Use of computed tomography guidance and mammographic hook wires to remove displaced, embedded contraceptive rods

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Because of dysfunctional uterine bleeding, a patient requested removal of levonorgestrel contraceptive rods. The patient was referred to a general surgeon by her gynecologist who was unable to palpate the rods in the region of implantation in her left upper arm. Initially, the surgeon was able to locate and remove four of the six previously implanted rods. Because these implants are not visible under convention radiography or fluoroscopy, computed tomography was used to locate the remaining two rods. After localization by use of mammographic hook wires, the remaining two rods were successfully removed surgically.

(Key words: Computed tomography, foreign body localization, Norplant subdermal contraceptive system, levonorgestrel system, mammographic hook wire localization)

The levonorgestrel subdermal contraceptive system (Norplant, Huhtamaki Oy/Leiras Pharmaceuticals, Turku, Finland; Wyeth-Ayerst Laboratories, Philadelphia, Pa) comprises six silastic rods, each measuring 36 mm in length and 2.4 mm in width (*Figure 1*). The six rods are placed subdermally in the medial aspect of the arm above the brachial fossa in a fan-shaped array. The six rods contain a total of 36 mg of levonorgestrel crystals. Approximately 30 μg of levonorgestrel is released into the bloodstream per 24 hours via diffusion through the silastic rods. The levonorgestrel release provides sustained contraception for a 5-year period.[1] One of the complications of removal of this system is incomplete extraction resulting from displaced or embedded rods.[2] Our literature search did not reveal statistics on the frequency of this complication.

We describe the localization of two deeply embedded levonorgestrel subdermal contraceptive rods by placement of mammographic hook wires guided by computed tomography (CT). These contraceptive implants are not radiopaque on conventional radiographic imaging. Consequently, we used CT scans to locate the rods. Mammographic hook wires were used for localization to ensure a proper cut-down site after the arm was prepared in the operating suite.

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Report of case

A 29-year-old woman sought to have the levonorgestrel contraceptive system removed 1 year after implantation because she had dysfunctional bleeding. This bleeding is reported to be the most significant side effect associated with the levonorgestrel contraceptive system, and it is observed in all continuous low-dose progestogen-only contraceptive systems.[3,4] The patient's gynecologist was unable to remove the six rods as they were not palpable in the medial aspect of the patient's left upper arm above the brachial fossa. The ability to palpate the rods is necessary for efficient and complete removal. The patient was then referred to a general surgeon (J.A.H.).

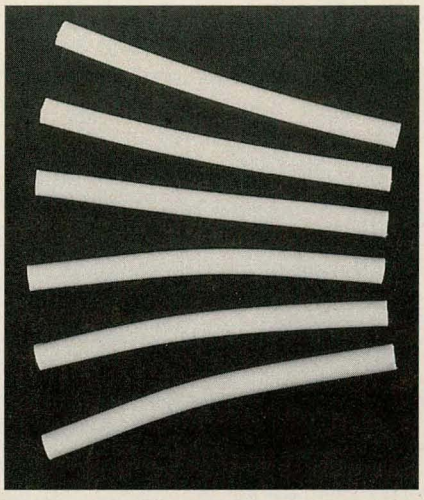

Figure 1. Levonorgestrel subdermal contraceptive rods.

The surgeon made an incision over the site of insertion but was unable to find the rods. The incision was extended and, after 2.5 hours of exploration, only four of the six rods were retrieved. Intraoperative fluoroscopy and radiography were used in an attempt to visualize the rods, but these imaging procedures were unsuccessful. The surgeon then consulted the Interventional Radiology Section for imaging and localization of the two remaining levonorgestrel rods.

High-resolution CT scanning of the left upper arm was done at 4-mm contiguous scan intervals without use of an intravenously administered contrast medium. The images were obtained from the distal half of the left humerus to the midbrachial fossa. The two levonorgestrel rods were found to be embedded under the fascia and within the medial superficial muscle fibers of the biceps brachii muscle (*Figure 2*). After consultation with

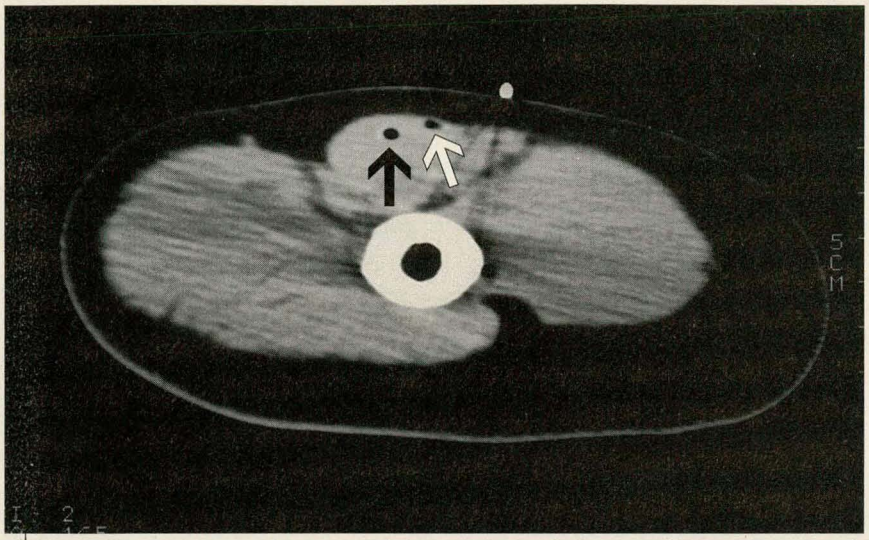

Figure 2. Axial computed tomography image through the distal left humerus. Black arrow: Medial levonorgestrel rod. Outlined arrow: Lateral levonorgestrel rod. Both contraceptive rods are embedded in the biceps muscle.

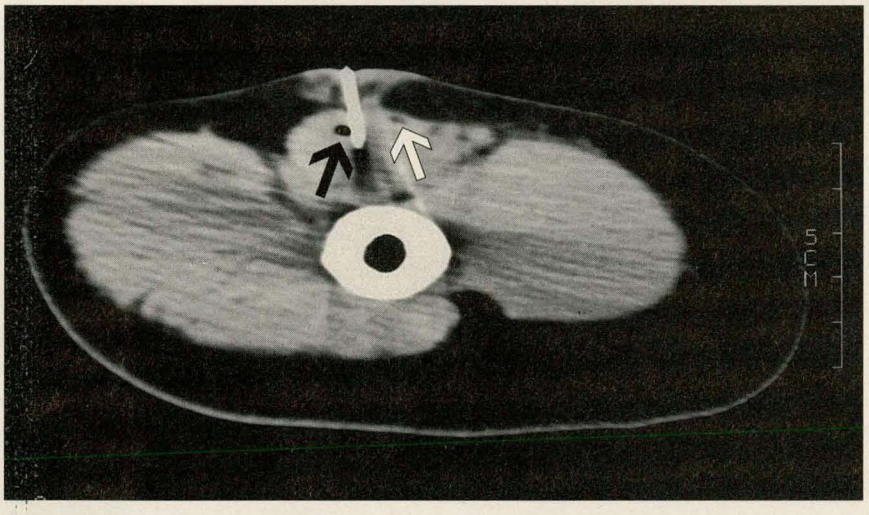

Figure 3. Black arrow: Medial levonorgestrel rod with the hook wire adjacent to it. Outlined arrow: Inferior tip of lateral levonorgestrel rod.

the surgeon, we decided to place hook wires rather than cutaneous markers for localization. This placement would ensure a satisfactory cut down because the hook wires, unlike cutaneous markers, cannot be dislodged during preoperative preparation of the patient.

Computed tomography visualization of the rods demonstrated high-attenuation circles approximately 3 mm in diameter by 35 mm in total length with low-attenuation centers. Cutaneous markers were used for placement of hook wires by the radiologist. These markers were subsequently used before surgical removal of the contraceptive rods. The skin was suitably prepared and draped. The skin and subcutaneous tissues were then infiltrated with a 1% solution of lidocaine buffered with sodium bicarbonate. Two mammographic hook wire needles (Homer Mammoloc, NAMIC Angiographic Systems, Glens Falls, NY) were inserted and the hook wires deployed. The distal aspects of these hook wires are flexible and relatively atraumatic, making their use suitable for this application (*Figure 3*).

The patient was transferred to the operating suite for removal of the silastic rods. The surgeon had no difficulty reaching the rods by cutting down adjacent to the hook wire shafts. However, dissecting out the rods was difficult owing to scar tissue combined with the biceps brachii fascia and superficial muscle fibers. Nonetheless, the surgeon successfully removed both embedded rods intact. The patient tolerated the procedures well and returned to work the next day. The patient has had no sequelae to the CT-guided localization or surgical removal of the levonorgestrel rods.

Comment

Needle localization before surgical excision of nonpalpable breast masses and microcalcifications has been done for many years and has proved to be a useful adjunct to excisional breast biopsy. At the time we performed the described procedure, the use of the mammographic hook wire localization techniques in regions other than the breast had not been reported in the literature. Although intraoperative ultrasound could have been used in this patient, all physicians involved thought that using the mammographic hook wire localization technique was the most expedient and precise method to assist in the removal of the two missing levonorgestrel rods. Therefore, hook wire localization may have a broader application in the retrieval of other nonpalpable lesions and foreign bodies.

References

1. Shoupe D, Mishell DR: Norplant: Subdermal implant system for long-term contraception. *Am J Obstet Gynecol* 1989;160:1286-1292.

2. Akhter H, Dunson TR, Amatya RN, et al: A five year clinical evaluation of Norplant contraceptive subdermal implants in Bangladeshi acceptors. *Contraception* 1993;47:569-582.

3. Croxatto HB: Norplant: Levonorgestrel releasing contraceptive implant. *Ann Med* 1993;25:155-160.

4. Darney PD, Klaisle CM, Walker DM, Ghadially R: The importance of proper insertion of Norplant contraceptive implants. Editorial. *J Fam Pract* 1992;34:545-546.