice worldwide, and most surgical facilities do not routinely obtain postoperative radiographs to look for the radiopaque marker in sponges, and for instruments.

Factors adversely affecting the results of the intraoperative radiograph Intraoperative radiographs currently form the main tool for ruling out a suspected RFO. However, they have several shortcomings that limit their value.³

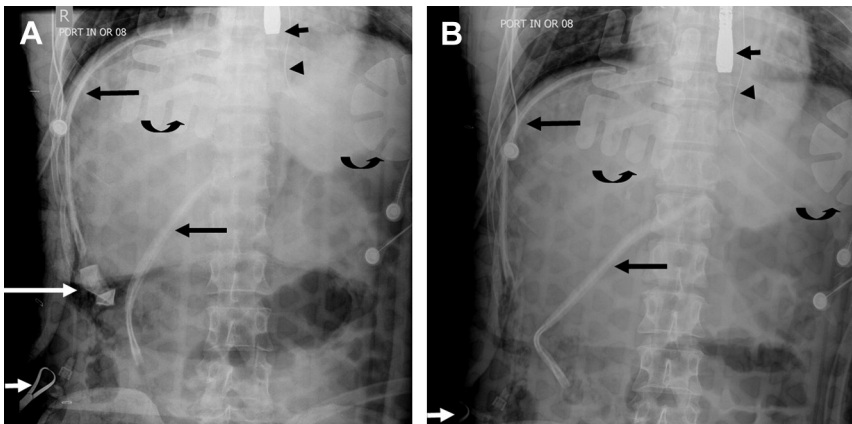


Fig. 1. Retained sponge identified on intraoperative radiograph. (A) Radiograph obtained at the end of laparotomy because of a mismatch in sponge count shows multiple radiopaque densities: an esophageal Doppler probe (*short black arrow*), a nasogastric tube (*black arrowhead*), 2 drains (*long black arrows*), several overlying external defibrillator/pacer pads (*curved black arrows*), clamp (*short white arrow*), and a radiopaque marker within a sponge (*long white arrow*) in the right mid abdomen. (B) Subsequent radiograph after removal of the sponge shows all previously noted radiopaque densities except for the radiopaque marker within a sponge.

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