

English & Japanese Oral Session 16 "Contracture/ Arthroscopy"
Feb. 4th (Sat) 15:25~16:15
Room 2 (Yamagata Tessa 1F Tessa Hall)

O16-1

Development and validation of a prognostic nomogram for open elbow arthrolysis: the Shanghai Prediction model for Elbow Stiffness Surgical Outcome (SPESSO)

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Aims

This study aimed to develop and internally validate a prognostic nomogram to predict the probability of gaining a functional range of motion (ROM $\geq 120^\circ$) after open elbow arthrolysis for posttraumatic elbow stiffness.

Methods

We developed the Shanghai Prediction Model for Elbow Stiffness Surgical Outcome (SPESSO) basing on a training dataset of 551 patients who underwent open elbow arthrolysis in 4 collaborative institutions. Demographic and clinical characteristics were collected through medical records. The least absolute shrinkage and selection operator (LASSO) regression model was used to optimize feature selection. Multivariable logistic regression analysis was applied to build SPESSO. The prediction performance of SPESSO was evaluated using the concordance index (C-index) and calibration plot. Internal validation was conducted using bootstrapping validation.

Results

Body mass index, disease duration, preoperative range of motion, preoperative pain intensity, and grade of posttraumatic elbow arthritis were identified as outcome predictors and incorporated to construct the nomogram. SPESSO displayed good discrimination with a C-index of 0.73 (95% CI 0.64 to 0.81). A high C-index value of 0.70 could still be reached in the interval validation. The calibration plot showed good agreement between nomogram prediction and observed outcomes.

Conclusion

The newly developed SPESSO is a valid and convenient model to predict the clinical outcome of open elbow arthrolysis. SPESSO could assist clinicians in counselling patients regarding treatment expectations and therapeutic choices.

Take home message

--We developed and validated a nomogram (SPESSO) that would predict the probability of gaining a functional ROM in posttraumatic elbow stiffness patients undergoing open elbow arthrolysis.

--BMI, disease duration, preoperative ROM, preoperative pain intensity, and grade of posttraumatic elbow arthritis are independent predictors for open elbow arthrolysis outcome.

--SPESSO could assist clinicians in counselling patients regarding treatment expectations and taking medical interventions to optimize care for posttraumatic elbow stiffness patients.

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O16-2

Locational Distribution Characteristics and Risk Factors of Heterotopic Ossification in Post-traumatic Elbow Stiffness

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Objective

This study intends to evaluate the characteristics of locational distribution of heterotopic ossification (HO) in patients with post-traumatic elbow stiffness based on elbow 3DCT, and to analyze and explore the risk factors for the development of HO in different locations.

Methods

Patients with post-traumatic elbow stiffness due to HO development who were admitted to our department from January 2018 to December 2018 were consecutively enrolled. The baseline data and CT data were collected and processed using Mimics 20.0. The locational distribution of HO for each patient were determined based on 8 regions including anteromedial, anterolateral, posteromedial, posterolateral, posterior, medial, lateral, and proximal radioulnar area. For the initial trauma, in addition to specific diagnosis, the injury patterns of each patient was further divided according to whether or not these five types of injuries existed: distal humerus fractures, olecranon fractures, radial head fractures, coronoid fractures and elbow dislocations. Taking the occurrence of HO in a certain location as the dependent variable and the initial trauma and baseline data as independent variables, logistic regression analyses were used to evaluate the risk factors of HO in each location.

Results

A total of 91 patients were enrolled in this study. For the occurrence rate of HO, 88 cases had posteromedial HO (96.7%), 62 cases had posterior HO (68.1%), 60 cases had posterolateral HO (65.9%), 41 cases had anteromedial HO (45.1%), 26 cases had anterolateral HO (28.6%), 13 cases had proximal radioulnar HO (14.3%), 8 cases had lateral HO (8.8%), and 7 cases had medial HO (7.7%). Logistic regression analysis showed that the presence of ulnar nerve symptoms (OR=4.354, P=0.017), the presence of elbow dislocation in the initial trauma (OR=2.927, P=0.042) were the independent risk factors for the development of anteromedial HO, and the presence of olecranon fracture in the initial trauma (OR=0.277, P=0.023) was the protective factor for the development of anteromedial HO. The presence of radial head fracture in the initial trauma was the independent risk factor for the development of anterolateral HO (OR=2.891, P=0.033), posterolateral HO (OR=3.467, P=0.025) and proximal radioulnar HO (OR=6.525, P=0.004), respectively. Age was a protective factor for the development of medial HO (OR=0.899, P=0.028).

Conclusion

HO development in patients with post-traumatic elbow stiffness has unique locational distribution characteristics and is closely related to the initial trauma. These results have important reference value for the clinical evaluation of HO in patients with post-traumatic elbow stiffness.

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O16-3

Serial changes in clinical outcomes of arthroscopic osteocapsular arthroplasty for primary elbow osteoarthritis: A medium-term follow-up study

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Background: Arthroscopic osteocapsular arthroplasty (OCA) shows promising short-term outcomes for primary elbow osteoarthritis (OA). This study was to evaluate the serial clinical outcomes of primary elbow OA after arthroscopic OCA.

Methods: Patients with primary elbow OA who were treated with arthroscopic OCA between January 2010 and April 2020 were included. The elbow range of motion (ROM), visual analog scale (VAS) pain score, and Mayo elbow performance score (MEPS) were assessed preoperatively, at short- (3–12 months), and medium-term follow-up (≥ 2 years).

Results: A total of 56 patients who underwent short-term follow-up (mean [range], 5.9 months [3–9]) and medium-term follow-up (62.2 months [24–129]) after arthroscopic OCA were analyzed. Compared with preoperative assessment, ROM arc (89.4° to 111.7° , $P < .001$), VAS pain score (4.9 to 2.0, $P < .001$) and MEPS (62.3 to 83.7, $P < .001$) significantly improved at short-term follow-up. At medium-term follow-up, ROM arc (111.7° to 105.4° , $P < .001$) decreased while VAS pain score (2.0 to 1.4, $P = .010$) and MEPS (83.7 to 87.8, $P = .005$) improved from short-term period. The time interval between short-term and medium-term follow-up showed significant positive correlations with the aggravation of ROM in terms of both ROM subtraction (correlation coefficient: 0.290, $P = .030$) and ROM ratio (correlation coefficient: 0.302, $P = .024$), and a significant negative correlation with improvement of MEPS (correlation coefficient: -0.274, $P = .041$).

Conclusions: Serial assessment of patients with primary elbow OA who underwent arthroscopic OCA showed that the clinical outcomes were improved from preoperative assessment to short-term follow-up and medium-term follow-up. Specifically, ROM had decreased over time while VAS pain score and MEPS showed serial improvement until medium-term follow-up.

Key terms: Elbow osteoarthritis; osteocapsular arthroplasty; arthroscopy; elbow arthrolysis

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O16-4

Clinical outcomes of revision arthroscopic osteocapsular arthroplasty in primary elbow osteoarthritis: A retrospective cohort study

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Purpose: This study aimed to assess clinical outcomes after revision arthroscopic osteocapsular arthroplasty (OCA) in patients with primary elbow osteoarthritis (OA).

Methods: Patients who underwent arthroscopic OCA due to primary elbow OA, from January 2010 to June 2021, were enrolled. We assessed range of motion (ROM), visual analogue scale (VAS) pain score, Mayo elbow performance score (MEPS), preoperatively and at final follow-up. Patient satisfaction with surgery was asked at the final follow-up.

Results: Data from 61 patients (PRIMARY: 53 patients, REVISION: 8 patients) were analyzed. Mean age was 56.3 ± 8.5 years and 54.3 ± 8.9 years in PRIMARY and REVISION groups, respectively ($P = .684$). Mean interval from primary to revision surgery was 76.4 (range, 26–168) months. PRIMARY group had significantly better preoperative (PRIMARY vs. REVISION, $89.9 \pm 20.3^\circ$ vs. $71.3 \pm 22.3^\circ$, $P = .021$) and postoperative ROM arc ($112.4 \pm 17.1^\circ$ vs. $96.9 \pm 16.5^\circ$, $P = .019$) than that with the REVISION group; however, degree of improvement was comparable between groups ($22.5 \pm 13.4^\circ$ vs. $25.6 \pm 11.5^\circ$, $P = .445$). Both postoperative VAS pain score (2.0 ± 1.7 vs. 1.1 ± 1.0 , $P = .164$) and MEPS (83.8 ± 12.8 vs. 88.1 ± 8.8 , $P = .581$) were comparable between the groups, as were degree of improvement in VAS pain score (2.8 ± 2.7 vs. 3.5 ± 3.2 , $P = .691$) and MEPS (21.7 ± 15.7 vs. 25.6 ± 15.2 , $P = .604$). All patients were very satisfied ($n = 2$, 25.0%) or satisfied ($n = 6$, 75.0%) with revision surgery.

Conclusion: Revision arthroscopic OCA is a favorable treatment option in primary elbow OA patients, who have recurrent symptoms. Compared to primary surgery, degree of ROM, VAS pain score, and MEPS were comparable after revision surgery, and all the patients were satisfied with revision surgery.

Level of Evidence: Level III; Retrospective comparative study; Treatment Study

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O16-5

Incidence of Heterotopic Ossification in Elbow Arthroscopy

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Purpose: To assess the incidence of heterotopic ossification (HO) after elbow arthroscopy.

Methods: Data of consecutive patients receiving elbow arthroscopy from May 2011 to April 2022 at the authors' center were retrospectively reviewed. HO identified on the radiograph and CT was graded using the Hasting & Graham classification. The clinical outcomes were assessed using the pain Visual Analogue Scale (VAS), and the functional outcomes were evaluated using the Quick Disabilities of the Arm Shoulder and Hand (QuickDASH) questionnaire, the Mayo Elbow Performance Score (MEPS), and the Single Assessment Numeric Evaluation (SANE) before and after surgery.

Results: Of the 253 patients enrolled, 13 (5.1%) of them had HO confirmed with 10 formed on the medial side. The mean follow-up was 365.9 days (range, 37–1,166 days). Eleven patients had Hasting & Graham grade 1 and 2 had grade 2. At the last follow-up, the functional outcomes of the 11 asymptomatic patients were all improved (QuickDASH, 33.1 ± 15.9 vs. 6.2 ± 5.4 ; MEPS, 73.9 ± 17.5 vs. 93.9 ± 8.2 ; SANE, 40.0 ± 17.3 vs. 79.3 ± 17.3 ; all $P < 0.001$), but the clinical outcome was slightly improved without statistical significance (VAS, 1.6 ± 1.4 vs. 0.4 ± 0.9 ; $P = 0.064$). Two symptomatic patients underwent repeated arthroscopy for HO excision, and their clinical and functional outcomes were all improved at the last follow-up. HO appeared as early as 8 weeks after surgery, and younger age and male gender were suggested as significant factors (odds ratio [age], 0.948, $P = 0.026$; odds ratio [sex], 9.002, $P = 0.038$).

Conclusions: HO is a younger age- and male gender-prone minor complication of elbow arthroscopy. Although the presence of HO has minimal clinical or functional impact on most patients, it should be closely monitored for a minimum of 8 weeks postoperatively.