



Box-loop ligament reconstruction of the elbow for medial and lateral instability

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Background: Elbow instability remains a challenging surgical problem. Most commonly, isolated reconstructions of the medial collateral ligament or lateral collateral ligament are performed; however, on occasion, there can be deficiency that requires reconstruction of both ligaments. The senior author has developed a method to reconstruct both the medial and lateral collateral ligaments using 1 graft. This technique uses a “box-loop” design, whereby the donor tendon is passed through the humerus and ulna and tied back to itself, creating a loop.

Materials and methods: Fourteen cases with mean follow-up of 64 months were reviewed. Nine patients returned to the clinic and were evaluated both clinically and radiographically. An additional 5 patients participated by phone questionnaire.

Results: Average follow-up time was 64 months (range, 19-109 months). According to the Summary Outcome Determination given by the patients, 7 elbows were normal or nearly normal, 4 were greatly improved, 2 were improved, and 1 was worse compared with before surgery. The Summary Outcome Determination score average was 7 (range, -2 to 10). American Shoulder and Elbow Surgeons scores (including both clinic patients and phone questionnaire patients) ranged from 36 to 100, with an average of 81; of 14 patients, 8 had an American Shoulder and Elbow Surgeons self-satisfaction score of 10. The average Quick Disabilities of the Arm, Shoulder, and Hand score was 13 (range, 0-64). The average Mayo Elbow Performance Index score was 88 (range, 60-100), with 4 excellent (90-100), 3 good (75-89), and 3 fair (60-74) results and no poor results.

Discussion: This technique was found to have excellent midterm results. Compared with separate medial- and lateral-sided reconstruction, there is simplification of bone tunnel formation as well as graft fixation.

Level of evidence: Level IV, Case Series, Treatment Study.

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Keywords: Elbow instability; box-loop reconstruction; medial collateral ligament; lateral collateral ligament

The Mayo Clinic Institutional Review Board that convened on October 22, 2009, approved this project: Protocol No. 09-001432. Consent forms were signed by all participating patients.

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Reconstructive techniques have been described to address each of the forms of instability, including the medial collateral ligament (MCL) or the lateral collateral ligament (LCL) complex.^{7-11,14,17} Gross instability of the elbow requires reconstruction of both ligaments.^{15,18,19} A technique has been described by van Riet et al^{18,19} to

Table I Patient demographics

Case	Age at surgery	Side	Job	Comorbidities	Preoperative diagnosis	Prior surgeries	Concomitant surgery at time of box-loop reconstruction
1	28	Left	Merchant Marine officer	None	Contracture, HO after closed head injury	1—Anterior capsulectomy and HO excision	HO and capsular excision, ulnar nerve transposition
2	25	Right*	Flight student (U.S. Navy)	None	Chronic instability with deficient coronoid and radial head	4—ORIF with radial head replacement, radial head implant removal and capsular release, ulnar nerve transposition and MUA, MCL reconstruction	Revision radial head arthroplasty, coronoid osteotomy and ORIF, ulnar nerve neurolysis
3	48	Right*	Nurse	None	Chronic instability with medial epicondyle nonunion, ulnar neuropathy	1—ORIF of medial epicondyle nonunion	Excision of medial epicondyle nonunion, ulnar nerve decompression
4	68	Left	Homemaker	Smoker, fibromyalgia, history of lung cancer	Chronic instability, failed radial head replacement	1—Radial head replacement	Revision radial head arthroplasty
5	56	Left	Livestock producer/loan officer	None	Chronic instability with coronoid nonunion	0	None
6	38	Left	Registered nurse	Diabetes mellitus	Chronic instability, overstuffed radial head prosthesis with erosion of capitellum	2—Radial head replacement, LCL repair and capsular imbrication	Removal of radial head prosthesis, ulnar nerve decompression
7	50	Left	Engineer	None	Chronic instability after terrible triad injury, ulnar neuropathy	1—ORIF of radial head and LCL repair, external fixator placement (in place \times 6 weeks)	ORIF coronoid nonunion, HO and capsular excision, ulnar nerve transposition
8	18	Left	Material handler	None	Chronic instability, capitellar nonunion	0	Hemicap reconstruction of capitellum
9	49	Right*	Accountant	None	Contracture, radioulnar synostosis after proximal radius and ulna fracture, ulnar neuropathy	2—ORIF ulna, delayed skin grafting	HO and capsular excision, radial head arthroplasty, ulnar nerve transposition
10	26	Right*	Manual laborer	None	Chronic instability with medial epicondylar avulsion, ulnar neuropathy	0	Ulnar nerve decompression
11	51	Right*	Farmer	None	Chronic varus and valgus instability, prior ulnar neuropathy, distal radius malunion	2—Ulnar nerve transposition, joint débridement and MCL repair	Distal radius osteotomy/correction
12	20	Left	Sales	None	Chronic instability after multiple instability episodes	0	None
13	18	Left	Student (athlete)	None	Chronic instability with coronoid nonunion	0	ORIF coronoid nonunion, ulnar nerve transposition
14	32	Left	Teacher	None	Chronic instability with medial epicondylar nonunion	0	Excision of medial epicondyle nonunion, ulnar nerve decompression

HO, heterotopic ossification; ORIF, open reduction and internal fixation; MUA, manipulation under anesthesia; MCL, medial collateral ligament; LCL, lateral collateral ligament.

* Dominant side.

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