

Location and removal of non-palpable Implanon® implants with the aid of ultrasound guidance

Madan Singh, Diana Mansour, David Richardson

Abstract

Background Implanon® insertion appears to be an easy procedure, but in a small minority of cases difficulties have been encountered with removal if the rod is impalpable.

Methods Patients were referred to the contraceptive and sexual health service with non-palpable Implanon. Following a clinical assessment and examination of the arm where the implant had been inserted, an ultrasound examination was carried out to identify and locate the implant. These implants were subsequently removed, some under general anaesthesia and others under local anaesthesia.

Results Twenty-seven patients were referred to the unit with impalpable Implanon rods. In four cases the rods were palpable and were removed in the clinic setting without the need for further intervention. Positive identification of the implants was achieved in 21 of the remaining 23 cases using ultrasound. No implant was detected in two cases and etonogestrel was not demonstrated serologically in either woman, suggesting non-insertion. All 21 Implanon rods identified by ultrasound were successfully removed. In just over 52% of women a previous attempt at removal had been undertaken prior to referral.

Conclusions It is possible to identify and locate impalpable Implanon rods with the aid of ultrasound, facilitating their subsequent safe removal. Although previous reports have identified the position of 'lost' implants using ultrasound, this is the first case series to discuss measuring the skin/implant depth. This parameter, together with the precise position of the implant (in muscle or fat), aids removal. All health professionals inserting and removing contraceptive implants should have been appropriately trained.

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Key message points

- Non-palpable Implanon® rods are not radio-opaque but can be identified and located by ultrasound scanning carried out by a skilled ultrasonographer.
- Ultrasound detection facilitates safe and uneventful removal of the contraceptive implant.
- Early referral of women with non-palpable Implanon rods to centres of expertise should be made to avoid unnecessary patient distress. Clinicians should not attempt removal themselves.
- Care should be taken at insertion to ensure subdermal placement of the Implanon rod.

Department of Obstetrics and Gynaecology, Royal Victoria Infirmary, Newcastle-upon-Tyne, UK

Madan Singh, DM, FRCOG, Emeritus Consultant Gynaecologist

Newcastle-upon-Tyne Contraception and Sexual Health Services, Newcastle General Hospital, Newcastle-upon-Tyne, UK

Diana Mansour, FRCOG, FFFP, Consultant in Community Gynaecology and Reproductive Health Care

Department of Radiology, Royal Victoria Infirmary, Newcastle-upon-Tyne, UK

David Richardson, FRCR, Consultant Radiologist

Correspondence to: Dr Diana Mansour, Newcastle-upon-Tyne Contraception and Sexual Health Services, Graingerville Clinic, Newcastle General Hospital, Westgate Road, Newcastle-upon-Tyne NE4 6BE, UK. E-mail: diana.mansour@newcastle-pct.nhs.uk

Introduction

Implanon® is a single, semi-rigid rod containing 68 mg of the desogestrel metabolite, etonogestrel, which is released at a rate of 60-70 µg/day. It provides effective contraception for 3 years. This implant system is inserted under local anaesthesia, subdermally into the upper medial aspect of the non-dominant arm, and is normally invisible. In thin women an impression may be noticeable and the capsule can always be felt if it has been inserted correctly.¹

A number of health professionals in the UK are now inserting this contraceptive implant following completion of a recognised training course and a period of clinical supervision. Many have previously managed women using Norplant®, the multi-rod, levonorgestrel, contraceptive implant system, and experienced removal problems particularly if the capsules were incorrectly inserted. The silastic capsules were then difficult to palpate and often broke during the removal process. Norplant, in common with Implanon, was not radio-opaque. It now appears from the literature and from our own recent experience that similar difficulties – with the exception of breakage – are being encountered with the single-rod contraceptive system.

A literature search on management of impalpable contraceptive implants has revealed different approaches to location of the rods to facilitate their removal. The methods described involved the use of ultrasound, radiology or magnetic resonance imaging (MRI). Creinin and Klaisle² in their case report stated that they were able to identify and remove impalpable Norplant capsules with the aid of radiography. Although initially ultrasound examination was performed, there was some uncertainty with regard to the exact location of the implants using this method.

Letterie and Garnaas³ describe a case in which they were unable to palpate the sixth Norplant capsule during a removal procedure. A plain X-ray film of the upper arm failed to reveal the location of the capsule. Ultrasound examination of the region was similarly unrevealing. Eventual location was accomplished using compression film screen mammographic techniques of the soft tissues at the site of insertion. The capsule was removed in the operating room through a 3 cm incision. The procedure required heavy intravenous sedation and local infiltration because of the deep dissection required to retrieve the capsule.

Several papers⁴⁻⁷ report the use of real-time ultrasound and MRI as a guide for removal of non-palpable and intramuscular Norplant capsules. Nelson and Sinow⁴ were able to remove 64 non-palpable or intramuscular Norplant capsules from 24 women between 1992 and 1997 with the use of real-time ultrasound guidance. Twenty-three of the women had undergone at least one previous removal attempt. Merki-Feld *et al.*⁶ reported on the use of MRI to locate non-palpable Implanon rods that were not detectable ultrasonographically. They stated that they were able to locate a non-palpable Implanon rod only by use of MRI. Westerway *et al.*⁷ in their study found that it was possible to image normal and abnormally placed rods using both ultrasound and MRI. They studied three female

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Figure 1 Ultrasound probe placed perpendicularly to the humerus

volunteers with correctly placed rods and nine non-palpable rods, which were inserted into a leg of pork. All the Implanon rods were successfully imaged with both ultrasound and MRI. However, the authors stated that MRI requires caution when differentiating blood vessels and fibrous septae from the implants. Lantz *et al.*⁸ described the ultrasound characteristics of subdermally implanted Implanon rods. They observed that the implants could be indirectly identified as a result of the posterior acoustic shadow cast by the Implanon rod.

This article is a report of our initial experience of managing women referred with non-palpable Implanon rods. We provide details of an ultrasound technique used to locate the rods and an operative procedure for their removal.

Methods

A total of 27 patients were initially referred to the contraception and sexual health service for assessment and removal of non-palpable Implanon in the period

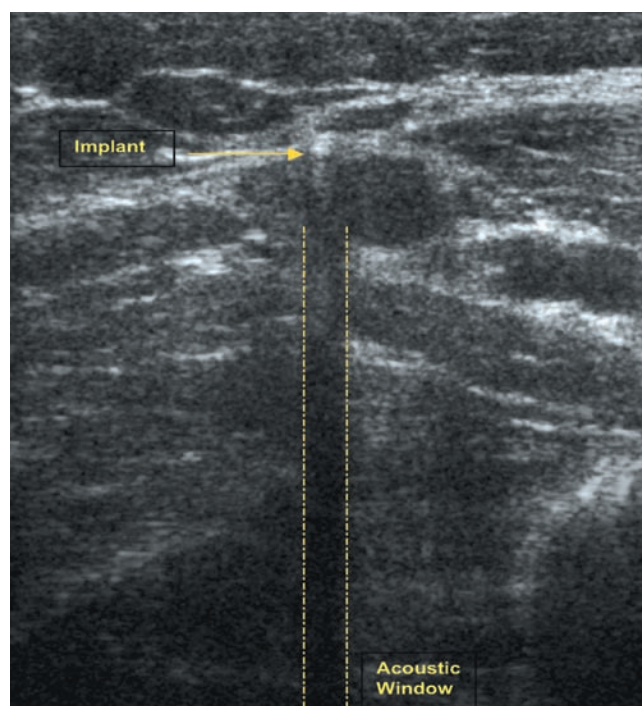


Figure 3 Ultrasonographic image showing Implanon® location in the transverse plane demonstrating the acoustic shadowing



Figure 2 Ultrasound probe placed longitudinally to the humerus

2001–2005. All patients were seen initially by one of the authors (D.M.) when a history was taken and a clinical assessment made of the Implanon insertion site. Where the implant was confirmed to be 'impalpable', arrangements were made for ultrasound examination. Another of the authors (D.R.) performed this examination.

The localisation of Implanon was carried out using high-frequency linear array probes (7–10 MHz, Siemens Sonoline Elegra or Toshiba Powervision 7000 machines) with the probe placed directly on the skin with coupling gel. The arm was placed in the same position that is required for removal (usually abducted at the shoulder with the patient's hand behind her head). Scanning was commenced initially perpendicular to the length of the humerus in the region of the insertion scar and then rotated to a longitudinal position (Figures 1 and 2).

The implant is most easily located by the acoustic shadowing created by the rod as a thin, dark wedge extending deep to the rod. A bright 'dot' representing the implant, at the apex of the acoustic shadowing, may be seen. Once this is seen the ultrasound probe is rotated through approximately 90° to be in line with the implant. The bright reflection of the implant is then appreciated (Figures 3 and 4).

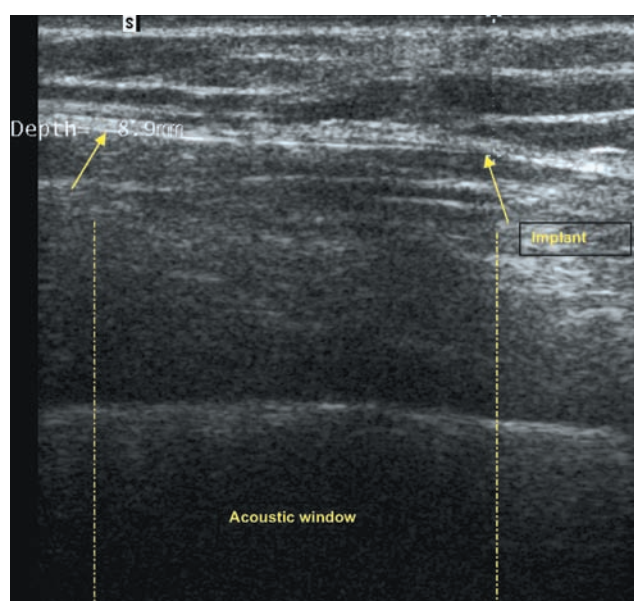


Figure 4 Ultrasonographic image showing Implanon® location in the longitudinal plane

The anatomical position of the implant is established (e.g. in the subcutaneous fat or muscle) and its depth from the skin surface is measured with callipers. The skin is then marked with a marker pen to correspond with each end of the implant in order to facilitate removal. The ultrasound probe causes some compression of the skin and subcutaneous fat, therefore it should be lightly applied to reduce errors in skin/implant measurements.

Following this ultrasound examination, arrangements were made for implant removal in the day surgical unit. Until our experience grew, all impalpable implants were removed under general anaesthesia.

The procedure for removing the Implanon is as follows. Following routine cleansing of the skin and draping of the arm with sterile cloths, a longitudinal incision is made between the previously made ultrasound skin markings. The size of the incision is usually between 1.5 and 2 cm. With careful blunt dissection the implant is first palpated then visually identified and removed using small curved artery forceps. The wound is reconstituted using subcutaneous absorbable sutures. At the end of the procedure, 3–5 ml 0.5% bupivacaine is instilled for postoperative pain relief. The average time duration for removal is approximately 10 minutes. Patients are advised on future contraception and allowed home the same day. Patients are asked to attend their general practitioner or local community clinic for follow up.

Results

Twenty-seven patients were initially referred to our unit with impalpable Implanon rods. Their ages ranged between 22 and 42 years. Some patients were nulliparous and others had between one and three children. In four cases the Implanon rods were palpable at the initial visit and were removed without the need for further intervention. Details and management of the remaining 23 cases are presented.

Table 1 gives details of the time duration since insertion of Implanon, the reason(s) for requesting removal and the number of previous removal attempts. The time interval between insertion and request for removal varied between 1 and 36 months. The patient who requested removal after 1 month complained of persistent

Table 1 Time duration since insertion of Implanon®, reason(s) for requesting removal and number of previous attempts at removal

Case	Duration since insertion (months)	Reason(s) for removal	Previous attempts at removal (n)
1	9	Weight gain	1
2	1	Pain in arm, vaginal bleeding	0
3	6	Pain in arm, vaginal bleeding	0
4	10	Vaginal bleeding	2
5	5	Vaginal bleeding, weight gain, emotional upset	0
6	5	Pain in arm	0
7	9	Weight gain, depression	1
8	11	Migraine, weight gain	2
9	14	Wanted to become pregnant	0
10	24	Vaginal bleeding	3
11	27	Weight gain, irregular bleeding	1
12	4	Nausea	0
13	24	Weight gain	1
14	36	Wanted to become pregnant	0
15	17	Vaginal bleeding	1
16	36	Vaginal bleeding	0
17	28	Partner had vasectomy	1
18	36	Vaginal bleeding	3
19	36	Partner had vasectomy	1
20	11	Vaginal bleeding	0
21	17	Vaginal bleeding	0
22	30	Pregnant	0
23	24	Pregnant	0

Table 2 Ultrasound findings in patients with non-palpable Implanon® rods

Case	Ultrasound findings	Measurements of rod depth (mm)	
		Distal end	Proximal end
1	Implanon lying on biceps muscle	9.1	5.7
2	Implanon identified	5	9
3	Implanon within biceps muscle	5	6.7
4	Implanon identified	5	5
5	Implanon on superficial surface of biceps	7.5	8.6
6	Implanon identified within biceps muscle	4	7.8
7	Implanon within subcutaneous tissues superficial to biceps	6	6
8	Implanon identified	6.5	3.7
9	Implanon identified on surface of muscle	4	4
10	Implanon identified deep in subcutaneous tissues superficial to muscle	4	4
11	Implanon identified	4	7
12	Implanon within muscle	4.5	4.5
13	Implanon within subcutaneous fat	10	10
14	Implanon within subcutaneous fat	7	7
15	Implanon deep to skin surface	6	4
16	Implanon in subcutaneous fat	4	3
17	Implanon subdermal	2	2
18	Implanon on surface of muscle	5	4.5
19	Implanon within subcutaneous fat	5	6
20	Implanon within subcutaneous fat	4	4
21	Implanon 12 mm deep in muscle fascia	12	12
22	Ultrasound showed no evidence of implant. Etonogestrel not detected in blood sample. Conclusion: non-insertion of implant		
23	Ultrasound showed no evidence of implant. Etonogestrel not detected in blood sample. Conclusion: non-insertion of implant		

pain in her arm. Cases 22 and 23 attended for Implanon removal 30 and 24 months, respectively, after insertion. Both were 9–10 weeks' pregnant at the time of referral. Ultrasound failed to demonstrate an implant in either case and etonogestrel was not detected serologically in either patient. We conclude that these were cases of non-insertion of the implant.

The most common reasons for requesting removal were bleeding and weight gain. Depression, migraine, planning a pregnancy and no longer requiring contraception (i.e. partners had undergone vasectomy) were other reasons. In nine cases no attempt was made to remove the implant prior to referral, however previous attempts were made in 12 cases (just over 52% of referrals).

Table 2 gives details of the ultrasound examinations. This table demonstrates two significant findings. In some cases the rod was identified within subcutaneous fat or on the surface of the biceps muscle or in the muscle itself. In six cases the proximal end was seen to be deeper than the distal end, suggesting a downward direction of the inserting cannula at the time of fitting.

With regard to the surgical procedure to remove the implants, 15 were removed under general anaesthesia and six removed using local anaesthesia. In all cases the size of the incision made to remove the implant was between 1.5 and 2 cm. The findings at the time of removal of the Implanon rods equated with the ultrasound examination in that the rods were located either in fatty tissue or adjacent to or within the biceps muscle. However, the implants were located between 2 and 4 mm deeper than suggested by the ultrasound measurements as a result of tissue compression at the time of the ultrasound examination.

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Discussion

This initial review investigating the management of non-palpable Implanon has highlighted several relevant issues. First, we found it possible to locate all 'inserted' implants with the aid of ultrasound but became aware that compression by the probe can artificially reduce the skin/implant measurements. Expertise is required to perform the ultrasound examination. In particular, a high-frequency probe should be used initially in the transverse plane to identify the shadow cast by the implant rather than looking for the implant itself or shadowing in the longitudinal plane. Implanon is not radio-opaque therefore X-ray localisation is not possible.

Second, in cases where we failed to locate the implant by ultrasound we can be almost 100% sure that these represent cases of non-insertion. We have subsequently had two further cases of 'non-insertion' of Implanon that resulted in pregnancy (cases not included in the present series). These rods were not demonstrated by ultrasound scan and serum etonogestrel levels were negative. Recently Harrison-Woolrych and Hill⁹ reported on a series of unintended pregnancies in 127 women purported to be using Implanon. It transpired that in 84 of these cases there was failure to insert the implant. This report, together with the present findings, is worrying. We therefore strongly recommend that following insertion it should be clearly documented in the clinical notes that the implant was easily palpated. Better still, the client should also be encouraged to feel the implant thus confirming its presence.

Third, impalpable Implanon equates with poor insertion technique. The procedure for insertion has been well described but emphasis must be placed on superficial subdermal placement of the implant parallel to the skin. At insertion the skin should be tented when the insertion cannula is advanced. The obturator must be stabilised when the cannula is withdrawn. This will ensure that the implant is palpable and about 1 cm from the insertion point. The present study supports the findings of a previous audit from our unit that suggest impalpable implants result from incorrect insertion rather than displacement due to migration (unpublished data). True migration of Implanon is rare.¹⁰ It is of interest to note that in six of the cases in the present series the proximal end of the rod was noted to be deeper than the distal end, implying that after insertion the point of the cannula was directed downwards rather than parallel to the skin.

We were able to successfully remove all of these impalpable Implanon rods based on ultrasound location. The technique has been modified so that general anaesthesia is now reserved for those women with implants deeply located in muscle. Otherwise local anaesthesia (2–4 ml 2% lidocaine) is employed for more superficially placed implants.

Nelson and Sinow⁴, in their report on removal of non-palpable and intramuscular Norplant capsules, said they used 2% lidocaine with 1:100 000 epinephrine buffered with 8.7% sodium bicarbonate in a 5:1 ratio to neutralise the solution. This was injected beneath the implant under real-time ultrasound guidance. Various instruments were used including straight and curved forceps and a non-grasp clamp (which is a modified no-scalpel vasectomy clamp).

Taneepanichskul *et al.*¹¹ describe a method for removing misplaced Norplant implants using 3 ml 1% lidocaine with 1:100 000 epinephrine for local anaesthesia. A 2-inch 21-gauge hypodermic needle is placed underneath the capsules, thus providing elevation to facilitate their easy removal using mosquito forceps.

Anecdotally, operators have removed Implanon with modified vasectomy forceps under real-time ultrasound guidance.¹² This may be appropriate for implants found within the subcutaneous layer of skin but could cause additional neurovascular/muscular trauma in deeply placed implants.

Conclusions

This review of our management of impalpable Implanon implants, together with a review of the related literature, should alert health care professionals that incorrect placement of the implant can occur even if the initial insertion was performed by staff trained to carry out the insertion procedure. Attempting to fit the implant with inadequate training may further contribute to incorrect placement. Our study has revealed that some implants were placed deeply in fat, adjacent to muscle or even within the muscle rather than subcutaneously. We therefore recommend that staff should at all times follow strict guidelines for insertion.

With regard to removal of impalpable implants, we would advise that early referral to an experienced operator should be made in order to avoid repeated attempts. If the Implanon rod cannot be palpated along its full length we would suggest that no attempt should be made to remove it.

We have demonstrated that it is possible to locate Implanon accurately using ultrasound and this has been reinforced by information obtained from a review of the literature. This examination should, however, be performed by an experienced ultrasonographer. As Implanon is not radio-opaque it is futile to attempt to locate the implant using X-ray. In the event that ultrasound has failed to identify an implant then serological testing for etonogestrel is advised. These blood tests can only be organised via Organon Laboratories Ltd, and such cases should be discussed on an individual basis.

Statements on funding and competing interests

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