

Learning curve of the elbow arthroscopy by needle scope: a cadaveric study

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Disclosures: There is no disclosure.

INTRODUCTION: Elbow arthroscopy is a minimally invasive diagnostic tool that enables us to perform therapeutic procedures for various diseases and injuries. Elbow arthroscopy has several disadvantages, including the risk of damage to neurovascular tissues and articular cartilage because of the narrow space in the elbow joint. In the 1990s, a needle scope with a small diameter was developed. With the development of technology, needle scopes have been applied to several joints. However, little is known about the experiences on the needle scope required for surgeons to utilize it with adequate proficiency. This study aimed to determine the learning curve for elbow arthroscopy using a needle scope.

METHODS: In this study, thiel-embalmed five elbows (mean age 89.2 ± 7.8 years) were included. Patients with osteoarthritis diagnosed using fluoroscopy or contractures (flexion $< 120^\circ$) were excluded. Each specimen was placed in supine position. A 1.9-mm needle scope with 0° viewing (NanoScope™, Arthrex, Naples, FL, USA) was inserted into four standard portals (anterolateral portal [ALP], anteromedial portal [AMP], lateral portal [LP], and posterior portal [PP])¹⁾ to observe 19 checkpoints. The ALP was created 2 cm proximal and 2 cm anterior to the lateral humeral epicondyle and ①coronoid fossa, ② humeral trochlea, ③anterior medial capsule, ④coronoid process, and ⑤proximal radioulnar joint (Fig. 1a, b) were observed. The AMP was created 2 cm proximal to the medial humeral epicondyle and just anterior to the intermuscular septum, and ⑥the radial head, ⑦humeral capitulum, ⑧anterior lateral capsule, and ⑨radial fossa were observed. LP (soft spot portal) was created in the center of the triangle formed by the lateral humeral epicondyle, olecranon, and radial head, and ⑩articular surface of the radial head, ⑪humeral capitulum, ⑫proximal radioulnar joint, ⑬humeroulnar joint, ⑭olecranon tip were observed. PP was created 3 cm proximal to the olecranon tip, and ⑮olecranon tip, ⑯the border between trochlea cartilage and olecranon fossa, ⑰lateral edge of the olecranon, ⑱medial edge of the olecranon, and ⑲posterior of lateral epicondyle were observed. A 0.9% saline solution was used to irrigate joints. All procedures were performed by three surgeons with > 15 years of experience in arthroscopic elbow surgery. The observation time of all the checkpoints from each portal was recorded, and the average time for the first and fifth times were compared using a paired t-test with significance set at $p < 0.05$. All statistical analyses were performed using the open-source statistical computing software package R. This study was approved by the Institutional Review Board of the Ethics Committee.

RESULTS: The mean time for the fifth time decreased compared to the first time in ALP, AMP, and LP (ALP; 36.7 ± 9.1 s in first time, 16.3 ± 9.7 s in fifth time [Fig. 2], AMP; 14.7 ± 2.5 s in first time, 12.0 ± 1.7 s in fifth time, LP; 36.7 ± 19.0 s in first time, 27.0 ± 9.2 s in fifth time); however, the difference was not significant. A decreasing trend was not observed in PP (41.0 ± 6.6 s in first time and 50.3 ± 27.2 s in fifth time).

DISCUSSION: In this study, a needle scope was used to observe several areas of the elbow joint that could be visualized with conventional oblique arthroscopy. The fifth observation required less time than the first observation for ALP, AMP, and LP. Meanwhile, regarding the posterior joint space via the PP, no decreasing trend was identified following the five trials. One reason for these differences is that the soft tissue in the posterior joint space obstructs visualization. Hence, another working portal is required to remove the soft tissues.

SIGNIFICANCE/CLINICAL RELEVANCE: The observation time via the ALP, AMP, and LP was shorter after five trials, but the observation time of the posterior joint space through the PP did not decrease owing to frequency because of difficulties in obtaining a clear view without working portals.

REFERENCE: 1. Champ L, et al. American Journal of Sports Medicine.1999

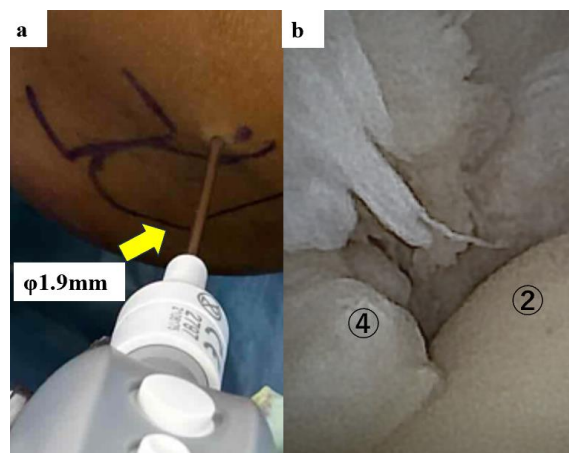


Fig.1. (a) Elbow arthroscopy with needle scope via anterolateral portal. (b) Arthroscopic image with needle scope observing humeral trochlea② and coronoid process④. Similarly, 19 checkpoints were observed via four portals.

Arrow: a 1.9mm-diameter needle scope



Fig.2. Mean time to observe five checkpoints in the elbow joint via the anterolateral portal (ALP).