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# Thumb CMC Arthroplasty. Is it Time to Move Away from LRTI?

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## Hypothesis

Thumb carpometacarpal osteoarthritis (CMC-OA) is present on 21% of hand x-rays in patients over 40 years old, with symptoms reported in 1.9% of adults over 60 and 4.1% by age 70.<sup>1,2</sup> Numerous surgical methods have been developed to treat symptomatic CMC-OA, with no clear advantage to any one procedure.<sup>3,4</sup> We hypothesized that newer surgical techniques would confer improvements in both surgical outcomes and patient-reported outcomes, compared to traditional ligament reconstruction tendon interposition (LRTI).

## Methods

A retrospective review was performed of all primary thumb CMC arthroplasties performed by the University of Pennsylvania's Hand Surgery Section from 2015 to 2019. Demographic data included age, sex, and hand dominance (Table 1). Disease and surgical data included duration of symptoms, Eaton stage, operative time, and complications. X-rays were assessed for trapezial space height. Patient-reported outcomes included visual analog scale pain scores and PROMIS scores, for up to six months post-operatively (Table 2). Statistical analysis was performed using ANOVA and Tukey-Kramer Honest Significant Difference tests for

continuous variables and Chi-square and Fisher's exact tests for categorical variables.

## Results

172 thumb CMC arthroplasties were performed: 100 LRTI, 49 suture suspensionplasty (SS), 15 Arthrex suspensionplasty with InternalBrace (IB), and 8 Arthrex Mini TightRope (MTR) arthroplasties. 75% of patients were female. Surgery was performed at a mean age of 62 years of age, 50% involved the dominant hand, and Eaton stage III arthritis was most frequent with symptoms present for a mean of 36.6 months. There were no significant differences in these characteristics or preop VAS pain scores (mean 6.4) between groups.

Operative time was significantly shorter for MTR (65 min) and SS (81 min) compared to LRTI (102 min) and IB (109 min). There was no difference in postoperative subsidence between groups (−6.4mm). MTR was associated with a 50% complication rate including one failure, one postoperative fracture, and one symptomatic hardware removal. Complications were lower for other methods (LRTI 8%; SS 18%; IB 20%). Pain consistent with complex regional pain syndrome was more frequent with SS. Two MTR and two SS patients required revision arthroplasty.

**Table 1. Demographics (all continuous variables are reported as mean values except where noted; median values are italicized in parentheses where appropriate).**

	LRTI	Suture Suspensionplasty	Swivel Lock	Mini Tightrope
N	100	49	15	8
Age	63	62	63	57
Female	71 (71%)	39 (81%)	11 (73%)	7 (88%)
Dominant hand	44 (44%)	26 (53%)	9 (60%)	6 (75%)
Duration of symptoms (months)	36.3	31.7	50.2	34.0
Eaton Stage	3 (3)	2.8 (3)	2.9 (3)	2.9 (3)
Preop Trapezial Space Height (mm)	11.3	11.5	12.3	11.1
Preop Pain	6.1 (6)	6.9 (8)	6.1 (7)	8.3 (8.5)
Preop PROMIS Physical Score	13.7 (14)	12.1 (12)	12.9 (13)	12.0 (13)
Preop PROMIS Mental Score	14.2 (15)	13.2 (13)	14.2 (15)	14.0 (14)

**Table 2: Outcomes (all continuous variables are reported as mean values except where noted; median values are italicized in parentheses where appropriate).**

	LRTI	Suture Suspensionplasty	Swivel Lock	Mini Tightrope
Operative time (minutes)	102	81*	109	65*
Complications	8 (8%)	9 (18%)	3 (20%)	4 (50%)**
Complications requiring reintervention	2 (2%)	2 (4%)	0 (0%)	3 (38%)#
Number of follow up visits	4 (4)	4 (4)	5 (5)	7 (5.5)##
Postop Pain – final visit	1.9	3.3§	1.7	3.3
Postop Trapezial space height (mm)	5.0	5.5	4.2	5.0
Subsidence (mm)	6.3	5.6	7.8	6.0
Postop PROMIS Physical Score – final visit	14.4	13.1¥	15.5	11.0€
Postop PROMIS Mental Score – final visit	15.0	13.7	15.3	12.3

\*Suture Suspensionplasty and Mini Tightrope significantly shorter operative times than other two methods ( $p < 0.01$ ).

\*\*Mini Tightrope with significantly higher complication rate than LRTI ( $p = 0.005$ ).

# Significant difference between Mini Tightrope and all other methods ( $p < 0.005$ ).

## Significantly more follow ups for Mini Tightrope versus LRTI and Suture Suspensionplasty ( $p < 0.01$  for both).

§ Significant difference between LRTI and Suture Suspensionplasty ( $p < 0.001$ ).

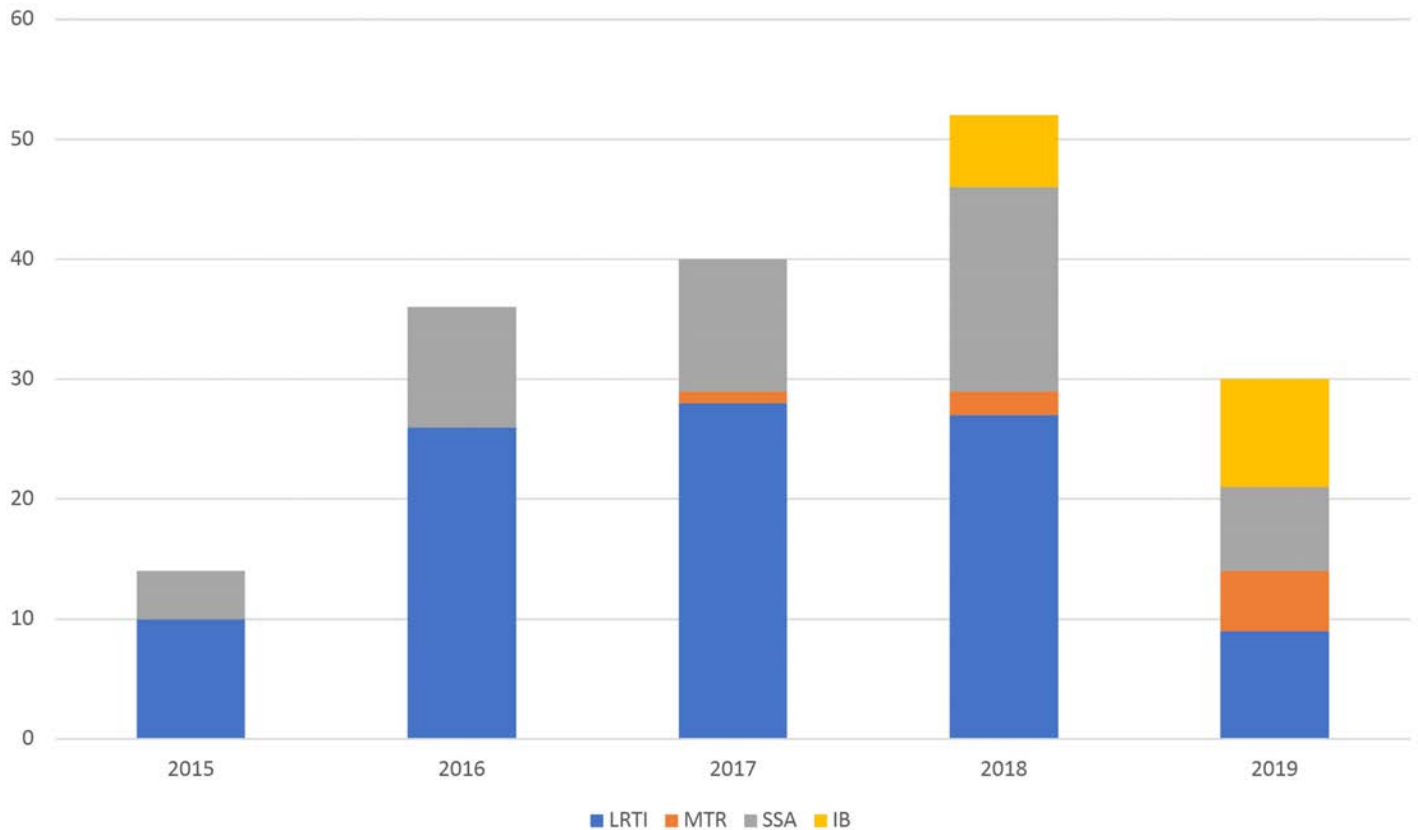
€ Significant difference between Mini Tightrope and LRTI and Swivel Lock ( $p < 0.005$  for both).

¥ Significant difference between Suture Suspensionplasty and Swivel Lock ( $p < 0.005$ ).

Patients undergoing LRTI and IB reported lower pain scores at the final visit (1.9, 1.7) although there was no significant difference in pain improvement from the preoperative to final visit (-4.0). Preoperative PROMIS physical (13.0) and mental (13.9) health scores were similar between groups with no

significant difference in the change in PROMIS scores from pre to postoperatively.

Trends in arthroplasty technique changed over the 5 year period (Figure 1). LRTI made up 70% or more of thumb CMC arthroplasties performed during the first three years declining



**Figure 1.** Annual Trend in Thumb CMC Arthroplasty Technique. LRTI = ligament reconstruction tendon interposition; MTR = Mini Tight Rope; SSA = suture suspension arthroplasty; IB = Internal Brace.

to 30% by 2019. Frequency of SS stayed relatively stable throughout the 5 year period. The use of newer, implant-based techniques were the main influence on frequency of LRTI.

## Conclusions

There was no superior method of arthroplasty for CMC-OA in regards to subsidence or patient-reported outcomes. SS and MTR arthroplasty required less operative time than other methods. MTR, however, was associated with a higher complication and reoperation rate. The use of LRTI was also shown to decrease in frequency over the 5 year study period. When one considers these findings in conjunction with practice patterns more frequently utilizing removable splints instead of casting for shorter periods of postoperative immobilization and a quicker return to normal activities,

there is the suggestion of continued evolution in the surgical management of thumb CMC OA.

## References

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