

# USG-Guided Percutaneous Thread Carpal Tunnel Release

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## Abstract

### Keywords

- carpal tunnel
- carpal tunnel release
- carpal tunnel syndrome

Ultrasonography (USG) is utilized for the diagnostic and interventional management of patients with carpal tunnel syndrome (CTS). The management of patients with severe and/or refractory CTS includes the surgical (open/endoscopic) release of transverse carpal ligament. With the advancements in the resolution of USG, the release of transverse carpal ligament can be done safely with the help of transecting/cutting devices. We discuss the technical report on the principle of percutaneous thread carpal tunnel release with the help of surgical grade thread.

## Introduction

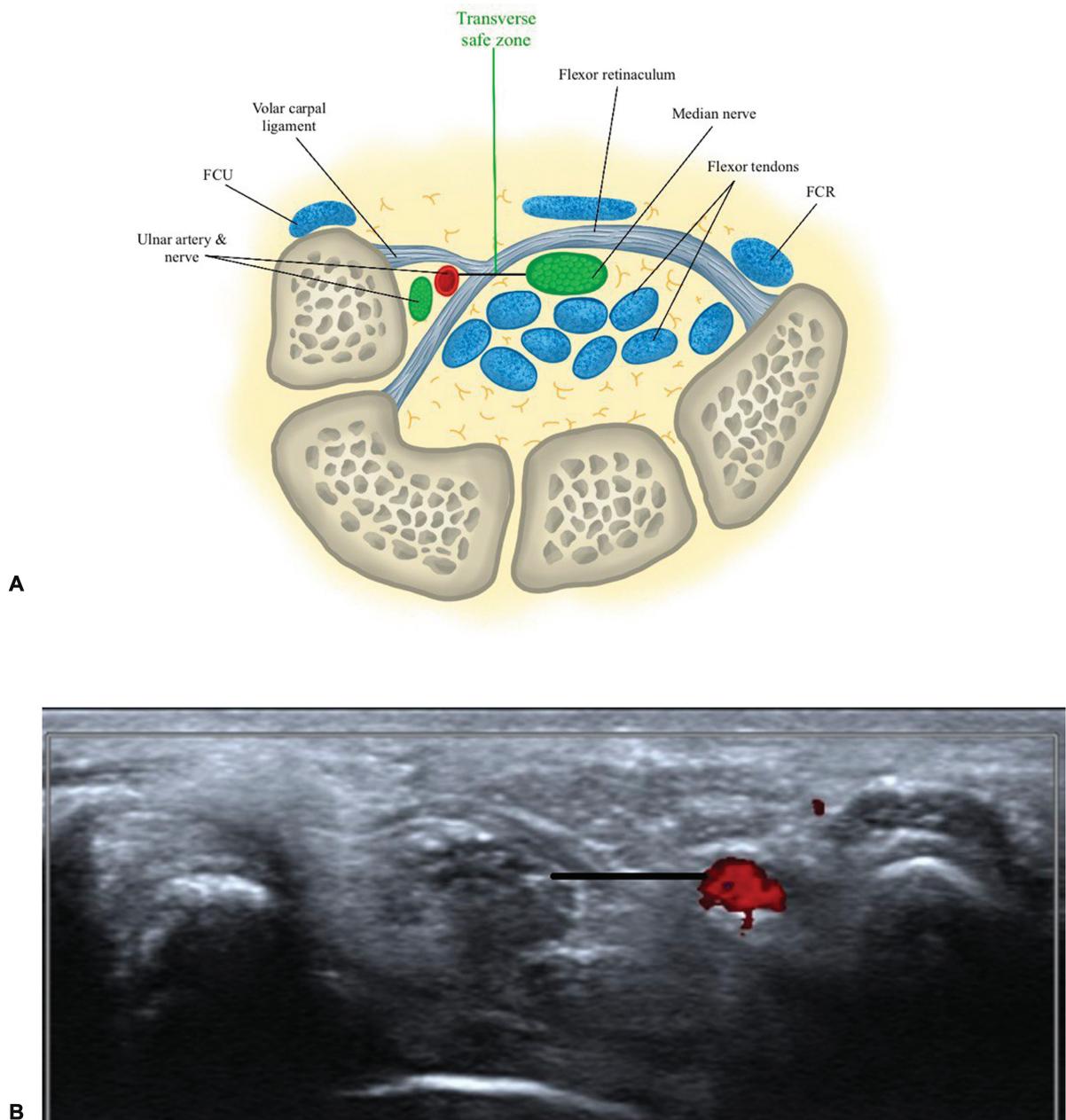
The main indication for the release of the transverse carpal ligament in carpal tunnel syndrome (CTS) is severe CTS (cross-sectional area > 15 mm<sup>2</sup>) with absent sensation or motor weakness/thenar muscle atrophy.<sup>1</sup> Surgical release has the demerits of scar tissue and longer time to return to work. Ultrasonography (USG)-guided release of carpal tunnel allows for the continuous assessment of the anatomy of carpal tunnel including the safe zone making it a safe procedure.<sup>2</sup> It has two needle punctures with no scar tissue and earliest return to work. The main advantage of using the thread is its universal availability and being economical.

## Technique

1. USG to evaluate the safe zones of carpal tunnel which is devoid of neurovascular bundles. The transverse safe zone is between the median nerve and the ulnar artery (**►Fig. 1A, B**). The longitudinal safe zone is the space

between the distal extent of the transverse carpal ligament and the superficial palmar arch (**►Fig. 2A, B**). Longitudinal safe zone of less than 2 mm or transverse safe zone of 0 mm is contraindication for the procedure.<sup>2</sup>

2. Under aseptic precaution, a curved spinal needle is passed through longitudinal safe zone deep to the transverse carpal ligament after hydrodissection with 1% lignocaine. The curved needle is taken out 2 cm proximal to distal palmar crease. Threading the curved needle with medical grade suture leaving sufficient length of suture at both entry and exit points (**►Fig. 3A-C**). The spinal needle is removed and the suture left inside.
3. Reentry at palm with straight needle superficial to transverse carpal ligament. The needle is maneuvered to exit at the same exit point in the wrist (**►Fig. 4A, B**). The free end of the thread from the wrist end is passed through the straight needle and taken out from the palm (**►Fig. 4C**).
4. The straight needle is removed and the loop of the thread one part superficial and another deep to the ligament remains in situ (**►Fig. 5A, B**). USG scan to confirm the position of the thread loop in the safe zone and its relationship with the median nerve and ulnar artery is



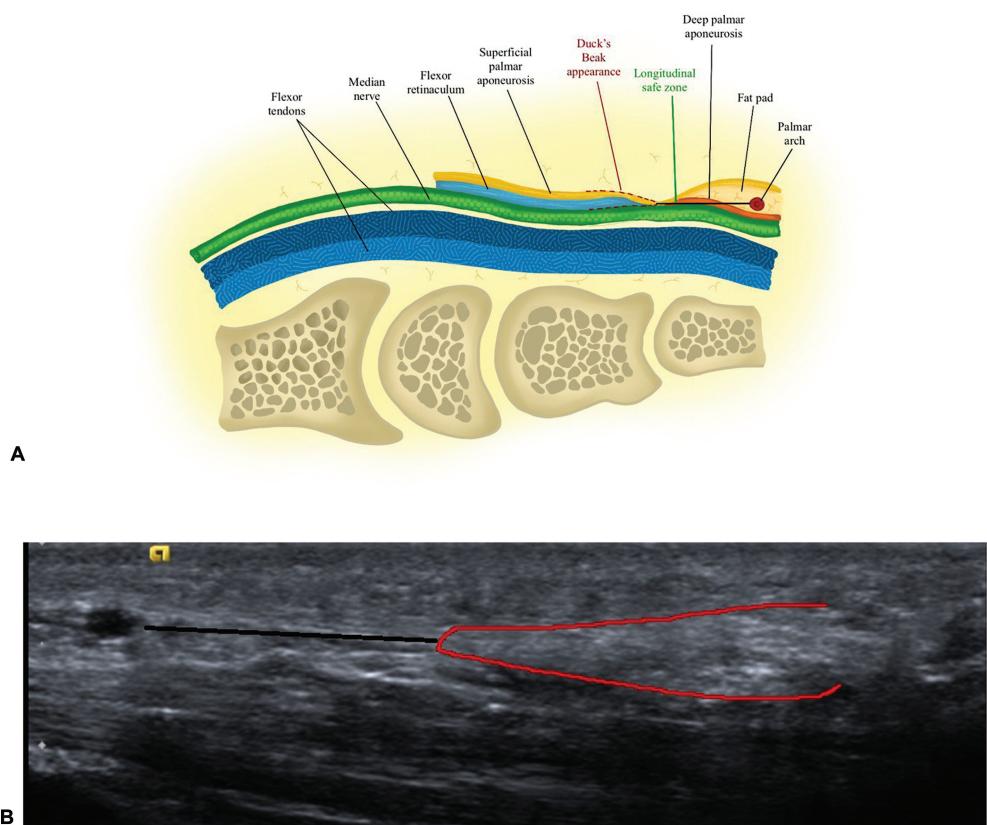
**Fig. 1** (A, B) Schematic image (A) and short-axis ultrasonography (USG) image (B) at the inlet of the carpal tunnel shows the transverse safe zone which represents the avascular zone between the medial margin of the median nerve and the radial margin of the ulnar artery at the inlet of carpal tunnel.

- confirmed prior to initiating the release procedure (**►Fig. 5C**).
5. Manual release of the transverse carpal ligament by alternate pulling of both ends of the thread under continuous USG monitoring. Postprocedure USG to confirm the transection of the transverse carpal ligament (**►Fig. 6A, B**).
  6. Postprocedure care includes resting the affected wrist with wrist brace for 2 days, avoiding driving/machinery work on the day of intervention as the hand is anesthetized, and symptomatic treatment for analgesia if required.

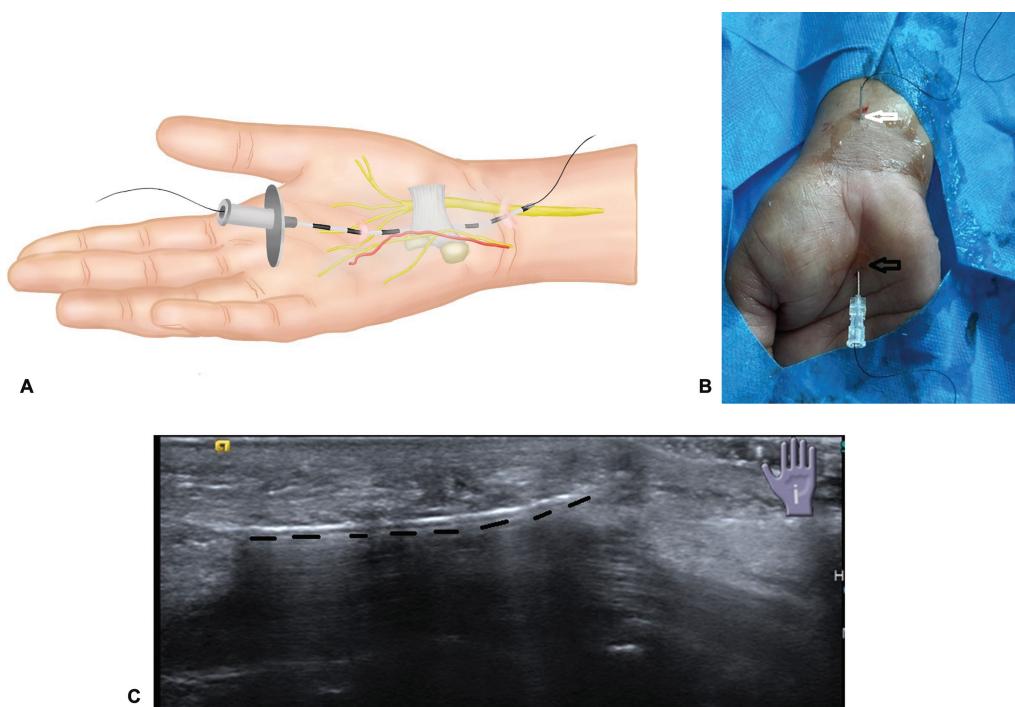
## Discussion

Surgical management of CTS involves transection of the transverse carpal ligament by either open or endoscopic technique.

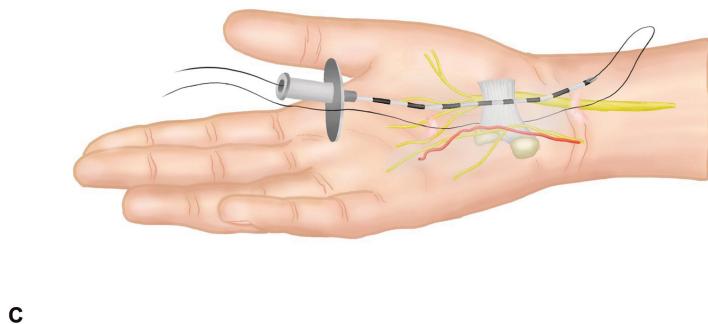
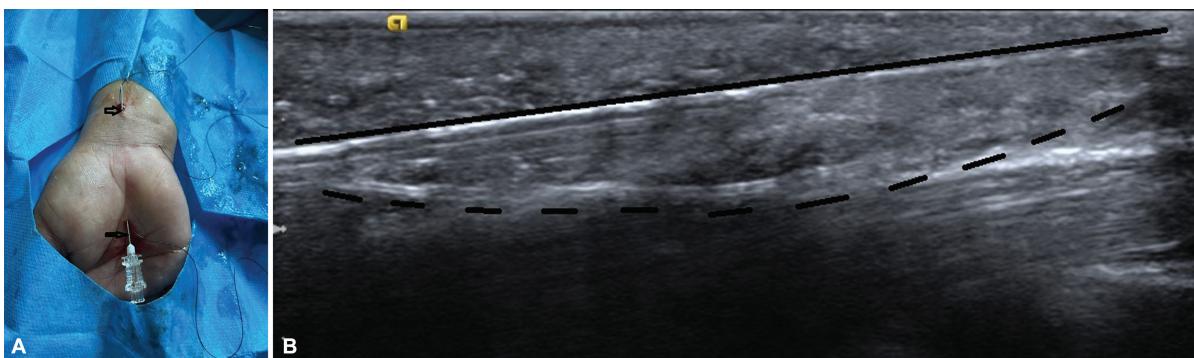
USG-guided thread carpal tunnel release (TCTR) is performed by looping of the ligament by medical grade suture in the safe zone. Advantages of using the thread includes no scar, control of the transaction under USG guidance, and thus, avoiding transaction of the nontargeted tissue.<sup>3,4</sup>



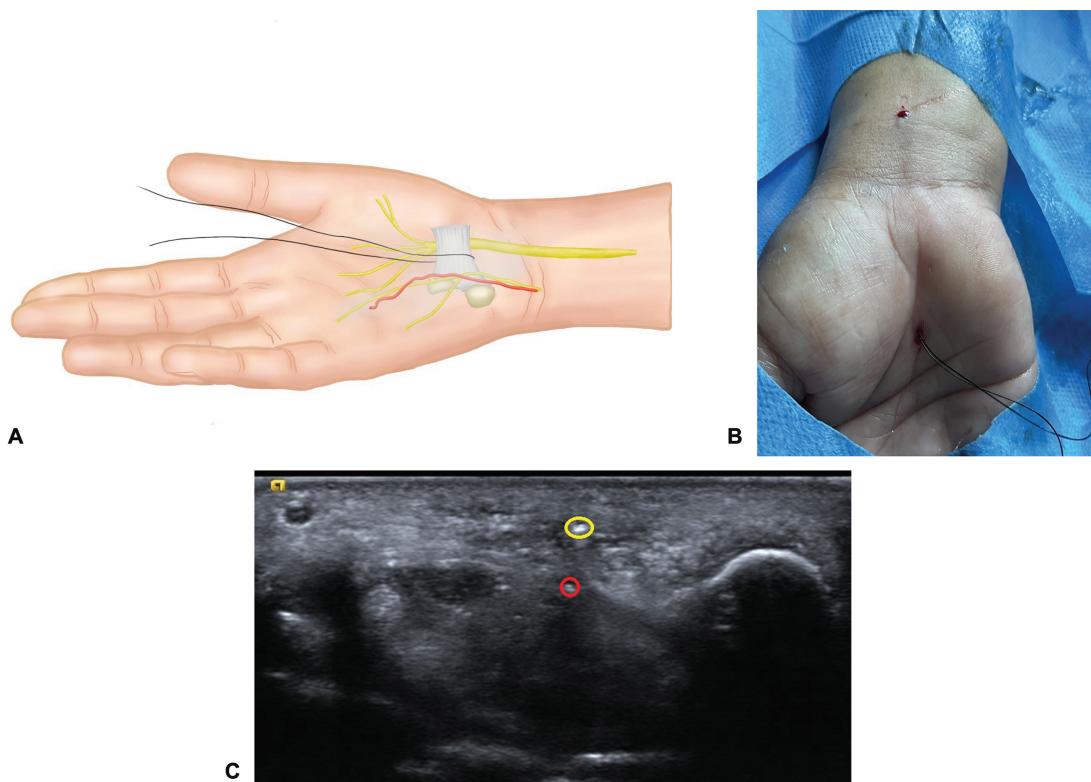
**Fig. 2** (A, B) Schematic representation (A) and long-axis ultrasonography (USG) image (B) at the outlet of the carpal tunnel shows the longitudinal safe zone which lies between the distal edge of the transverse carpal ligament (which has a duck beak morphology) and the superficial palmar arch.



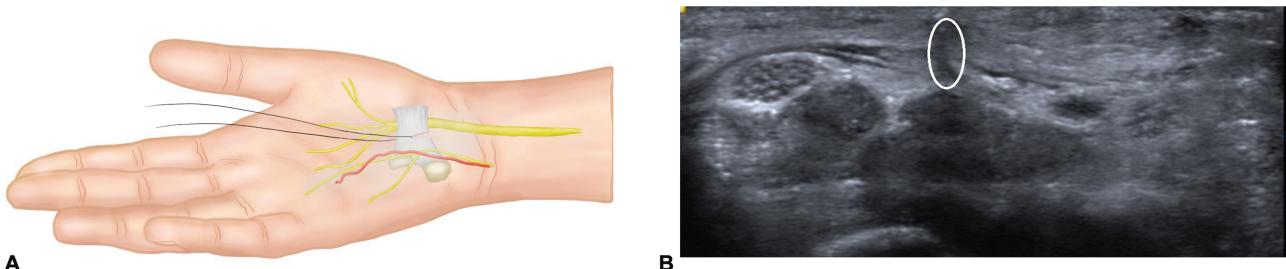
**Fig. 3** (A) Schematic representation of the curved needle and the thread entering from the palm and exiting at the wrist deep to the transverse carpal ligament. (B) Palm entry-wrist exit thread carpal tunnel release (TCTR) procedure photograph showing threaded curved needle entering from palm (black arrow) and exiting the carpal tunnel at wrist (white arrow). (C) Long-axis ultrasonography (USG) image shows the thread deep to the transverse carpal ligament after removing curved needle (dotted line).



**Fig. 4** (A) Thread carpal tunnel release (TCTR) photograph showing thread deep and needle superficial to the transverse carpal ligament (black arrows) at the same entry and exit points as curved needle. (B) Long-axis ultrasonography (USG) image shows the thread (dotted line) deep to the transverse carpal ligament and needle superficial to the ligament (straight black line). (C) Schematic representation of the threaded needle superficial to the transverse carpal ligament and thread deep to the transverse carpal ligament.



**Fig. 5** (A) Schematic representation of the looping of the surgical thread across the transverse carpal ligament. (B) Photograph of thread carpal tunnel release (TCTR) shows loop of the surgical thread. (C) Short-axis ultrasonography (USG) image at the level of carpal tunnel inlet shows the end (echogenic dot) of the thread above (yellow circle) and below transverse carpal ligament (red circle) within the safe zone of the carpal tunnel.



**Fig. 6** (A) Schematic image shows the transection of the transverse carpal ligament progressing from the proximal edge toward the distal margin of the ligament. (B) Axial ultrasonography (USG) image after the completion of procedure shows hypoechoic defect within the transverse carpal ligament (white circle).

## Conclusion

USG-guided TCTR can be a safe and effective alternative to the open and endoscopic release of the transverse carpal ligament in patients with severe CTS or CTS with thenar muscles weakness/atrophy. TCTR has a significant learning curve and this technical note will help the readers in understanding the steps of the procedure.

### Conflict of Interest

None declared.

### Acknowledgment

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