



ELSEVIER

ORIGINAL ARTICLE

Pediatric elbow arthroscopy: indications and safety

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Background: Elbow arthroscopy is a minimally invasive means by which to treat a variety of acute and chronic elbow conditions. Although the safety and efficacy is well documented in the adult population, comparatively little information is available about the role of elbow arthroscopy in the pediatric population. This study reports the indications for and safety of elbow arthroscopy in a series of pediatric patients.

Methods: A retrospective review was performed from 2001 to 2015 of a surgical database at a single institution. All elbow arthroscopies performed in patients aged 18 years and younger were reviewed. Indications for surgery, perioperative and postoperative complications, further surgical intervention, and descriptive demographic information were recorded.

Results: We identified 64 elbow arthroscopic procedures in 59 patients. The average age at the time of surgery was 11.8 years. Indications for the arthroscopic surgery included contracture release (45.3%), closed reduction and fixation for fracture (20.3%), treatment of osteochondritis dissecans (20.3%), diagnostic arthroscopy (7.8%), and débridement (6.3%). The overall complication rate was 17.2%, with a major and minor complication rate of 6.3% and 10.9%, respectively.

Conclusion: Elbow arthroscopy has applications in the pediatric population with an acceptable safety profile. The techniques and indications continue to evolve.

Level of evidence: Level IV; Case Series; Treatment Study

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Keywords: Elbow arthroscopy; pediatric elbow; elbow contracture; osteochondritis dissecans; lateral condyle fracture; elbow synovitis; elbow instability

Elbow arthroscopy has historically been considered a challenging procedure given the relatively confined joint space and proximity of surrounding neurovascular structures. However, with advancements in experience, technique, and instrumentation, elbow arthroscopy has emerged as a safe and

effective means to treat a wide range of acute and chronic elbow pathology. Although the body of literature regarding indications and outcomes for elbow arthroscopy in adults is growing, there are few reports on the use of this technique in the pediatric population.

Previously, the role of elbow arthroscopy in the pediatric patient was primarily limited to treatment of osteochondritis dissecans (OCD).^{6,7,10,12} A recent review of indications for pediatric elbow arthroscopy by Vavken et al¹³ reported that greater than half of all arthroscopic elbow procedures were performed for treatment of OCD lesions; however, they did discuss the growing indications for pediatric elbow arthroscopy

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in treating a number of conditions, including contracture, congenital abnormalities, and post-traumatic conditions.

Given the minimally invasive nature of arthroscopic treatment of elbow pathology, pediatric patients stand to benefit from an expanded role of elbow arthroscopy by avoiding the complications and large dissections associated with open techniques. The primary aim of this study was to analyze the indications and complications of a large series of pediatric elbow arthroscopies to demonstrate the expanding indications for and safety profile of arthroscopy in the pediatric population.

Materials and methods

Data collection

The operative database of a single surgeon with fellowship training in hand surgery and pediatric orthopedic surgery at a large academic adult and pediatric tertiary referral center was searched for all arthroscopic elbow procedures performed in patients aged 18 years and younger from 2001 to 2015. Patient records were reviewed. Data collected included the age of the patient at the time of surgery, laterality, sex, type of injury, indication for surgery, and any associated complications or unplanned reoperations in the perioperative and postoperative period.

Surgical technique

Although specific surgical technique varied according to the indication for surgery, a surgeon-specific protocol was followed. All patients were placed supine with the operative arm draped free and a tourniquet placed high on the brachium. The arm was placed in a McConnell arm positioner (McConnell Orthopedic Manufacturing Co., Greenville, TX, USA) with the elbow in 90° of flexion and the forearm in neutral position over the patient and parallel to the floor. Surface bony topology was identified, and the ulnar nerve was palpated and its course marked out. Typical portals used included the midlateral (soft-spot), posterolateral, anteromedial, and transtriceps. Various other accessory portals were used as needed, depending on the surgical procedure.

Results

Analysis of patient demographics

We identified 64 elbow arthroscopies in 59 patients (38 boys and 21 girls) aged 18 years and younger from 2001 to 2015. The average age at the time of surgery was 11.8 years old. The average documented last follow-up visit was 45 weeks after the index procedure.

Analysis of indications

Indications for elbow arthroscopy could be grouped into 5 distinctive categories: (1) release for elbow contracture (n = 29 [45.3%]), (2) arthroscopic-assisted reduction and fixation for

Table I Indications for arthroscopic elbow surgery

Surgical indication for arthroscopy	No. (%) [*] (n = 64)	Average age (y)
Contracture release	29 (45.3)	11.9
Assisted fixation for fracture	13 (20.3)	6.8
Treatment of osteochondritis dissecans	13 (20.3)	14.2
Diagnostic	5 (7.8)	13.8
Débridement for bony or soft tissue pathology	4 (6.3)	14.7
Total	64 (100)	11.8

^{*} Number of arthroscopic procedures.

fracture (n = 13 [20.3%]), (3) treatment of OCD (n = 13 [20.3%]), (4) diagnostic arthroscopy (n = 5 [7.8%]), and (5) débridement of bony or soft tissue pathology (n = 4 [6.3%]). **Table I** provides an overview of the indications for surgery and indication-specific demographic statistics.

Most of the patients who underwent arthroscopic contracture release presented with flexion contractures sustained after operative or nonoperative management of fractures around the elbow. The most common index fracture causing the associated contracture was a radial head fracture (n = 9). Other fractures included intra-articular distal humeral fractures (n = 4), supracondylar humeral fractures (n = 3), and lateral condyle fractures (n = 2). None of these contractures were thought to be the result of significant malunion and thus were not amenable to osteotomy. The remainder of the patients presented with stiffness after infection or after previous surgical management for various other pediatric elbow pathologies. The preoperative flexion-extension arc of motion was (mean ± standard deviation) 93° ± 39.9°. This improved to 128° ± 19.2° after arthroscopic contracture release for a total improvement of 35.2° ± 33.5° (P = .00002).

Of the 13 patients who underwent arthroscopic-assisted reduction and percutaneous fixation for fracture, 9 presented with a lateral condyle fracture. The remaining 4 procedures were for a coronoid fracture, an intra-articular distal humeral fracture, a medial epicondyle fracture, and a radial head and neck fracture. Although arthroscopic-assisted fracture fixation is a relatively new procedure, the technique for management of fractures about the elbow has recently been described.^{1,2} All patients had radiographic signs of union at the most recent follow-up and a stable, concentrically reduced elbow.

Of the 13 patients who underwent arthroscopic treatment of OCD, 5 patients had arthroscopic-assisted internal fixation of the lesion, 4 had arthroscopic débridement and removal of loose bodies, 2 had arthroscopic-assisted subchondral drilling, and 2 had an arthroscopic-assisted osteochondral autograft placement. The technique for an arthroscopic-assisted osteochondral autograft transfer procedure has been previously described.⁶

The remaining patients underwent diagnostic elbow arthroscopy or arthroscopic treatment of chronic bony or soft

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