

Systematic Review

Complications of Wrist Arthroscopy

Zahab S. Ahsan, B.S., and Jeffrey Yao, M.D.

Purpose: The purpose of this systematic review was to address the incidence of complications associated with wrist arthroscopy. Given the paucity of information published on this topic, an all-inclusive review of published wrist arthroscopy complications was sought. **Methods:** Two independent reviewers performed a literature search using PubMed, Google Scholar, EBSCO, and Academic Megasearch using the terms “wrist arthroscopy complications,” “complications of wrist arthroscopy,” “wrist arthroscopy injury,” and “wrist arthroscopy.” Inclusion criteria were (1) Levels I to V evidence, (2) “complication” defined as an adverse outcome directly related to the operative procedure, and (3) explicit description of operative complications in the study. **Results:** Eleven multiple-patient studies addressing complications of wrist arthroscopy from 1994 to 2010 were identified, with 42 complications reported from 895 wrist arthroscopy procedures, a 4.7% complication rate. Four case reports were also found, identifying injury to the dorsal sensory branch of the ulnar nerve, injury to the posterior interosseous nerve, and extensor tendon sheath fistula formation. **Conclusions:** This systematic review suggests that the previously documented rate of wrist arthroscopy complications may be underestimating the true incidence. The report of various complications provides insight to surgeons for improving future surgical techniques. **Level of Evidence:** Level IV, systematic review of Levels I-V studies.

Arthroscopy of the wrist is a valuable clinical technique that facilitates effective diagnosis and therapy. Since the introduction of wrist arthroscopy in 1979,¹ techniques in wrist arthroscopy have continued to evolve and advance into mainstream orthopaedic surgery. With a wide range of current indications and continued adaptation of open surgical procedures performed arthroscopically, the incidence of complica-

tions of wrist arthroscopy is yet to be thoroughly evaluated.

Possible complications may be related to traction and positioning of the arm, establishment of portals, procedure-specific injuries, and general complications involved in wrist arthroscopy.^{2,3} Complications that are universal to wrist arthroscopy include infection, articular surface damage, and equipment failure.³ The establishment of portals and introduction of instruments require a thorough knowledge of the regional anatomy and appropriate tactile sensitivity of the surgeon. Poor positioning of portals and forceful insertion of instruments may damage articular cartilage, ligaments, tendons, cutaneous nerves, and vascular structures.⁴

The incidence of wrist arthroscopy complications has been cited at 2%.^{3,4} It is believed that this approximation is largely an underestimate, which can be attributed to the minor severity of many complications, as well as the unwillingness of surgeons to report their complications. The purpose of this sys-

From the Indiana University School of Medicine (Z.S.A.), Indianapolis, Indiana; and Department of Orthopaedic Surgery, Stanford University Medical Center (J.Y.), Stanford, California, U.S.A.

The authors report that they have no conflicts of interest in the authorship and publication of this article.

Received November 9, 2011; accepted January 10, 2012.

Address correspondence to Jeffrey Yao, M.D., Department of Orthopaedic Surgery, Stanford University Medical Center, 450 Broadway Street, Suite C442, Redwood City, CA 94063, U.S.A.

E-mail: jyao@stanford.edu

© 2012 by the Arthroscopy Association of North America

0749-8063/11734/\$36.00

doi:10.1016/j.arthro.2012.01.008

TABLE 1. Multiple-Patient Studies Presenting Wrist Arthroscopy Complications

Author	Year	Study Design	Level of Evidence	No. of Complications	No. of Patients in Study	%
Lourie et al. ⁵	1994	Prospective cohort	II	3	15	20.0
Warhold and Ruth ³	1995	Case series	IV	4	205	2.0
De Smet et al. ⁷	1996	Case series	IV	2	129	1.6
Doi et al. ²²	1999	Randomized controlled study	I	7	34	20.5
Hofmeister et al. ¹¹	2001	Prospective cohort	II	1	89	1.1
Beredjikian et al. ¹²	2004	Case series	IV	11	211	5.2
Pell and Uhl ¹³	2004	Case series	IV	3	47	6.4
Darlis et al. ¹⁵	2005	Case series	IV	2	16	12.5
Rocchi et al. ¹⁶	2008	Prospective randomized study	I	2	20	10
Gallego and Mathoulin ¹⁷	2010	Case series	IV	6	114	5.3
Chen et al. ¹⁸	2010	Case series	IV	1	15	6.6
Total				42	895	4.7

tematic review was to review the literature for all documented complications of wrist arthroscopy.

METHODS

All published studies in the English language that addressed wrist arthroscopy complications were identified. Two independent reviewers performed a literature search using PubMed, Google Scholar, EBSCO, and Academic Megasearch using the terms “wrist arthroscopy complications,” “complications of wrist arthroscopy,” “wrist arthroscopy injury,” and “wrist arthroscopy.” Studies were included if they met the following inclusion criteria: (1) provided Levels I to V evidence, (2) defined “complication” as an adverse outcome directly related to the wrist arthroscopy procedure, and (3) provided further information regarding the complication. Citations from relevant studies, as well as from any review articles captured by the search, were also examined to determine whether they were suitable for inclusion.

RESULTS

The PubMed search identified 209 articles. There were 11 studies with multiple patients that addressed complications of wrist arthroscopy (Table 1). There were 4 case reports that described unique incidences of wrist arthroscopy complications (Table 2).

In 1994 Lourie et al.⁵ reported a series of 15 patients with distal radioulnar joint arthroscopy. Three of these patients presented with transection of the transverse radioulnar branch of the dorsal sensory branch of the ulnar nerve (DSBUN). Persistent dysesthesia with a

positive Tinel sign, consistent with neuroma formation, was noted for each of these instances. Patients were treated with secondary operative excision of the neuroma; this relieved all symptoms with a small region of hypesthesia of the skin. The transverse radioulnar branch of the DSBUN is particularly vulnerable to injury in the region of the 6R portal because of variable arborization. Injury to this nerve has the potential to cause persistent pain from neuroma formation.

A study by Warhold and Ruth³ in 1995 provided a review of complications from a series of 205 reported wrist arthroscopies.⁶ Four complications were described, amounting to a 2% incidence. These complications consisted of 1 suture abscess that resolved on removal of the suture, 1 inclusion cyst that required surgical removal 6 months after the initial arthroscopy, and 2 cases of mild sympathetic dystrophy. The sympathetic dystrophy resolved spontaneously in 1 patient, whereas it remained as persistent wrist pain in the second patient.

In 1996 De Smet et al.⁷ presented a retrospective review of 129 patients having undergone wrist arthroscopy. There were 2 complications reported in this

TABLE 2. Summary of Case Reports (Level V) of Wrist Arthroscopy Complications

Author	Year	Description of Injury
del Piñal et al. ⁸	1999	Avulsion of DPIN
Tsu-Hsin Chen et al. ¹⁹	2006	Strangulation of DSBUN with pullout suture
Shirley et al. ¹⁴	2008	Extensor tendon sheath fistula formation
Nguyen et al. ²⁰	2011	Laceration of DSBUN with trocar

study: 1 tendon rupture over a Kirschner wire and 1 superficial infection.

In 1999 del Piñal et al.⁸ presented a case report of distal posterior interosseous nerve (DPIN) avulsion after wrist arthroscopy. Arthroscopy was performed, with the insertion of instruments into the 3-4, 6R, and radial midcarpal portals. A scapholunate injury was visualized, and an open repair was deemed necessary.⁹ Through an open approach with a longitudinal incision centered at the Lister tubercle, the DPIN was found to be avulsed at the level of the 3-4 portal. This is the only reported case of this injury in the literature. The lack of other reports may be attributed to the rarity of the injury or the fact that most arthroscopies do not require an open procedure that may show DPIN injury that may otherwise remain occult. This study presents the possibility of DPIN injury during wrist arthroscopy that may lead to chronic dorsal wrist pain. On the contrary, it is possible that complete avulsion of the DPIN provides symptomatic relief through partial sensory denervation for patients having prior chronic dorsal wrist pain.¹⁰

Hofmeister et al.¹¹ in 2001 presented a series of 89 wrist arthroscopies with 1 reported complication. This complication was a partial laceration of the extensor digitorum communis tendon to the small finger. An extension lag was noted, but no treatment was necessary.

In 2004 a retrospective review of 211 patients who underwent wrist arthroscopy identified 11 complications (5.2%).¹² These complications were further categorized into major and minor complications based on their tendency to resolve with observation or conservative treatment. There were 2 cases of major complications. One patient had permanent wrist stiffness (25° of extension and 30° of flexion) after 12 months of therapy. The other case consisted of ganglion cyst development that required surgical excision 12 months postoperatively. Minor complications in the remaining 9 patients consisted of transient sensory neurapraxia of the ulnar nerve, transient stiffness of the wrist and finger joints, superficial portal infection, first-degree burn, and extensor carpi ulnaris tendinitis.

Pell and Uhl¹³ reviewed 47 patients who underwent thermal ablation procedures during wrist arthroscopy and reported 3 tendon ruptures and 1 case of a full-thickness skin burn as a result of use of the electrothermal frequency probe.

Shirley et al.¹⁴ presented a case report in 2008 of extensor tendon sheath fistula formation. A 45-year-old male patient underwent diagnostic arthroscopy after sustaining a scapholunate ligament disruption.

On readmittance for tri-ligament reconstruction of the scapholunate ligament injury, a tender fluctuant swelling (6 × 3 × 1 cm) was noted on the dorsum of the hand. Through a longitudinal approach to the wrist, the collection of fluid was identified around the extensor pollicis longus tendon within the tendon sheath. A patent opening from the tendon sheath into the radiocarpal joint was identified at the location of the previous 3-4 portal. This was relieved by evacuation of the fluid and surgical diathermy to preserve the tendon sheath.

A 2005 study by Darlis et al.¹⁵ evaluated the treatment of partial scapholunate ligament injuries with arthroscopic debridement and thermal shrinkage. Of 16 patients undergoing treatment, 2 had complications: carpal tunnel syndrome of the affected extremity developed in 1 patient, and de Quervain tenosynovitis developed in the other patient.

Rocchi et al.¹⁶ presented a prospective randomized study comparing the treatment of articular ganglia through arthroscopic resection and open excision. Among 20 patients in the arthroscopic resection group, there were 2 complications: 1 case of neurapraxia of the sensory branch of the radial nerve to the dorsal aspect of the thumb and 1 injury to a branch of the radial artery. The neurapraxia recovered spontaneously in 6 months, and the arterial injury was converted to an open operation to treat the patient.

A 2010 study by Gallego and Mathoulin¹⁷ evaluated 114 patients for arthroscopic resection of dorsal wrist ganglia. The authors noted 6 arthroscopy-related complications: 2 hematomas that required surgical drainage, 1 case of tenosynovitis of the extensor pollicis longus tendon, 1 case of tenosynovitis of the extensor digitorum communis tendon, and 2 patients with transient neurapraxia of the dorsal radial/ulnar nerves.

Chen et al.¹⁸ presented a case series of 15 patients who underwent arthroscopic ganglionectomy, with a mean follow-up of 15.3 months. There was 1 arthroscopy-related complication: transient paresthesia along the radial side, which resolved in 1 month.

Two case reports of DSBUN injury during triangular fibrocartilage complex (TFCC) repair have been presented in the literature (Tsu-Hsin Chen et al.¹⁹ in 2006 and Nguyen et al.²⁰ in 2011). The mechanism of injury was different in each case. In the report of Tsu-Hsin Chen et al., the DSBUN was strangulated by a pullout suture of the joint capsule used for arthroscopic TFCC repair. Treatment entailed segmental excision of the nerve 2 cm proximal and distal to the suture site. In a cadaveric study of arthroscopic TFCC

repair, it has been shown by McAdams and Hentz²¹ that the inside-out sutures may be as close as 0.4 mm to the main trunk of the DSBUN, suggesting that if the nerve is not located and protected before passing of the sutures, there is an approximate 50% chance of nerve branch strangulation. The case report of Nguyen et al. indicated laceration of the DSBUN caused by the trocar used for drainage of the 6U portal. Complete sensory loss was noted in this case on the first post-operative day. Surgical exploration was performed, and on visualization of the injury, resection to healthy tissue was carried out and an epineural coaptation was performed. The 6U portal has been implicated with an increased risk of injury to the DSBUN because of its variable position and winding between the pisiform and ulnar styloid.²

DISCUSSION

A compilation of studies regarding complications of wrist arthroscopy in the literature yields a complication rate of 4.7%, higher than the previously reported 2%.²⁻⁴ A variety of complications have been cited, including nerve injuries, tendon injuries, tendon sheath fistulae, arterial injury, cyst development, development of carpal tunnel syndrome, de Quervain tenosynovitis, chronic loss of mobility, hematoma development, equipment-related burns, and local infections. It is possible that this rate may be an underestimate because of the low number of documented studies about wrist arthroscopy.

The reported rates varied among studies from 1% to 20.5%. Although a clear distinction is not made, many of the complications may be classified as minor because they resolve with little or no intervention whereas others are more severe and subject patients to revision procedures to alleviate the deleterious consequences. A variety of safety precautions should be taken to minimize the incidence of iatrogenic injury, including the use of a hypodermic needle to confirm portal placement, insufflation of the joint with saline solution before portal placement, use of a longitudinal incision that only penetrates the dermis, spreading of the soft tissue with a blunt hemostat to allow for important structures to move aside, insertion of a trocar with minimal resistance, and continuous monitoring of traction.²⁻⁴ In addition, avoidance of the 6U portal and ensuring the appropriate placement of any percutaneous needles used in ligament repairs are recommended.

Ultimately, the probability of wrist arthroscopy-associated injuries is dependent on the surgeon's mastery of the anatomy coupled with correct operative

technique and a thorough understanding of the equipment.² Nevertheless, wrist arthroscopy remains a very useful and relatively safe procedure for the hand and orthopaedic surgeon.

CONCLUSIONS

This systematic review suggests that the previously documented rate of wrist arthroscopy complications may be underestimating the true incidence. The report of various complications provides insight to surgeons for improving future surgical techniques.

REFERENCES

1. Chen YC. Arthroscopy of the wrist and finger joints. *Orthop Clin North Am* 1979;10:723-733.
2. Culp RW. Complications of wrist arthroscopy. *Hand Clin* 1999;15:529-535.
3. Warhold LG, Ruth RM. Complications of wrist arthroscopy and how to prevent them. *Hand Clin* 1995;11:81-89.
4. De Smet L. Pitfalls in wrist arthroscopy. *Acta Orthop Belg* 2002;68:325-329.
5. Lourie GM, King J, Kleinman WB. The transverse radioulnar branch from the dorsal sensory ulnar nerve: Its clinical and anatomical significance further defined. *J Hand Surg Am* 1994; 19:241-245.
6. Nagle DJ, Benson LS. Wrist arthroscopy: Indications and results. *Arthroscopy* 1992;8:198-203.
7. De Smet L, Dauwe D, Fortems Y, Zachee B, Fabry G. The value of wrist arthroscopy. An evaluation of 129 cases. *J Hand Surg Br* 1996;21:210-212.
8. del Piñal F, Herrero F, Cruz-Camara A, San Jose J. Complete avulsion of the distal posterior interosseous nerve during wrist arthroscopy: A possible cause of persistent pain after arthroscopy. *J Hand Surg Am* 1999;24:240-242.
9. Geissler WB. Arthroscopically assisted reduction of intra-articular fractures of the distal radius. *Hand Clin* 1995;11:19-29.
10. Weiss AP, Sachar K, Glowacki KA. Arthroscopic debridement alone for intercarpal ligament tears. *J Hand Surg Am* 1997;22: 344-349.
11. Hofmeister EP, Dao KD, Glowacki KA, Shin AY. The role of midcarpal arthroscopy in the diagnosis of disorders of the wrist. *J Hand Surg Am* 2001;26:407-414.
12. Beredjicklian PK, Bozentka DJ, Leung YL, Monaghan BA. Complications of wrist arthroscopy. *J Hand Surg Am* 2004; 29:406-411.
13. Pell RF IV, Uhl RL. Complications of thermal ablation in wrist arthroscopy. *Arthroscopy* 2004;20:84-86.
14. Shirley DSL, Mullet H, Stanley JK. Extensor tendon sheath fistula formation as a complication of wrist arthroscopy. *Arthroscopy* 2008;24:1311-1312.
15. Darlis NA, Weiser RW, Sotereanos DG. Partial scapholunate ligament injuries treated with arthroscopic debridement and thermal shrinkage. *J Hand Surg Am* 2005;30:908-914.
16. Rocchi L, Canal A, Fanfani F, Catalano F. Articular ganglia of the volar aspect of the wrist: Arthroscopic resection compared with open excision. A prospective randomised study. *Scand J Plast Reconstr Surg Hand Surg* 2008;42:253-259.
17. Gallego S, Mathoulin C. Arthroscopic resection of dorsal wrist ganglia: 114 cases with minimum follow-up of 2 years. *Arthroscopy* 2010;26:1675-1682.
18. Chen AC, Lee WC, Hsu KY, et al. Arthroscopic ganglionec-

- tomy through an intrafocal cystic portal for wrist ganglia. *Arthroscopy* 2010;26:617-622.
19. Tsu-Hsin Chen E, Wei J-D, Huang VWS. Injury of the dorsal sensory branch of the ulnar nerve as a complication of arthroscopic repair of the triangular fibrocartilage. *J Hand Surg Br* 2006;31:530-532.
 20. Nguyen MK, Bourgouin S, Gaillard C, et al. Accidental section of the ulnar nerve in the wrist during arthroscopy. *Arthroscopy* 2011;27:1308-1311.
 21. McAdams TR, Hentz VR. Injury to the dorsal sensory branch of the ulnar nerve in the arthroscopic repair of ulnar-sided triangular fibrocartilage tears using an inside-out technique: A cadaver study. *J Hand Surg Am* 2002;27:840-844.
 22. Doi K, Hattori Y, Otsuka K, Abe Y, Yamamoto H. Intra-articular fractures of the distal aspect of the radius: arthroscopically assisted reduction compared with open reduction and internal fixation. *J Bone Joint Surg Am* 1999;81:1093-1110.

2012 *Arthroscopy* Journal Prize for Level I Evidence

Although level of evidence is but one measure of the quality of a scientific article, studies of the highest levels of evidence are best able to provide answers to clinical questions. The Journal Board of Trustees, the AANA Board, and the Editors are pleased to announce that the *Arthroscopy* Journal Prize of \$5,000 will again be awarded to the report of the best Level I Evidence study. The 2012 prize will be judged by the Journal's Editors and Associate Editors who will consider those Level I papers published during the year.