Ten Foundational Principles in Hand Surgery: A Primer for Orthopedic Practice

Satvik N Pai[1], Srinivasan Rajappa[2], Madhan Jeyaraman[3,4], Ashok Shyam[5,6]

Learning Point of the Article:

Orthopedic surgeons must develop confidence and competency in managing hand injuries–even without subspecialty training–as many settings lack quick access to hand surgeons.

Introduction

Orthopedics is a very broad field dealing with a wide variety of cases and body parts. Over the past few decades, the field has become further sub-specialized, with arthroplasty, arthroscopy, spine surgery, pediatric orthopedics, limb reconstruction, orthopedic oncology, and regenerative orthopedics emerging as areas of sub-specialization. Another such subspecialty that has emerged is that of hand surgery [1]. While orthopedic surgeons have been performing surgeries on the hand for ages, the recent trend of sub-specialization has left the younger orthopedic surgeons to have limited exposure to hand surgery and the management of hand injuries [2]. It is, therefore, not uncommon to find many orthopedic surgeons who refer most cases related to the hand-to-hand surgeons or plastic surgeons. Despite the increasing number of hand surgeons in large metro cities, their numbers are still few. Majority of the hospitals do not have a hand surgeon or quick access to one, and so orthopedic surgeons will have to continue managing hand injuries to some extent. While sub-specializations increase expertise in a niche area, we must be able to do justice to and treat satisfactorily any orthopedic patient.

Many principles of orthopedics extend into the field of hand surgery; however, there are certain unique aspects of the field of hand surgery that orthopedic surgeons should be aware of. This article is an attempt to highlight those points. We refrain from diving into complex surgical steps or "tricks of the trade" and rather focus on simple, common aspects of the management of hand cases that can have a significant impact on the outcome. These are all aspects that orthopedic surgeons would encounter in the outpatient departments and wards. While it would be an exhaustive list to include everything a hand surgeon would like to teach, we have chosen ten points that we found are often overlooked, or not taught to, or missed by orthopedic surgeons and residents.

Here are the Ten Key Points

Specific involved finger radiographs rather than hand radiographs

When a patient presents with injury to any part of the hand, many orthopedic surgeons immediately ask for a radiograph of the hand, anteroposterior and oblique views. This is usually

Access this article online

Website: www.jocr.co.in

DOI: https://doi.org/10.13107/jocr.2026.v16.i01.6580

Author's Photo Gallery


Dr. Satvik N Pai


Dr. Srinivasan Rajappa


Dr. Madhan Jeyaraman


Dr. Ashok Shyam

[1]Department of Orthopaedics, PES University Institute of Medical Sciences and Research, Bengaluru, Karnataka, India,
[2]Department of Hand Surgery, Sri Ramachandra Medical College and Research Institute, Chennai, Tamil Nadu, India,
[3]Department of Orthopaedics, ACS Medical College and Hospital, Dr MGR Educational and Research Institute, Chennai, Tamil Nadu, India,
[4]Department of Regenerative Medicine, Agathisha Institute of Stemcell and Regenerative Medicine, Chennai, Tamil Nadu, India,
[5]Indian Orthopaedic Research Group, Thane, Maharashtra, India,
[6]Department of Orthopaedics, Sancheti Institute for Orthopaedics and Rehabilitation, Pune, Maharashtra, India.

Address of Correspondence:
Dr. Madhan Jeyaraman,
Department of Orthopaedics, ACS Medical College and Hospital, Dr MGR Educational and Research Institute, Chennai, Tamil Nadu, India.
E-mail: madhanjeyaraman@gmail.com

Submitted: 18/10/2025; Review: 22/11/2025; Accepted: December 2025; Published: January 2026

DOI: https://doi.org/10.13107/jocr.2026.v16.i01.6580

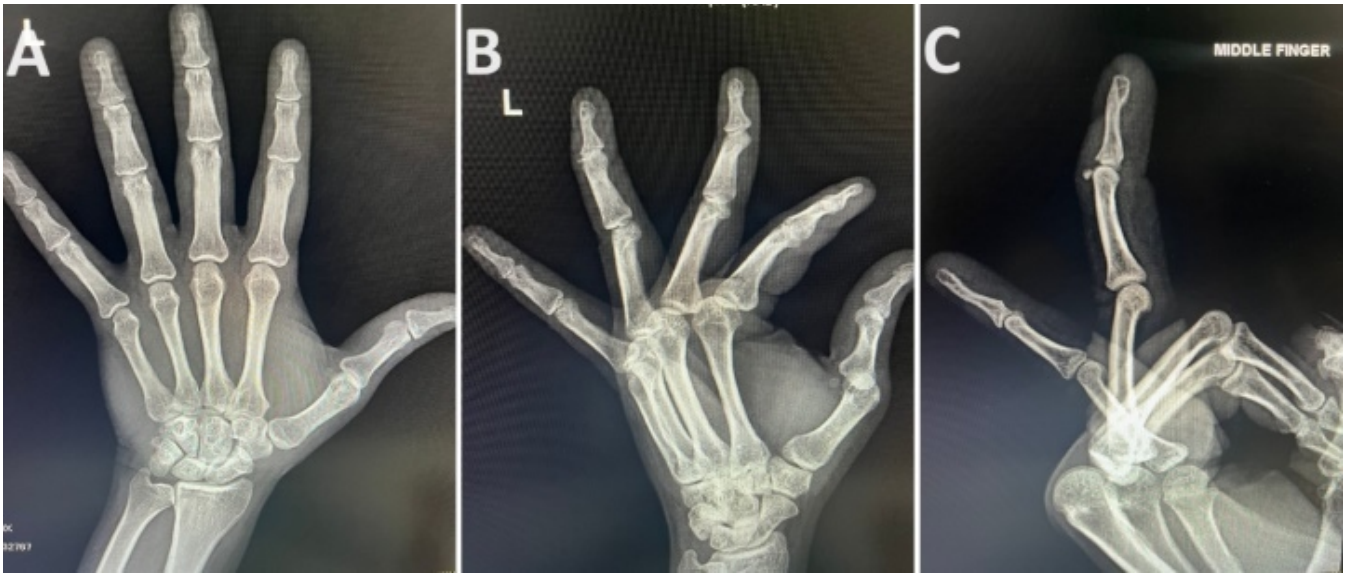

Figure 1: Radiographs demonstrating how a phalanx pathology can be easily missed in radiographs if only hand radiographs with anteroposterior (AP) and Oblique views are done. (a) AP and (b) Oblique radiographs of the hand of a patient who came with a history of injury to the hand with a cricket ball. The radiographs were viewed by an orthopedic surgeon, and the patient was only given analgesics and reassured. © However, when the patient returned a few days later, and a lateral view of the injured finger was done, it showed an avulsion chip fracture of the base of the distal phalanx, indicating a bony mallet finger.

satisfactory for certain injuries such as metacarpal fractures or grossly displaced phalanx fractures. However, this is also the reason for a host of missed diagnosis. Phalanx fractures, interphalangeal joint dislocations, and fracture-dislocations in the fingers are very often missed due to this reason. It does not require the expert eye of a hand surgeon to identify such injuries; it merely requires the correct radiographs to be taken. When a finger injury is suspected, an isolated radiograph of that finger – anteroposterior and lateral views, is a must (Fig. 1).

A contention to this, we heard from some colleagues is that the hand radiograph would identify any concomitant injuries to other digits. To them, we would like to explain that the integrity of the other digits is to always be checked by clinical examination. Radiographs cannot replace clinical examination. If multiple fingers are suspected to be injured, individual lateral radiographs of each of the digits are warranted. While it may

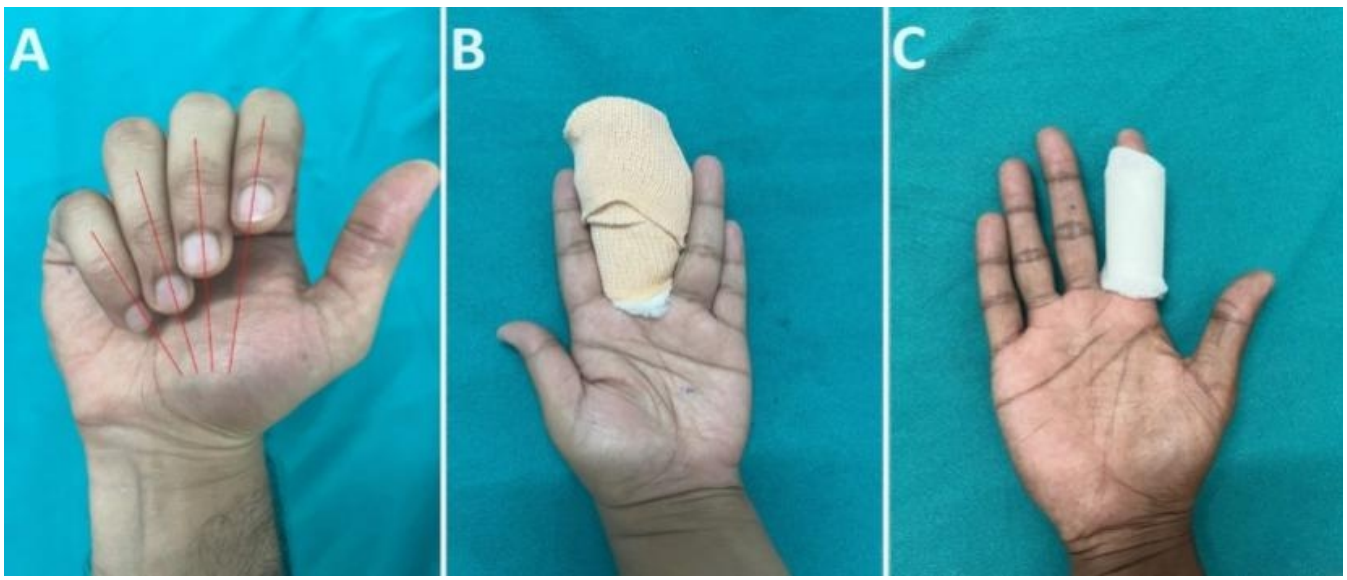

Figure 2: (A) Finger flexion cascade. All the fingers are pointing towards the scaphoid as indicated by the red lines. (B) How dressings should not be done – bulky, restricting the other fingers, not allowing for inspection of the distal tip of the finger. (C) How dressings should be done – covering the operated site only, not restricting the other fingers or joints, allowing for inspection of distal tip of the finger.

increase the expenses to the patient, it must be insisted on because it is definitely rational and indicated. From the medico-legal point of view as well, missing an injury in the other finger due to wrong radiographs can spell real danger for the surgeon.

How to preserve an amputated digit

Traumatic amputations of digits come into the emergency departments, and orthopedic surgeons are the ones called in. Even if the orthopedic surgeon is not going to be performing a replant and has to refer the patient to another doctor/healthcare establishment, it is imperative that the correct preservation of the amputated digit is started at the earliest possible time. Unfortunately, improper preservation of the amputated part is often the limiting factor to potential replantation [3, 4]. Here is a simple description of how an amputated digit must be preserved, along with an illustration:

- If the part appears contaminated, gently wipe the part with a saline-soaked gauze or rinse with saline
- Cover the part with a sterile, saline-soaked gauze
- Then place it in a plastic bag, preferably air-tight
- Place this plastic bag inside another bag containing ice water or ice.

How to apply pillow cover elevation

Elevating the limb following an injury or surgery is an important step to decrease the swelling of the injured/operated region. Pillows are most commonly used worldwide for this purpose. However, keeping an injured upper limb over the pillow does not actually provide sufficient elevation to prevent edema. A very effective method to give elevation to the upper limb is using a pillow cover. This is an extremely simple, inexpensive, and easily available method of ensure adequate elevation of the upper limb.

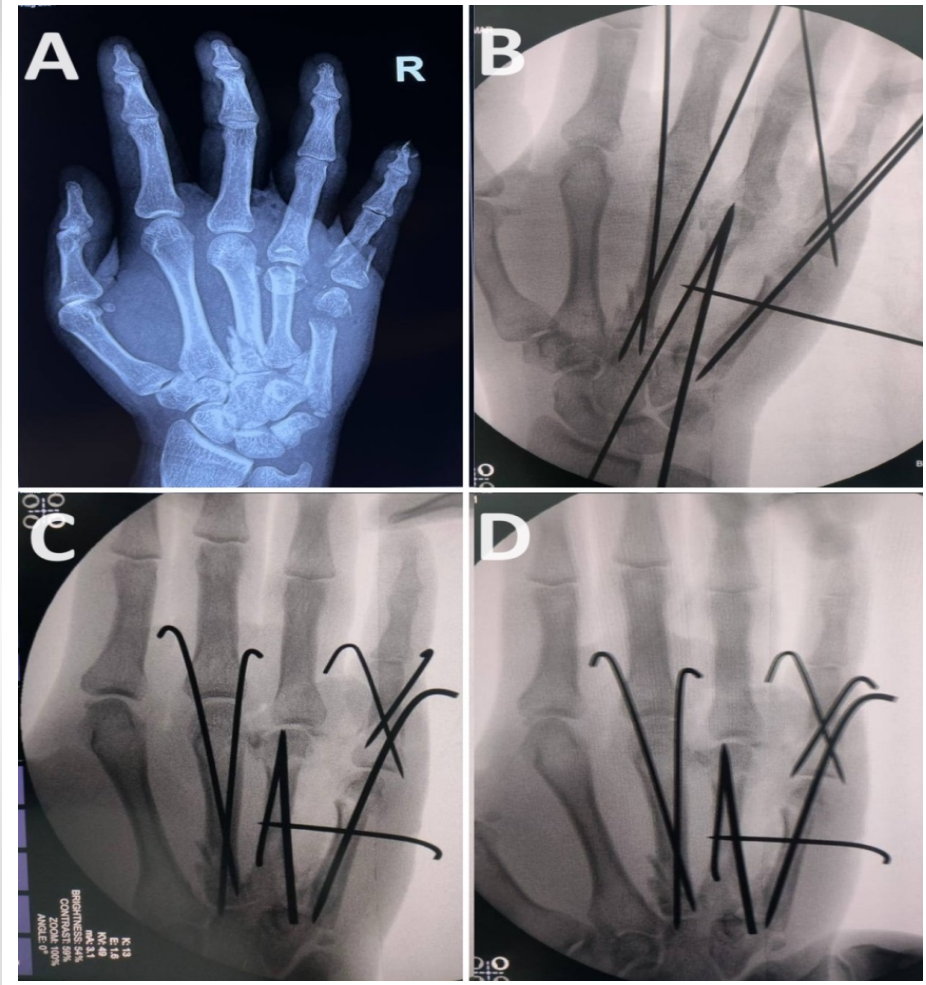

Figure 3: Importance of taking c-arm images after bending the k-wires. (A) Pre-operative radiograph showing multiple metacarpal and phalanx fractures. (B) Intra-operative c-arm images showing satisfactory k-wire placement, before bending of k-wires (C) C-arm image after bending of k-wires. One of the k-wires used to fix the 5th proximal phalanx fracture appears to have retracted/been pulled out partially when bending the k-wire. (D) Taking the c-arm image after bending of k-wires allows you to reposition the k-wires correctly even after bending the k-wire like in this case.

The pinprick test

When patients come with an injury to any digit or hand, it is essential that the vascularity of the part distal to the site of injury is checked. When it comes to the hand, this becomes a little tricky because no major pulse can be felt distal to the wrist. While one should assess the capillary refill, it is a little subjective and may yield inconclusive results at times. The difficulty in detecting loss of capillary refill after pulp pressure is compounded by the loss of contrast between brown skin and blood as compared to white skin and blood, where the contrast would be more obvious and easy to detect. The pinprick test is an objective way to assess the vascularity of the digit [5]. Another advantage of the pinprick test is that it is independent of skin color and swelling of the digit. The pinprick test is reliable even if the color of the fingertip is distorted by grease or other substances. The pin-prick test is performed by simply taking a sterile needle and pricking the pulp of the digit. Ideally, the test is to be done after anesthetizing the digit. We usually use the needle of a 5 mL syringe as it is less painful than larger

needles, but any sterile needle can be used. If the finger is well perfused, a small drop of blood would immediately pour out. If the finger perfusion is hampered marginally, there would be a very minute drop in blood formed after a few seconds. The absence of any bleeding would indicate an absence of blood flow to that part. The test can be done even without having to remove the finger dressing entirely.

The finger flexion cascade

The Verdan's cascade is the position of flexion the fingers adopt when the wrist is passively allowed to drop into extension. The flexed position is greater as we move from the index to the little finger. This is because of the tenodesis effect of the flexor tendons, which happens when the wrist is passively extended. Whenever there is a discontinuity in the flexor tendons, the affected digit lies extended instead of flexed because of the loss of the tenodesis effect. This is classically described as "finger lying out of cascade." It is noted that all the fingers point towards the scaphoid (Fig. 2a). This is a useful guide for the normal alignment of the fingers. This is especially useful in cases of phalanx fractures to assess for a rotational component to the fracture. This clinical test can be used when assessing the acceptability of a fracture for conservative management, intraoperative judgment on the adequacy of reduction of the fracture, and postoperatively to assess the outcome. How to assess fracture malalignment in an injured finger?

There are three displacements that can happen in a finger fracture: rotatory, angular, and axial (shortening). They can happen in isolation or in combination. Rotatory malalignment can be made out by asking the patient to flex the fingers. Normally, the fingers do not overlap with each other as they flex. If there is scissoring (or overlap of one over the other), this indicates that the fracture is malrotated. If the patient is asked to extend the fingers, the finger with an angulatory malalignment (mediolateral plane) will deviate away from the adjacent finger. An easy way is to compare it with the same maneuver in the uninjured hand. Shortening (axial collapse or angulation in the sagittal plane) is detected by asking the patient to extend the finger and observing the extensor lag in the joint distal to the fracture. For example, in a metacarpal neck fracture, this is made out by observing the extensor lag in the proximal interphalangeal joint.

Early mobilization and monitored physiotherapy

When it comes to hand cases, more often than not, early mobilization means really early mobilization. By that, we mean, mobilization is to be started on the operating table itself. Stiffness develops in fingers much earlier than it would in larger joints [6]. So even if a period of immobilization is required, it is rarely ever more than 3 weeks. If only certain movements are to be restricted, one should splint the finger in such a way that the opposite movement is still possible [7]. For example, after fixing a volar fracture-dislocation of the middle phalanx, an extension block splint can be done, which would prevent extension of the proximal interphalangeal joint but allow for flexion of the joint. This room for movement would prevent stiffness of the joint. Only in certain situations, for example, in replantation, etc., the mobilization is delayed.

Like in most orthopedic cases, the physiotherapy for hand cases is of utmost importance. This is further exaggerated due to how fast stiffness can develop in small joints of the hand compared to larger joints. Similar to how orthopedic surgeons may not have sufficient experience handling all types of hand surgery cases; physiotherapists also have limited exposure to specific hand physiotherapy. If hand surgeons are rare, hand physiotherapists are even rarer to find. This puts the onus on the operating surgeon to not only advise the appropriate physiotherapy, but also monitor the same. The surgeon must emphasize to the patient that the post-operative period will include several visits to the doctor for regular monitoring of the physiotherapy. The frequency of visits as well would be more than regular orthopedic follow-ups because a gap of even a few weeks between visits is enough for stiffness to develop, if the patient is not following the physiotherapy advice correctly.

Dressings

As orthopedic surgeons, we love to abundantly pad and compress our dressings. But that is not suitable for hand cases. Extra padding and tight compression do not serve any purpose in hand cases [8, 9]. The purpose of the dressing is to merely cover the surgical site and prevent exposure of the wound to the external environment. Bulky dressings would only limit the room for mobility of other joints and functional use of the hand (Fig. 2b). As far as possible, the distal tips of the finger must be left exposed so as to be able to assess perfusion of the finger regularly. We have witnessed cases where large dressings done for fingers have left no area for the assessment of perfusion, and the necrosis of the distal parts has not been noticeable to the surgeon till the entire dressing was removed for the next dressing change. To avoid the possibility of such an occurrence, dressings have to be small, and wounds need to be inspected often (Fig. 2c). One must also be careful and measured when opening hand dressings, as it is very easy for small k-wires to get pulled out if entangled in the dressing. The initial dressing intraoperative dressing can be made a little bulky to prevent visible excess soakage, which might worry the patient. However, bulky dressings subsequently prevent patients from moving

their fingers adequately, which can result in stiffness.

Right, left, and center

Side and site marking is very important in hand cases [10,11]. One should not only be wary that one is operating on the correct side, but also the correct finger. Prior marking of the operating site is therefore vital. When operating on lower limbs cases in orthopedics, the surgeon has the benefit of being able to check the correct side of surgery after the spinal/epidural anesthesia is given, just before the scrubbing of the limb. However, in hand cases, the nerve block may be administered by the anesthetist as per the side mentioned in the procedure name, even before the surgeon enters the operating theater. This additional safeguard is therefore not present when dealing with upper limb cases being done under nerve blocks. Going a step further, operating on the wrong hand or the wrong finger would be an absolute disaster and would constitute medical negligence. In cases such as trigger finger or chronic injuries, there may be no obvious swelling of the digit to easily alienate the finger involved. One should ideally not depend entirely on the marking of the side and finger on the radiograph, and instead always confirm the side and site of surgery with the patient before the patient is wheeled into the operating theater.

The other aspect that one should take into consideration the side, is when it comes to the functional expectations of the treatment. The requirements of one's right hand are not the same as the left; the contribution to grip strength of the thumb is not the same as the little finger. In addition, the decision-making has to also take into consideration what the patient's profession is. To a software engineer who is required to type on a keyboard, flexion of the distal interphalangeal joint of the index finger may be of utmost significance, while to a laborer, grip strength may be of primary concern. All of these factors must be kept in mind when deciding on the line of treatment and must be weighed in on the cost–benefit analysis a surgeon presents to their patient.

Finesse over power

They say orthopedic surgeons do not really enjoy a surgery unless they've had a few nice, powerful blows at something. Hand cases would, and should, be an exception. Dealing with a hand requires more finesse than power. Sometimes k-wiring does not even require a power drill; mere rotation with a T-handle does the job and is more controlled. Even when it comes to bending of k-wires, one does not need to bend them like Beckham. In fact, small diameter k-wires (1.5 mm or lesser in diameter) in the digits do not require to be bent at all. Bending the k-wire can lead to minor displacement of the k-wire, and that is often enough to disengage a cortex in the phalanx. If bending k-wires, it is recommended to always take c-arm images after bending the wires, even if you have already taken c-arm images before bending them and they looked satisfactory. Here is an example that demonstrates the importance of this point (Fig. 3). Even for the removal of k-wires, it requires one to observe the radiograph for the direction of the k-wires and pull them in the correct direction, rather than brute force being applied in the incorrect direction. The same principle applies to the reduction of dislocations in the hand and the reduction of fracture fragments. If any maneuver in operating hand cases requires a lot of force, it is probably being done wrong.

All of the above-mentioned points are small tips in dealing with hand cases that can improve the outcomes for patients and surgeons. These are all easily incorporable into regular orthopedic practice. Our aim is that this will give orthopedic surgeons more confidence in dealing with hand cases and decrease the need to refer out. That being said, it is important to know what is good in your hand, and what is not, implying we should know what we are trained/experienced to handle, and what we should refer out. We would like to conclude with a thought that we think everyone must keep in mind- the hand does not belong to plastic surgeons, the hand does not belong to orthopedic surgeons either, the hand does not even belong to hand surgeons, the hand belongs to a patient, and we must do justice to the patient.

Conclusion

Effective management of hand cases hinges on a set of core practices that can be effortlessly implemented across various clinical settings. When embraced consistently, these principles not only elevate patient care but also instill confidence in orthopedic surgeons, enabling precise and assured decision-making.

Clinical Message

- Orthopedic surgeons should be equipped with foundational hand surgery principles to manage common cases effectively–even in settings without subspecialty support
- Diagnostic accuracy hinges on targeted imaging (e.g., isolated finger radiographs) and clinical assessment, which prevents missed injuries and improves medicolegal safety
- Simple techniques such as the pinprick test, cascade alignment check, and early physiotherapy promote optimal outcomes
- Thoughtful practices – from appropriate dressings and limb elevation to side/site marking – demonstrate that finesse, not force, is key to hand case management.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflict of interest: Nil **Source of support:** None

References

1. Butler BA, Johnson D, Christian RA, Bigach SD, Beal MD, Peabody TD. Factors influencing subspecialty choice of orthopedic residents: Effect of gender, year in residency, and presumptive subspecialty. Iowa Orthop J 2020;40:19-23.

2. Bellaire CP, Graham EM, Bracey LM, Ferlauto HR, Weliver C, Mendenhall SD, et al. Recent trends in hand surgery fellowship applicants and programs. Surg Pract Sci 2023;15:100228.

3. Sinatro H, Massand S, Ingraham J. Proper preservation of amputated parts: A multi-level shortcoming. Am J Emerg Med 2022;52:155-8.

4. Singletary E, Laermans J, Pek JH, Cassan P, Meyran D, Berry D, et al. Preservation of traumatic completely amputated or avulsed body parts in the first aid setting: A scoping review. Cureus 2025;17:e81998.

5. Pafitanis G, Chen HC. The pinprick test: Key considerations in execution of skin flap perfusion testing. Plast Reconstr Surg Glob Open 2019;7:e2370.

6. Jerome TJ. Open dorsal distal interphalangeal joint dislocations: A report of 20 cases. Orthop Traumatol Surg Res OTSR 2021;107:102852.

7. Madi NS, Townsend CB, McEntee R, Marcus A, Tan V, Beredjiklian P. Hand-specific external fixation for treatment of complex proximal interphalangeal joint injuries. J Hand Microsurg 2024;16:100005.

8. Tantillo TJ, Klein B, Wilson M, Grewal KS, Bitterman AD, Sgaglione NA. Orthopaedic surgical dressings. Orthoplastic Surg 2021;5:9-17.

9. Atlan F, Ashkenazi I, Shehadeh K, Ben-Shabat D, Shichman I, Eisenberg G, et al. Early postoperative dressing removal in hand surgery: Novel concepts for individualized surgical dressing management. Hand Surg Rehabil 2021;40:389-93.

10. Pikkel D, Sharabi-Nov A, Pikkel J. The importance of side marking in preventing surgical site errors. Int J Risk Saf Med 2014;26:133-8.

11. Joseph L, Gulati B, Raju U, Mavaji A, Agarwal V. A multicentric study of practice of surgical site marking. Int J Healthc Qual Patient Centeredness Saf 2020;2:9-14.

Conflict of Interest: Nil
Source of Support: Nil

Consent: The authors confirm that informed consent was obtained from the patient for publication of this article

How to Cite this Article

Pai SN, Rajappa S, Jeyaraman M, Shyam A. Ten Foundational Principles in Hand Surgery: A Primer for Orthopedic Practice. Journal of Orthopaedic Case Reports 2026 January;16(01): 01-06.