CASE STUDY

CONTENTS

# Surgery to remove the plate from the distal radius with simultaneous reconstruction of the lacerated flexor pollicis longus tendon performed under WALANT: A case report

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## ABSTRACT

The tendon rupture was caused by the protruded distal edge of the palmar plate inserted for fixation of the distal radial fracture 2 years earlier. The patient was a 28-year-old patient who had stopped bending the distal phalanx of his right thumb 2 months prior to the presentation.
Performance of anaesthesia and operation is presented in details. The operation went smoothly, bleeding was minimal despite the relatively extensive wound, and the patient felt only little pain at the end of the operation.

**KEY WORDS:** WALANT, distal radius plate fixation, flexor pollicis longus rupture, tendon grafting

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## INTRODUCTION

Isolated injuries to the flexor pollicis longus (FPL) tendon occur when the hand is injured by a sharp object. They are relatively common, especially in young men, they occur at work, household activities, or in fights with sharp tools. Injuries caused by the circular saws are also common, in which, in addition to the FPL laceration, digital and metacarpal bone fractures and nerve injuries frequently occur. A relatively rare cause of damage to the FPL tendon is its rupture due to rubbing against the implant, placed at the distal end of the radius. These fractures are common, particularly in the older population, and one of the methods of surgical treatment is their fixation with the titanium palmar plate. If the implant is placed correctly, there is no need to remove it in the future because it is designed to stay permanently. The plate is made of titanium, does not corrode and is biocompatible. However, if the plate is placed incorrectly (which happens in about 10% of patients), it can cause complications, one of which is a rupture of the FPL tendon, which rubs against the upper edge of the plate and eventually ruptures. This was the cause of the damage to this tendon in the described case: the plate was fixed too distally (distal to the so-called "watershed line") caused the FPL tendon to rupture [1-4].

Repair of tendon injuries are now often performed under WALANT (Wide Awake Local Anaesthesia with no Tourniquet). This method of anaesthesia, performed by surgeons themselves, without the anaesthesiologist assistance, has gained great popularity in the last 10 years. It was developed and popularized by Canadian surgeon Mr Donald Lalonde, who published several papers on the subject and produced a book [1-3]. This contributed to the popularization of this technique, which has been used in the authors' institution for about 15 years [4-6]. In most cases, WALANT is used for minor operations, performed in an out-patient setting, such as carpal tunnel release, trigger finger or Dupuytren's contracture. More complex operation are rare performed in this anaesthesia due to their long duration, greater tissue exposure, which increases the risk of pain for the patient and worsens the surgeon's working conditions. For these operations, brachial plexus block anaesthesia is usually used, and the bloodless field is achieved by a tourniquet inflated on the arm of the patient. The aim of the study is to present a case where a relatively extensive and long-lasting surgery was successfully performed under WALANT delivered by the surgeons themselves and without anaesthesiologist assistance.

## CASE REPORT

The institution headed by the author was visited by a 28-year-old patient who had stopped bending the distal phalanx of his right thumb 2 months prior to the presentation. This indicated damage to the FPL


**Fig. 1**: a). X-ray of the distal radius of the patient at presentation (p-a view); b) X-ray of the distal radius of the patient at presentation (lateral view). Note protrusion of the distal edge of the plate
*Picture taken by the authors*

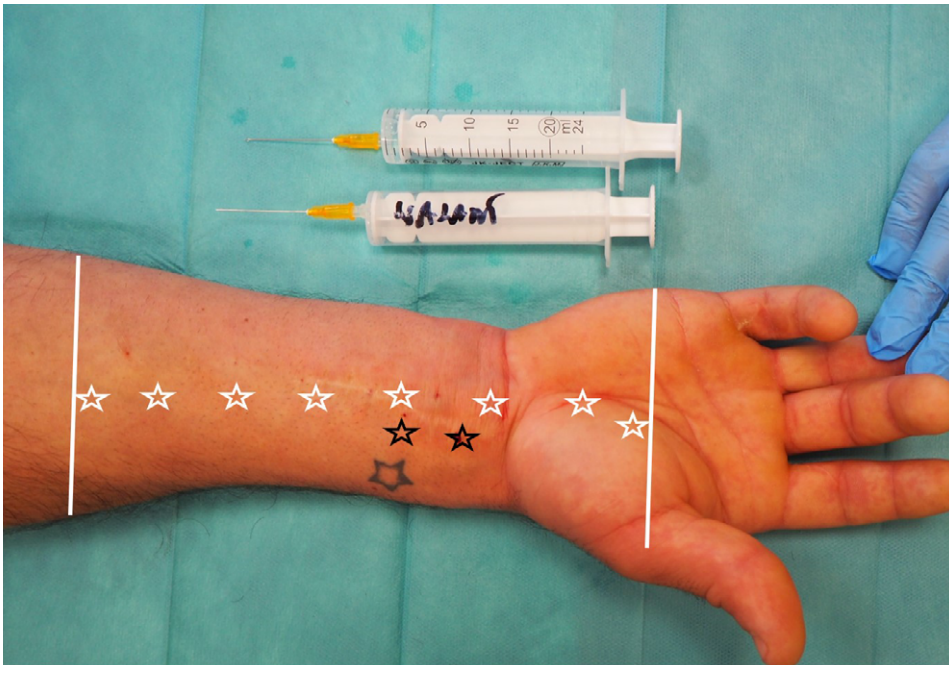

**Fig. 2.** Sites of injection of the anaesthetic solution marked with asterixis
*Picture taken by the authors*

tendon. When asked about the possible cause, he reported that 2 years ago he had underwent plate fixation of the distal radius fracture, which he suffered as a result of a fall from a bicycle. The postoperative course was uncomplicated and the patient regained full function of his hand. The X-ray taken during the consultation showed that the plate is screwed to the bone too distally, which, as mentioned earlier, poses a risk of tera of the FPL tendon on the distal edge of the plate (Fig. 1 a, b). This was the probable mechanism of the tendon damage. The patient has been scheduled for surgery.

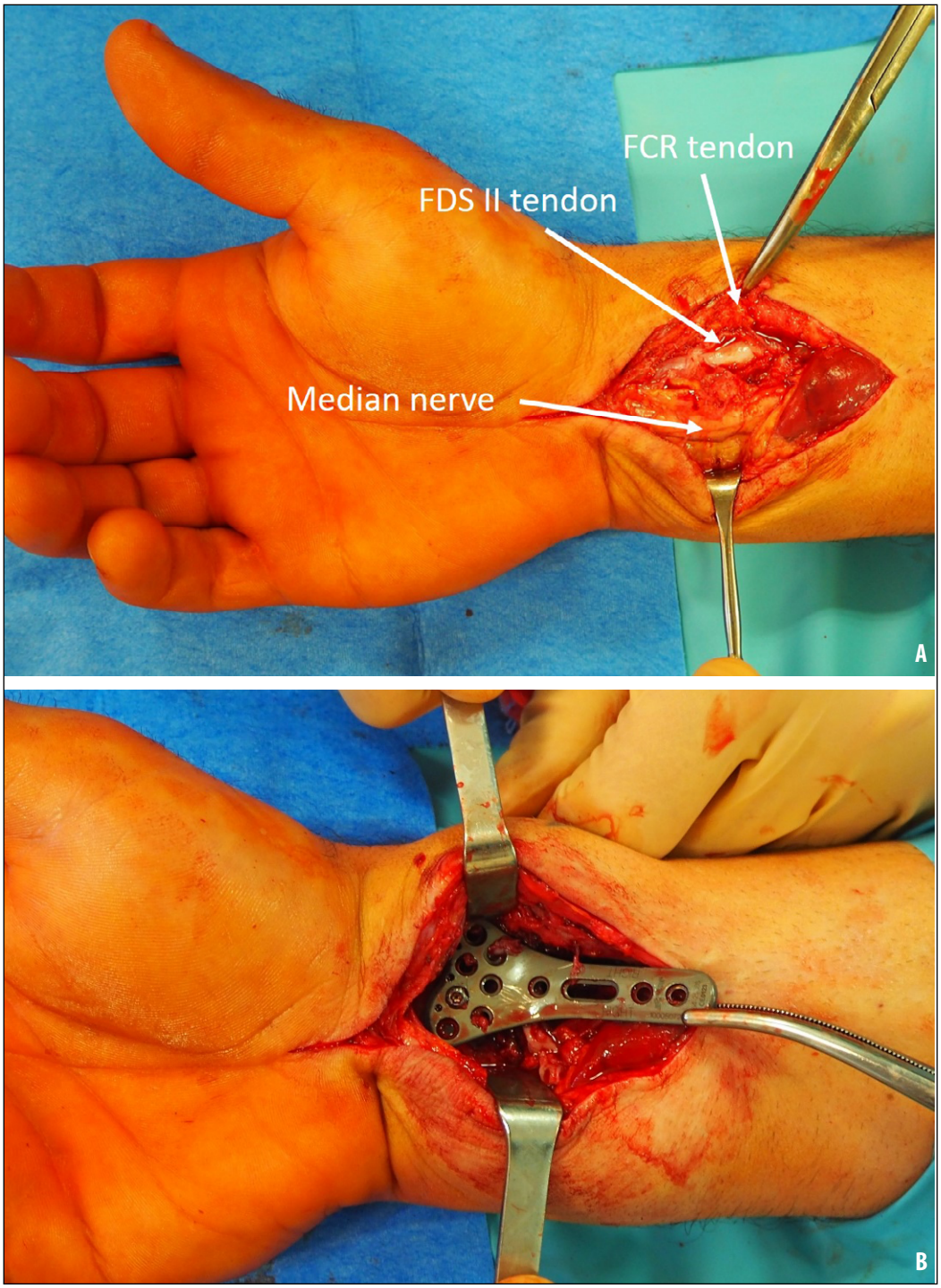


**Fig. 3**: A). Anatomical situation after opening of the forearm. Note bloodless operative field.
B). Removal of the palmar plate
*Picture taken by the authors*

In addition to removal of the plate, a simultaneous reconstruction of the FPL tendon was planned. The standard approach in this situation is two-stage operation: in a first step a silicone rod (tendon prosthesis) is implanted, followed by tendon grafting, 2-3 months after first operation. But after some thought, it was decided to perform a one-stage tendon reconstruction. The premise for such a decision was the zone of damage: III and IV in the Kleinert classification, i.e. areas where the tendons are not surrounded by a fibrous sheath. This location makes it unnecessary to create a canal for the transplanted tendon (palmaris longus, PL), as in the case of flexor tendon reconstruction in zone II. Therefore, for the patient's quicker recovery, it was decided to perform a simultaneous retrieval of the palmar plate and FPL tendon reconstruction using PL tendon graft. Such a complex and supposedly long-lasting surgery is performed as standard under brachial plexus block anaesthesia and with the use of a tourniquet. The authors decided to try to perform it under WALANT, which was a challenge, because such a complex surgery has not been described to date under local anaesthesia.


**Fig. 4.** Additional anaesthesia in the thumb
*Picture taken by the authors*

## THE ANAESTHESIA

The WALANT was performed in the procedure room at the surgical ward, about 15 minutes before the patient was transported to the operating theatre. A 40 ml of a standard solution of 1% lidocaine with added adrenaline at a dilution of 1:100,000, buffered with sodium bicarbonate, was used. To anesthetize a relatively large area, 10 injections had to be made, administering 4-5 ml of solution at each injection. The anaesthesia included the place where the plate was located (the area that roughly corresponds to the scar after the first surgery), but also the area where the PL tendon will be collected for grafting (up to the middle of the forearm) and the area where the distal FPL tendon stump may be located, i.e. on the metacarpal. The injection sites are marked with white stars in Fig. 2. Black stars mark places where the needle was inserted deeply, up to the plate.

## THE OPERATION

The operation was performed without the use of a mobile X-ray device (fluoroscope) and without the assistance of an anaesthesiologist. The surgery consisted of two stages: removal of the plate from the distal radius, and then FPL reconstruction with PL tendon grafting.

## STAGE 1: REMOVAL OF THE PLATE

Removal of the palmar plate consists of the same stages as fixation of the fracture. It even is more difficult due to adhesions which surround implant and soft tissue.

• Incision is made through the scar from previous surgery on the distal part of the forearm, which is extended distal to the wrist. After dissecting the subcutaneous tissue, the FCR tendon is identified and released from adhesions. In the presented case, the median nerve entrapped in the scar was present under the skin and the superficial flexor tendon of the index (FDS II) surrounded by a connective tissue capsule (Fig. 3 a).

• The proximal stump of the FPL was located deeper, at the upper pole of the wound, under the FCR tendon (not visible in the Fig. 3a).

• After dissecting the space between the FCR tendon and the FDS II, the plate was exposed, the screws were removed from it and the plate was separated from the bone (Fig. 3 b).

During this stage of the operation, the patient did not feel any pain and the operating conditions were good.

## STAGE 2: FPL RECONSTRUCTION

Since the FPL tendon rupture occurred as a result of abrasion at the edge of the plate, a large defect of the tendon length was to be expected, and thus the need for a tendon graft. An attempt to find the distal stump at the lower pole of the wound failed, so it was decided to find the FPL tendon on the thumb and then deliver it to the wound on the wrist. However, this required an additional anaesthesia with 5 ml of WALANT solution (Fig. 4).

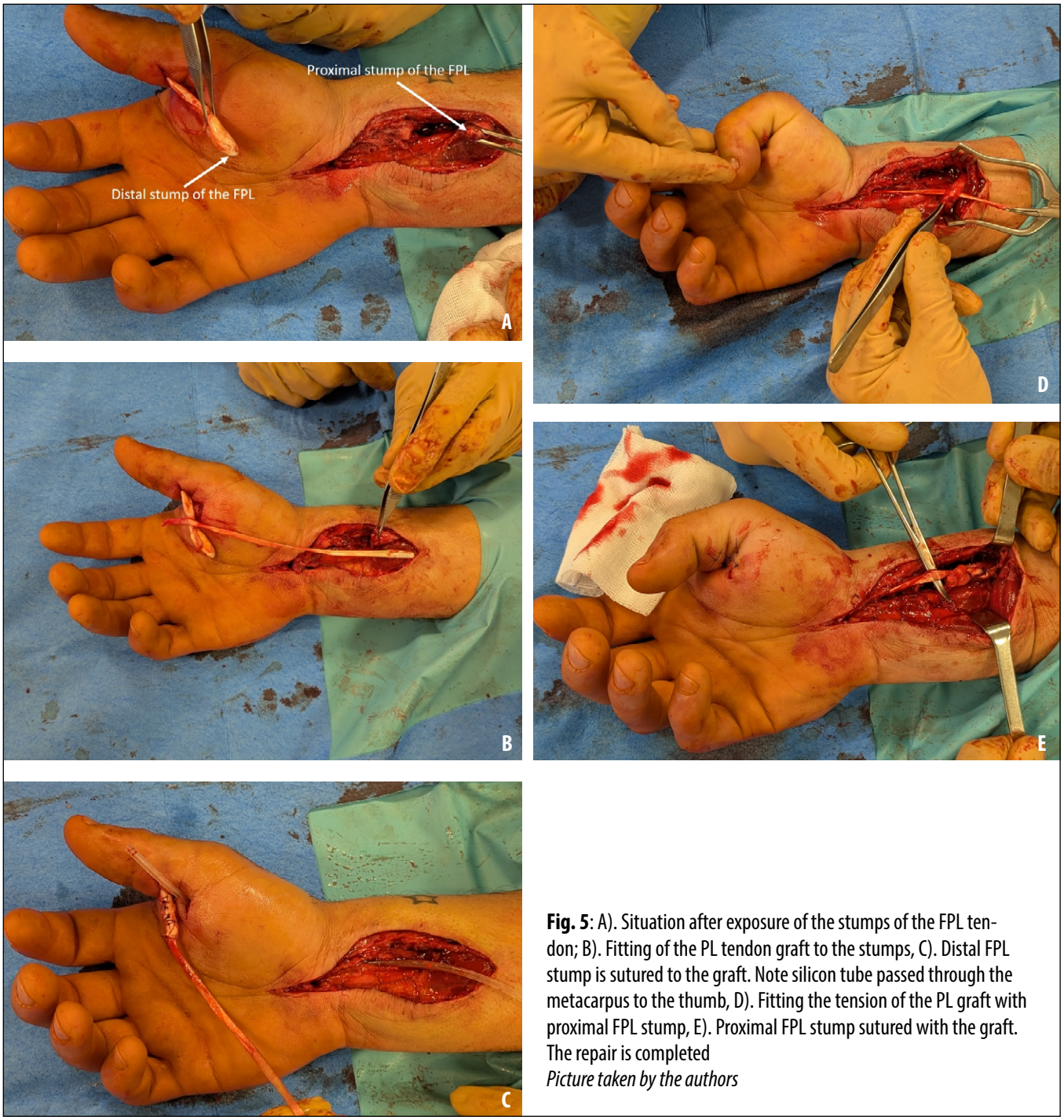


**Fig. 5**: A). Situation after exposure of the stumps of the FPL tendon; B). Fitting of the PL tendon graft to the stumps, C). Distal FPL stump is sutured to the graft. Note silicon tube passed through the metacarpus to the thumb, D). Fitting the tension of the PL graft with proximal FPL stump, E). Proximal FPL stump sutured with the graft. The repair is completed
*Picture taken by the authors*

• After making an incision on the proximal phalanx of the thumb, the FPL was dissected and pulled outwards (Fig. 5 a)

Pulling out the distal stump 2 months after the tendon rupture was difficult due to strong adhesions; considerable force had to be used to "tear" the distal stump from the surrounding tissues.

• Figure 5a shows the situation after dissecting both tendon stumps. Note, that the gap between tendon stumps was about 10 cm.

• The next stage of the operation was harvesting the PL tendon for grafting. After finding its distal end on the wrist and dissecting it from adhesions, the entire PL tendon was harvested with a tenolizer. Fig. 5 b shows the fitting of the PL tendon to the FPL tendon stumps.

• Then, a silicone tube was passed through the space on the metacarpal so that the graft could be pulled through this place without making an additional incision (Fig. 5 c).

• The end of the PL tendon graft was sutured to the distal stump of the FPL using the Pulvertaft technique (Fig. 5 c).

• Then the graft was pulled to the wound on the forearm, after suturing its distal end to the drain.


**Fig. 6**: A). Intraoperative flexion of the thumb, B). Intraoperative extension of the thumb
*Picture taken by the authors*

• After pulling the PL tendon, its free end was sutured to the proximal stump of the FPL tendon. This part of the operation is important because the tendons must be sutured under the optimal tension. After making three "threadings" of the PL graft in the proximal FPL stump, the author keeps both tendons under tension so that the thumb is in flexion and the proximal FPL stump tendon is stretched (Fig. 5 c). The situation after the completion of tendon reconstruction is shown in Fig. 5 e.

• After the repair was completed, the patient was asked to flex and extend the thumb actively to ensure that the reconstruction was performed under the appropriate tension (Fig. 6 a, b).

• Finally, the thumb was immobilized in a plaster splint.

The entire operation lasted 2 hours and during the last 20 minutes, the patient began to feel pain in the forearm, which could be due to the metabolized lidocaine and the cessation of its activity in the tissues. For this reason, the patient was given 100 mg of ketoprofen i.v., which allowed him to comfortably complete the operation.

The WALANT is a new quality in hand surgery which significantly improves conditions of the work of surgeons. The most important advantage is that it can be delivered by the surgeon himself, without the participation of an anaesthesiologist. Compared to simple infiltration anaesthesia, the WALANT makes the conditions of a bloodless surgical field, which usually requires use a tourniquet. Operating under WALANT allows the patient to move with the operated fingers, which is important for control of the quality of the repair performed. The WALANT is suitable for most hand surgeries, both on soft tissue and bones. It is particularly useful for tendon repair and corrective osteotomies of finger bones. In the described case, this anaesthesia was successfully used for a relatively complex operation of removal of the plate and simultaneous reconstruction of the FPL tendon. The operation went smoothly, bleeding was minimal despite the relatively extensive wound, and the patient felt only little pain at the end of the operation.

The literature offers several reports on use of WALANT in various hand surgeries, most of them minor and performed in an out-patient setting. More extensive operations are rare reported and most of them are case reports. The repair of the damaged FPL tendon under WALANT anaesthesia was reported in this journal in 2019 [4]. However, it was a much simpler operation compared to the one reported here.

One of the bigger series comes from the authors' institution. The authors report that in a period of 10 years (2013-2022), a total of 5638 operations were performed under WALANT performed by surgeons themselves. Efficacy of these procedures was 98% in terms of no pain experienced by the patients during surgery. A total of 203 (3,6%) adverse reactions were noted associated with anesthesia, most of them transient, not requiring emergency intervention and without serious consequences. In only 12 cases (0,02%) adverse effects caused cancellation and postponing of scheduled operation. The authors conclude that WALANT performed by surgeons themselves is effective and safe method of anaesthesia for hand surgery operations [6].

Sim et al. (2019), reported results of analysis of 1994 local and regional anaesthesia for hand surgery operations performed by surgeons in tertiary orthopedic department in Singapore. Almost 100% efficacy of anaesthesia was noted. Adverse events occurred in 67 patients (3,4%), but none of them was serious or life-threatening. The authors emphasize benefits associated with non-engagement of anesthesiologists and significant reduction of costs at this setting [7].

Kurzman et al. (2021) presented results of meta-analysis of literature on efficacy and safety of WALANT for surgery on upper limbs. They reviewed 80 papers published in years 2005-2022 and found high level of efficacy, safety and multiply benefits associated with operating without anesthesiologist's assistance: greater availability of surgeries for patients burdened with concomitant diseases, shortening the waiting time and reduction of costs. The reviewed studies show that WALANT allows operating patients at older age, with obesity and other concomitant diseases for whom standard anaesthesia (general or regional) might be dangerous, and who (for this reason) are frequently disqualified by anesthesiologists from surgery [7].

## CONCLUSIONS

To the best knowledge of the authors, the described case is the first in the literature concerning such a complex hand surgery. With the passage of time and gaining experience, more and more complex operations are performed under WALANT in the authors' institution. The authors believe that presentation of this case will be interesting for hand surgeons and will encourage them to extend the scope of operations performed under WALANT.

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**CONFLICT OF INTEREST**
The Authors declare no conflict of interest

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