Functional Outcomes for Meniscal Allograft Interposition Arthroplasty of the Hand

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Background: Osteochondral defects of the carpometacarpal (CMC), metacarpophalangeal (MCP), and proximal interphalangeal (PIP) joints often necessitate arthrodesis or arthroplasty. Meniscal allograft has been used for large joint resurfacing, but its application to smaller joints is less well understood. We propose its use for hand joint resurfacing as an off-the-shelf alternative to address osteochondral defects and restore articular function.

Methods: Thirty-one patients with osteoarthritis of the CMC, MCP, or PIP joints underwent arthroplasty with meniscal allograft. Patient demographics and operative information were recorded. Preoperative Disability of the Shoulder, Arm, and Hand, Wong Baker pain, grip and pinch strength, and range of motion were compared to postoperative scores at 6 weeks, 6 months, and 1 year.

Results: Twenty-three women and 8 men, mean age 62.8 years, underwent 39 joint reconstructions, including CMC (n = 26), thumb MP (n = 2), thumb IP (n = 2), digit MP (n = 2), and digit PIP (n = 7). At 1 year, mean Disability of the Shoulder, Arm, and Hand scores decreased from 41.3 to 15.6 ($P < 0.001$) and pain scores from 6.9 to 1.0 ($P < 0.001$). Grip strength increased from 38.1 to 42.9 ($P = 0.017$) and radial and palmar abduction from 43.1 to 49.2 ($P = 0.039$) and 43.7 to 51.6 ($P = 0.098$), respectively. There were no complications related to the meniscus.

Conclusions: Meniscal allograft represents an alternative to arthrodesis which obviates the need for a donor site and avoids many of the complications inherent to synthetic alternatives. Our early results demonstrate its successful use to reduce subjective pain and disability scores, improve objective strength measures, and maintain range of motion. *(Plast Reconstr Surg Glob Open 2021;9:e3520; doi: 10.1097/GOX.0000000000003520; Published online 20 April 2021.)*

INTRODUCTION

Articular damage of the hand joints can be caused by various factors including trauma, infection, or most commonly, osteoarthritis. The resultant pain and limited range of motion can cause significant disturbances to patient's quality of life and functionality. Classically, treatment has fallen into either complete joint arthrodesis,[1–3] total joint arthroplasty with either hinged metal or silicone implants,[4–6] or joint resurfacing with either synthetic or autologous implants.[7–9] However, all of these approaches come with disadvantages. Arthrodesis, by fusion of the joint, eliminates joint motion and total joint arthroplasties have been plagued by high rates of complications including loosening of the prosthesis, implant failure, infection, bone absorption, and osteophyte formation.[10–12] Joint resurfacing with synthetic implants similarly has been complicated by high migration rates, dislocation, and instability.[12,13] Autologous osteochondral grafts from both costrochondral[14,15] and patellofemoral donors have been proposed,[9] but both require harvest from an intact joint with the risk of donor-site morbidity.

Meniscus allograft transplantation (MAT) with meniscal allograft has long been utilized in the knee to treat various forms of meniscus damage or degradation. MAT yields fair to excellent results in almost 85% of patients

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with long-term improvements in pain and functional outcomes.[16,17] Complication rates are low,[17–22] with low reoperation and revision rates even in an athletic population.[22] Although predominantly used in the lower extremity, Nanavati et al[23] first described the use of MAT for proximal carpectomy in the hand. More recently, Shapiro et al[24] described the use of MAT for interposition arthroplasty in trapeziometacarpal arthritis, and Hoang et al[25] described it for resurfacing of metacarpal phalangeal and proximal interphalangeal joints of the hand. However, further studies regarding clinical outcomes are lacking.

In this study, we describe our surgical approach for meniscal allograft joint resurfacing of the hand and prospectively evaluate the clinical outcomes, including strength and range of motion, as well as patient reported pain and disability.

METHODS

Patients

A prospective, single-arm, single-center, physician-initiated trial was undertaken with 31 patients enrolled from November 2017 to December 2019. Inclusion criteria included patients with a demonstrated osteochondral defect of the thumb carpal-metacarpal joint (CMC), thumb or digit metacarpal phalangeal joint (MCP), thumb interphalangeal joint (IP), or digit proximal interphalangeal joint (PIP) requiring surgical intervention, greater than 18 years of age, in good overall health and willing to undergo arthroplasty with meniscus allograft. Osteoarthritis were graded as Eaton stage 2, 3, or 4 for CMC arthritis. Specific grading of MCP, IP, and PIP arthritis was not utilized, but cases were considered moderate or severe. Exclusion criteria included patients with collagen-vascular, connective tissue or bleeding disorders, active smokers or those who had smoked in the prior 2 months, those with a disease, such as diabetes, which could negatively impact wound healing, pregnant or breastfeeding patients, patients with regional sympathetic dystrophy, alcohol/substance abuse, or active infection at the time of surgery. Eligible patients were approached by a study administrator at the time of their preoperative visit for inclusion in the study. Discussion of the study occurred after consent for the procedure was signed to ensure that patients understood that their participation in the study would not affect their care. Thirty-eight patients were recruited with an 81% enrollment rate.

Operative Technique

Patients underwent standard surgical exposures. For IP joints, a volar approach with a Bruner type incision was used to expose the joint. With care taken to preserve the collateral ligaments, the joint was then shot-gunned open to expose the osteochondral defect. For the MCP joint, a dorsal longitudinal incision was made over the MCP joint and the extensor tendon was split longitudinally. The dorsal capsule was divided to expose the joint. For CMC joint, an incision was made over the dorsal aspect of the CMC joint at the thenar eminence, approximately 1 cm distal to the tip of the radial styloid, and extended distally for 4–5 cm. The dorsal sensory branches of the radial nerve and the dorsal branch of the radial artery were identified and protected, and the interval between the abductor pollicis longus and extensor pollicis brevis tendons was identified. A longitudinal capsulotomy was performed in this interval to expose the joint.

A synovectomy was then performed using a rongeur. In less severe cases, only the proximal aspect of the joint was decorticated with a burr. In more severe cases in which the joint architecture had been destroyed, both the proximal and distal aspects of the joint were decorticated to facilitate a "cup and saucer" fit. Measurements were then taken of the debrided osteochondral defect and used to design a graft of appropriate size from the meniscus allograft (MTF Biologics, Edison, N.J.). The meniscus allograft was provided fresh–frozen and sterile after being aseptically processed with no terminal irradiation. Half of the thickness of the meniscus was used, making sure that the resultant graft was at least 2–3 mm thick, and the rough surface of the graft placed against the decorticated bone to facilitate cellular repopulation. The allograft was then secured with extracapsular 4-0 Mersiline sutures (Ethicon, Somerville, N.J.). Figure 1 demonstrates a representative intraoperative sequence for PIP arthroplasty in a severe case in which both the proximal and distal joint were resurfaced. Figure 2 demonstrates a less severe MCP arthroplasty with only the proximal head resurfaced. After graft placement, the joint space was reduced and taken through a full range of passive motion to ensure smooth tendon gliding, adequate joint stability, and no boney contact and fluoroscopy was used to evaluate adequate positioning of the joint and implant. The joint was then sealed with fibrin glue. Where appropriate, the joint capsule and extensor mechanism was repaired with either interrupted mattress sutures or a running suture with a monofilament absorbable suture and the skin closed.

All patients were placed in a splint, which was removed and exchanged for a removable splint at 2 weeks, at which time a hand therapist initiated gentle range of motion exercises. At 4–6 weeks, the splint was discontinued and progressive hand therapy was continued. Routine hand radiographs were taken at each postoperative visit at 6 weeks, 6 months, and 1 year.

Study Outcomes

The primary outcome measures were improvement in the subject's Disabilities of the Arm, Shoulder, and Hand (DASH) score, active range of motion, grip and pinch strength, and Wong Baker pain scale scores. Patients' DASH and Wong Baker pain scale scores were recorded with validated, standardized survey instruments.[26,27] Grip strength was measured with a JAMAR dynamometer (Sammons Preston, Bolingbrook, Ill.) and pinch strength was measured by a B&L pinch gauge (Baseline, Link, Germany). Key pinch and tip pinch were separately tested and were measured only for patients who underwent CMC arthroplasty so as not to skew the data with the inclusion of intact joints. Strength tests were conducted by the same certified hand therapist at each visit and for each strength test, the scores of 3 successive trials were recorded and the average value was used for analysis. Range

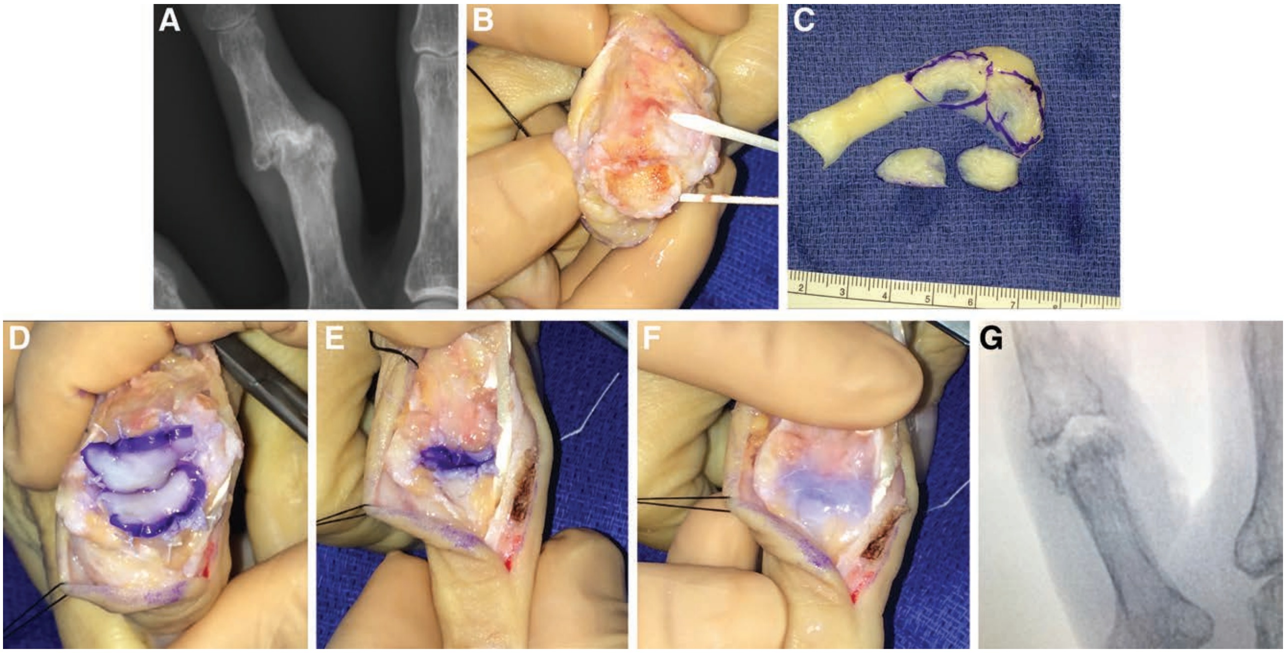

Fig. 1. Intraoperative sequence for PIP arthroplasty of the left ring finger in an 81-year-old woman with osteoarthritis. A, Preoperative radiograph demonstrating joint destruction. B, Decorticated proximal and distal aspect of the joint. C, Meniscus allograft carved on the back table. D, Inset of the allograft over the proximal and distal aspects of the joint. E, Reduced joint. F, Joint sealed with fibrin glue. G, Postoperative radiograph demonstrating "cup and saucer" fit of the newly resurfaced joint.

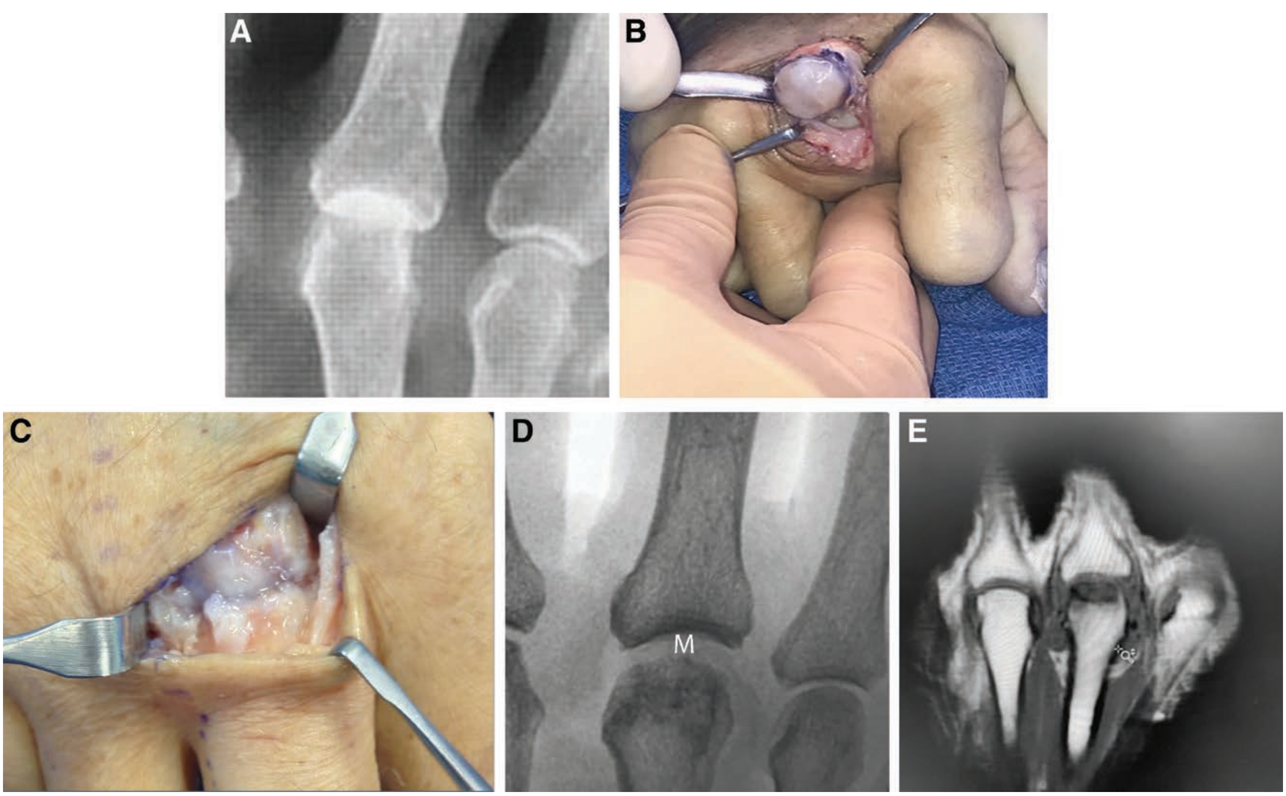

Fig. 2. Intraoperative sequence for MCP arthroplasty of the right long finger in a 57-year-old woman with osteoarthritis. A, Preoperative radiograph demonstrating osteoarthritic changes. B, Inset of the allograft over the decorticated proximal aspect of the MCP joint. Note the preserved convexity of the metacarpal head. C, Reduced joint. D, Postoperative radiograph highlighting joint space preservation with the meniscal allograft, marked "M." E, Postoperative MRI demonstrating the meniscal allograft.

of motion data, measured as radial abduction and palmar abduction in CMC arthroplasty and active arc of motion in PIP, IP and MCP arthroplasty, were collected for the affected joint by the same certified hand therapist each visit. Standard arm positioning was used (patient seated with shoulder in neutral position and elbow at 90 degree of flexion). Patients with multiple joints addressed at the same surgery had individual range of motion scores taken for each joint. Scores were measured at the preoperative visit, and again at 6 weeks, 6 months, and 1 year postoperatively.

Statistical Analysis

The Wilcoxon signed rank test was used to determine statistical differences between the paired preoperative and postoperative measurements at each time point. *P* values were two-tailed, and values equal to or less than 0.05 were defined as statistically significant. Twenty joints (51.2%) had full 1 year follow-up. Thirteen joints (33.3%) had 6-month follow-up and the remainder (15.3%) had 6-week follow-up. Given the descriptive nature of the , no imputation of missing data was performed. Descriptive summaries were based on the observations available within each of the time points. SPSS software (IBM SPSS,V22.0, Armonk, N.Y.) was used for all analyses. The study was approved by our institution's institutional review board, and informed consent was obtained from all patients.

RESULTS

Twenty-three women and 8 men, with mean age of 62.8 years (41–81), underwent a total 39 joint reconstructions. Reconstructive sites included thumb CMC joint (n = 26), thumb MCP joint (n = 2), thumb IP joint (n = 2), digit MCP joint (n = 2), and digit PIP joint (n = 7). The vast majority of patients underwent the procedure due to osteoarthritis, although 1 patient presented with a malunion of the thumb MP joint.

Two patients had 2 joints on the same hand operated on simultaneously (1 patient with an index and long PIP joint and another patient with a ring PIP joint and thumb CMC joint). Five patients went on to have a second surgery on the contralateral hand. The majority of patients presented for primary surgery, with the exception of 2 patients—one who had failed CMC arthroplasty with an allograft dermal matrix (FlexHD, MTF Biologics, Edison, N.J.) 6 months prior and another who had a silastic implant placed at the ring PIP joint at another hospital several years prior. Of the 31 patients who underwent the meniscus resurfacing, all achieved successful joint arthroplasty with no complications related to the meniscus. Two patients had complications unrelated to the meniscus. A patient with PIP arthroplasty experienced an ulnar collateral ligament tear requiring repair 1 year postoperatively and another patient experienced a fungal infection of the surgical site successfully treated with oral antifungals. Table 1 shows patient-specific details for all 31 patients.

A statistically significant improvement ($P < 0.001$) was achieved in both pain and disability by 1 year postoperatively. Mean preoperative and postoperative pain and DASH scores with SD, percentage change, and associated *P* values with confidence intervals are summarized in Table 2. Figures 3 and 4 demonstrate the change in DASH scores and Wong Baker pain scale scores at each of the time points, demonstrating a transient increase in disability at 6 weeks, but improvement past baseline by 6 months, and a consistent decrease in pain. Strength measures reached a statistically significant improvement in grip as well as pinch ($P < 0.05$). Both similarly demonstrated a transient decrease at 6 weeks, but subsequent improvement by 6 months. By 1 year, grip strength decreased slightly, although remained higher than baseline, whereas pinch continued to marginally improve. Findings are summarized in Table 3 and Figure 5. Range of motion improvement reached statistical significance in palmar abduction and PIP total arc of motion ($P < 0.05$) and trended toward significance in radial abduction ($P = 0.098$) (Table 4 and Fig. 6). The 4 patients who underwent MCP arthroplasty did not have complete range of motion data and were therefore excluded from the table. The PIP range of motion showed the most significant initial decrease at 6 weeks, but improved past baseline by 6 months and continued to improve at 1 year. Palmar and radial abduction had a smaller initial decrease, but also improved past baseline by 6 months, although plateaued in improvement at 1 year (Videos 1–3). (**See Video 1 [online]**, which displays functional results 1 year postoperatively from right index MCP arthroplasty in a 57-year-old woman. The patient's preoperative range of motion of the affected joint was 35 degrees and improved to 45 degrees. She reported no pain.) (**See Video 2 [online]**, which displays functional results 6 months postoperatively from left small PIP arthroplasty in a 67-year-old woman. The patient's preoperative range of motion of the affected joint was 50 degrees and improved to 70 degrees at 6 months. She reported no pain.) (**See Video 3 [online]**, which displays functional results 1 year postoperatively from right CMC arthroplasty in a 60-year-old woman. The patient maintained her preoperative palmar abduction of 45 degrees. She reported no pain.)

DISCUSSION

MAT has unique properties that contribute to its potential application for arthroplasty of the hand. The composition of meniscal tissue allows it to behave as a fiber-reinforced, porous, permeable composite material similar to articular cartilage. Type I collagen fibers maintain significant tensile strength (100–300 MPa), whereas high frictional drag caused by relatively low permeability of the matrix (1/6 that of articular cartilage) allows for more energy dissipation.[28] The decellularization process of the meniscus allograft maintains the native scaffold, allowing it to maintain its intrinsic strength while permitting repopulation with host cells once placed in the joint. Debeer et al[29] demonstrated that one year after MAT, the DNA of the meniscal allograft was 95% identical to that of the human recipient, showing that the allograft is nearly completely repopulated by host cells. As it is an allograft, a concern for a foreign body reaction exists; however, Rodeo et al[30] assessed the histological and immunohistochemical characteristics of meniscal specimens in patients 16 months post-MAT and found a minimal, and clinically insignificant, immune response. In our own series, we did see a trend of transiently increased

Table 1. Individual Patient Operative Details

Patient Number	Age (y)	Gender	Occupation	Operative Hand	Operative Digit	Operative Joint	Diagnosis	Notes
1	54	Female	Not recorded	Right	Thumb	MP	OA	
2	41	Female	Illustrator	Right	Thumb	MP	Maluninon	
3	57	Female	Homemaker	Right	Index	MP	OA	Both digits performed at the same surgery
				Right	Long	MP	OA	
4	72	Female	Professor	Left	Thumb	CMC	OA	
5	60	Female	Not recorded	Right	Thumb	CMC	OA	
6	68	Female	Retired	Left	Index	PIP	OA	Both digits performed at the same surgery
				Left	Long	PIP	OA	
				Right	Index	PIP	OA	Performed 5 mo later
7	60	Female	Teacher	Right	Thumb	CMC	OA	
8	67	Female	Accountant	Left	Small	PIP	OA	
9	64	Male	Pianist	Right	Thumb	CMC	OA	
				Left	Thumb	CMC	OA	Performed 6 mo later
10	62	Male	Sales	Right	Thumb	CMC	OA	
11	67	Female	Teacher	Right	Thumb	CMC	OA	Failed prior CMC arthroplasty with FlexHD
12	64	Female	Not recorded	Right	Long	PIP	OA	UCL tear requiring operative repair
13	53	Female	Not recorded	Right	Thumb	CMC	OA	
14	70	Female	Not recorded	Left	Thumb	CMC	OA	
15	57	Male	Doctor	Left	Thumb	CMC	OA	
16	54	Male	Contractor	Left	Thumb	CMC	OA	
17	71	Female	Consultant	Right	Thumb	CMC	OA	
18	81	Female	Retired	Right	Thumb	CMC	OA	
				Left	Thumb	CMC	OA	Performed 6 mo later
19	57	Male	Computer/IT	Right	Thumb	IP	OA	
20	60	Female	Law clerk	Left	Thumb	CMC	OA	
21	71	Male	Not recorded	Right	Thumb	CMC	OA	
22	70	Female	Retired	Left	Thumb	CMC	OA	
23	69	Female	CEO	Left	Thumb	CMC	OA	
24	80	Female	Writer	Right	Thumb	CMC	OA	
25	61	Female	Retired	Right	Thumb	CMC	OA	
26	49	Male	Sales	Right	Thumb	CMC	OA	
				Left	Thumb	CMC	OA	Performed 6 mo later
27	62	Female	Actress	Right	Thumb	CMC	OA	
28	62	Female	Dentist	Right	Thumb	IP	OA	Fungal infection treated with PO antifungal
29	81	Female	Retired	Right	Ring	PIP	OA	Both digits performed at the same surgery
				Right	Thumb	CMC	OA	
				Left	Ring	PIP	OA	Performed 6 mo later Failed prior silastic implant
30	60	Male	Bank manager	Left	Thumb	CMC	OA	
31	51	Female	Pianist	Left	Thumb	CMC	OA	

OA, osteoarthritis.

DASH scores and decreased strength measures and range of motion measures at the 6-week follow-up. Although these scores improved past baseline by the 6-month follow-up, this transient increase in disability and decrease in strength and motion may be due to an initial inflammatory response to the meniscal implant. Interestingly, though there was no concomitant increase in pain at this same time point.

A large number of studies have been performed on various approaches for addressing osteochondral defects of the hand, but none have been found to be definitively superior. With MAT, we found improvements in pain, disability, and strength measures comparable to other methods of arthrodesis and arthroplasty, although the heterogeneity of outcomes measures and paucity of prospective studies with pre to postoperative comparison make a direct comparison to our current sample difficult. With respect to improvements in pain and disability, nearly all studies support significant improvements from arthrodesis,[31,32] as well as arthroplasty with silicone,[33–36] titanium,[37,38] or pyrocarbon implants.[35,39–41] Likewise, autologous donors from the patellofemoral joint and costrochondral cartilage have shown significant improvements in pain and disability scores.[9,15] In contrast, strength measures across surgical approaches have not shown as consistent an improvement postoperatively. Multiple studies have shown increases in strength, but findings are often non-statistically significant and improvement across different measures of grip and pinch strength are variable within the same technique.[9,15,33–35,38–41] Other studies have demonstrated decreases in strength over time.[35,36] Our own

Table 2. Mean DASH and Pain Scale Scores with SD, % Change, and *P* Value with 95% Confidence Interval

	Pre	6 wks	6 mo	1 y	% Change	*P*
DASH (all joints, n = 39)	41.3 (±22.9)	43.8 (±21.7)	20.2 (±18.5)	15.6 (±10.9)	62.2%	<0.001 (19.2, 47.6)
Pain (all joints, n = 39)	6.9 (±2.2)	2.7 (±2.3)	1.1 (±1.2)	1.0 (±2.0)	85.3%	<0.001 (4.9, 7.3)

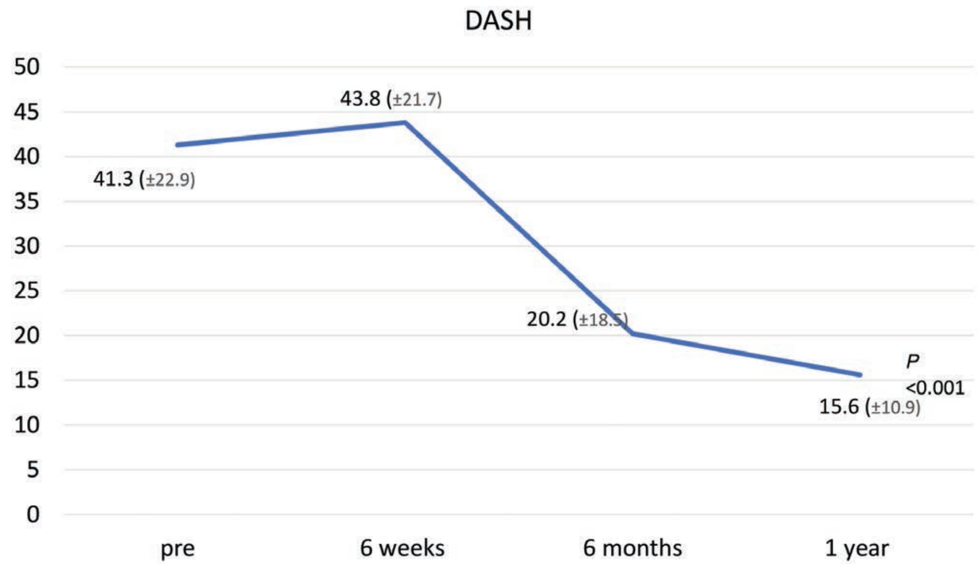

Fig. 3. DASH scores preoperatively and at 6 weeks, 6 months, and 1 year postoperatively.

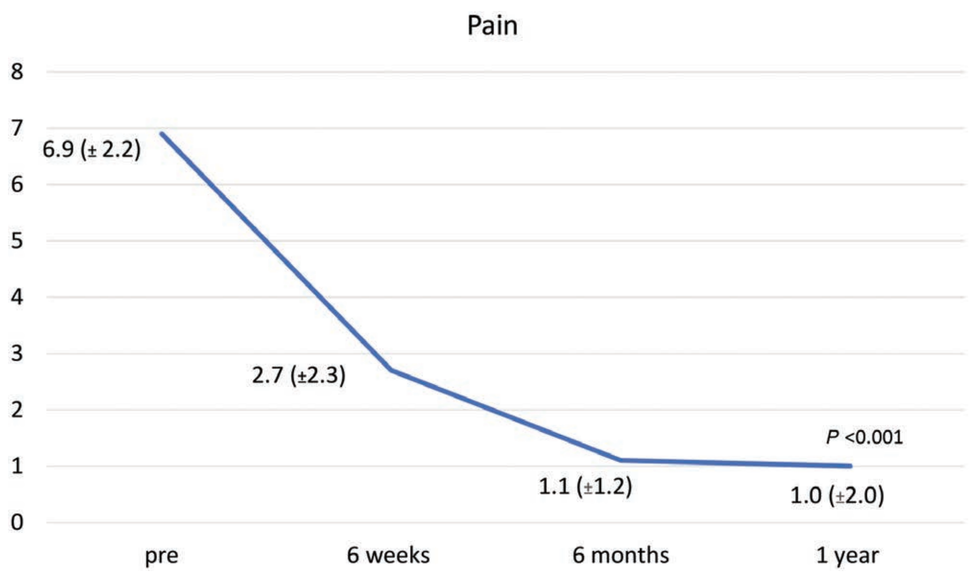

Fig. 4. Wong Baker pain scale scores preoperatively and at 6 weeks, 6 months, and 1 year postoperatively.

results are promising, demonstrating statistically significant increases in key and tip pinch strength and trends toward significance in palmar pinch and grip strength. Finally, preservation of range of motion is cited as one of the main advantages of arthroplasty over arthrodesis. However, even with arthroplasty, range of motion is often at best preserved, but rarely improved, from preoperative measures. A few studies have demonstrated statistically significant improvements,[9,34] but many found no significant change in range of motion[35,38–40,42,43]and others saw decreases postoperatively.[4,44–47] In our own study, we found improvement in arc of motion, with palmar abduction and PIP arc of motion reaching statistical significance, and radial abduction trending toward significance.

Importantly, these alternative choices for small joint arthroplasty are fraught with complications avoidable

Table 3. Mean Strength Measures with SD, % Change, and *P* Value with 95% Confidence Interval

	Pre	6 wks	6 mo	1 y	% Change	*P*
Grip (All joints, n = 39)	38.1 (±22.4)	24.4 (±18.6)	49.1 (±26.1)	42.9 (±21.1)	12.5%	0.017 (−22.0, −2.5)
Key pinch (CMC arthroplasty, n = 26)	9.9 (±5.1)	5.3 (±3.5)	11.7 (±4.7)	12.3 (±4.5)	24.2%	<0.001 (−5.2, −2.1)
Tip pinch (CMC arthroplasty, n = 26)	5.4 (±3.6)	2.8 (±2.2)	7.5 (±2.9)	8.9 (±4.3)	64.8%	0.001 (−7.1, −2,3)

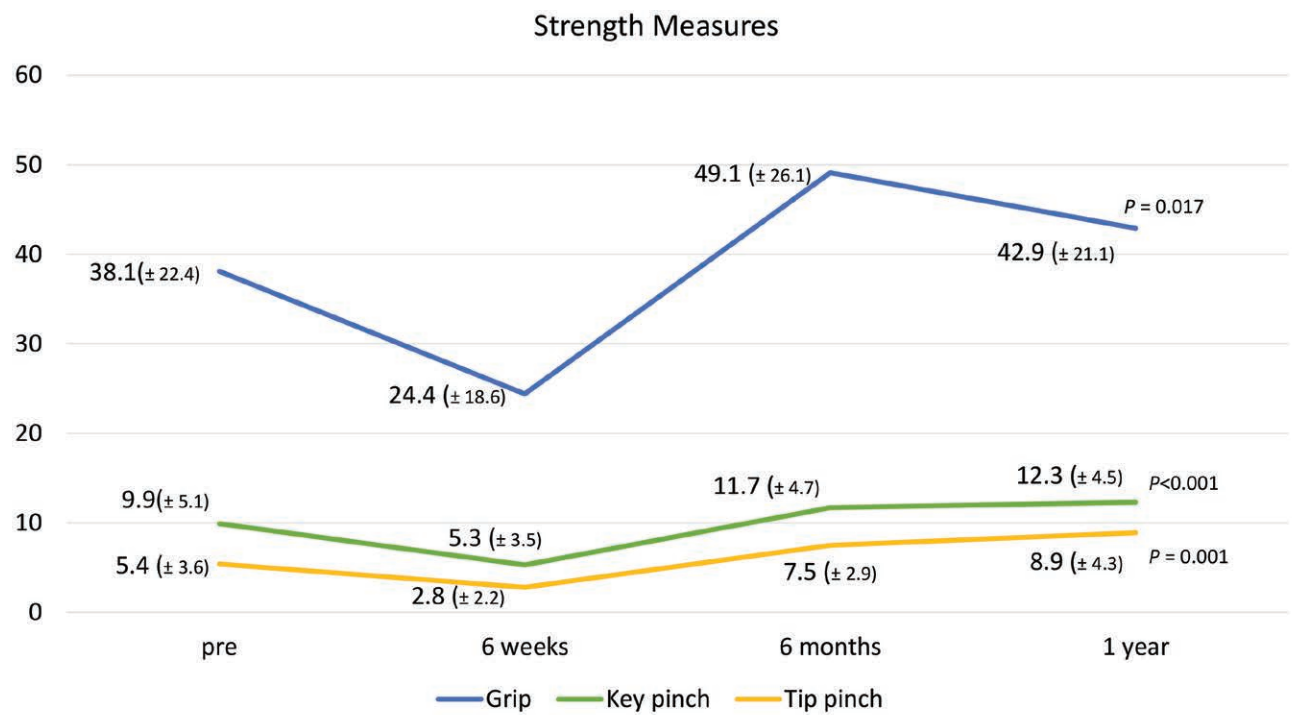

Fig. 5. Strength measures preoperatively and at 6 weeks, 6 months, and 1 year postoperatively.

Table 4. Mean Range of Motion Measures with SD, % Change, and *P* Value with 95% Confidence Interval

	Pre	6 wks	6 mo	1 y	% Change	*P*
Palmar abduction (CMC arthroplasty, n = 26)	43.1 (± 8.5)	41.6 (± 10.7)	48.3 (± 6.4)	49.2 (± 7.6)	12.1%	0.039 (−13.2, −0.4)
Radial abduction (CMC arthroplasty, n = 26)	43.7 (±9.7)	41.2 (±11.7)	51.3 (±6.1)	51.6 (±11.5)	18.1%	0.098 (−16.6, 1.6)
PIP/IP total arc of motion (n = 9)	47.5 (±35.4)	33.3 (±11.5)	50.0 (±32.7)	52.5 (±24.7)	10.5%	0.020 (−18.8, −4.4)

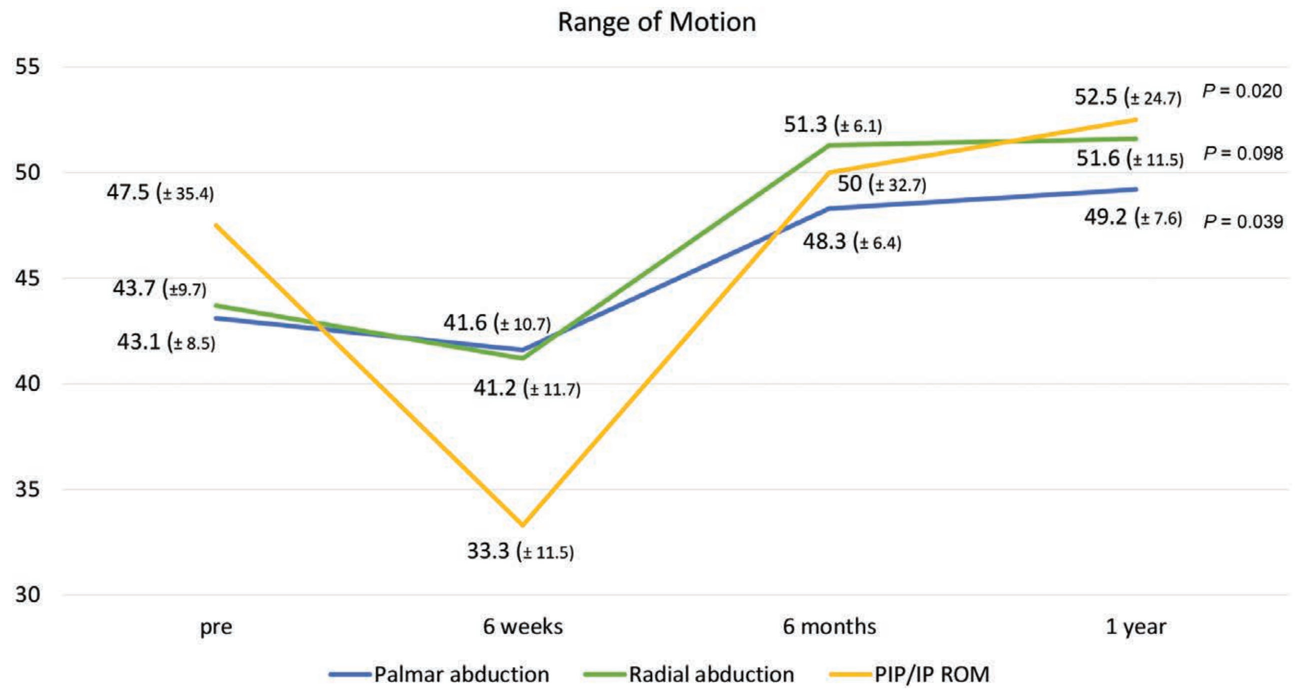

Fig. 6. Range of motion measures preoperatively and at 6 weeks, 6 months, and 1 year postoperatively.

through the use of MAT. Arthrodesis not only sacrifices motion but carries the complications of nonunion, malunion, dorsal skin necrosis, and prominent hardware.[48–50] Implants preserve motion; however, they are similarly plagued with high complication and revision rates. The silicone implant is not designed anatomically (constrained hinge-type design) and complications can include implant fracture and dislocation and less commonly, inflammatory synovitis, joint deformity, and heterotopic bone formation.[6,10,12,33,34,42,51,52] The clinical impact of such complications is variable, but long-term rates of complication have been reported as high as 63%.[51,52] Nonconstrained implants require adequate bone stock and sufficient soft tissues for stability and similarly are reported to have complications of dislocation, fracture and squeaking, with rates up to 43%[53] and explantation rates up to 39%.[36] The literature on autologous cartilaginous donors is limited and complications have not been reported[9,14] with the exception of a high rate of graft necrosis (20%) in a study of 7 patients with costochondral grafts by Sato et al.[15] Nonetheless, these approaches require harvest from a donor site, increasing the chance of donor morbidity. MAT obviates the need for such a donor, while providing a more anatomic, biointegrable construct which avoids the risk of implant fracture, failure, or migration.

Several limitations to the present study exist, most notably its small sample size and limited follow-up period. Further time is needed to determine the durability of these results as well as long-term complication rates. Because of small overall numbers, subgroup analysis for specific joints was not possible, but is an area of future study with ongoing data collection. Although strength and range of motion were subcategorized by relevant joint, pain and DASH utilized averages across multiple joints. Improvements in pain and disability must also be interpreted with caution, as denervation of the joint during the procedure may have contributed to this improvement irrespective of the meniscal graft. Additionally, the placebo effect has been shown in arthroscopic surgery of the knee to be significant,[54] and the influence of this effect in our own patient population cannot be eliminated given the lack of a sham comparison group. Additionally, the cost of the meniscus allograft is a limitation to the approach. At approximately $1200 USD for a full meniscus, it is comparable to other currently used implants, for example, the pyrocarbon spacer, PI2 (Tornier Bioprofile, Grenoble, France) which retails for € 930 European, the Arthrex mini-tightrope (Arthrex, Inc, Naples, Fla.) at approximately $1000 USD, the GraftJacket acellular dermal matrix (Wright Medical Group, Memphis, Tenn.) between $1000 and 3000 USD, and the titanium hemiarthroplasty implant at approximately $2000 USC (Wright Medical Group).[24,55] Tailored smaller MAT sizes specific to the hand and small digit joint space may further reduce the cost of the meniscus allograft and maximize the use of the donated human tissue. Studies have demonstrated a cost-effectiveness of arthroplasty using pyrocarbon implants in rheumatoid patients with MCP joint arthroplasty in terms of repeat operations and overall utilization of the healthcare system.[56] It stands to reason that this product should prove similarly cost-effective, but further long-term follow-up is ongoing to formally determine if there is sufficient improvement in disability and patient satisfaction to justify the cost.

CONCLUSION

Our early results suggest that meniscus allograft offers a safe and effective method of restoring a functional, less painful hand, maintaining range of motion, and improving strength. The meniscus represents an alternative to arthrodesis; obviates the need for a donor site, thus avoiding potential morbidity; and offers a biointegrable material that avoids many of the complications inherent to synthetic alternatives. Further data collection is ongoing to evaluate the durability of this approach over time and evaluate for long-term complications.

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