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Thumb revascularisation: Our experience from a rural healthcare setup

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Abstract

It is fairly usual for traumatic thumb injuries to cause a digital artery to be lost segmentally.

The radial digital artery of the index finger or the superficial palmar arch can be used to reconstruct the ulnar digital artery of the thumb for revascularization in order to close the gap and heal a transacted digital artery.

Better outcomes can be achieved by performing revascularization based on either the radial digital artery of the index finger or the superficial palmar arch, since this avoids the need for two anastomose sites after segmental loss from a crushed ulnar digital artery of the thumb. It is also possible to improve the wounded thumb's venous return by using the digital vein from the index finger.

Keywords: Traumatic thumb injury, digital artery loss, ulnar digital artery reconstruction, radial digital artery, superficial palmar arch

Introduction

Following a crush injury, the choice to proceed with revascularizing the thumb is based on a number of considerations, including as the cause of injury, the patient's age, occupation, and hand dominance, as well as the intraoperative assessment of the affected structures and general medical status. Reconstructive surgeons may face difficulties when treating crush injuries at the base of the thumb that result in the loss of digital artery segments. If there are concomitant fractures, the proximal phalangeal bone may need to be shortened in order to accomplish the challenging primary repair of the digital artery. Due to the fact that lesions in this area frequently cause severe segmental loss of the digital artery, repair of the artery will probably need vein grafting.

Case Report

A 27 year old male sustained a mutilating injury from a cracker blast to his dominant right thumb. He presented to us about 6 hrs from the time of incident.

Age	Sex	Hand dominance	Time to presentation	Mechanism of injury
27	Male	Right (dominant)	~6 hours post-injury	Cracker blast (mutilating)

On examination

- Patient conscious and oriented
- CVS/RS: NAD
- PA: Soft
- No NFND
- Bleeding wound over the right hand
- Right hand:

Lacerated wound over the right thumb circumferentially with near total amputation of the right thumb at the level of the carpo metacarpal junction with exposed bone, tendons and soft tissues.

Deformity over the ring finger at the level of the metacarpophalangeal level.

Aspect	Details
General	Conscious, oriented; CVS/RS: NAD; PA: Soft; No NFND
Local (Right hand)	Circumferential laceration with near-total amputation of thumb at CMC level; exposed bone, tendons, soft tissues
Ring finger	Deformity at MCP level

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Plain radiograph of the right hand

- 1. Dislocation of the right thumb at the level of the CMC joint.
- 2. Undisplaced fracture of the base of the metacarpal of the ring finger.

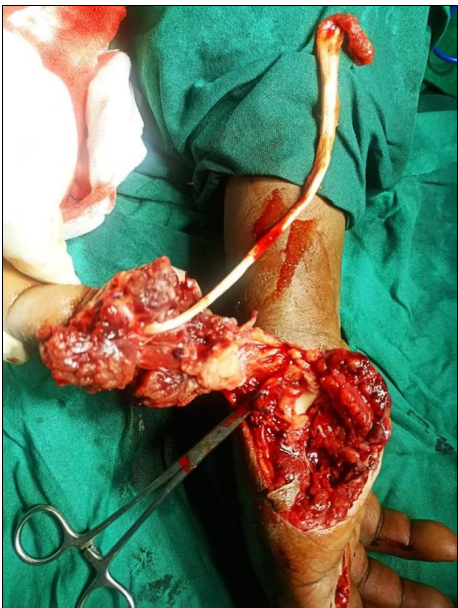


Intraop

- 1. Intraoperatively there was only a dorsal flap measuring about 2cm connecting the nearly amputated thumb to the hand.
- 2. Vessels, tendons and nerves were found to be completely transected and contaminated.
- 3. A thorough wash was given with Povidone Iodine, H2O2 and Normal Saline about 12 litres

4. The wound was thoroughly debrided.

A cut end of a branch of the radial artery was identified, flushed and clamped. The distal portion of the artery was not identified, however a vessel most likely to be a branch of the ulnar digital artery of the thumb was identified and was anastomosed end to end using 6-0 Prolene after flushing and clamping both ends and also after using K wires to stabilise the thumb with the hand.



- 1. The wound was then closed using 2-0 Ethilon and a Functional Slab was applied
- 2. The patient was given antibiotics, vasodilators and Inj Enoxaparin for about 2 weeks

Adequate dressings were done. The thumb was found to be dusky in the initial 1 week post op but with subsequent dressings the thumb was found to be viable, There was also skin peel and CRT was <3secs. The slab was maintained for 6 weeks. He is still on follow up. The plan is to do a tendon transfer on him after about 3 months

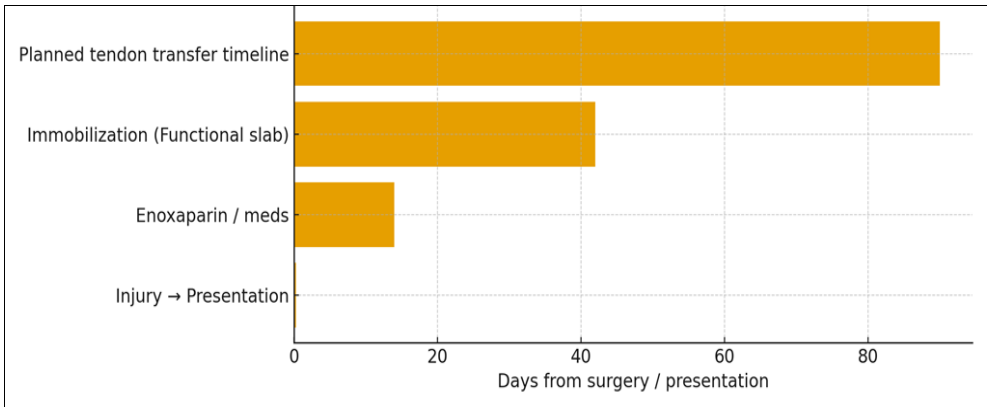


Fig 1: Post-Injury / Post-Operative Timeline

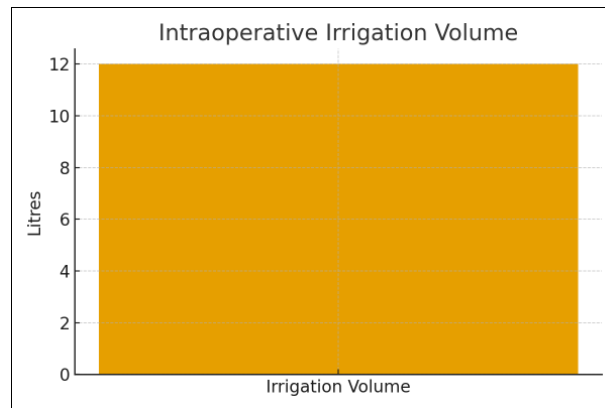


Fig 2: Intraoperative Irrigation Volume



Discussion

Long segments of veins may sustain considerable damage from thumb avulsion injuries, making direct suturing of the structures challenging. The choice to move forward Revascularizing an avulsed thumb relies on a number of variables, such as the injury mechanism, age, occupation, and hand dominance of the patient, as well as the patient's general health and the intraoperative evaluation of the damaged structures. If it is decided to save the thumb through revascularization, two approaches are available: either transfer neighbouring vessels to adequately bridge the gap left by the wounded segment, or employ a vein transplant to repair the segmental loss. The ulnar digital artery should ideally be repaired end-to-end to avoid the requirement for two anastomotic sites, as is the case with vein grafting.

The radial artery's and the ulnar artery's superficial palmar branches combine to generate the traditional morphology of the entire superficial palmar arch^[1]. The radial and ulnar arteries constitute the superficial and deep palmar arches of the hand, which supply the hand's primary blood supply along with a complex collateral circulation system. There are two types of superficial palmar arches: complete and imperfect.

When there are no anastomoses between the radial and ulnar superficial arteries that make up the arch, the latter develop^[2]. Surgeons who do reconstructive hand surgery and restore the functional architecture of the hand should be aware of the variability in the superficial palmar arch pattern. Numerous cadaveric and radiographic investigations have

demonstrated significant variations in the vascular structure of the superficial and deep palmar arches^[3]. The superficial palmar arch is typically formed by the superficial palmar branches of the radial and ulnar arteries. The primary feeding vessel seems to be the ulnar artery^[1]. The anatomical structure of the superficial palmar arch determines the capacity to reconstitute the arterial flow during revascularization of the thumb via the palmar arch or radial digital artery of the index finger.

Additional techniques for revascularizing such injuries include creating an arteriovenous fistula and repairing the wounded section using vein grafts taken from the distal third of the forearm artery shift of the radial or ulnar arteries. One benefit of vein grafting treatments is that the palmar arch does not have to be sacrificed.

The requirement for two anastomoses and the possibility of spasm in the proximal segment of the wounded artery due to its proximity to the trauma zone are drawbacks. This may lead to an unfavourable outcome after anastomosis, requiring further incisions for vein graft harvest and revision surgeries.

Conclusion

For the plastic surgeon, revascularizing the thumb is a demanding and satisfying procedure. A thorough understanding of the superficial palmar arch's anatomical diversity is essential for effective revascularization. Thus, for the purpose of revascularization, it may be safe to transfer the radial digital artery of the index finger, the

superficial palmar arch, or the transected ulnar digital artery of the thumb over the vascular gap.

Conflict of Interest

Not available

Financial Support

Not available

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