

Supinator Cyst in a Young Female Softball Player Successfully Treated With Aspiration

Lauren H. Redler, MD, Eric C. Makhni, MD, Christopher J. Visco, MD, and Christopher S. Ahmad, MD

Abstract

Ganglion cysts around the elbow joint are rare, with fewer than 25 citations in the English-language literature, most of them case reports. Among the many causes of elbow pain, cysts are primarily a diagnosis that depends on advanced imaging. When an elbow ganglion or perineural cyst is symptomatic, treatment has ranged from nonoperative to surgical intervention. Our case is unique because it is the first documented ultrasound-guided aspiration and cortisone injection that successfully alleviated a patient's symptoms. The procedures and outcomes of minimally invasive ultrasound-guided aspiration and steroid injections have not been described for cysts around the elbow.

Ganglion cysts around the elbow joint are unusual, with fewer than 25 citations (most of which are case reports) in the English-language literature. Among the many causes of elbow pain, cysts are chiefly diagnosed by advanced imaging. When an elbow ganglion or perineural cyst is symptomatic, treatment has ranged from nonoperative to surgical intervention. Our case report is the first documented ultrasound-guided aspiration and cortisone injection to successfully alleviate a patient's symptoms. The procedures and outcomes of minimally invasive ultrasound-guided aspiration and steroid injections have not been described for cysts around the elbow. The patient and patient's guardian provided written informed consent for print and electronic publication of this case report.

Case Report

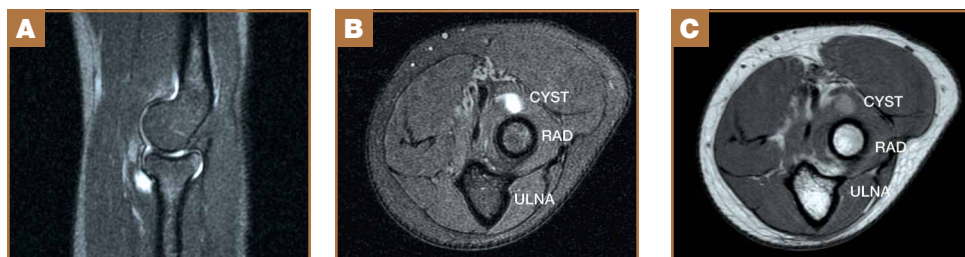
A 14-year-old female freshman varsity softball pitcher on multiple teams presented with 6 months of vague right elbow pain. She was unable to pitch and had intermittent

sharp pain localized to the lateral proximal forearm. She was, however, able to bat without pain and denied any radiating paresthesias. Despite a reduction in sports activities, the symptoms did not improve.

On physical examination, there was preserved strength that was symmetric with the contralateral side of all major muscles innervated by the radial nerve in the right arm, including full wrist, thumb, and finger extension. Sensation was intact to light touch in all major nervous distributions of the right and left upper extremities. She was tender to palpation at the radiocapitellar joint anteriorly, as well as just distally. The patient was also tender with motion through the proximal radial head. She had pain with resisted finger extension; however, resisted supination elicited no discomfort or pain.

The initial diagnostic workup included radiographs of the right elbow, a magnetic resonance imaging (MRI) scan, and an ultrasound. Elbow radiographs revealed no abnormalities. The MRI scan showed a well-circumscribed ovoid T2-hyperintense structure within the supinator muscle measuring 0.6×0.6×0.4 cm (longitudinal × anteroposterior × transverse), just deep to the split of the superficial and deep radial nerves (Figures 1A-1C). A musculoskeletal ultrasound was performed to further characterize and determine the relationship to neurovascular structures. Longitudinal (Figure 2A) and transverse (Figure 2B) images showed a hypoechoic cystic structure, separate from any local nerve, and without Doppler flow, consistent with what was seen on MRI. Additionally, there was an apparent stalk communicating with the anterior margin of

Figure 1. (A) Sagittal T2-weighted fat-saturated magnetic resonance imaging (MRI) of the right elbow showing a hyperintense lesion at the level of the radial neck. (B) Axial T2-weighted fat-saturated MRI of the right elbow showing a hyperintense cyst just anterior to the radial neck. Abbreviation: RAD, radial head. (C) Axial proton-density MRI of the right elbow showing a characteristic low-signal cyst anterior to the radial neck (RAD).



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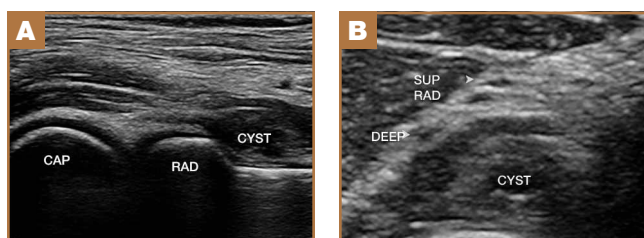


Figure 2. (A) Sagittal ultrasound image of the right elbow showing the capitellum (CAP), radial head (RAD), and cyst just anterior to the radial neck. (B) Axial ultrasound image of the right elbow showing the cyst deep to the division of the radial nerve into its superficial sensory (SUP RAD) and posterior interosseous (DEEP) components.

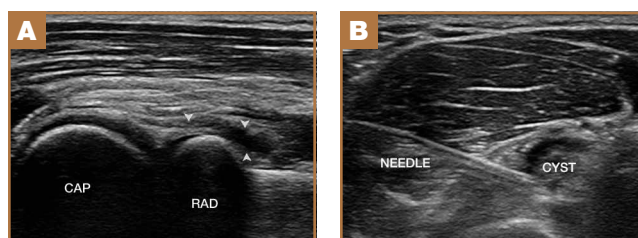


Figure 3. (A) Sagittal ultrasound image of the right elbow showing connection of the cyst (2 arrowheads) to the anterior margin of the radiocapitellar joint via a thin stalk (1 arrowhead). Abbreviations: CAP, capitellum; RAD, radial head. (B) Sagittal ultrasound image of the right elbow using a 1.5-in, 9-g needle in a lateral-to-medial in-plane approach, transverse to the radius, to aspirate the cyst.

the radiocapitellar articulation, seen on longitudinal images, suggesting an extension of the joint capsule (**Figure 3A**).

We diagnosed the patient with a radiocapitellar ganglion cyst. Her symptoms continued despite several sessions of physical therapy and cessation from all throwing. Given the ultrasound and MRI findings, and continuation of the symptoms despite conservative treatment, alternative treatment plans were discussed with the patient. These included continued activity modification and nonoperative treatment, open excision of the cyst, or aspiration of the cyst under ultrasound guidance. All appropriate risks and benefits were discussed, including possibility of nerve damage given the proximity of the cyst to the radial nerve branches. After a thorough discussion with both patient and family, a plan was made to undergo aspiration under ultrasound guidance. This was carried out using a lateral-to-medial in-plane approach, transverse to the radius. Using a 19-g, 1.5-inch needle (**Figure 3B**), 1 mL of serosanguinous fluid was aspirated from the cyst, followed by injection of 40 mg methylprednisolone sodium succinate.

The patient made a dramatic recovery within 8 days after aspiration. On examination, she had full strength to resisted flexion, extension, pronation, and supination; had no tenderness to palpation over the supinator; and no pain with resisted finger extension. She began dedicated physical therapy and a gradual return to throwing. She was able to return to her original level of softball activities 2 months after the aspiration. The patient continued to be symptom-free 26 months after the aspiration/injection. There was no evidence of recurrence of the ganglion on repeat ultrasound at her most recent follow-up (**Figures 4A, 4B**).

Discussion

Our review of the English-language literature identified 23 reports of cysts in and around the supinator muscle. Ganglion cysts are benign lesions that are uncommonly seen about the elbow. This highlights the rarity of this diagnosis, as well as the need for recognition of its existence. Cysts located in the substance of the nerve¹⁻⁵ and extraneural ganglia causing symptomatic nerve compression have been described. These extraneural ganglia have been reported to cause compression of the ulnar nerve,^{1-4,6} posterior interosseous nerve (PIN),^{5,7-12}

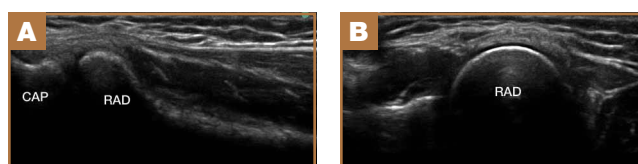


Figure 4. (A) Sagittal ultrasound of the right elbow 26 months after aspiration confirming no recurrence of the cyst. (B) Axial ultrasound image of the right elbow at the level of the radial neck 26 months after aspiration confirming no recurrence of the cyst. Abbreviations: CAP, capitellum; RAD, radial head.

and radial nerve,¹³ and isolated compression of the radial sensory branch.¹⁴⁻¹⁷ Ganglion cyst compression in the elbow can result in pain, decreased motor function, and decreased sensation. The PIN syndrome is primarily a motor deficiency, whereas isolated compression of the sensory branches of the radial nerve presents as pain along the radial tunnel and extensor muscle mass.¹⁷

Most ganglion cysts are formed when joint fluid extrudes through a defect in the joint capsule; they have also been described originating from a nonunion site.¹⁸ When conservative treatment fails, surgical excision has been recommended.^{5,6,8-10,12-16} We present the first known case of successful ultrasound-guided aspiration and injection of a ganglion cyst from the proximal radiocapitellar joint.

In the earliest described case in 1955, Broomhead¹⁹ noted exploration was essential to establish the diagnosis of nerve palsy. In 1966, Bowen and Stone⁷ were the first to report PIN compression by a ganglion and that compression was likely where nerves pass through confined spaces. In keeping with the known potential for compression of the common peroneal nerve around the fibular head, Bowen and Stone⁷ posited that the same could be true of the PIN coursing through the supinator and around the radial neck.

Many authors have noted that nerve palsy either improves with rest or worsens with heavy manual work.^{3,20,21} These observations suggest that dynamic factors in addition to compression of the nerve by the ganglion may influence the occurrence of the nerve palsy.¹⁴ This is in line with our patient whose symptoms worsened after pitching.

Ogino and colleagues²⁰ reported on the first use of ultrasonography as a screening examination for a ganglion, particularly when palpation was difficult. Ultrasound allows a detailed assessment of peripheral nerve continuity with a mass, differentiating an intraneural lesion from an adjacent extrinsic ganglion.¹³ Tonkin¹⁰ published the first description of MRI used for the diagnosis of an elbow cyst, and its use has been supported by others.^{5,8,20} The typical appearance of ganglion cysts on MRI include low signal on T1-weighted images and very high signal on T2-weighted images. Only the periphery of the mass is enhanced by gadolinium, if used.

As recently as 2009, Jou and associates¹³ suggested that surgical excision should be performed promptly to ensure optimal recovery from a nerve palsy. Many authors agree that early diagnosis and careful surgical excision is associated with a satisfactory outcome without recurrence of the cyst.^{5,6,8-10,12-15} There are only 4 published case reports¹⁴⁻¹⁷ of ganglions causing isolated compression of the superficial radial sensory nerve, as in our case. Their patients had pain with exertional trauma¹⁴ as did our patient, a positive Tinel sign,¹⁵ and resolution of symptoms after surgical excision without recurrence.¹⁴⁻¹⁶ Mileti and colleagues¹⁶ state that standard management for resistant radial tunnel syndrome is open decompression of the radial nerve.

In the last decade, a few reports of arthroscopic excision being a viable and safe alternative to open excision have been published.^{16,22,23} In 2000, Feldman²² described the benefits of an arthroscopic approach as decreased soft-tissue dissection, increased ability to identify intra-articular pathology, and similar recurrence rates to open procedures. He reported 1 transient neurapraxia of the superficial radial nerve from the arthroscopy, highlighting a risk of arthroscopic treatment.

An alternative to open or arthroscopic cyst decompression is aspiration. The only mention of aspiration in the literature comes from Broomhead¹⁹ in 1955 when he described 2 patients in whom treatment by aspiration was unsuccessful in relieving their symptoms. Yamazaki and colleagues¹² noted that 1 of their 14 patients with PIN palsies caused by ganglions at the elbow underwent puncture of the ganglion with recovery of the paralysis. With the aid of ultrasound guidance, we were able to accurately locate the ganglion cyst, aspirate its contents, and inject methylprednisolone sodium succinate. Our patient continued to be symptom-free and was an active pitcher on a varsity softball team 26 months after aspiration.

Conclusion

This case report describes a rare location for a ganglion cyst in a high-level softball player. To our knowledge, successful treatment with ultrasound-guided aspiration and injection of a supinator cyst has not been reported in the literature. This case report highlights the importance of a careful diagnosis of this condition and an alternative treatment algorithm.

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This paper will be judged for the Resident Writer's Award.
