Subdermal contraceptive implants; MRI findings

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Learning objectives

- To review types of subdermal contraceptive implants (SCI)
- To show MRI normal appearance of SCI Jadelle®.
- To distinguish MRI findings of potential pathology: misplacement/migration, neurovascular injury, infection.

Background

In 1983, the first subdermal contraceptive implant, Norplant®, was approved by the Finnish national drug regulatory authority. Since then, several more implants such Jadelle® (Norplant II) and Implanon®, the most commonly used in Spain, have been registered. A large body of evidence demonstrates the high contraceptive effectiveness and safety of the 5-year levonorgestrel releasing implants Norplant® and Jadelle® (1). Implanon® is a nonbiodegradable, progestogen only single-rod based on an ethylene vinylacetate carrier of desogestrel metabolite etonogestrel (ENG) which is released for a duration of at least 3 years.

Subdermal implants should ideally be inserted into the subdermal medial aspect of the nondominant upper arm, 6-8 cm above the elbow (2) (Figure 1). Norplant® is a six-capsule preparation easily visualized with X-Ray (3), Jadelle® is a two-rod preparation, with a size of 43 x 2.5 mm. whereas newer Implanon® is a single-rod preparation with a size of 40 x 2 mm., visualized with X-Ray since 2013 (4) (Figure 2), easier to insert and remove from subdermal target than Norplant® (2, 5-8).

Imaging techniques such as digital fluoroscopy have been used to remove subdermal implants in the past (9), but ultrasound is considered the "gold-standard" imaging technique to assess the localization for the removal of subdermal nonpalpable implants (10). An implant located just under the skin, under the fascia muscularis or one located deep in the muscle can most often be localized with ultrasound, with a characteristic pattern of an echogenic focus producing a posterior acoustic shadow. Specific settings of the ultrasound machine, such as a high-resolution linear array transducer (10-15 MHz), cancelling of all image improvement processing (multiple focusing, image compounding, adaptive post-processing) or positioning of the focus in the near field are mandatory (11). In a previous study from Singh M et al, positive identification of the implants was achieved in 21 of 23 cases using ultrasound. All 21 Implanon® rods identified by ultrasound were successfully removed. No implant was detected in two cases and etonogestrel was not demonstrated serologically in either woman, suggesting non-insertion (12). Perhaps in both patients an MRI might have been an additional option to exclude insertion of
nonfunctional rods. Measurements of serum etonogestrel levels may be necessary to confirm the presence or absence of the implant when it cannot be visualized by either of the two imaging methods (10). In those patients and in other rare cases, subdermal implants could not be localized due to previous scars, major obesity, deep implantation or migration. Under these circumstances, MRI might have been considered the best imaging technique for the unequivocal localization of nonpalpable, ultrasonographically not detectable implant rods (10, 13). In another study, Westerway SC et al published that MRI imaging requires caution when differentiating blood vessels and fibrous septae from the Implanon® rods (14).

We report the MRI findings of two patients carrying nonpalpable Jadelle® subdermal implants. To the best of our knowledge, this is the first study which describes those findings.

Images for this section:

Fig. 1: Jadelle® contraceptive rods should theoretically be inserted with a disposable trocar with CE mark just under the skin of the non-dominant upper arm in the shape of a narrow V, 6-8 cm above the elbow (black lines).
Fig. 2: Female Caucasian patient. Implanon rod. Few subdermal rods are radiopaque. Sometimes it may be inadvertently placed too deep (within the biceps) as seen here in this X-Ray plain film (arrows). Imaged adapted from case courtesy of Dr. Amit Tripathi, Radiopaedia.org.
Findings and procedure details

In this section we will show two patients with nonpalpable Jadelle® subdermal implants, retrospectively selected from our institutions.

Case 1.

A Jadelle® subdermal implant was inserted four years ago in the upper non-dominant left arm of a 29 year old female. One year ago she presented vaginal bleeding disturbances (prolonged and irregular bleeding), and underwent local removal. Unfortunately, only one rod was removed and surrounding soft-tissue was infected (cellulitis). Ultrasound (figure 3) and MRI techniques (figures 4, 5) of the left arm were obtained before a second removal was undertaken with plastic surgery, showing the implant rod among the fibers of biceps muscle without surrounding abscesses or other signs of infection. Postoperative evolution of the patient was successful.

Case 2.

A Jadelle® subdermal implant was inserted two years ago on the upper non-dominant left arm of a 34 year old female. She presented vaginal bleeding disturbances and headaches, and underwent local removal. The implant rod was nonpalpable, and an MRI was done (figures 6-8). Further implant removal was successful.

Images for this section:
Fig. 3: US sagittal view through the medial aspect of the upper left arm could suggest a Jadelle® implant as an echogenic tube line (arrows) placed below the fascia of the biceps muscle.
Fig. 4: MRI SET1-weighted in coronal plane shows a hypointense, well-shaped tubular structure (arrows) measuring 4 cm. compatible with an implant rod.
Fig. 5: MRI SET2-weighted in axial plane shows the same hypointense implant rod (arrow), misplaced among the superficial fibers of biceps muscle, which are isointense. No hyperintense fluid collections suggesting abscesses surrounding the rod are found.
Fig. 6: MRI SET1-weighted image in coronal plane shows a hypointense, V-shaped tubular structures (arrows) measuring 4 cm. compatible with a Jadelle® subdermal implant.
Fig. 7: MRI SET1-weighted image in axial plane shows two hypointense implant rods (arrows) surrounded by hyperintense subcutaneous fat, too close to the Basilic vein (blue arrowhead). Caution is needed to avoid neurovascular structures (nerves median, medial cutaneous and cubital; yellow arrowheads) when rods are inserted or removed and distinguish implant rods from vascular structures in MRI (red arrowheads).
**Fig. 8:** MRI STIR-weighted image in the same axial plane as figure 7. Implant rods remain hypointenses (arrows), whereas Basilic vein (blue arrowhead) and subcutaneous vascular structures (red arrowheads) have changed their signal, so differentiating them from each other. No hyperintense fluid collections or trabecular edema suggesting infection surrounding the rods are found.
Conclusion

Little attention has been focused on MRI findings of subdermal contraceptive implants in radiology literature. Radiologists and gynecologists must be aware of their types:

- Norplant®: six-capsule preparation
- Jadelle®: two-rod preparation, with a size of 43 x 2.5 mm.
- Implanon®: single-rod preparation with a size of 40 x 2 mm.

and MRI findings: hypointense signal on all sequences, sharp margins.

Caution is needed:

- When insertion is made so close to basilic or brachial vein in the medial aspect of the arm. In our opinion an anterior location farther away from the neurovascular bundle would be better.
- Differentiating blood vessels and fibrous septae from subdermal implants.

Accordingly, it is mandatory to report subdermal implant/implants location and furthermore look for surrounding complications such as infection or nerve entrapment. To the best of our knowledge, this is the first study which describes MRI findings of Jadelle® subdermal implants.

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