

Arthroscopic Dorsal Wrist Ganglion Excision

Sahil Sanghavi¹, Satish Mane¹, Anup Bansode², Abhijeet L Wahegaonkar^{1,2}

Abstract

Ganglions represent the most common tumors of the wrist and hand. As compared to open surgery, arthroscopic dorsal wrist ganglion excision has several advantages, of which concurrent evaluation of intra-articular pathology, better visualization and resection of the ganglion stalk and lower risk of scapholunate ligament injury are the most important. Furthermore, it has a distinct advantage for excision of occult intra-articular dorsal wrist ganglia. We describe our technique for arthroscopic dorsal wrist ganglion excision along with a deliberation of its several advantages, disadvantages/complications and few modified techniques. However, it has a long-learning curve and requires meticulous surgical training. Precise placement of portals, knowledge of structures at risk, and diagnosing intra-articular pathology are essential to the success of this procedure.

Keywords:

Introduction

Ganglions represent the most common tumors of the wrist and hand. They are seen in young adults and are three times more common in women as compared to men. Typical sites include the dorsal wrist, volar carpal ganglions, and the dorsal aspect of the distal interphalangeal joint. Less common ones are ganglions from tendons, volar retinacular ganglion cysts, and intraosseous ganglions. Of these, the most common is the dorsal wrist ganglion which classically arises from the dorsal scapholunate interosseous ligament at its capsular attachment [1].

Various factors such as trauma or repetitive microtrauma, intra-articular pathologies such as scapholunate instability, myxoid degeneration of connective tissue, and synovial herniation have been proposed as the etiology for dorsal wrist ganglia. While the etiopathogenesis remains obscure, a one-way valve mechanism at the dorsal capsular attachment to the scapholunate ligament has been proposed as studies have

confirmed communication of fluid from the wrist joint into the ganglion but not viceversa [1]. They lack a synovial lining, and hence, are not considered as true cysts. Clinically, they present as a subcutaneous swelling on the dorsum of the wrist which is mobile and compressible. They are seen to transilluminate on physical examination. The main symptoms for which patients seek consultation are an unsightly swelling and pain [2].

Management of these cysts ranges from observation and reassurance to closed rupture, aspiration with or without injectable materials, and surgical excision which may be open or arthroscopic. Surgical excision has lower recurrence rates as compared to conservative measures [3]. First described by Osterman and Raphael [4] in 1995, arthroscopic ganglion excision has increasingly become the preferred mode of surgical excision. Arthroscopy has the advantage of being minimally invasive and offers better cosmetic results due to smaller incisions

which avoid scar formation, decreased post-operative pain, quicker recovery to function, and lower complication rates [5,6]. More importantly, it allows concurrent evaluation of intra-articular pathology and better visualization and resection of the ganglion stalk. Furthermore, it has a distinct advantage for excision of occult intra-articular dorsal wrist ganglia. Scapholunate instability is another reported disadvantage of open excision [7].

Surgical Steps

Anesthesia: Options include general anesthesia (GA), forearm Bier block, and ultrasound-assisted regional nerve block. Recurrence rates have been shown to be higher following excision under local anesthesia as opposed to GA [8,9].
Position of the patient: Supine. The arm is fixed to the table, and elbow is kept in 90° flexion. The fingers are fixed in a traction tower with 5-8 kg of traction applied.
Tourniquet: Pneumatic tourniquet is applied in the upper arm and raised to 240-270 mmHg.
 Skin preparation with antiseptic solutions and draping.

Portal marking: (Fig. 1)

- A. Radiocarpal portals
1. 6R portal - palpate the extensor carpi ulnaris tendon and go radial to it.
 2. 3-4 portal - locate the Lister's tubercle on the dorsal aspect of the radius. 0.5-1 cm distal to it a depression is felt. This portal is located between the extensor pollicis longus and extensor digitorum communis.
 3. 4-5 portal - this portal is located between

¹Department of Upper Extremity, Hand and Microvascular Reconstructive Surgery, Sancheti Institute for Orthopedics and Rehabilitation, Pune, Maharashtra, India,

²Department of Hand Surgery, Jehangir Hospital, Pune, Maharashtra, India.

Address of Correspondence

Dr. Sahil Sanghavi,
 Sancheti Institute for Orthopedics & Rehabilitation, 16 Shivajinagar, Pune-41105, Maharashtra, India.
 E-mail: sahil.sanghavi@hotmail.com



Dr. Abhijeet L. Wahegaonkar



Figure 1: Surface marking of the distal radius and ulna along with the boundaries of the ganglion cyst

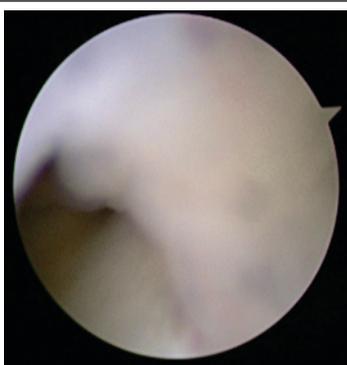


Figure 2: Cyst viewed from the 3-4 portal



Figure 3: Removal of the cyst through the shaver



Figure 4: Testing the interosseous part of the scapholunate ligament through the radiocarpal portal

the extensor digitorum communis and extensor digiti minimi, which is in line with the 4th metacarpal.

B. Midcarpal portals

1. MCR portal - this portal lies between the extensor carpi radialis brevis and extensor digitorum communis. It is located along the radial border of the 3rd metacarpal, about 1.5 cm distal to the 3-4 portal.

2. MCU portal - this portal lies between the extensor digitorum communis and extensor digiti minimi and lies about 1.5 cm distal to the 4-5 portal.

Surgical steps

A No.15 scalpel blade is used to make a transverse incision. The 6-R portal is used as a visualization portal. A 2.7 mm arthroscope with a visualization angle of 30 degrees is first introduced through this portal. Then, a working portal is created at the 3-4 or 4-5 portal site, and a 3.5 mm full radius shaver is inserted through this portal (Fig. 2 and 3). Thereafter, examination proceeds from radial to ulnar, distal to proximal, and volar to dorsal. The radio- and the mid-carpal joints are examined. The scapholunate ligament integrity or laxity and the dorsal capsule are examined.

Debridement of the capsule is done with the shaver. Look for the pearl-like stalk of the ganglion. Manipulation by external pressure helps to push the cyst toward the shaver. An 18-gauge needle is passed through the cyst into the joint with a 2-0 polydioxanone suture. The needle is then removed, and the suture acts as a lighthouse. Through the working portal, the entire ganglion along

with its stalk is excised. Keep the shaver facing away from the scapholunate joint to prevent injury to the scapholunate ligament (Fig. 4 and 5). While debriding the dorsal capsule, it is important to identify the extensor carpi radialis brevis, extensor digitorum communis, and the extensor pollicis longus tendons which are susceptible to injury as they lie just superficial to the dorsal capsule. The dorsal aspect of the wrist is then palpated to evaluate if any portion of the cyst is remaining which indicates a communication with the midcarpal joint. Ulnar and radial midcarpal portals are created to perform a capsulotomy, the midcarpal joint is evaluated for any communications or remnants, and the dorsal aspect of the scapholunate ligament and the dorsal capsuloligamentous scapholunate septum (DCSS) are examined (Fig. 6 and 7). Dorsal synovitis is often present and should be resected. Closure: Portal sites are closed with 5-0 nylon sutures.

Immobilization: A below elbow crepe bandage is applied for 3 weeks. If any intra-articular pathology has been addressed, then a volar splint is given for 6 weeks.

Post-operative rehabilitation protocol: Passive ROM exercises are started after 3 weeks followed by active exercises. Patients are advised to avoid strenuous activities for 3 months.

Discussion

Concomitant evaluation and management of intra-articular pathology is the most valuable advantage of arthroscopic excision as compared to open excision. Scapholunate

instability resulting from scapholunate ligament tears has been proposed as a cause of ganglion cyst formation. Edwards and Johansen [6] found that most ganglion cysts were associated with Types II and III scapholunate instabilities and Type III lunate-triquetral instabilities. Osterman and Raphael [4] also reported almost 50% incidence of intra-articular abnormalities in their series with scapholunate ligament tears being the most common. Arthroscopy particularly offers an advantage for surgical management of occult ganglia over open excision. Excessive blunt dissection is required during open procedures for such ganglia which causes increased scarring and leads to stiffness post-operatively. This can be prevented by easier identification and resection of the stalk of the ganglion with the aid of arthroscopy [10]. Povlsen and Peckett [11] reported on arthroscopic findings in 16 patients with painful dorsal wrist ganglia. While radiographs were abnormal in only 1 case, arthroscopy revealed abnormalities in 12 cases of which 10 had evidence of scapholunate ligament injury in the form of partial scapholunate dissociation.

Identification and removal of the stalk have been postulated to be the most critical factor in surgical excision, and failure to do so has been linked with increased chances of recurrence. However, Gallego and Mathoulin [2] in their series of 114 patients were able to identify the stalk in all their cases but yet had a recurrence rate of 12.3%. Similarly, the studies by Kang et al. [12] and Aslani et al. [13] too reported the identification of the stalk in 100% of

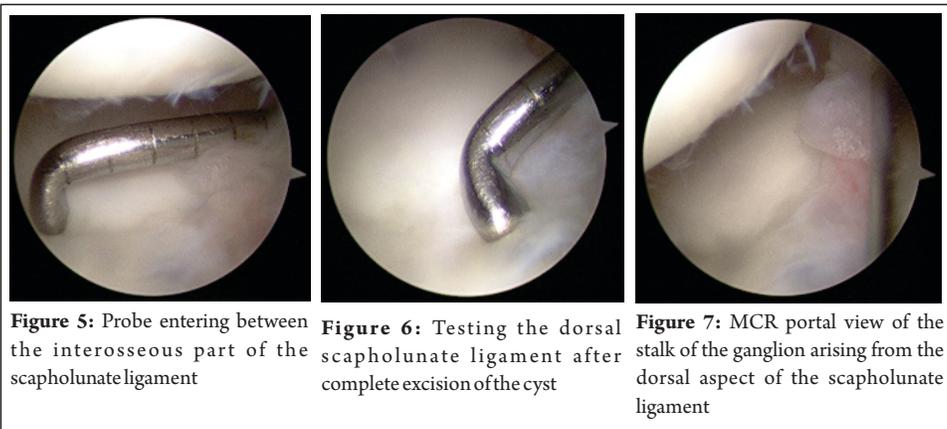


Figure 5: Probe entering between the interosseous part of the scapholunate ligament

Figure 6: Testing the dorsal scapholunate ligament after complete excision of the cyst

Figure 7: MCR portal view of the stalk of the ganglion arising from the dorsal aspect of the scapholunate ligament

their cases but yet had recurrence rates of 11% and 17.3%, respectively. On the other hand, Osterman and Raphael [4] were unable to identify the stalk in 1/3rd of their patients and found no recurrences in this group, whereas Edwards and Johansen [6] too reported stalk identification in only 9% of their cases and had no recurrences in any case at a minimum follow-up of 2 years. Nonetheless, arthroscopy offers the advantage of easier and precise identification of the stalk which lowers the risk of injury to the scapholunate ligament as seen with open procedures, which leads to scapholunate instability [10]. Nishikawa et al. [14] developed an arthroscopic classification of ganglia to indicate the amount of dorsal capsular resection required. The ganglia were classified into 3 types as follows: Type I - ganglia and stalks were visible, Type IIa - ganglia or their stalks ballooned into the wrist joint with external compression, and Type IIb - ganglia or their stalks could not be identified in the wrist joint even with external compression. They advocated wide capsular resection for Type IIb ganglia, whereas resection of only the ganglion and its stalk was sufficient for Types I and IIa. Following arthroscopic excision, increase in wrist flexion and extension along with improved grip strength have been well documented. Osterman and Raphael [4] in their study obtained improvement in range of movement in 94% of their cases. 27% of their cases had grip strength equivalent to 20% of the contralateral side which increased to 90% post-operatively. Gallego and Mathoulin [2] reported improvement of 20% and 14% post-operatively in flexion

and extension, respectively, as also a statistically significant difference in pre- and post-operative grip strength from 78% to 100% as compared to the opposite side. In a prospective study, comparing the outcome of open versus arthroscopic excision by Kang et al., [12] at final follow-up recurrence rates, were 9% in the open group and 11% in the arthroscopic group. However, most of the studies report equal or less recurrence rates for arthroscopic excision as compared to open [1,4,7,12,15]. Chen et al. [16] advocated the use of an intra-focal cystic portal for shaving to aid removal of residual tissue and the stalk followed by the introduction of the arthroscope through this portal to confirm complete excision of the ganglion or stalk remnant. Yao and Trindade [17] used a 1:10,000 solution of indigo carmine which was injected intralesionally into the ganglion if the stalk was not fully visualized following which a 3.5 mm full-radius arthroscopic shaver was used in the areas colored blue by the dye. Purported benefits of their technique were the avoidance of extensive capsule debridement and a decrease in the rate of conversion to open procedures due to an increase in stalk visualization. Yamamoto et al. [18] reported the use of sonography-guided arthroscopy for wrist ganglion excision and were able to visualize the ganglion stalk and the cycling tip of the arthroscopic shaver by sonography in all 22 cases (of which 16 were dorsal wrist ganglia), whereas ganglion stalks by arthroscopy were visualized in only 4 out of 22 cases. Not only the ganglion but also vessels, tendons, and nerves could also be

clearly visualized which helps to reduce the risk of complications in addition to the added ability to control both the depth and direction of the shaver. While most cysts do arise from the scapholunate ligament, routinely entering the midcarpal joint during arthroscopic ganglion excision is still debated. Edwards and Johansen [6] reported a 74% incidence of cysts communicating with the midcarpal joint. We routinely enter the midcarpal joint in all our cases to minimize the risk of recurrence and to examine the dorsal

aspect of the scapholunate ligament and the DCSS [19]. In the majority of the cases, the ganglion cyst is only a part of the procedure for addressing the scapholunate instability.

The main complication following arthroscopic dorsal ganglion excision is a recurrence. Others include painful neuroma, infection, and scapholunate instability. Edwards and

Johansen [6] reported a 6% incidence of extensor tenosynovitis in their series which they attributed to tendon or tenosynovial irritation during an extensive capsulotomy. Another disadvantage is increased operating room time, not only relating to the surgical procedure but also that required for setting up the arthroscopy equipment and traction unit [10].

Conclusions

Wrist arthroscopy offers several aforementioned advantages over open excision for dorsal wrist ganglion excision. However, it has a long-learning curve and requires meticulous surgical training with an in-depth understanding of wrist anatomy. Precise placement of portals, knowledge of structures at risk, and diagnosing intra-articular pathology are essential to the success of the procedure

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Conflict of Interest: NIL
Source of Support: NIL

How to Cite this Article

Sanghavi S, Mane S, Bansode A, Wahegaonkar AL. Arthroscopic Dorsal Wrist Ganglion Excision. *Asian Journal Arthroscopy* Sep-Dec 2017;2(2):15-18.