

# Trapezium Tunnel Syndrome

Ahmadreza Afshar, MD,\* Ali Tabrizi, MD,\* Mohammad Javad Shariyate, MD\*

The trapezium tunnel is situated on the lateral side of the carpal tunnel, lined with synovial tissue, and accommodates the flexor carpi radialis tendon. Trapezium tunnel syndrome is characterized by flexor carpi radialis tendinitis/peritendinitis and may lead to complicated clinical scenarios, such as flexor carpi radialis tendon rupture and the formation of primary or recurrent ganglion cysts on the volar radial side of the wrist and thenar area. Notably, the simultaneous presence of trapezium tunnel syndrome might contribute to unsuccessful outcomes in carpal tunnel surgeries. Trapezium tunnel syndrome may arise from either intrinsic or extrinsic factors. The entity of trapezium tunnel syndrome has attracted a low index of clinical suspicion because the other causes of radial side wrist pain that are more prevalent and frequent. We present a narrative review of this condition in an endeavor to heighten awareness and clinical suspicion of trapezium tunnel syndrome. (*J Hand Surg Am.* 2024;49(1):51–56. Copyright © 2024 by the American Society for Surgery of the Hand. All rights reserved.)

**Key words** Flexor carpi radialis fibro-osseous tunnel, flexor carpi radialis tendinitis, stenosing tenosynovitis, trapezium tunnel, trapezium tunnel syndrome.

THE CONDITION KNOWN AS TRAPEZIUM tunnel syndrome has not been given a high level of clinical suspicion due to the higher prevalence and frequency of other causes of radial side wrist pain. The objective of this review is to enhance the understanding and clinical awareness of trapezium tunnel syndrome.

## ANATOMY

The trapezium bone, characterized by its unique palmar groove, functions as a conduit for the flexor carpi radialis (FCR) tendon. As it extends radially, the transverse carpal ligament bifurcates into superficial and deep strata. The superficial layer anchors to the tubercle of the scaphoid bone and the crest of the trapezium bone, while the deeper layer

connects to the medial edge of the trapezium groove. The FCR fibro-osseous tunnel, referred to as the trapezium tunnel, is situated on the lateral side of the carpal tunnel. It is demarcated radially by the trapezium body and ulnarly by the superficial and deep layers of the transverse carpal ligament. This tunnel is lined by synovial tissue and the FCR tendon occupies an estimated 90% of its cross-sectional area. The FCR tendon demonstrates a close anatomical relationship with the scaphoid and the scapho-trapezium-trapezoid (STT) joint within the trapezium tunnel. The FCR tendon undergoes substantial angulation, shifting from an anterior neutral position at the scaphoid bone to a posterior orientation at an angle of approximately 35° to 60°, eventually residing within the trapezium tunnel. Therefore, the FCR tendon is susceptible to developing primary stenosing tenosynovitis within the narrow confines of the trapezium tunnel and is vulnerable to lesions affecting the nearby carpal bone structures, thereby developing secondary tendinitis.<sup>1–5</sup>

## PATHOGENESIS

Trapezium tunnel syndrome may arise from either intrinsic or extrinsic conditions. Intrinsic conditions include rheumatic and metabolic diseases, infections,

From the \*Department of Orthopedics, Imam Khomeini Hospital, Urmia University of Medical Sciences, Urmia, Iran.

Received for publication June 23, 2023; accepted in revised form October 15, 2023.

No benefits in any form have been received or will be received related directly to this article.

**Corresponding author:** Ahmadreza Afshar, MD, Department of Orthopedics, Imam Khomeini Hospital, Urmia University of Medical Sciences, Modaress Street, Ershad Boulevard, Urmia 57157 81351, Iran; e-mail: Afshar\_ah@yahoo.com.

0363-5023/24/4901-0010\$36.00/0  
<https://doi.org/10.1016/j.jhsa.2023.10.014>



**FIGURE 1:** A large ganglion cyst along the course of the FCR at the entrance of the trapezium tunnel of the left wrist.

calcific tendinitis, and overuse syndrome due to repetitive activities. Extrinsic conditions include osseous abnormalities that violate the trapezium tunnel space and encroach on the FCR tendon as well as trapezium and scaphoid fractures, malunion and nonunions, osteoarthritis of the adjacent STT and trapezium-metacarpal joints and complications after trapezium-metacarpal surgical procedures.<sup>5–11</sup>

Trapezium tunnel syndrome may present with a radial side ganglion cyst; however, the wrist ganglion cyst may have multiple potential etiologies. According to literature, it has been suggested that joint capsules and ligaments generate mucin in response to stress, which subsequently triggers the production of modified synovial and mesenchymal cells and fibroblasts. The mucin produced is believed to dissect and follow the path of least resistance through the ligaments and joint capsules, ultimately culminating in the formation of a ganglion cyst.<sup>12</sup> In trapezium tunnel syndrome, a ganglion cyst may herniate through the scaphotrapezium ligament and emerge proximally at the trapezium tunnel's entrance (Fig. 1) or distally at the exit of the trapezium tunnel in the thenar muscles (Fig. 2).<sup>13</sup> Vesely



**FIGURE 2:** A large ganglion cyst in the right thenar muscles in a gymnast.

and Burge<sup>14</sup> described a case of intraosseous ganglion cyst of a trapezium in communication with the FCR tendon sheath. The communication occurred at the entrance of the FCR tendon into the trapezium tunnel.<sup>14</sup> In some cases, the cyst may protrude from the trapezium tunnel and invade the carpal tunnel, resulting in an unusual cause of carpal tunnel syndrome. The study conducted by Greendyke et al<sup>15</sup> focused on 29 scaphotrapezium ganglion cysts. A total of 10 patients experienced the recurrence of ganglion cysts subsequent to surgical intervention. A total of 19 cysts were detected within the FCR tendon tunnel, with an additional cyst located within the thenar eminence and three cysts protruding into the carpal canal. Notably, despite the presence of these cysts, no symptoms of carpal tunnel syndrome were observed.<sup>15</sup>

## DIAGNOSIS

Trapezium tunnel syndrome patients may present with radial side wrist pain along the course of the FCR tendon and at the base of the thenar eminence. There may be swelling, localized tenderness, and a ganglion cyst over the FCR tendon at the wrist. Ganglion cysts may occur either as primary or recurrent lesions in the volar radial region of the wrist



**FIGURE 3:** Ganglion cyst (G) along the course of the FCR. Synovial fluid (arrow) is drained from the trapezium tunnel. (The images are of the same patient presented in Fig. 1).



**FIGURE 4:** The FCR tendon sheath is thickened. There is abundant tenosynovitis (red stars) along the course of the FCR tendon (arrow).

(Fig. 3) as well as in the thenar area<sup>16,17</sup> Resisted palmar flexion, radial flexion, and pronation of the wrist will elicit and intensify the pain. Passive stretching of the FCR tendon and hyperextension of the wrist may intensify the wrist pain. Infiltration of a small amount of a local anesthetic along the sheath of the FCR and tender point may aid diagnosis if it provides temporary relief.<sup>1-9</sup>

The hallmark of trapezium tunnel syndrome is FCR tendinitis and peritendinitis (Fig. 4). Some patients also may present with FCR tendon rupture.<sup>1-5,18,19</sup> Trapezium tunnel syndrome may accompany STT osteoarthritis.<sup>3,8-11,20-26</sup> Van Demark et al,<sup>20</sup> Tonkin and Stern,<sup>18</sup> Rogers and Watson,<sup>10</sup> Verellen et al<sup>21</sup> and Landström<sup>3</sup> have described spontaneous FCR tendon rupture because of STT osteoarthritis. Verellen et al<sup>21</sup> reported two cases of attritional rupture of the FCR tendon because of bony spurs secondary to STT osteoarthritis.

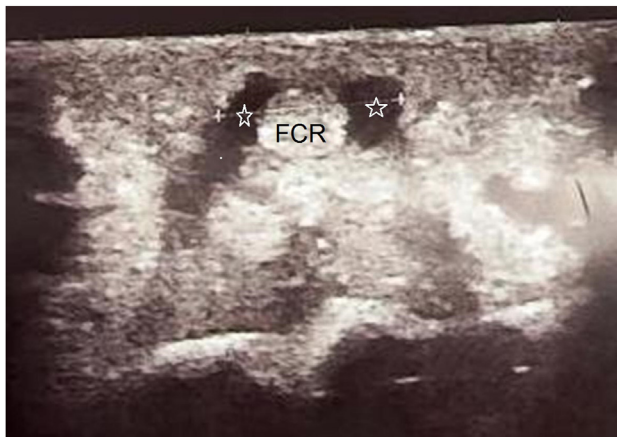
The coexistence of trapezium tunnel syndrome may be an explanation for an unsuccessful outcome following carpal tunnel surgery.<sup>10,18</sup> Rogers and Watson<sup>10</sup> studied 21 patients who had undergone STT arthrodesis due to osteoarthritis. The study revealed that one out of the three patients with ganglion cysts originating from the STT joint experienced recurrence of palmar ganglion cyst. Two patients had symptoms similar to carpal tunnel syndrome, while three patients underwent carpal tunnel surgery but continued to experience wrist pain.<sup>10</sup>

Various imaging modalities, including plain radiography, ultrasound, computed tomography scan, and magnetic resonance imaging, have been employed for the assessment of bone and soft tissue involvement in

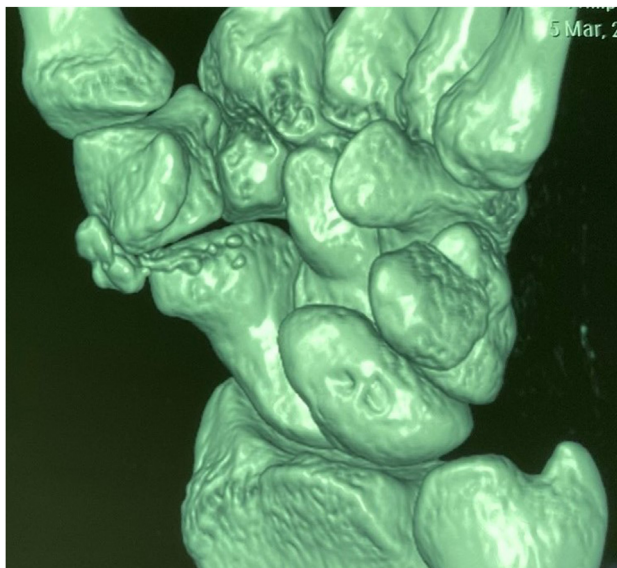
trapezium tunnel syndrome.<sup>8-27</sup> On plain radiographs, STT osteoarthritis can manifest as joint narrowing, subchondral cyst formation, subchondral sclerosis, and osteophyte formation. Ultrasound is considered the optimal imaging modality for the evaluation of ganglion cysts and tenosynovitis affecting the wrist tendons (Fig. 5). Ganglion cysts manifest as a loculated fluid-filled structure that appears to originate within the trajectory of the FCR tendon sheath. Computed tomography scanning has the capability to exhibit inconspicuous anomalies in bone structures (Fig. 6). Magnetic resonance imaging can be used for assessing the presence of a ganglion cyst in an unusual location, such as within the thenar muscles (Fig. 7). Tenosynovitis is defined as an increased fluid signal and/or signal enhancement surrounding the FCR tendon sheath on magnetic resonance imaging. Magnetic resonance imaging is also recommended in cases where the ganglion cyst is situated at a distance from the site of pain.<sup>8-27</sup>

## TREATMENTS

Nonsurgical treatments of trapezium tunnel syndrome include immobilization, physical therapy, nonsteroidal anti-inflammatory agents, injection of corticosteroids for primary tendinitis, and fenestration and aspiration of the accompanying ganglion cyst.<sup>27,28</sup> However, corticosteroid injection may increase the risk of spontaneous rupture of the FCR tendon.<sup>18,19</sup> Look et al<sup>17</sup> indicated that less than 10% of patients improve with nonsurgical management. In cases where nonsurgical interventions have proven ineffective, patients may express a need for more



**FIGURE 5:** The FCR tendon is surrounded with tenosynovitis (white stars). (The images are of the same patient presented in Fig. 4).



**FIGURE 6:** A three-dimensional reconstructed computed tomography scan demonstrates calcium deposits at the scapho-trapezium joint and calcium deposits spread into the left trapezium tunnel.

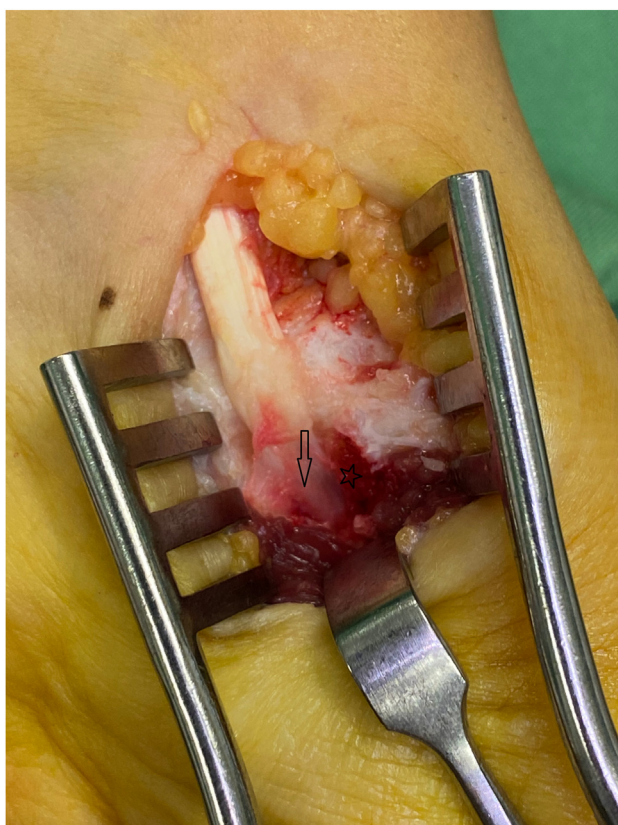
definitive treatment, such as decompression of the trapezium tunnel.<sup>29–31</sup> Brink et al<sup>32</sup> performed simple blind FCR tenolysis for trapezium tunnel syndrome. Landström<sup>33</sup> described arthroscopic ganglion excision and tenovagotomy of the trapezium tunnel sheath. At surgery, the trapezium tunnel must be thoroughly explored and any local lesions, such as the trapezium crest and protruding osteophytes of the adjacent joints that encroach on the FCR tendon, must be removed (Figs. 8, 9). Surgical decompression of trapezium tunnel syndrome carries the potential risk of damaging the palmar cutaneous branch of the median nerve.<sup>5</sup>



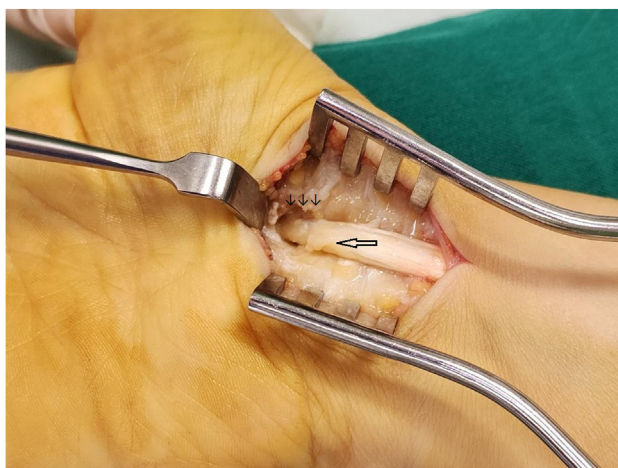
**FIGURE 7:** Magnetic resonance imaging demonstrates a large ganglion cyst at the exit of trapezium tunnel and a smaller ganglion cyst at the entrance of the trapezium tunnel along the course of the FCR tendon. (The images are of the same patient presented in Fig. 2).

## SUMMARY

Trapezium tunnel syndrome is identified based on FCR tendinitis and peritendinitis.<sup>1–4</sup> Trapezium tunnel syndrome may be complicated with FCR rupture and the presence of a primary and recurrent ganglion cyst at the volar radial side of the wrist and thenar area. Trapezium tunnel syndrome has not been given substantial clinical attention and is often overlooked due to the higher incidence and prevalence of other causes of wrist pain and dysfunction. To the best of our knowledge, descriptions of FCR tendinitis and its accompanied problems date back to 1952.<sup>9</sup> Nevertheless, some authors failed to distinguish the independent anatomy of the trapezium tunnel in their reports.<sup>10,17,20</sup> Despite identification of the anatomy of the trapezium tunnel, some authors neglected to consider the possibility of trapezium



**FIGURE 8:** The trapezium crest is removed (black star), and the FCR tendon is bruised (arrow). (The images are of the same patient presented in Fig. 1).



**FIGURE 9:** The FCR tendon (large arrow) demonstrates attritional changes beneath the removed trapezium crest (small arrows). (The images are of the same patient presented in Fig. 4).

tunnel syndrome.<sup>7,14,15</sup> We hope the current review increases clinical suspicion regarding trapezium tunnel syndrome and encourages surgeons to include it in the differential diagnosis of radial side wrist pain.

## REFERENCES

- Bishop AT, Gabel G, Carmichael SW. Flexor carpi radialis tendinitis. Part I: operative anatomy. *J Bone Joint Surg Am.* 1994;76(7):1009–1014.
- Gabel G, Bishop AT, Wood MB. Flexor carpi radialis tendinitis. Part II: results of operative treatment. *J Bone Joint Surg Am.* 1994;76(7):1015–1018.
- Landström JT. Volar radial wrist-forearm primary and recurrent ganglia of the flexor carpi radialis tendon secondary to pathology isolated to the trapezial fibro-osseous synovial sheath tunnel: A case series report. *SAGE Open Med Case Rep.* 2020;8:2050313X20977389.
- Mitchell AR, Kerkhof FD, Wadhwa H, Ladd AL. The role of the flexor carpi radialis groove in trapeziometacarpal osteoarthritis. *Hand (N Y)*. Published online September 1, 2022. <https://doi.org/10.1177/15589447221120844>
- Poggi DS, Massarella M, Piccirilli E. Surgical management of the trapezium canal syndrome: an uncommon presentation of tenosynovitis of flexor carpi radialis. *J Hand Surg Glob Online.* 2022;4(2):118–121.
- Michaelides M, Drakonaki E, Petridou E, Pantziara M, Ioannides C. Osteoid osteoma of the scaphoid bone associated with flexor carpi radialis calcific tendinitis and treated with CT-guided RF ablation. *Skeletal Radiol.* 2018;47(10):1449–1453.
- Soejima O, Iida H, Naito M. Flexor carpi radialis tendinitis caused by malunited trapezial ridge fracture in a professional baseball player. *J Orthop Sci.* 2002;7(1):151–153.
- Parellada AJ, Morrison WB, Reiter SB, et al. Flexor carpi radialis tendinopathy: spectrum of imaging findings and association with triscaphe arthritis. *Skeletal Radiol.* 2006;35(8):572–578.
- Fitton J, Shea FW, Goldie W. Lesions of the flexor carpi radialis tendon and sheath causing pain at the wrist. *J Bone Joint Surg Br.* 1968;50(2):359–363.
- Rogers WD, Watson HK. Degenerative arthritis at the triscaphe joint. *J Hand Surg Am.* 1990;15(2):232–235.
- Takami H, Aso K. Bilateral FCR tendon injury associated with osteoarthritis of the STT joint. *J Wrist Surg.* 2020;9(4):362–364.
- Bracken J, Bartlett M. Ganglion cysts in the paediatric wrist: magnetic resonance imaging findings. *Pediatr Radiol.* 2013;43(12):1622–1628.
- Azzopardi EA, Gujral S, Mandal A, Kulkarni M. Rapidly expanding thenar eminence ganglion: a case report. *Cases J.* 2009;2:129.
- Vesely MJ, Burge PD. Intraosseous ganglion of the trapezium in communication with the flexor carpi radialis tendon sheath. *J Hand Surg Br.* 1999;24(4):486–488.
- Greendyke SD, Wilson M, Shepler TR. Anterior wrist ganglia from the scaphotrapezial joint. *J Hand Surg Am.* 1992;17(3):487–490.
- Weeks PM. A cause of wrist pain: non-specific tenosynovitis involving the flexor carpi radialis. *Plast Reconstr Surg.* 1978;62(2):263–266.
- Look N, McNulty M, Rodriguez-Fontan F, Fenoglio AK. Radial-sided wrist pain differentials: presentation, pathoanatomy, diagnosis, and management. *Medicina (B Aires).* 2023;83(1):96–107.
- Tonkin MA, Stern HS. Spontaneous rupture of the flexor carpi radialis tendon. *J Hand Surg Br.* 1991;16(1):72–74.
- Henry M. Pseudotendon formation causing painful tethering of ruptured flexor carpi radialis tendons. *J Hand Microsurg.* 2013;5(1):1–3.
- Van Demark RE, Helsper E, Hayes M, Hayes M, Smith VJS. Painful pseudotendon of the flexor carpi radialis tendon: a literature review and case report. *Hand (N Y).* 2017;12(5):NP78–NP83.
- Verellen K, Dauwe D, Demuyneck M, Kestelijn P, Vanden Berghe L. Spontaneous ruptures of the flexor carpi radialis tendon secondary to STT osteoarthritis. *Acta Orthop Belg.* 1992;58(4):474–476.
- Irwin LR, Outhwaite J, Burge PD. Rupture of the flexor carpi radialis tendon associated with scapho-trapezial osteoarthritis. *J Hand Surg Br.* 1992;17(3):343–345.

23. Bowe A, Doyle L, Millender LH. Bilateral partial ruptures of the flexor carpi radialis tendon secondary to trapezial arthritis. *J Hand Surg Am.* 1984;9(5):738–739.
24. Anzel SH, Covey KW, Weiner AD, Lipscomb PR. Disruption of muscles and tendons; an analysis of 1, 014 cases. *Surgery.* 1959;45(3):406–414.
25. Boyes JH, Wilson JN, Smith JW. Flexor-tendon ruptures in the forearm and hand. *J Bone Joint Surg Am.* 1960;42-A(4):637–646.
26. Allred DW, Rayan GM. Flexor carpi radialis tendon rupture following chronic wrist osteoarthritis: a case report. *J Okla State Med Assoc.* 2003;96(5):211–212.
27. Stoop N, van der Gronde BATD, Janssen SJ, Kuntz MT, Ring D, Chen NC. Incidental flexor carpi radialis tendinopathy on magnetic resonance imaging. *Hand (N Y).* 2019;14(5):632–635.
28. Boeisa AN, Bu Ali BM, Al Fehaid MS. Non-surgical management of trapezium canal syndrome an uncommon presentation of flexor carpi radialis tenosynovitis. *MOJ Orthop Rheumatol.* 2022;14(6):190–192.
29. Keller HP, Lanz U. Stenosing tendovaginitis of the flexor carpi radialis tendon. Article in German. *Handchir Mikrochir Plast Chir.* 1984;16(4):236–237.
30. Kerboull L, Leviet D. Flexor carpi radialis tendinitis. Pathophysiology and results of surgical treatment in a series of 28 cases. *Ann Chir Main.* 1995;14(3):135–141.
31. Le Viet D, Kerboull L, Ebelin M. Trapeziectomy in the treatment of peritrapezial arthritis. Article in French. *Rev Chir Orthop Reparatrice Appar Mot.* 1988;74(suppl 2):158–161.
32. Brink PR, Franssen BB, Disseldorp DJ. A simple blind tenolysis for flexor carpi radialis tendinopathy. *Hand (N Y).* 2015;10(2):323–327.
33. Landström JT. Arthroscopic tenovaginitis and ganglion excision of the flexor carpi radialis fibro-osseous tendon sheath. *Tech Hand Up Extrem Surg.* 2020;25(1):20–24.