English & Japanese Oral Session 2 "UCL 1"

Feb. 3rd (Fri) 14:45〜15:15
Room 2 (Yamagata Terrsa 1F Terrsa Hall)

O2-1

Change in Humeral Anchor Position Significantly Affects Isometry in UCL Repair: A 3-Dimensional Computer Modeling Study

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Objectives: Medial ulnar collateral ligament (UCL) repair utilization is increasing in recent years, bolstered by shorter rehabilitation and satisfactory clinical outcomes. While previous literature has illustrated the importance of tunnel position on restoring graft isometry in UCL reconstruction, there remains a paucity of literature guiding anchor placement in UCL repair. Herein, we describe a 3-dimensional (3D) elbow model to measure and optimize anchor location during UCL repair.

Methods: A 3D computer model of a human elbow joint was created using CT and MRI images from a single patient. The humeral and ulnar attachments of the UCL were plotted using three distinct methodologies: 1) geometric cloud mapping; 2) quantitative measurements as described by the anatomical studies by Camp et al[1]; and 3) Frangiamore et al[2]. A 3.5mm-diameter clockface was placed on each attachment site which allowed for simulation of 12 distinct, 1.75mm deviations in anchor position. The three elbow models were then ranged through 0-120 degrees of flexion at 10-degree increments, and the 3D distances were measured between the two ligament centroids. The humeral and ulnar anchors were sequentially repositioned around the clockfaces, and ligament lengths were again measured to evaluate changes in isometry. An independent t-test was performed to determine if there was a significant difference in isometry between the humeral or ulnar anchor deviations.

Results: Using method 1, the UCL length at 90 degrees of elbow flexion was 26.8mm. This ligament underwent 13.6mm of total excursion for a 46.4% change in length throughout arc of motion. Method 2 produced a 19.3mm ligament that underwent 0.8mm of excursion for a 3.9% length change throughout the arc. Method 3 produced a 24.5mm ligament that underwent 2.3mm of excursion for a 9.4% length change throughout arc. Identifying ligament footprints using the quantitative anatomical measurements as described by Camp et al[1] and Frangiamore et al[2] produced better ligament isometry through 120 degrees of flexion (ligament length changes of 3.9% and 9.4%, respectively) when compared to using the geometric cloud technique (46.4% length change). Humeral anchor deviations produced a statistically significant increase in ligament excursion when compared to ulnar anchor deviations ($p < 0.001$).

Conclusion: When performing UCL repair, small deviations in humeral anchor position may significantly influence graft and ligament isometry. Anchor position was most isometric while using the quantitative measurements as described in Camp et al[1]. Particularly when addressing detachments of the humeral footprint, surgeons should be critical of the humeral anchor position in order to restore native anatomy and optimal biomechanics.

一般2「UCL 1」

2月3日（金）14:45〜15:15
第2会場（山形テルサ 1F テルサホール）

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O2-2

Self-controlled case seriesを用いた内側型野球肘からTommy John手術へのリスク比

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Risk of Little Leaguer's Elbow to Tommy John Surgery Using Self-Controlled Case Series

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【目的】内側型野球肘（以下 LLE）は投球時の肘外反力を高め、肘内側側副靱帯（以下 UCL）への動的ストレスを上昇させる要因と考えられている。しかし LLE 症例に対し縦断的追跡研究を継続することは難しく、LLE 発症がその後の UCL 損傷や Tommy John 手術（以下 TJS）に与える影響は不明である。Self-Controlled Case Series（以下 SCCS）はイベントが生じた対象自身をコントロールとし、暴露から調査期間内に生じるアウトカムの発生率比を調べる研究デザインである。目的は SCCS を用いて LLE 発症から5年以内に TJS に至る発生リスク比を調査すること。

【方法】2017年から2021年に TJS を受けた45名の中高校生野球選手を対象とした。全例が小学生から野球を開始し、LLE の既往歴はカルテ内情報、受診時や検診時の野球問診表から得た。SCCS では①野球開始年齢から②TJS 実施までを観察対象期間とし、③LLE 発症（暴露）から④5年間（60か月）を焦点期間と定め、TJS の実施が焦点期間内か焦点期間外かを比較しリスク比を R を用いて算出した。

【結果】LLE 既往は35名に認め、複数回発症は12名、初回 LLE 発症平均年齢は11.4歳で TJS 実施時平均年齢は16.5歳であった。LLE 発症から5年以内の TJS 発生リスク比は2.389倍（95%CI: 1.146 to 5.385、p=0.0256）多かった。

【考察】中高校生の野球選手にとって LLE の発症は UCL 損傷および TJS に発展するリスクを高める。

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O2-3

Low Rates of Postoperative Complications and Revision Reconstruction After Primary Elbow Ulnar Collateral Ligament Repair in 286 Patients with Minimum 2-Year Follow-Up

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Background: Recent innovative techniques and biomechanical evidence have generated revived interest in repair of medial ulnar collateral ligament (UCL) injuries. However, data regarding postoperative complications and revision surgery is limited.

Purpose: To evaluate the 90-day postoperative complications and incidence of revision surgery following primary UCL repair at minimum 2-year follow-up.

Study Design: Case Series, Level of Evidence, 4.

Methods: A retrospective review of a national insurance database was conducted from 2015 to 2020 to identify patients with documented UCL injuries that underwent a primary UCL repair with minimum 2-year follow-up data. Patients >40 years of age, those with concomitant elbow fracture, dislocation, radial lateral collateral ligament injures, medial epicondylitis, a history of previous elbow surgery/ injury, and/or elbow arthritis were excluded. The number of patients that underwent concomitant ulnar nerve transposition or decompression during the primary UCL repair was recorded. Rates of 90-day postoperative complications, including ulnar neuropathy (both new and persistent cases), superficial wound complications, and elbow stiffness were assessed. Subsequent ulnar nerve surgeries after the primary UCL repair were also tracked. The incidence and timing of revision UCL surgery, defined by ipsilateral revision UCL reconstruction or revision repair, were tracked using Kaplan-Meier analysis.

Results: In total, 286 patients that underwent primary UCL repair met inclusion criteria with an average follow-up of 3.9 ± 1.2 years. The average age was 20.4 ± 7.0 years, with 62.9% of patients being male. Concomitant ulnar nerve decompression or transposition was performed in 34.2% (98/286) of patients at the time of primary UCL repair. The most common 90-day postoperative complication was ulnar neuropathy (N=15, 5.2%), while surgical site infections, wound dehiscence, hematoma formation, elbow stiffness, and medial epicondyle fractures were much less common (<2%). Of the 15 patients with postoperative ulnar neuropathy, 5 (33%) underwent subsequent ulnar nerve surgery (2 primary and 3 secondary) at an average of 1-year after the primary UCL repair. The revision UCL surgery rate was low (1.0%, 3/286) at an average follow-up of 3.9 ± 1.2 years and all 3 patients were converted to a UCL reconstruction 9 months after the primary repair.

Conclusion: The most common postoperative complication for patients that underwent primary UCL repair was ulnar neuropathy (5.2%), with 33% of those requiring a subsequent ulnar nerve surgery within a year after the primary UCL repair. At an average follow-up of 3.9 years, the rate of revision surgery was only 1% (3/286), and all 3 patients underwent a revision UCL reconstruction 9 months after the primary UCL repair.