

Manual for localizing deeply placed contraceptive implants with ultrasound assistance.



This manual was developed as part of the Global Implant Removal Task Force which aims to deliver clear evidence and best practices to offer tangible solutions for identified problems in implant removal services. Members include Bayer AG, Bill & Melinda Gates Foundation, Clinton Health Access Initiative, EngenderHealth, FHI360, Global Impact Advisors, International Planned Parenthood Federation, IntraHealth, Jhpiego, John Snow, Inc., Marie Stopes International, MSD & Co., Pathfinder International, Population Services International, United Nations Population Fund, and the United States Agency for International Development.

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Published by:

Jhpiego Corporation
Brown's Wharf

1615 Thames Street
Baltimore, Maryland 21231-3492, USA
www.jhpiego.org

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Abbreviations

CT	computerized tomography
MRI	magnetic resonance imaging
US	ultrasound sonography

Introduction

Many women use implantable contraceptives, such as Implanon®, Nexplanon®, or Jadelle®, as their method of choice. Implanon and Nexplanon have one rod each, and Jadelle has two rods. Regardless of the brand, a clinician inserts an implant on the inner side of a woman's nondominant arm, approximately 10–15 cm above the elbow. Once it is inserted, the implant is effective in preventing pregnancy for 3–5 years; the time period of the effectiveness varies by brand. If a clinician inserts an implant as indicated in the product guide, then the implant will lie just under the skin and be easily palpable. After 3–5 years, or earlier if a woman chooses, a clinician can remove the implant easily during a simple office visit or clinic procedure. However, in a small number of cases, clinicians cannot palpate an implant because of the following reasons:

- Clinician had inserted the implant deeper than the subcutaneous layer.
- Clinician had inserted the implant in a place other than recommended.
- Clinician had not inserted the implant at all.
- The woman has gained significant weight, and her arms have thickened.
- The implant has migrated away from the insertion site.

Migration has been reported as a possible reason for difficulties in locating implants, especially in the rare case where an implant is deeply inserted in the biceps or triceps muscle or in the muscle fascia. The repetitive pushing (or massaging) of skin above the implant, especially shortly after its insertion, can cause even a properly inserted implant to migrate. It is unlikely for implants to migrate spontaneously since they become encapsulated by fibrotic tissue shortly after insertion; however, some movement of implants (1–2 cm) up or down the upper arm is possible. Though extremely rare, a provider may insert an implant too deep and into a blood vessel. This may cause the implant to migrate with the blood stream, including into the pulmonary artery,¹ but such an occurrence is very rare.

When a clinician cannot palpate an implant, she or he must use radiological imaging techniques to locate the implant in the arm. In such cases, implant removal will require the clinician to possess specific skills as well. **A clinician should not make any attempts to remove the implant until its exact location is identified.**

Purpose of manual

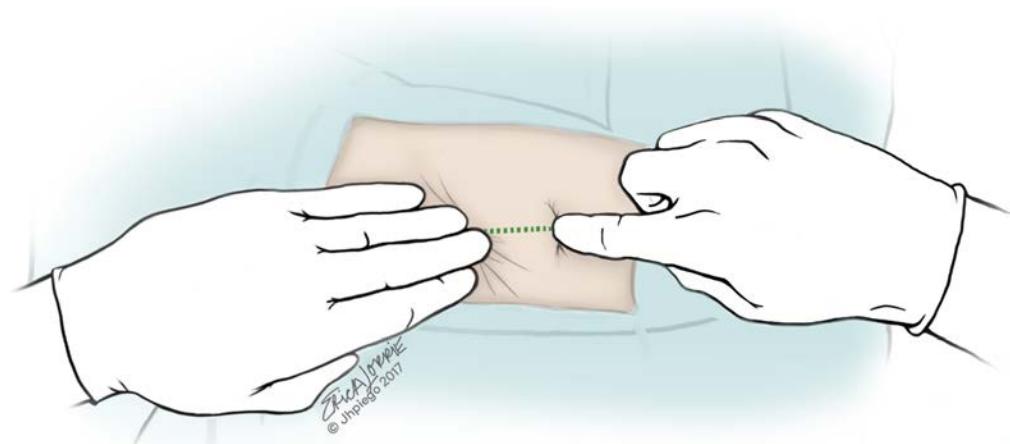
This manual is intended as a guide to help clinicians locate implants for removal that are either deeply palpable or non-palpable.

¹Heudes PM, Querat VL, Darnis E, et al. 2015. Migration of a contraceptive subcutaneous device into the pulmonary artery: report of a case. *Case Reports in Women's Health*. 8:6–8.

Implant localization

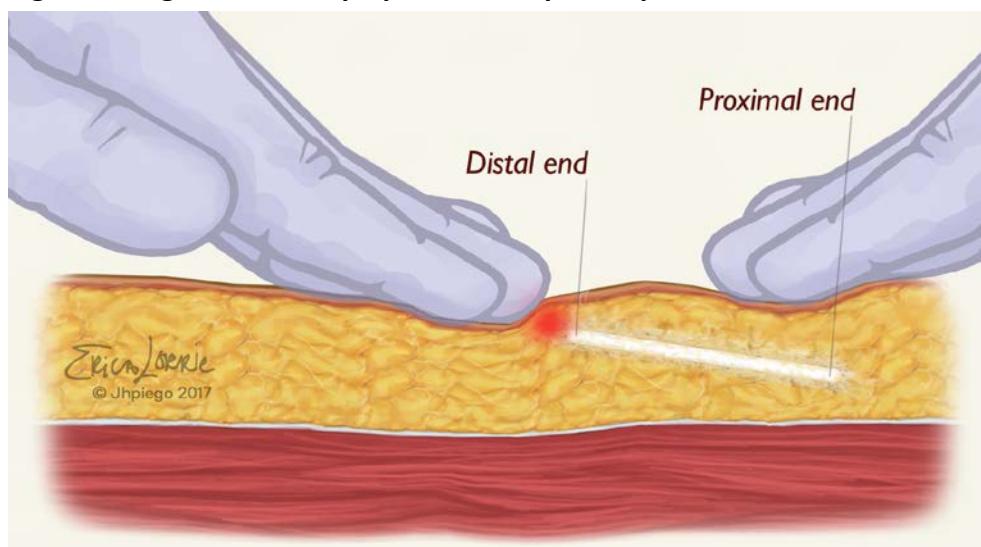
If an implant is not initially palpable, palpate it again by moving your fingers from the proximal end of where the implant ought to be to its distal end, and reverse the order to find the tips of the implant rather than the implant itself (see Figures 1 and 2).

Figure 1. Palpation of the implant tips



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Figure 2. Sagittal view of palpation of implant tips



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If the implant is still not clearly palpable using this technique, then the presence and position of the implant need to be confirmed through radiography. For this radiographic exam, refer the patient to a health care center with experience localizing and removing nonpalpable implants. In the meantime, advise the woman to use a barrier method for contraception in case the implant had not been inserted at all.

Implant localization techniques by brand

Implanon: The Implanon rod is not radiopaque, so it is not visible on an X-ray or a computerized tomography (CT) scan. Therefore, to locate an Implanon rod that is not palpable, use ultrasound sonography (US) or magnetic resonance imaging (MRI) techniques.

Nexplanon: The Nexplanon rod contains barium sulfate, which makes it visible on an X-ray or a CT scan, as well as on US and MRI. An X-ray can approximately locate the implant, but this method is not ideal to identify the exact location of the implant or its depth.

Jadelle: The two Jadelle rods do not contain barium sulfate but are radiopaque, so they are visible on an X-ray (set at 50–55 kV and 4–5 mA with an exposure time of 0.03 seconds) or a CT scan. To locate Jadelle rods that are not palpable through an X-ray, use US and MRI techniques.

US scan is the optimal technique to use for locating Implanon, Nexplanon, and Jadelle implants for their removal.

Ultrasound sonography (US)

US equipment is widely available, and the examination is relatively simple and the method of choice to locate nonpalpable implants. Because Implanon and Nexplanon rods have diameters of only 2 mm and lengths of 4 cm, and Jadelle implants have diameters of 2.5 mm and lengths of 4.3 cm, clinicians will receive best results in locating these implants by using high-frequency linear array transducers.^{2,3} Portable US machines can be used as long as they have a high-frequency linear array transducer (7–14 MHz, preferably 12–14 MHz). When using a transducer with low or intermediate frequency, apply a silicone patch or large amount of gel to enhance the implant's visibility. Another option to enhance the implant's visibility is to scan on top of a bag with intravenous fluid or a latex glove that is filled with water (see Figure 3).

Figure 3. Scanning using bag of intravenous fluid or a latex glove filled with water



Source: Oklahoma University (OU) Children's Physicians. An introduction to pediatric emergency ultrasound. OU website. http://dwulab.com/ed_ultrasound/gels-and-sheaths/. Accessed December 7, 2017.

Before performing the US scan, the clinician needs to know where the implant—or implants in the case of Jadelle—was approximately inserted. The clinician can obtain key information from the patient's user card, if it was used, or by asking the patient the following questions:

1. In which arm was the implant inserted?
2. Where was the implant approximately placed?
3. Was the small scar from the insertion once visible, or is the scar still visible?

For the US scan, position the patient so that she is lying on her back, with her implant arm slightly bent and placed to easily scan the inner side of her upper arm (see Figure 4).

²Mansour D, Fraser IS, Walling M, et al. 2008. Methods of accurate localisation of non-palpable subdermal contraceptive implants. *BMJ Sexual & Reproductive Health*. 34(1):9–12. doi: 10.1783/14711890878332285.

³Walling M. 2005. How to remove impalpable Implanon® implants. *BMJ Sexual & Reproductive Health*. 31(4):320–321. doi: 10.1783/147118905774480770.

Figure 4. Arm placement to scan the inner arm for ultrasound



Photo by Erica L. Chin, Jhpiego.

To optimize the implant's visibility, the clinician may have to change the US equipment's setting before performing the scan:

- Set the focus to a single point rather than multiple points.
- Set the depth of the focus to approximately 0.5–1.0 cm as this is the most likely depth where the implant is located. If no implant is visible at a depth of 0.5–1.0 cm, adjust the focus depth.
- Choose fundamental rather than compound imaging.
- Switch off image processing/enhancing software, so the shadow is not removed. (Advanced US technology automatically reduces shadows to improve image quality. The acoustic shadow of the implant, however, is the key to successfully locating impalpable implants.)
- If using a low-frequency US probe, select the highest frequency available on that equipment.
- Adjustments to the overall or individual gain might increase attenuation through the tissue and aid to better contrast the image.

After applying US gel to the upper arm, position the transducer transversely (at a 90-degree angle to the presumed longitudinal direction of the implant) in the region proximal to the insertion site—usually the inner side of the nondominant arm, approximately 10–15 cm above the elbow. If the insertion location is still visible as a small scar, begin scanning just proximal to this spot.

Identification of Implanon or Nexplanon on US

Key features for identifying Implanon or Nexplanon during **transverse US scanning** are 1) the small echogenic 'white dot' of the implant and, most importantly, 2) the acoustic shadow seen under the implant (see Figures 5–9).

Figure 5. Implant as seen through a transverse US scan



Photo by Merck.

Note: The implant is the little (white) echogenic dot at the top of the acoustic shadow. In this case, the implant is correctly placed superficially, immediately below the skin.

Figure 6. Implant in the biceps muscle, just below the muscle fascia, as seen through a transverse US scan

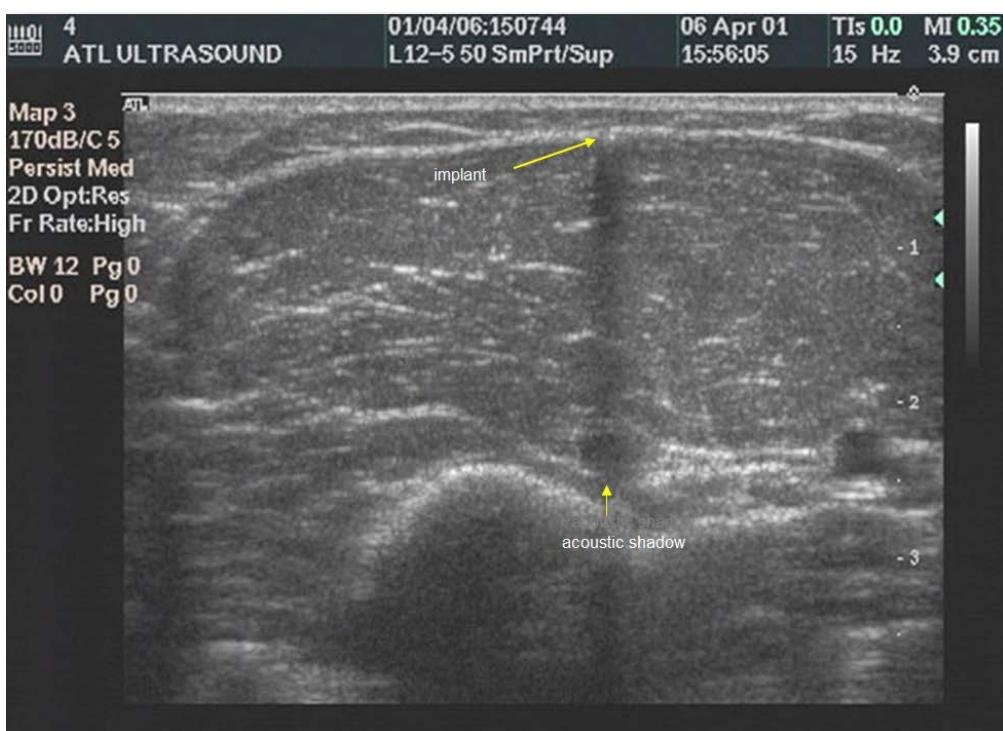


Photo by Merck.

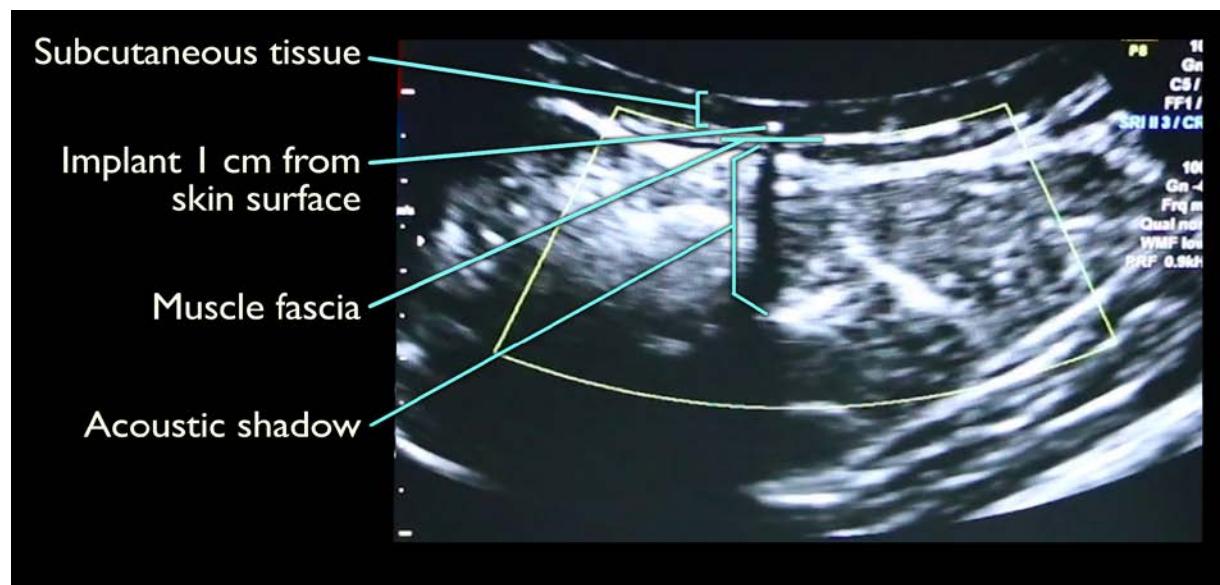
Note: The acoustic shadow is very clearly visible, and the implant is located at the top of the shadow.

Figure 7. Transverse view of an implant deep in the biceps muscle



Photo by Merck.

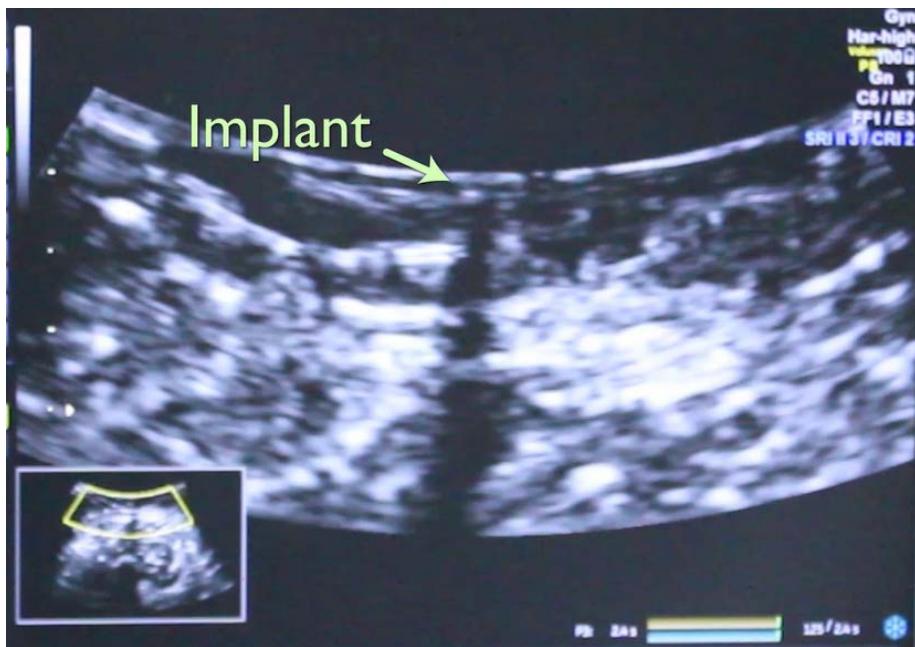
Figure 8. Transverse view of a nonpalpable implant



Ultrasound scan photo by Erica L. Chin, Jhpiego.

Note: This scan used a low-frequency probe of 3–5 MHz.

Figure 9. Transverse view of a nonpalpable implant



Ultrasound scan photo by Erica L. Chin, Jhpiego.

Note: This scan used a low-frequency probe of 3–5 MHz.

Once the clinician identifies the implant during the transverse scanning, she or he then turns the transducer 90 degrees to obtain a longitudinal view of the implant. The rod will appear as an echo-dense “white stick” that is 4 cm in length and at the same depth and location as in the transverse view. In a longitudinal view, the acoustic shadow will usually be less visible or not visible at all (see Figure 10).

Figure 10. Longitudinal scan of an implant in the biceps muscle, seen as an echogenic stick that is 4 cm in length



Photo by Merck.

Note: The acoustic shadow underneath the implant is still visible, but not as clear as it was in the transverse scan.

The clinician can determine the exact location of the implant by first using a transverse US scan, followed by a longitudinal scan. To mark the location of the implant tips, the provider should scan transversely toward each end of the implant and then mark the skin where the white spot has disappeared from the screen. If this is done properly, the implant should be immediately underneath and between these skin markings. The clinician can also read the depth of the implant from the US scan. The markings on the arm and US-measured depth of the implant will tell the clinician of the implant's exact location and approximate depth. If a small incision is made in the middle between the two markings of the tips of the implant, the implant should be right under the incision at the estimated depth. Typically, the US scan will underestimate the actual depth due to probe compressing the tissue. This should be taken into consideration when dissecting down to the level of the implant.

Identification of Jadelle on US

Key features on US for identifying Jadelle during **transverse scanning** are 1) the small echogenic white dots of the implants and, most importantly, 2) the acoustic shadows seen under the implants (see Figures 11 and 12).

Figure 11. Ultrasound of two Jadelle implants in transverse scanning

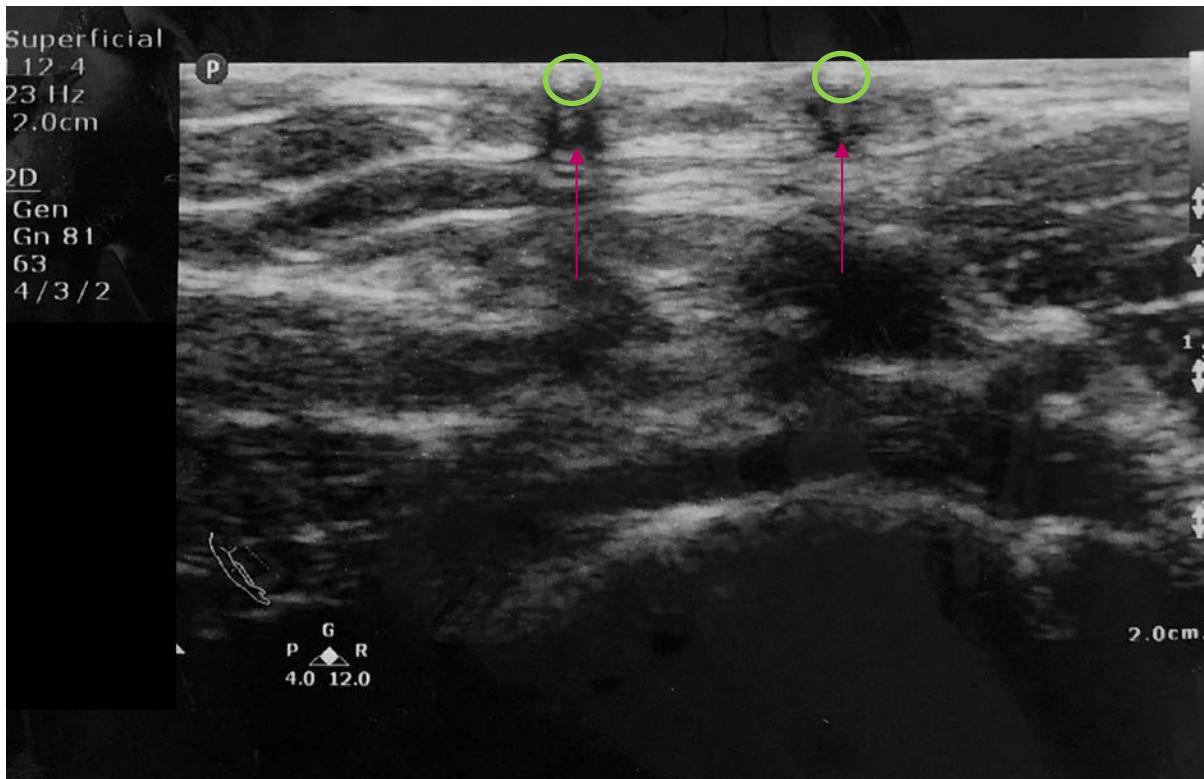


Photo by Bayer AG (from Scan Lab Kitengela, Kenya).

Note: The implants are the little echogenic (white) dots at the tops of the acoustic shadows.

Figure 12. Longitudinal scan of two Jadelle implants, seen as echogenic sticks that are 4.3 cm long

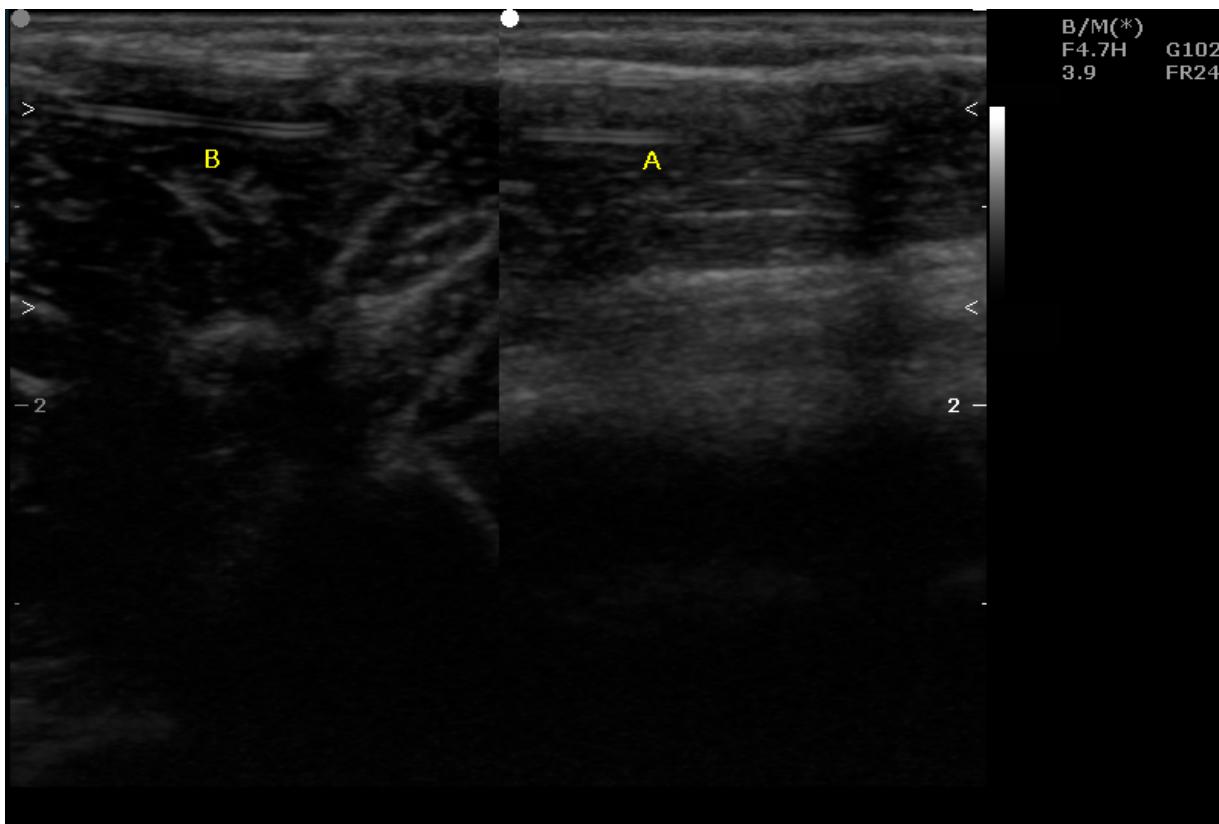


Photo by Pwani Medical Center, Kenya.

Note: The acoustic shadow underneath the implants is not visible in this scan.

Identification of Nexplanon on X-ray

The Implanon rod is not radiopaque and, therefore, not visible on an X-ray. The Nexplanon rod contains barium sulfate, which makes it visible on an X-ray (see Figure 13). Jadelle rods do not contain barium sulfate but can be seen on an X-ray. As X-rays provide a two-dimensional picture, they will give an approximate location of the implant. The exact depth and location is not easy to distinguish on an X-ray because the picture will vary based on the angle under which the X-ray was taken. Therefore, clinicians should perform the US scan at the approximate location of the implant to determine its exact localization and depth prior to removal.

Figure 13. X-rays of Nexplanon in three different users



Photo by Merck.

Note: The pictures provide a good indication where in the arm the implant is located, but they do not provide information on the exact location and depth of the implants. All three implants were inserted correctly and palpable.

Video on localization and removal of deeply placed contraceptive implants

In late 2015, Jhpiego initiated the Implant Removal Task Force, which included its implementing partners and donors in the area of contraception, to identify existing best practices and research and programming gaps in an effort to expand access to quality contraceptive implant removal services. One such activity was to identify any gaps in skills required to remove difficult-to-locate implants and develop resources to address the gaps. This video is the result: Localization and Removal of Deeply Placed Contraceptive Implants (https://www.youtube.com/watch?v=jT49LfcRS_M&t=52s).

The video builds the capacity of clinicians to locate and safely remove deeply placed implants in an outpatient clinic or low-resource setting. This video is also intended for sonographers and other health care providers who help localize deep implants.

Additional information

For more information and resources, please read the Implant Toolkit and Implant Removal Resources on K4Health (<https://www.k4health.org/toolkits/implants/implant-removal-resources>) or email implantrt-admin@knowledge-gateway.org for more information.

