Early Results of Surgical Treatment of Triangular Fibrocartilage Complex Tears in Children and Adolescents

Mark Wu, MD,* Patricia E. Miller, MS,* Peter M. Waters, MD,* Donald S. Bae, MD*

Purpose To investigate the clinical results and patient-reported outcomes following surgical treatment for triangular fibrocartilage complex (TFCC) tears in the pediatric and adolescent population.

Methods We reviewed 149 patients with 153 arthroscopy-confirmed TFCC tears. Mean age at surgery was 15.5 years (range, 7−19 years). There were 86 females. Plain radiographs and magnetic resonance imaging were used to characterize bony and soft tissue pathology. Mayo Modified Wrist Score (MMWS) and Patient-Reported Outcomes Measurement Information System (PROMIS) Upper Extremity Short Form assessed functional outcomes. Median patient follow-up was 21.8 months (IQR:5.9-55.4).

Results Pre-operatively, all patients had wrist pain or instability with activities. The median preoperative MMWS was 80 (interquartile range [IQR], 65−90). Fifty-six (35%) presented with positive ulnar variance. Concomitant pathology included distal radioulnar joint (DRUJ) instability (14%), ulnocarpal impaction (20%), ulnar styloid nonunion (33%), and distal radius growth arrest (30%). On arthroscopy, there were 15 (10%) isolated 1A, 79 (52%) 1B, 1 (1%) 1C, 30 (20%) 1D tears, and 25 (16%) cases of multiple tears. Twenty-six percent of wrists underwent TFCC debridement, 68% arthroscopy-assisted repair, 6% both for combined tears. Fifty-one percent of wrists underwent bony procedures—most commonly ulnar-shortening osteotomy to achieve neutral ulnar variance (40%) and symptomatic ulnar styloid nonunion excision with concomitant TFCC repair (39%). At final follow-up, pain, wrist range of motion, DRUJ stability, ulnar variance, and MMWS (median, 95 [IQR, 86.5−100]) improved significantly. The median PROMIS T-score at final follow-up was 57 (IQR, 45−57). The MMWS was better in those with concomitant bony procedures at index surgery than those with only repair or debridement of TFCC tears.

Conclusions Most pediatric TFCC tears are posttraumatic and peripheral. Surgical treatment of TFCC tears and concomitant pathology in the pediatric and adolescent population results in decreased pain, improved motion and stability, and excellent functional outcomes in the majority of patients. *(J Hand Surg Am. 2020;45(5):449.e1-e9. Copyright © 2020 by the American Society for Surgery of the Hand. All rights reserved.)*

Type of study/level of evidence Therapeutic IV.

Key words Athlete, pediatric, TFCC, ulnar wrist pain, wrist arthroscopy.

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The triangular fibrocartilage complex (TFCC) functions as a load-bearing surface across the ulnocarpal joint and as a primary stabilizer of the distal radioulnar joint (DRUJ).[1] A TFCC injury may lead to ulnar-sided wrist pain, mechanical symptoms during forearm motion, pain with forceful grip and ulnar deviation, and DRUJ instability.[2] Palmer[3] classified acute TFCC tears into

*From the *Department of Orthopaedic Surgery, Boston Children's Hospital, Boston, MA.*

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Corresponding author: Donald S. Bae, MD, Department of Orthopaedic Surgery, Boston Children's Hospital, 300 Longwood Ave., Hunnewell 2, Boston, MA 02115; e-mail: donald.bae@childrens.harvard.edu.

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4 subtypes based on tear location, aiding diagnosis and management.

The rich vascular supply to the outer 10% to 40% of the TFCC make peripheral lesions more amenable to surgical repair relative to central or radial-sided tears.[4] Peripheral TFCC repair is most commonly treated with arthroscopy-assisted techniques.[5–12] Central tears are most often treated with debridement. Existing literature has mainly focused on TFCC injuries in adults, with limited retrospective case series describing treatment in the pediatric and/or adolescent population.[13–17] With rising sports participation, there appears to be either an increasing incidence or diagnosis of TFCC tears in the younger population.

The purpose of this study was to characterize the clinical results and patient-reported outcomes following surgical treatment for TFCC tears in the pediatric and adolescent population. The secondary aim was to compare outcomes across injury patterns, including tear location, presence of concomitant bony pathology, and surgical treatment methods, including TFCC repair and/or debridement. We hypothesized that surgery for TFCC tears would result in decreased pain and improved functional outcomes but outcomes would vary based on injury characteristics and that TFCC repairs would result in superior outcomes compared with debridement.

MATERIALS AND METHODS

A retrospective review approved by our institutional review board was performed of patients 19 years old and younger who underwent surgical repair or debridement for TFCC tears at a high-volume, tertiary care, academic children's hospital between January 2000 and January 2016. We identified 149 patients with 153 arthroscopy-confirmed TFCC tears. There were 86 females and 63 males. The right wrist was affected in 70 patients, and the left in 83 patients. Four patients had bilateral TFCC tears. Symptoms were present prior to surgical intervention for a median of 6 months (interquartile range [IQR], 1.6–12.2 months). The mean age at surgery was 15.5 years (range, 7–19 years). The median follow-up was 21.8 months (IQR, 5.9–55.4).

History and physical examination were performed and documented by 1 of 2 orthopedic surgeons fellowship-trained in both pediatric orthopedics and hand surgery (P.M.W. and D.S.B.). Historical and physical examination features were collected at pre- and postoperative clinical visits (Table 1). The DRUJ stability was assessed using the DRUJ ballottement test with comparison with the contralateral side. Pain at rest and during activity was assessed using a categorical scale of no pain, mild pain, moderate, or severe pain. Surgical complications such as TFCC re-tear (seen on magnetic resonance imaging [MRI] or repeat arthroscopy), infection, nonunion following corrective osteotomy, DRUJ instability, recurrent pain, and ulnar dorsal sensory nerve injury were recorded.

Preoperative plain radiographs of the wrist were available in 87% (n = 133) of cases because some preoperative radiographs from outside hospitals could not be located. Radiographs were used to measure radial inclination and ulnar variance according to Steyer's method of perpendiculars. Radiographs were examined for concomitant pathology, such as ulnar styloid nonunion/malunion, DRUJ malalignment on standardized views, and radial growth arrest. Preoperative advanced imaging with MRI was performed in 101 wrists, and magnetic resonance arthrography in 14 wrists. T2 sequences were used to assess for the presence and location of a TFCC tear. The TFCC tears were categorized using the Palmer classification.[3] Patients with more than 1 tear were categorized as having multiple tears.

Patients with persistent ulnar-sided wrist pain and/or functional limitations with radiographic and/or MRI evidence of ulnar wrist pathology who failed 6 months of nonsurgical treatment underwent surgery. Prior to surgical intervention, patients underwent standardized nonsurgical management, which included activity modification, orthosis wear, anti-inflammatories, corticosteroid injection, and/or physical therapy. A diagnosis of TFCC tear was made during surgery via diagnostic wrist arthroscopy.

Overall, 132 wrists underwent arthroscopic repair or debridement, and 21 underwent an open repair of the TFCC. Fourteen of 21 were combined procedures in which diagnostic arthroscopy was followed by an open TFCC repair owing to the presence of concomitant pathology.

Wrists with 1A tears underwent arthroscopic debridement. Complete 1B peripheral tears were repaired with an outside-in technique.[18] Open 1B repairs were performed in some patients who underwent concomitant bony procedures, extensor carpi ulnaris stabilization, or capsulodesis.[19] When there was persistent DRUJ instability after the TFCC repair, the repair was reinforced with a flap of fifth and sixth dorsal extensor retinaculum.[15]

Complete 1C tears underwent repair whereas partial tears underwent debridement.[20] Generally, complete 1D tears also underwent repair whereas partial 1D tears underwent debridement. Our preference was to repair any 1C or 1D tear if deemed feasible upon

TABLE 1. Patient Presenting Characteristics

Characteristic	Frequency	%
Dominant wrist affected	65	50
Prior sport-related trauma	102	67
Prior distal radius and/or ulnar fracture	85	56
Age at wrist fracture (y), mean (SD)	12.8	2.9
Moderate/severe pain with activity	127	91
Pain at rest	54	35
Pain score at rest, mean (SD)	1.9	2.7
Physical examination		
Pain with hyperpronation/ hypersupination	88	57
Ulnar-sided tenderness	140	92
Restricted wrist ROM*	27	21
DRUJ instability	21	14
ECU subluxation or tenderness	11	7
Preoperative MMWS, median (IQR)	80	65−90
Imaging		
Positive ulnar variance	54	35
Ulnocarpal impaction	31	27
Premature distal radius growth arrest	36	30
Ulnar styloid nonunion	50	33
TFCC tear appreciated on MRI/MRA	102	89
TFCC tear incorrectly identified on MRI/MRA	41	35
ECU tendinitis	9	8
Intercarpal ligament tear†	4	3

ECU, extensor carpi ulnaris; MRA, magnetic resonance angiogram.
*Restricted wrist ROM defined as <120° arc of motion or <90% of the contralateral side.
†Three scapholunate and 1 lunotriquetral.

arthroscopic evaluation. For those who underwent arthroscopy-assisted repair, an outside-in, transradial repair was performed.[21]

Patients with ulnar-sided wrist pain and greater than 1 mm of positive ulnar variance underwent an ulnar neutralization procedure by either ulnar-shortening osteotomy (USO), excision of ulnar styloid nonunion, or hypertrophic union to 1- to 2-mm negative variance to avoid persistent pain and/or recurrent TFCC tear (Fig. 1). Patients with gross DRUJ instability after TFCC repair with or without USO underwent open DRUJ stabilization using the extensor retinaculum (Herbert sling).[22]

After surgery, patients were immobilized in an above-elbow cast for 4 weeks, followed by an additional 2 weeks of below-elbow casting. Physical therapy was initiated at 6 weeks after surgery for range of motion (ROM), isometric then isotonic strengthening, scar management, and proprioceptive retraining. Questionnaires were used to assess patient functional outcomes. The Modified Mayo Wrist Score (MMWS) is a 100-point score divided among pain, active flexion/extension as percentage of the opposite side, pronation/supination, and ability to return to daily and recreational activities.[15,23] The MMWS was collected both before and after surgery. After surgery, 38% (n = 57) of all patients were contacted by phone to fill out the questionnaire. Patients (or their guardians if patients were younger than 18 years at the time of contact) were given verbal instructions over the phone on how to measure pronation/supination, flexion/extension, with the help of the illustration depicted in Appendix A (available on the *Journal*'s Web site at www.jhandsurg.org). For 49 patients who were unable to be contacted via phone, clinic notes with specific information regarding activity level, ROM, and pain were used to assess for postoperative MMWS at final follow-up. The Patient-Reported Outcomes Measurement Information System (PROMIS) Upper Extremity Short Form (patient form) is a health outcome tool supported by the National Institutes of Health. It is shorter than the computerized adaptive test in order to reduce response burden and has shown good correlation with the computerized adaptive test (Appendix A; available on the *Journal*'s Web site at www.jhandsurg.org).[24] Fifty-seven patients were contacted by phone to fill out this PROMIS questionnaire. Length of follow-up was defined as either final telephone conversation or final clinic visit, if patient was unable to be reached via phone.

A power analysis determined that samples of 10 or 20 would provide 80% power to detect differences of 10 points in MMWS and PROMIS outcome scores assuming SDs of 10 and 15, respectively, using a paired *t* test with alpha set to 5%. In the event that the data are substantially affected by ceiling effects and are skewed in nature, a nonparametric signed-rank test would require a similar number of subjects for comparable power. In addition, sample sizes of 30 to 56 subjects would provide 80% power to detect 30% differences in binary outcome measures from preoperative to postoperative based on McNemar's test with alpha set to 5%.

Injury and treatment characteristics were summarized at preoperative and postoperative time points by

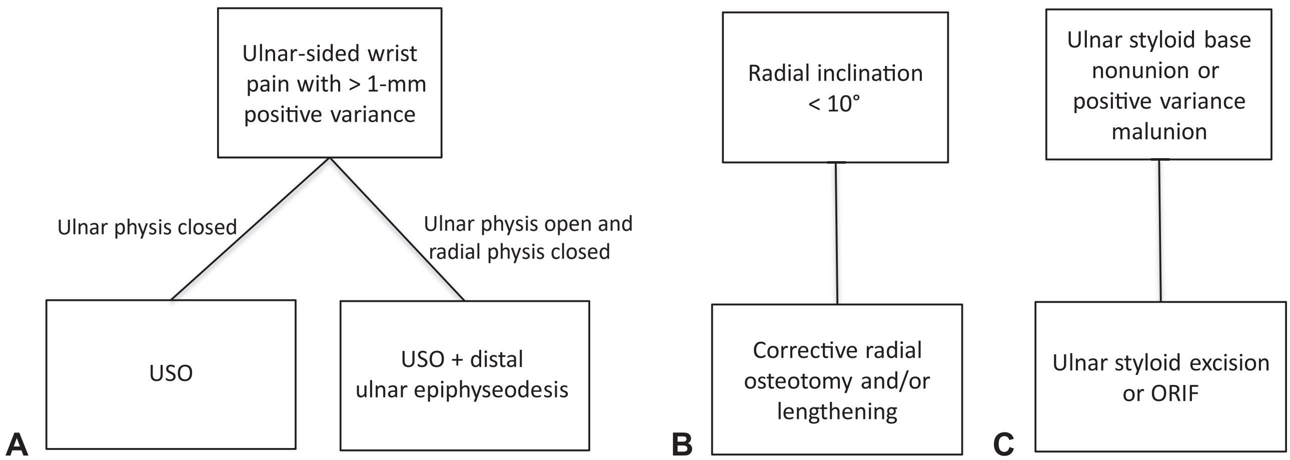

FIGURE 1: Surgical algorithm for performing **A** USO with or without distal ulnar epiphysiodesis. If the patient has clinical and/or radiographic evidence of ulnocarpal impaction and >1 mm of positive variance, USO is performed. **B** Corrective radial osteotomy and/or lengthening. **C** Ulnar styloid excision or open reduction internal fixation (ORIF) of ulnar styloid.

mean and SD or median and IQR (as appropriate) for continuous and ordinal characteristics and by frequency and percent for categorical characteristics (Table 1). Improvement in pain and ROM measurements from preoperative to postoperative and characteristics of those who did versus did not undergo additional surgery were assessed using a signed-rank test or paired *t* test based on data distribution. Improvement in the ability to perform daily activities and instability was assessed using the McNemar test. Fisher exact or chi-square tests were used to evaluate differences in proportions of dichotomous variables based on data distribution. The MMWS and PROMIS Upper Extremity scores were summarized for all cases and by tear (IA, IB, IC, or ID) and treatment (repair vs debridement) type. General linear modeling was used to assess the effect of tear type, bony involvement, and treatment (repair vs debridement) type on outcomes.

RESULTS

Presentation and surgery

Presenting features can be seen in Table 1. Of note, 56% of all patients had prior wrist trauma resulting in a distal radius and/or ulna fracture. On diagnostic arthroscopy, most TFCC tears were peripheral ulnar 1B (52%) and radial 1D (20%) tears (Table 2). Interestingly, preoperative MRI incorrectly identified the Palmer tear type in 35% (41 of 116) of wrists after confirmation of tear type by diagnostic arthroscopy. Twenty-six percent (n = 40) of wrists underwent TFCC debridement, 68% (n = 105) repair, and 6% (n = 9) both (Table 2). The 1A tears underwent debridement (except 1). All patients with complete 1B tears (73 of 73) underwent repair; 56 of 73 (77%) had arthroscopy-assisted outside-in repairs, and 17 of 73 (23%) underwent open repairs owing to concomitant procedures. The 1C tears were rare in this population (n = 1). Nineteen of 30 (63%) 1D tears underwent arthroscopy-assisted transradial repair. The other 11 (37%) 1D tears underwent debridement; 10 were partial 1D tears, and 1 was a complete, unrepairable 1D tear that was debrided (Table 2).

Thirty percent of patients had premature distal radius growth arrest, and 32% had an ulnar styloid nonunion. Bony procedures were done in 51% (n = 78) of wrists at index surgery (Fig. 2 and Table 2). Eighty-nine percent (50 of 56) of those with positive ulnar variance underwent a corrective bony procedure; 45 USOs, 2 ulnar styloid nonunion excision, and 3 corrective radial osteotomy. Of the 50 with ulnar styloid nonunion, 35 underwent ulnar styloid nonunion excision, 6 underwent USO, 1 corrective radial osteotomy, and 1 open reduction internal fixation of nonunion.

Reoperations

Following index surgery, 29 of 153 (19%) of wrists had persistent or recurrent pain and underwent additional procedures (Fig. 3). Four wrists underwent a second repair of the TFCC owing to reinjury during sports participation. Patients who underwent additional surgeries were significantly younger (14.7 ± 1.9 years vs 15.7 ± 2.4 years; $P < .05$) and more likely to be female (79%) than those without additional surgeries ($P < .05$).

Included in the 29 of 153 who underwent additional procedures, 7 of 43 (16%) USO patients had subsequent plate removal owing to implant irritation. Breakdown of surgeries can be seen in Figure 4.

Postoperative clinical results and functional outcomes

At final clinical follow-up (median, 15.4 months), pain, DRUJ stability, and ulnar variance (to −0.2 mm [SD, 1.07]) significantly improved ($P < .05$) (Table 3). The final median MMWS improved significantly as well ($P < .05$). Twenty-three (18%) patients reported moderate (n = 21) or severe (n = 2) pain with activity. In this specific cohort of patients, pain improved from a median of 65 (poor) before surgery to 80 (fair) after surgery.

There were 65 (61%) excellent MMWSs, 21 (20%) good scores, 12 (11%) fair scores, and 6 (6%) poor scores at final follow-up. In the 6 patients with poor MMWSs, pain and limited ROM were the issues, although their level of activity improved at final follow-up. Patients who only underwent TFCC surgery without concomitant surgery also had good to excellent outcomes (Fig. 4) and a median MMWS that improved from 85 before surgery to 93 after surgery ($P = .14$).

The median PROMIS *t* score at final follow-up (n = 57) was 57 (IQR, 45−57). All patients returned to either full (83%), restricted (7%) or low-demand (9%) functional/athletic activities at a median of 4.1 months after surgery (IQR, 3.6−5.3). Of note, 1 patient refractured after implant removal and was treated successfully with casting and 1 patient with a superficial skin infection after surgery was treated with oral antibiotics.

Associations/predictors of outcomes

Postoperative MMWSs were better in patients who underwent concomitant bony procedure at the index procedure surgery (100; IQR, 95−100) compared with those who had soft tissue repairs only (95; IQR, 85−100; $P < .05$). In addition, although conclusions are limited by small sample sizes within subgroups, we were not able to detect in difference in MMWS, rate of return to sport, or pain when comparing repair and debridement or when comparing tear types (Table 4).

DISCUSSION

Triangular fibrocartilage complex injuries can cause considerable ulnar-sided wrist pain and DRUJ instability in the pediatric and adolescent population.[25−27] Limited literature exists on the presentation and surgical management of these injuries

TABLE 2. Index Procedures by TFCC Tear Type

Procedure	1A (15) Frequency (%)	1B (79) Frequency (%)	1C (1) Frequency (%)	1D (30) Frequency (%)	Multiple (25)* Frequency (%)	*P*
Complete tear (vs partial)	13 (87)	73 (94)	0 (0)	20 (67)	23 (92)	<.05
Repair (vs debridement)	1 (7)	74 (95)	0 (0)	19 (63)	15 (60)	<.05
USO	6 (40)	18 (23)	0 (0)	9 (30)	8 (32)	.49
Ulnar styloid nonunion excision	0 (0)	29 (37)	0 (0)	2 (7)	10 (40)	<.05
ORIF ulnar styloid	0 (0)	0 (0)	0 (0)	1 (3)	0 (0)	.40
Ulnar epiphysiodesis	1 (7)	8 (10)	0 (0)	2 (7)	3 (12)	.91
Corrective radial osteotomy	1 (7)	5 (6)	0 (0)	1 (3)	0 (0)	.16
DRUJ stabilization	2 (13)	8 (10)	1 (100)	2 (7)	1 (4)	.48

ORIF, open reduction internal fixation.
*Multiple TFCC tears.

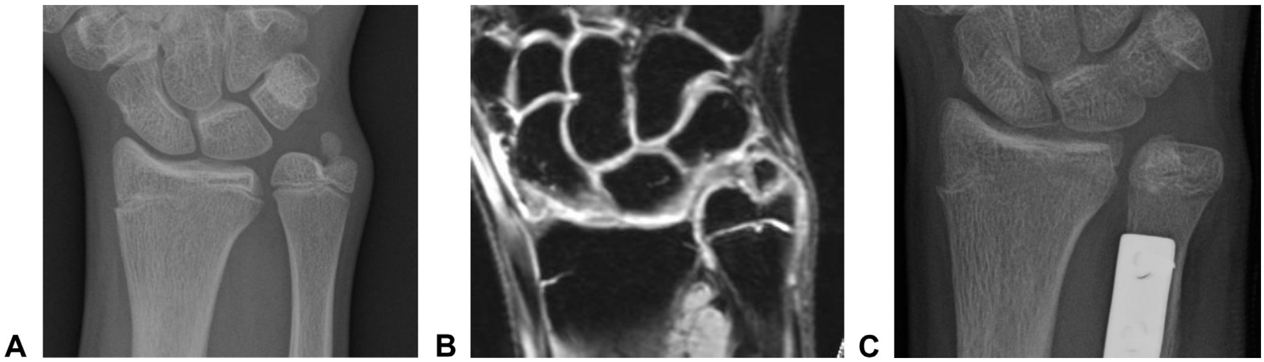

FIGURE 2: **A** Preoperative plain radiograph reveals distal radius growth arrest, positive ulnar variance, and ulnar styloid nonunion. **B** Preoperative coronal MRI shows increased signal in the TFCC and mild marrow edema of the lunate. **C** Plain radiograph of the wrist status post USO with plate fixation and neutral ulnar variance.

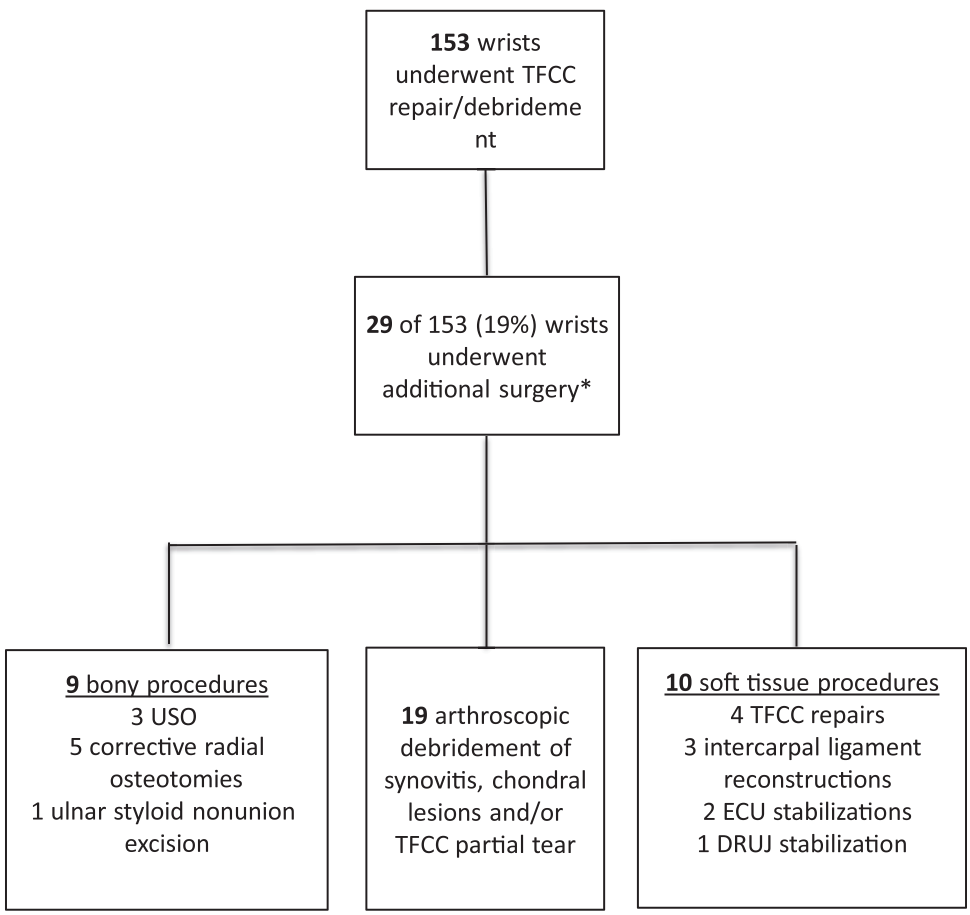

FIGURE 3: Additional procedures for patients with persistent wrist pain following index surgery. ECU, extensor carpi ulnaris, *Some wrists underwent more than 1 procedure.

in younger patients. The majority of our patients presented with additional pathology; in particular, 51% underwent concomitant bony procedures. Trehan et al[17] reported 49% of patients with concomitant pathology and 16% with additional bony procedures. Our higher numbers are likely attributable to more patients (56%) presenting with acute trauma.

Failure to recognize and address frequently observed concomitant bony deformity at presentation, such as positive ulnar variance or nonunion, may lead to suboptimal postoperative outcomes. In our cohort, patients who underwent concomitant bony procedures at index surgery had superior postoperative MMWSs than those with only soft

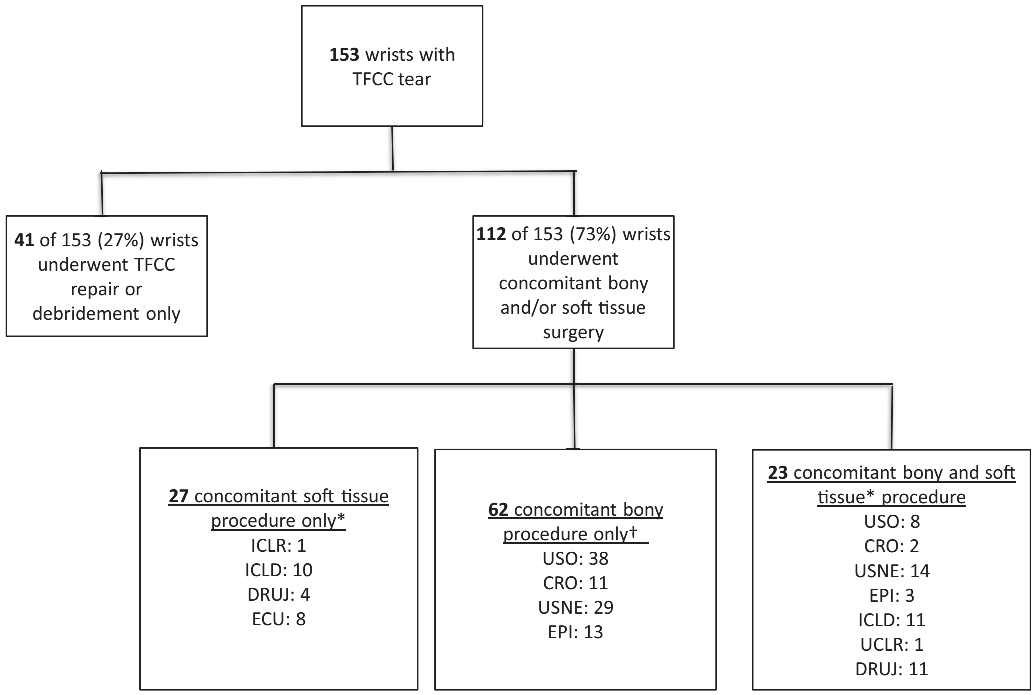

FIGURE 4: Flowchart depicts overall breakdown of surgeries, specifically, TFCC-only repair/debridement versus TFCC surgery with concomitant bony and/or soft tissue procedure(s). *Soft tissue procedures listed include intercarpal ligament reconstruction (ICLR) or debridement (ICLD), DRUJ stabilization, ulnocarpal ligament repair (UCLR), and extensor carpi ulnaris (ECU) stabilization/repair. †Bony procedures listed include USO, corrective radial osteotomy (CRO), ulnar styloid nonunion excision (USNE), and epiphysiodesis (EPI).

TABLE 3. Pre- and Postoperative Clinical and Functional Parameters*

Parameter	Preoperative	After Index†	Final Postoperative‡	*P* Value
Moderate/severe pain with activity, n (%)	96/105 (91)	46/132 (35)	23/126 (18)	<.05
Restricted active wrist ROM, n (%)	22/126 (17)	–	20/136 (15)	.36
DRUJ instability, n (%)	21/153 (14)	–	3/153 (2)	<.05
MMWS, median (IQR)	80 (65–90)	95 (85–100)	95 (86.3–100)	<.05
Ulnar variance (mm), mean (SD)	3.0 (2.5)	–	−0.2 (1.07)	<.05

*Data are presented as the proportion out of subjects with available data and corresponding percent, unless stated otherwise.
†Overall scores after index surgery.
‡Overall scores after any additional surgeries.

tissue procedures. Fishman et al[16] analyzed outcomes after TFCC surgery in 22 young athletes and also had a substantial number of patients who underwent concomitant bony procedures; 32% of their cohort underwent concomitant USO. It is unclear to what extent these improved outcomes are attributable to TFCC surgery versus bony procedures such as USO, given the frequency in which these conditions occur together. However, our positive results when looking at TFCC surgery alone lead us to believe that addressing both soft tissue and bony pathology is key to maximizing outcomes. In contrast to our findings, Fishman et al[16] actually reported positive results in TFCC surgery with subsequent development of asymptomatic positive ulnar variance and state that it is unclear whether ulnar shortening is necessary.[17]

After index surgery, 19% of patients had persistent pain requiring additional procedures. After additional surgery, the percent with moderate to severe pain decreased. This reoperation rate is similar to prior reports.[6] Of note, 3 patients required subsequent USO to relieve their pain and restore higher-level function. For this reason, we support that index USO should achieve neutral or

TABLE 4. Breakdown of Postoperative MMWS

MMWS Domain	Frequency	%
Pain		
No pain	70	56
Mild pain	34	27
Moderate	20	16
Severe pain	2	2
Total	126	100
Functional status		
Full return to activity	91	83
Restricted return to activity	8	7
Different/lower demand activity	10	9
Unable to return to activity	0	0
Total	109	100
Flexion/extension (percent of normal)		
90–100	98	80
80–89	12	10
70–79	2	2
50–69	8	7
25–49	2	2
0–24	0	0
Total	122	100
Pronation/supination (percent of normal)		
90–100	107	88
80–89	6	5
70–79	7	6

up to 2 mm negative ulnar variance because even minimal positive variance may be symptomatic.

Overall, surgical treatment of TFCC tears along with concomitant pathology achieved good to excellent outcomes in 81% of all patients, with significant improvements in clinical parameters. Prior studies, most of which were performed in adult populations with peripheral TFCC tears, published similar results for TFCC surgery using the MMWS.[6,14,28] Farr et al[13] reported on 12 patients (mean age, 16.3 years) treated with arthroscopy-assisted repair of peripheral TFCC tears. At mean 1.3-year follow-up, mean MMWS improved from 65 to 88, 77% with good to excellent scores.[14]

Deciding between repair and debridement of a TFCC tear is predicated on the vascular supply of the TFCC, which has been well documented. Treatment of radial ID tears remains controversial, however, and initial studies supported debridement owing to concerns about vascular supply to the radial attachment.[4] More recent studies on 1D repair have shown good healing potential and a significant decrease in pain; indeed, some authors advocate repair when possible, although surgical techniques are complex and continue to evolve.[9,21,29,30] Fishman et al[16] and Trehan et al[17] had 23% and 7% of patients with 1D tears, respectively. Both studies reported that all 1D tears underwent debridement. Our study shows positive outcomes between patients treated with transradial repair of complete 1D tears (n = 19) or debridement of partial tears (n = 11) in the younger population.

There were a number of limitations to this study. First, the majority of our patients had concomitant pathology, making it difficult to attribute all outcomes to repair of the TFCC. However, our study demonstrates that, in those with additional pathology, it is important to address all injuries to achieve the best results, particularly those patients with bony pathology. Another limitation was related to the detection of foveal tears. These are important pathological findings that can influence presentation, surgical strategies, and response to treatment. However, we were unable to specifically address this issue: given (1) there was not universal recognition of the importance of foveal disruption at the time this study first started, (2) not all patients had high-resolution preoperative imaging to identify deep fiber tears, (3) diagnostic arthroscopy was performed of the radio- and ulnocarpal joints (not DRUJ), and thus, the ligamentum was not visualized or routinely assessed in all patients. Furthermore, given the retrospective nature of data acquisition, not all preoperative clinical data and radiographic imaging studies were available—this was a small percentage of patients and unlikely to affect the study conclusions. Also inherent in our retrospective methodology is that complication rates should be considered estimates and represent minimum risk, given that patients who were lost to follow-up may have received treatment elsewhere.

In obtaining functional outcome scores, the variation in which we obtained postoperative outcome measures is another weakness of the study. Some patients had their MMWS obtained in their last clinic visit, whereas others were contacted via phone. To achieve the most accurate scores, we scripted verbal instructions over the phone and provided patients (or their guardians) with a diagram and written instructions (Appendix A; available on the *Journal*'s Web site at www.jhandsurg.org). Furthermore, the PROMIS pediatric Upper Extremity Short Form was used for all patients, even those outside of the validated age range at final follow-up because an adult

Upper Extremity PROMIS form did not exist at the time surveys were distributed. This may have contributed to higher PROMIS scores and a ceiling effect. Such an effect is unlikely with the MMWS, given the objectivity of the score such as ability to return to prior levels of activity/sport and ROM.[31] There are no studies assessing the minimal clinically important difference of the MMWS.

The clinical and functional outcomes presented here support our current surgical algorithm for different tear types as described.[7,8,10,14] We believe that proper patient selection, consideration of tear type, and meticulous surgical technique account for our positive results for repair or debridement of each tear type, along with addressing concomitant injuries.

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