Ulnar Nerve Ligation After Removal of Norplant: a Case Report.

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CASE REPORTS

Ulnar nerve ligation after removal of Norplant: a case report

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Introduction

Levonorgestrel implants are an acceptable and effective long-term option for reversible contraception [6, 11]. These synthetic, biologically active progestogen products have been available since 1975 [7] and have undergone many formulation changes. The Norplant system consists of six 2.4×34 mm silicone tubes [6], while newer preparations, such as Implanon, contain only a single rigid capsule [20, 23] and are preloaded for ease of insertion [21]. Norplant has since been discontinued and replaced, however, because of the unavailability of one of its components [36].

As suggested by the manufacturer, Wyeth-Ayerst Laboratories, [6, 30, 44], Norplant capsules are placed subdermally along the medial aspect of the nondominant arm. Through a 2-mm incision, the implants are distributed in a fanlike pattern 6–10 cm proximal to the elbow. Often, the procedure takes less than 10–15 min [44]. The removal procedure generally takes twice as long [21] and involves a 4-mm incision made at the apex of the insertion site, using forceps for extraction of the capsule(s) [30, 44].

While there is evidence of the efficacy and safety of implantable contraceptives [6, 44], both insertion and removal procedures for these implants have been associated with complications. Insertion site complications were noted in 5.9 % of women within the first year of use [15]. Removal complications were reported in 4.5 % of women, most commonly from implant breakage or embedment in the subdermal plane [10]. Further, 48 % of women experienced significant pain during implant removal [12]. We describe a case of significant neuropathy after ulnar nerve ligation during the removal of a Norplant implantable contraceptive.

Case Report

A 38-year-old right hand-dominant female presented for evaluation of numbness and tingling of the left ring and small finger. The patient stated that the symptoms began after a Norplant implantable contraceptive device was removed from her upper arm 3 weeks prior to evaluation. Her implant had been in place for 5 years without complication and had been functioning appropriately. At the time of removal, she noted severe pain radiating distally towards the elbow and into the fingers. In the interim, she also noted increasing difficulty using the left hand secondary to clumsiness, numbness, and tingling. Her past medical history was otherwise unremarkable. The details of the insertion and removal procedures were unavailable for review.

Physical exam showed good range of motion of her neck with limited motion of her left shoulder secondary to guarded positioning of the left arm. Visual inspection revealed a wound 7 cm proximal to the left medial epicondyle, with an exposed braided suture (Fig. 1). A marked Tinel's sign was present at the site of the exposed suture and throughout the distribution of the ulnar nerve. The hand was edematous with decreased active range of motion and inability to abduct the digits. She was unable to flex the ring and small fingers and could not cross her fingers (Fig. 2). A Wartenberg's and Froment's sign (Fig. 3) were evident, as was an early claw deformity. Semmes–Weinstein was noted at 6.65 in the small finger and 4.31 in the ulnar nerve distribution of the ring finger. Static two-point discrimination was >15 mm along the small finger and 11 mm in the ulnar nerve

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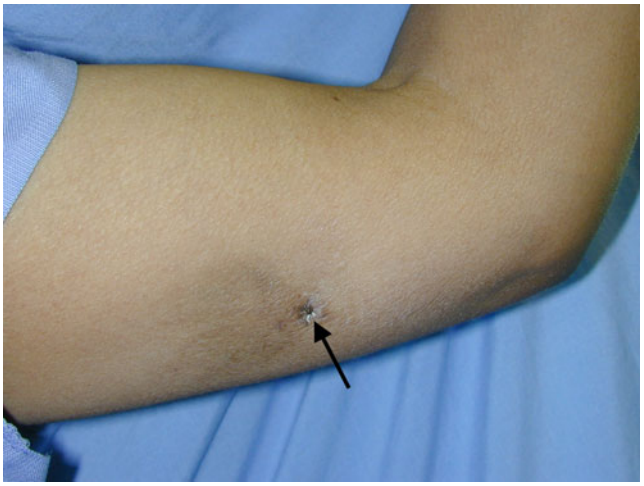

Fig. 1 Preoperative photograph of the left upper arm wound with an exposed braided suture (*black arrow*)

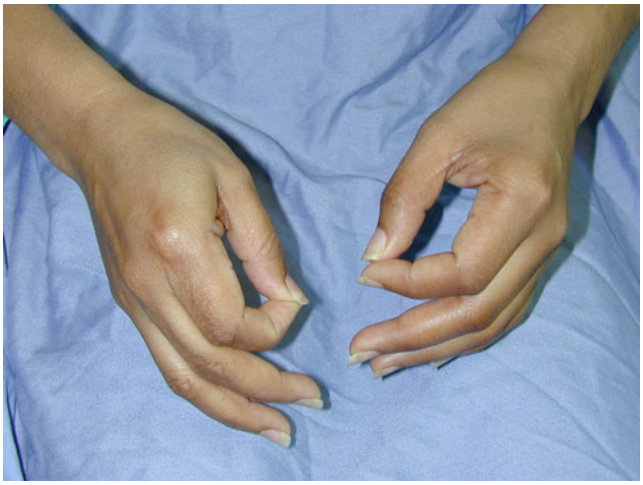

Fig. 3 Preoperative photograph showing Froment's sign

distribution of the ring finger. Tip pinch was 16 lb per square inch (PSI) on the right and 1 PSI on the left. Jamar grip strength dynamometry in the second position was 55 PSI on the right and 3 PSI on the left.

X-ray studies were obtained of the upper arm and elbow and these were unremarkable. Electromyography and nerve conduction tests were notable for an ulnar nerve conduction velocity of 12.93 m/s (nml, >50 m/s) and amplitude of 0.38 mV (nml, >5.0 mV) between the midhumerus and the elbow consistent with severe axonal compromise. Contralateral midhumerus to elbow ulnar nerve conduction velocity was found to be >50 m/s with an amplitude of >5.0 mV. Distal sensory latency for the ulnar nerve was absent. She had 3^{+} sharp waves and denervation changes in the left first dorsal interosseous, left abductor digiti minimi, and left flexor carpi ulnaris muscles. The median nerve latencies and amplitudes were within normal parameters.

Due to the concern for ulnar nerve injury, the patient was taken to the operating room for exploration. The previous surgical incision was incised longitudinally for 5 cm. Within the wound, a large braided suture was noted and, upon further exploration, was found to be completely encircling the ulnar nerve (Fig. 4). A 25 % area of focal constriction was also found. The suture was removed and neurolysis was performed proximally and distally. Due to poor perfusion of the nerve upon release of the tourniquet, epineurotomy was performed under loupe magnification with subsequent improvement of nerve perfusion (Fig. 5). The wounds were then closed uneventfully.

Follow-up was performed at 1, 2, 6, 8, 12, 20 weeks and 1 year. At 2 weeks, her paresthesias were improving, the sutures were removed, and she began hand therapy. At 6 weeks, her elbow and wrist motion had improved dramatically. Her intrinsic function had minimal improvement by 8 weeks. Repeat electrodiagnostic studies showed an

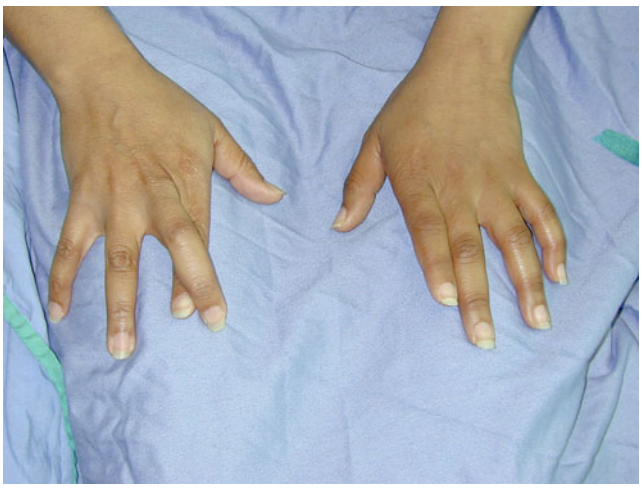

Fig. 2 Preoperative photograph showing inability to cross fingers

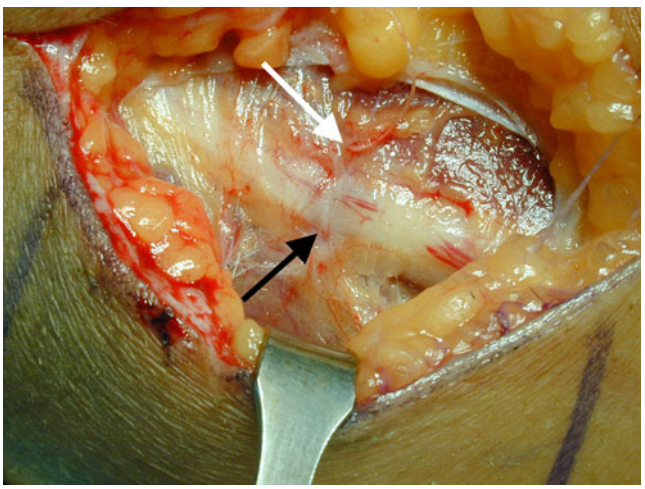

Fig. 4 Intraoperative photograph showing point of constriction (*black arrow*) and suture completely encircling the ulnar nerve (*white arrow*)

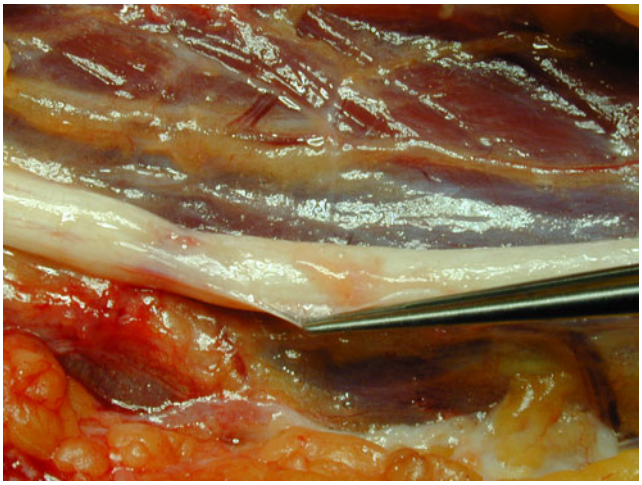

Fig. 5 Intraoperative photograph of the ulnar nerve after removal of suture and epineurolysis

increased ulnar nerve conduction velocity of 37.74 m/s across the zone of injury. A markedly increased motor amplitude (3.41 mV), indicating significant increase in the number of functioning motor axons, was also found. By 20 weeks, her intrinsic function had improved and less clawing was evident. Semmes–Weinstein was noted at 4.31 in the small finger and 3.61 in the ulnar nerve distribution of the ring finger. At 1 year follow-up, Jamar grip strength dynamometry in the second position was 90 PSI on the right and 55 PSI on the left. Despite these gains, she continued to have persistent first dorsal interosseous muscle wasting.

Discussion

Neuropathy related to implantable contraceptive devices is an unusual, yet potentially significant, situation and has been described previously [37]. Wechtelsberger et al. noted injury to the medial antebrachial cutaneous nerve during both implantation and removal of an Implanon device [43]. Gillies et al. noted two cases of significant median nerve injury following dissection of the arm during removal [13]. Others describe injuries to the musculocutaneous nerve [20] or transient post-operative paresthesias of the ulnar nerve [42]. Osman et al. and Allouch et al. report cases of iatrogenic lesions of the ulnar nerve after insertion of a contraceptive implant [1, 25], while Smith et al. describe a case of prolonged intrinsic muscle weakness after removal of the implant [37]. These risks increase dramatically if the implant is inserted deeply or around the brachial groove where multiple major neurovascular structures are located [32].

When removal is found to be difficult, additional modalities are available to assist with a safe, successful extraction [2–6, 8, 14, 16, 18, 24, 27, 29, 31, 33–35, 38–41, 45]. Multiple authors describe techniques whereby ultrasound guidance can be utilized to assist with implant removal [1, 2, 5, 8, 13, 39]. Such implants can be localized with a 10–14 MHz transducer [11] or, when necessary, magnetic resonance imaging [23]. Use of X-ray and computerized tomography has become obsolete, however, as the currently available implants are not radio opaque [11]. Lastly, Osman recommends removal of a nonpalpable implant or an implant associated with neurological symptoms be done by a trained microsurgeon [25].

Though some removal procedures may be more challenging and require adjunctive maneuvers, nerve-related sequelae typically resolve without surgical intervention. This is, however, the first report of ulnar nerve ligation during the removal procedure and only the second report of surgical intervention for lack of symptom improvement.

A similar case was described by Marin et al. in 1998 [20]. In their report, a 27-year-old female presented with ulnar neuropathy where, upon exploration, the nerve was found to be encased in connective tissue scar. This patient presented with an axonal losing motor and sensory neuropathy after removal of Norplant. Despite surgical intervention, she developed denervation potentials, paralysis of the intrinsic muscles, and a claw hand. The authors concluded that "insertion-site complications are not due to Norplant capsules, but rather because of poor surgical technique on the part of the inserting or removing provider".

More recently, as newer implantable contraceptives have been developed, complication rates have decreased [9, 17, 21, 26] and removal times have shortened [22, 26, 28] owing to the single-tube, semi-rigid design [21], and standardization of techniques. A simple "pop-out" method using a 2-mm incision is commonly employed and has been described previously [21]. Alternatively, some surgeons prefer to grasp the contraceptive with a hemostat after making a small stab incision overlying the palpable implant [19]. Both of these techniques limit unnecessary dissection around critical structures, thereby mitigating risk of injury.

The contemporary physician has a multitude of surgical techniques to assist with a difficult removal [3, 16, 20, 24, 27, 29, 31, 34, 35, 38] and providers are now required to complete a 3-hour Food and Drug Administration-mandated training session prior to performing implant insertions [11]. However, when neurological symptoms persist after removal, we recommend a repeat nerve conduction study at 4–6 weeks, as the vast majority of symptoms are self-limited. With lack of improvement, surgical exploration may be warranted.

An extensive literature search and review of manufacturer instructions for use did not yield evidence for or against placement of these implants into the medial upper arm. While placement of contraceptive implants into the medial thigh has previously been suggested for women with a

paucity of upper extremity subcutaneous tissue [25], it may be considered for all women in the future to prevent such significant complications. Insertion would otherwise be similar and major structures are very easily avoided with limited knowledge of local anatomy. An additional, albeit secondary, reason for implantation into the medial thigh would be the lack of an easily visible insertion and removal site scar.

Conclusion

Mandatory training, increasing experience, and the availability of safer products will undoubtedly decrease the risk of insertion- and removal-associated complications. When pain or minor neurological symptoms persist, a repeat nerve conduction study is warranted at 4–6 weeks. In the rare situation when a patient experiences significant nerve-related symptoms, such as those described in this report, surgical intervention may be required. As with any nerve repair, however, the multifactorial risks of incomplete return of sensibility and muscle function exist. Further, it may be prudent to consider placement of all contraceptive implants into the medial thigh, to minimize risk for injury to major neurovascular structures.

Implantable contraceptives are, by and large, safe, well-tolerated, effective, and cost efficient [43], but their risks can be significant and should be discussed with patients prior to insertion and removal.

Conflict of Interest Statement The authors declare that they have no conflicts of interest, commercial associations, or intent of financial gain regarding this research.

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