Imaging of Surgical Paraphernalia: What Belongs in the Patient and What Does Not

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Many radiologists are not familiar with the names of various instruments, surgical sponges, and needles that may be seen on intraoperative and postoperative radiographs. These devices may be intentionally placed for localization or therapeutic intervention, discovered on radiographs obtained to evaluate incorrect sponge or needle counts, or incidentally encountered on postoperative radiographs. These paraphernalia are usually described in vague nonspecific terms in radiology reports. In this article, photographs and radiographs of several instruments commonly used for intraoperative localization or therapy are presented, as well as examples of sponges, needles, and other devices that should not be found on postoperative radiographs. Familiarity with their appearances will allow a more precise and knowledgeable description in radiology reports.

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Introduction

Radiologists are often asked to evaluate radiographs obtained in the perioperative period, yet many of us are not familiar with the names of surgical equipment commonly seen on these radiographs. In radiology reports, surgical devices are frequently ignored or only incidentally commented on in vague nonspecific terms. The presence of these paraphernalia, however, may be important if they were placed intentionally for localization, discovered on radiographs obtained to evaluate incorrect needle or sponge count, or unexpectedly seen on postoperative radiographs (1).

This article presents radiographs and photographs of several instruments, sponges, and needles seen on perioperative radiographs (2). Images are provided of a nerve hook, forceps, clamps, bone curette, and periosteal elevator; sponges, dissectors, needles, antibiotic-impregnated beads, and sutures; as well as a wing nut from a retractor and a drill bit. Familiarity with the appearance of these objects will allow a more precise and knowledgeable description in radiology reports.

Figures 1-3. (1) Nerve hook used for localization is depicted on an intraoperative cross-table lateral radiograph of the spine (a) and in a photograph (b). (2) Kocher clamp used for spine localization is depicted on an intraoperative radiograph (a) and in a photograph (b). (3) Allis forceps used for localization is depicted on an intraoperative radiograph (a) and in a photograph (b).
Figures 4, 5. (4) Bone curette used for localization, between the blades of a retractor, is depicted on an intraoperative radiograph (a) and in a photograph (b). (5) Periosteal elevator used for localization is depicted on an intraoperative radiograph (a) and in a photograph (b).

Things That Belong in a Patient

Findings at Intraoperative Radiography

Intraoperative radiographs are obtained for a variety of reasons, including to help the surgeon localize a region of interest (eg, the spine at spinal surgery) or search for foreign bodies after an incorrect instrument, sponge, or needle count. Both of these scenarios may carry serious medicolegal implications if the radiographs are misinterpreted. Unfortunately, such intraoperative radiographs are often of limited diagnostic quality owing to their acquisition with portable technique, overlying surgical drapes, or the inability to properly position the patient. Familiarity with the radiographic appearance of these instruments can help the radiologist overcome these limitations.

Instruments used for localization (Figs 1–3) are frequently designed to hold tissue for retraction or dissection. Orthopedic surgeons also commonly use bone instruments for localization (Figs 4, 5).
Surgical sponges (Figs 6–10) can be used for removing excess fluid from the field, packing, tissue retraction, or dissection. Radiopaque markers are incorporated into all sponges. Some are interwoven in the sponge itself. Others, such as the lap sponge, have markers located in an attached string or tail. Cottonoids are small square or rectangular pieces of absorbent material with a long string attached that are used, typically in neurosurgical procedures, for packing and hemostasis of small tissues. Peanut dissectors are small wads of absorbent material that are held at the end of a clamp and used for their gripping properties to delicately retract small tissues. Knowledge of the radiographic appearance of these markers not only facilitates their identification but also allows proper specification of sponge type in the radiology report.

**Figure 6.** Ray-tech sponge with interwoven radiopaque markers (arrow in a) overlies the spine on an intraoperative radiograph (a) and is depicted in a photograph (b).

**Figure 7.** Lap sponge made of radiolucent material, with a radiopaque tail overlying the lower lumbar spine (arrow in a), is depicted on a radiograph (a) and in a photograph (b).

Surgical needles (Figs 11, 12) vary considerably in size and shape. They are typically of the atraumatic variety, with the suture material bonded to the needle. Less commonly, the needle may have an eye that must be threaded before use. Both of these needle types may be curved or straight.

**Findings at Postoperative Radiography**

Postoperative radiographs may be obtained for several reasons. The surgeon is often interested in documenting the result of a surgical procedure. In other cases, radiographs are acquired to evaluate for possible complications or search for retained surgical devices. On occasion, therapeutic devices may be intentionally placed at the time of surgery. After surgical débridement of chronic osteomyelitis, for example, materials containing antibiotics may be placed to provide prolonged direct delivery to the involved tissues before a
Figures 8-10. (8) Tonsil sponge with a radiopaque marker and a radiolucent tail is depicted on a radiograph (a) and in a photograph (b). (9) Cottonoid sponge marker is a linear opacity on a radiograph (a) and is depicted in a photograph (b). (10) Peanut dissectors with interwoven markers are depicted on a radiograph (a) and in a photograph (b).

Figures 11, 12. (11) Curved needles are depicted on a radiograph (a) and in a photograph (b). (c) Intraoperative radiograph depicts a curved needle (arrow) lying on a drape that overlies the perineum. (12) Straight needles are depicted on a radiograph (a) and in a photograph (b).
Figures 13, 14. (13) Calcium sulfate beads impregnated with antibiotics, which were placed for treatment of osteomyelitis, are depicted on a radiograph. (14) Radiographs depict infected total-knee arthroplasty (a) and antibiotic-impregnated methyl methacrylate cement spacer placed after removal of the arthroplasty (b).

Figure 15. Bolster (retention) sutures, cut sections of red rubber catheter used to facilitate wound closure, are depicted on radiographs (a, b) and in a photograph (c).

definitive procedure is performed (Fig 13). In the case of an infected arthroplasty when immediate exchange of the components is not desirable or feasible, a methyl methacrylate spacer impregnated with antibiotics may be placed to keep the soft tissues lengthened in anticipation of replacement at a later date (Fig 14).

Wound closure is sometimes not possible immediately after surgery. In these cases, common tubes or catheters may be cut and threaded over suture material to facilitate wound closure with tension (Fig 15).
Things That Do Not Belong in a Patient

Findings at Postoperative Radiography

In general, most of the surgical instruments, sponges, or needles depicted on an intraoperative radiograph should not be seen once the patient leaves the operating room. Nonetheless, these may be found unexpectedly on postoperative images (Figs 16–20). Some objects, such as sponges, have a variable appearance depending on how

Figures 16–18. (16) Radiopaque tail marker (arrow) of a retained lap sponge is depicted on an abdominal radiograph (a) and on a computed tomographic scan (b). (17) Retained Ray-tech sponge (arrow) in the mediastinum after sternotomy is depicted on a radiograph. (18) Retained wing nut (arrow) from a retractor is depicted on a radiograph.
Figure 19. Retained curved needle (arrow) is depicted on a radiograph.

Figure 20. Retained Kelly clamp is depicted on a radiograph.

Figure 21. Acupuncture needles are depicted on radiographs in the soft tissues of the leg (a) and in the paraspinal soft tissues (b).
Miscellaneous Perioperative Findings

Devices related to prior treatment or surgery are occasionally seen. For example, acupuncture needles may remain indefinitely in soft tissues and are usually of no consequence (Fig 21). Surgical devices may be left in the patient simply because they are inaccessible to the surgeon and may or may not be of clinical significance (Fig 22).

Conclusions

A working familiarity with the appearance of various surgical instruments, needles, sponges, and other foreign bodies not only helps the radiologist be precise in radiology reports but also helps recognition of surgical misadventures that may have serious medicolegal implications. Although the examples presented in this article do not compose a complete list, the authors hope that the reader will find them to be a useful knowledge base in clinical practice.

References