—**Original**—

Novel Modification of Abductor Pollicis Longus Suspension Arthroplasty with Trapeziectomy for Thumb Carpometacarpal Osteoarthritis

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Background: We compared the clinical results of a newly modified abductor pollicis longus (APL) suspension arthroplasty with trapeziectomy procedure (modified Thompson procedure) with those of the original APL suspension arthroplasty with trapeziectomy procedure (original Thompson procedure) for treatment of advanced osteoarthritis of the thumb carpometacarpal (CMC) joint and assessed the effectiveness of the modified Thompson procedure for thumb CMC osteoarthritis.

Methods: Ten hands of 10 patients (Group 1) were treated with the original Thompson procedure. Twenty hands of 16 patients (Group 2) were treated with the modified Thompson procedure, in which the bone tunnel positions were rearranged for a more dorsoradial passage of the transferred APL.

Results: Significant differences between values before and after surgery were noted in thumb palmar and radial abduction angles, pinch power, grip strength, Quick Disability of Arm, Shoulder, and Hand questionnaire (Quick DASH) score, and visual analog scale (VAS) score. There was no statistically significant difference in thumb palmar abduction angle, pinch power, grip strength, Quick DASH score, or VAS score between Groups 1 and 2. However, range of motion of radial abduction in the thumb was significantly better for patients in Group 2 than for those in Group 1.

Conclusions: The modified Thompson procedure is a simple, effective technique that results in greater improvement in thumb radial abduction angle, as compared with the original technique, in patients with advanced thumb CMC osteoarthritis. Additionally, the modified technique is as useful as the original procedure for early restoration of thumb function and pain relief.

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Key words: abductor pollicis longus, bone tunnel, suspension arthroplasty, thumb carpometacarpal osteoarthritis

Introduction

Thumb carpometacarpal (CMC) osteoarthritis is a common condition: the prevalence rate is as high as 57% in adults older than 60 years[1]. Most patients with advanced osteoarthritis of the thumb CMC joint have pain and dysfunction in this joint and difficulty with activities of daily living. Restoration of thumb function is thus important for these patients.

Recent reports have described good results for various suspension arthroplasty techniques for thumb CMC osteoarthrosis[2–16]. These procedures are widely described treatments for thumb CMC osteoarthritis and are standard, effective procedures for improving function in the thumb CMC joint[2–16]. Most hand surgeons perform some form of suspension arthroplasty for surgical treatment of advanced thumb CMC osteoarthritis[16]. In particular, abductor pollicis longus (APL) suspension arthroplasty with trapeziectomy, described by Thompson[13], is one of the most common techniques for treating advanced thumb CMC osteoarthritis[6,10,11]. Diao[6] reported that the Thompson procedure provided good long-term results and high satisfaction in all 38 patients studied. In addition, all but one patient attained full opposition and flexion (ability to touch the thumb tip to the base of the fifth

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finger), and the Disability of Arm, Shoulder, and Hand questionnaire (DASH) indicated high overall patient satisfaction. Unfortunately, no detailed information on thumb abduction was provided.

However, several studies reported no difference in thumb abduction after the original Thompson procedure[17–20]. We assume that this lack of improvement in postoperative thumb abduction was caused both by the existence of thumb adduction contracture and the procedure itself-that is, by the position of bone tunnels made by surgeons during the Thompson procedure.

No study has investigated the importance of bone tunnel positions in the Thompson procedure. Additionally, most reports do not provide detailed information on the techniques used for the Thompson procedure[17–20].

To achieve stable improvement in thumb abduction, we developed a modified APL suspension arthroplasty with trapeziectomy procedure (modified Thompson technique) by precisely arranging the positions of the bone tunnels. The present study compared the clinical results of this modified Thompson procedure and the original Thompson procedure for treatment of advanced osteoarthritis of the thumb CMC joint and assessed the effectiveness of the modified technique. The results indicate that the modified Thompson procedure may be useful for immediate complete pain relief in the thumb CMC joint, for improved postoperative thumb abduction, strength, and stability, and for prevention of thumb subsidence.

Materials and Methods

This study was approved by our institutional review board and conducted in accordance with the Declaration of Helsinki. We recruited 26 consecutive patients (30 hands; 6 men, 20 women; mean age, 70.8 years; age range, 52-81 years) who received a clinical diagnosis of primary advanced osteoarthritis of the thumb CMC joint on the basis of radiographic findings from 2010 through 2017. The affected hand was the right hand in 9 patients, the left hand in 13, and both hands in 4. The follow-up duration ranged from 12 to 49 months (mean, 25 months). Patients with thumb CMC osteoarthritis were excluded if they reported a history of systemic disease associated with a high incidence of thumb CMC osteoarthritis, such as rheumatoid arthritis, thyroid disease, hemodialysis, or traumatic injuries to the upper extremities. All patients had been treated unsuccessfully by conservative management with splints, nonsteroidal anti-inflammatory drugs, local steroid injections, or activity modification for longer than 6 months, and all had undergone surgical intervention. According to Eaton's classification, 26 hands had stage III and 4 hands had stage IV osteoarthritis. All treatments and examinations proceeded after written informed consent had been obtained from all patients in this study.

The patients were classified into two groups: those who underwent the original APL suspension arthroplasty procedure (original Thompson procedure)[13] from 2010 through 2013 (Group 1) and those who underwent our modified APL suspension arthroplasty procedure (modified Thompson procedure) from 2014 through 2017 (Group 2).

Group 1 comprised 10 patients (10 hands; 1 man, 9 women; mean age, 72.0 years; age range, 58-78 years) with thumb CMC osteoarthritis: five patients underwent left-sided procedures, five underwent right-sided procedures, and no patient underwent a bilateral procedure. Group 2 comprised 16 patients (20 hands; 5 men, 11 women; mean age, 70.3 years; age range, 52-81 years): eight underwent left-sided procedures, four underwent right-sided procedures, and four underwent bilateral procedures. A single surgeon (M.N.) performed all APL tendon suspension arthroplasties.

Surgical Technique

Both the modified and original Thompson procedures were performed according to the technique described by Thompson. A curved dorsal skin incision of approximately 3 cm was made over the thumb CMC joint, from the APL attachment on the thumb metacarpal base to the first dorsal extensor compartment. Sharp dissection of the subcutaneous tissue was extended down to the capsule of the thumb CMC joint, while protecting the dorsal sensory branches of the radial nerve and radial artery. The CMC joint was exposed between the extensor pollicis brevis and extensor pollicis longus. Longitudinal capsulotomy was performed with subperiosteal dissection of the thumb metacarpal base approximately 1 cm distal to the APL insertion. The trapezium was meticulously exposed and then completely removed in a piecemeal manner with bony spurs and loose bodies attached by using a rongeur and chisel. Osteophytes at the base of the thumb and second metacarpals were completely removed. Preserving the extensor retinaculum of the first compartment, a few (three in many cases) APLs and the extensor pollicis brevis were identified in the same incision. Among those APLs, one that that could pass through a 3-mm bone tunnel was selected and dissected proximally. To harvest the maximum length of the APL, transverse incisions of about 1 cm along the APL were

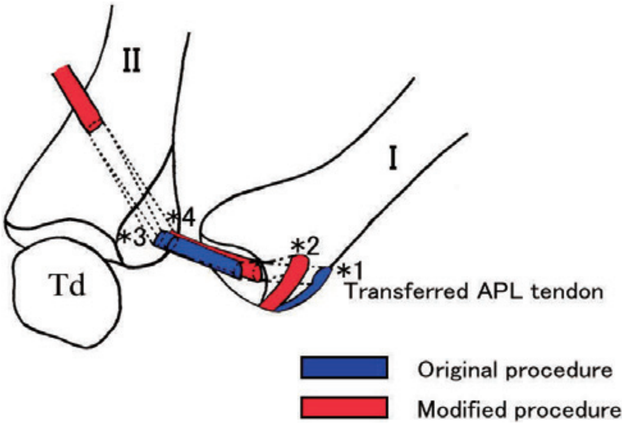

Fig. 1 Bone tunnel positions in the original and modified Thompson procedures (left wrist).
Blue and red transferred APL tendons: paths of the transferred tendon in Groups 1 and 2.
I: first metacarpal, II: second metacarpal, Td: trapezoid
*1: APL attachment (bone tunnel position in Group 1)
*2: Dorsolateral ligament attachment (bone tunnel position in Group 2)
*3: Center of intermetacarpal joint (bone tunnel position in Group 1)
*4: Volar intermetacarpal ligament attachment (bone tunnel position in Group 2)

made on the dorsoradial side of the forearm at about 3-cm intervals. One substantial slip of the three APL tendons, attached to the thumb metacarpal base, was harvested to obtain a tendon length of approximately 11 cm proximal to the musculotendinous junction, to obtain enough to transfer to the extensor carpi radialis brevis (ECRB). The dorsoradial cortex of the thumb metacarpal (attached to the APL and dorsoradial ligament [DRL]) and the articular joint surface of the thumb CMC joint were exposed.

The procedures for Groups 1 and 2 differed with respect to the position of the bone tunnel of the thumb metacarpal and second metacarpal. In Group 1, a 3-mm Kirschner wire was used to create a bone tunnel in the thumb metacarpal base, from 1 cm distally in line with the APL insertion to the center of the articular surface of the thumb metacarpal base, as described by Thompson (**Fig. 1, 2**). In contrast, the modified Thompson procedure was performed in Group 2 to physiologically reconstruct the ligaments of the thumb CMC joint in accordance with the natural ligament anatomy, as described by Nanno et al.[21] In Group 2, a 3-mm Kirschner wire was used to create a bone tunnel in the thumb metacarpal base from the attachment of the DRL, which was more

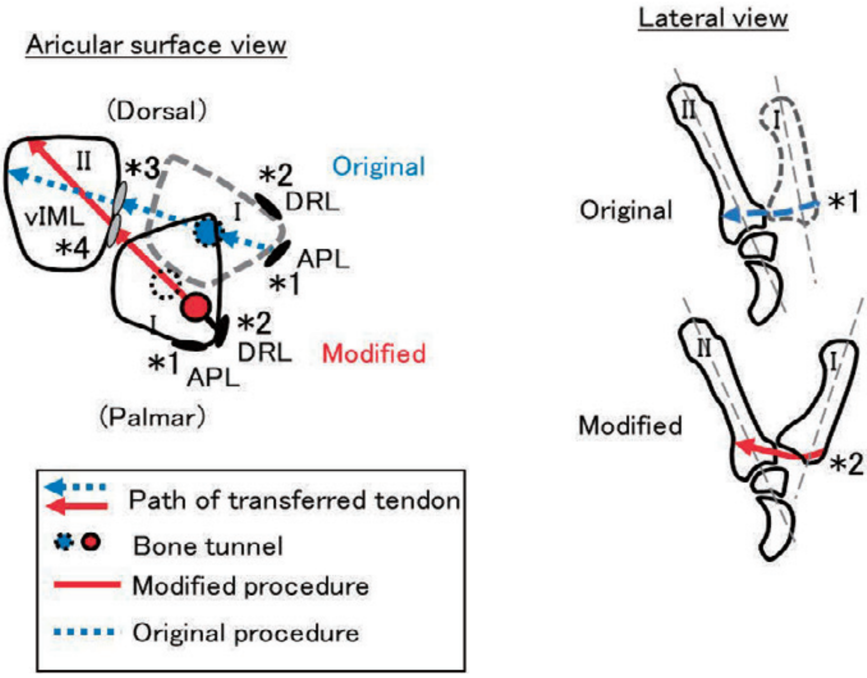

Fig. 2 Paths of transferred APL in the original and modified Thompson procedures.
Dotted line: Path of transferred tendon in Group 1
Solid line: Path of transferred tendon in Group 2
*1: APL attachment (bone tunnel position in Group 1)
*2: Dorsolateral ligament attachment (bone tunnel position in Group 2)
*3: Center of intermetacarpal joint (bone tunnel position in Group 1)
*4: Volar intermetacarpal ligament attachment (bone tunnel position in Group 2)

dorsal and proximal than the attachment of the APL, to an additional 2 to 3 mm dorsal to the center of the articular surface of the thumb metacarpal base (**Fig. 1, 2**). Nanno et al.[21] reported that the DRL attachment was approximately 1 cm distal to the articular surface. Surgeons must avoid fracturing the bone dorsal to these bone tunnels, because this would significantly compromise the stability of the reconstructed ligament.

Next, in Group 1 a 3-mm Kirschner wire was used to create a bone tunnel of the second metacarpal base from the trapezial facet to the dorsoulnar insertional area of the ECRB, as described by Thompson (**Fig. 1, 2**). In Group 2, a 3-mm Kirschner wire was used to create a bone tunnel in the second metacarpal base from the attachment of the volar intermetacarpal ligament (vIML), as described by Nanno et al.[21], which was more volar than the bone tunnel in Group 2 (**Fig. 1, 2**). The APL slip was then passed through the tunnel from the dorsoradial hole of the thumb metacarpal base to the articular surface hole. A small longitudinal incision was made on the dorsal side of the second metacarpal base, to expose the tendinous insertion of the ECRB. Finally, the APL tendon slip was passed in a palmar-to-dorsal direction through the bone tunnel of the second metacarpal and woven twice into the ECRB with the thumb in full palmar and radial abduction at maximum tension. No transfixing Kirschner wire was used to hold the thumb metacarpal. The dorsal capsule of the trapezial space and the skin were then closed layer by layer. A short-arm thumb spica splint was thereafter applied to immobilize the thumb in maximum palmar and radial abduction, with the wrist in a neutral position, for 3 weeks after surgery, while allowing some interphalangeal joint motion. Active and passive thumb range-of-motion exercises were started without restriction after the splint was removed.

We retrospectively compared the clinical results before and ≥12 months after surgery. We also used two patient-oriented questionnaires that have been recognized as important tools and have been widely used to assess patients with thumb CMC osteoarthritis, namely, the Japanese Society for Surgery of the Hand version of the Quick Disability of Arm, Shoulder, and Hand questionnaire (Quick DASH)[22] and the visual analog scale (VAS) for pain during a pinch test.

In addition, thumb palmar and radial abduction angles, grip strength, and pinch power were examined before and ≥12 months after surgery. Pinch power and grip strength were assessed with a pinch gauge (Pinch Meter SPR-641; SAKAI Medical Co., Ltd., Tokyo, Japan) and a digital hand dynamometer (Matsuyoshi & Co., Ltd., Tokyo, Japan), respectively.

The trapezial space ratio (TSR) was calculated by dividing the trapezial space between the thumb metacarpal and scaphoid by the thumb proximal phalangeal length in resting position, as described by Kadiyala et al.[23], and was used to evaluate shortening of the thumb in a lateral radiograph. The trapezial space was measured by drawing parallel lines along the subchondral surface of the distal pole of the scaphoid and across the thumb metacarpal base. The perpendicular distance between these two lines is the trapezial space. The proximal phalangeal length was measured between the midpoints of the distal and proximal articular surfaces of the proximal phalange. Maintenance of thumb stability and proximal migration of the thumb metacarpal were evaluated by using the TSR. Radiographs were obtained at ≥12 months after surgery in all patients. Complications during the follow-up period were also recorded.

All statistical analyses were performed with the software program IBM SPSS Statistics 21.0J (IBM Japan Ltd., Tokyo, Japan). Thumb palmar and radial abduction angles, grip strength, and pinch power before and after surgery were analyzed with the Student paired t-test and compared between Groups 1 and 2 with the Student unpaired t-test. A p-value of <0.05 was considered to indicate statistical significance.

Results

There was no significant difference in age, sex, disease duration, or follow-up duration between Groups 1 and 2.

In Group 1, average thumb radial and palmar abduction angles, grip strength, and pinch power markedly improved from 30.1°, 36.8°, 11.8 kg, and 3.51 kg, respectively, before surgery to 45.5°, 46.2°, 18.9 kg, and 4.30 kg after surgery (**Table 1-4**). Thumb radial and palmar abduction angles, grip strength, and pinch power significantly differed before and after surgery ($p < 0.01$) (**Table 1-4**).

In Group 2, average thumb radial and palmar abduction angles, grip strength, and pinch power markedly improved from 30.9°, 36.5°, 13.3 kg, and 3.43 kg, respectively, before surgery to 54.1°, 48.9°, 18.8 kg, and 4.61 kg after surgery (**Table 1-4**). The thumb radial abduction angle for Group 2 after surgery was significantly better than the value for Group 2 before surgery and the value for Group 1 after surgery ($p < 0.01$) (**Table 1**), but there was no significant difference in thumb palmar abduction angle, pinch power, or grip strength between Groups 1

Table 1 Clinical results for thumb radial abduction before and after surgery in Groups 1 and 2

	Thumb radial abduction angle (°)			
	Group 1 (Original Thompson procedure)		Group 2 (Modified Thompson procedure)	
	NS (Group 1 vs Group 2)			
Before surgery	30.1±14.1	*	30.9±16.8	*
After surgery	47.3±18.9		54.1±10.9	
	* (Group 1 vs Group 2)			

(*; p<0.01)
(NS; not significant)

Table 2 Clinical results for thumb palmar abduction before and after surgery in Groups 1 and 2

	Thumb palmar abduction angle (°)			
	Group 1 (Original Thompson procedure)		Group 2 (Modified Thompson procedure)	
	NS (Group 1 vs Group 2)			
Before surgery	36.8±13.9	*	36.5±14.8	*
After surgery	45.5±15.5		48.9±11.9	
	NS (Group 1 vs Group 2)			

(*; p<0.01)
(NS; not significant)

Table 3 Clinical results for grip strength before and after surgery in Groups 1 and 2

	Grasp strength (kg)			
	Group 1 (Original Thompson procedure)		Group 2 (Modified Thompson procedure)	
	NS (Group 1 vs Group 2)			
Before surgery	11.8±5.5	*	13.3±6.1	*
After surgery	18.9±7.7		18.8±8.3	
	NS (Group 1 vs Group 2)			

(*; p<0.01)
(NS; not significant)

and 2 (**Table 2-4**). Thumb palmar abduction angle was larger in Group 2 than in Group 1 but the difference was not significant.

In Group 1, Quick DASH and VAS scores markedly improved, from 46.0 and 8.01, respectively, before surgery to 17.1 and 1.68 after surgery (**Table 5, 6**). In Group 2, Quick DASH and VAS scores markedly improved, from 43.6 and 8.64, respectively, before surgery to 13.6

Table 4 Clinical results for pinch power before and after surgery in Groups 1 and 2

	Pinch power (kg)	
	Group 1 (Original Thompson procedure)	Group 2 (Modified Thompson procedure)
Before surgery	3.51±1.7	3.43±1.6
After surgery	4.30±1.6	4.61±1.5

Before surgery Group 1 vs Group 2: NS; After surgery Group 1 vs Group 2: NS; Before vs After surgery within Group 1: *; within Group 2: *

(*; p<0.01)
(NS; not significant)

Table 5 Quick DASH results before and after surgery in Groups 1 and 2. Quick DASH: Japanese Society for Surgery of the Hand version of the Quick Disability of Arm, Shoulder, and Hand questionnaire

	Quick DASH (point)	
	Group 1 (Original Thompson procedure)	Group 2 (Modified Thompson procedure)
Before surgery	46.0±12.9	43.6±15.0
After surgery	17.1±12.2	13.6±10.4

Before surgery Group 1 vs Group 2: NS; After surgery Group 1 vs Group 2: NS; Before vs After surgery within Group 1: *; within Group 2: *

(*; p<0.01)
(NS; not significant)

Table 6 Visual analog scale scores before and after surgery in Groups 1 and 2

	Visual analog scale (point)	
	Group 1 (Original Thompson procedure)	Group 2 (Modified Thompson procedure)
Before surgery	80.1±0.89	8.64±0.56
After surgery	1.68±1.20	1.20±1.19

Before surgery Group 1 vs Group 2: NS; After surgery Group 1 vs Group 2: NS; Before vs After surgery within Group 1: *; within Group 2: *

(*; p<0.01)
(NS; not significant)

and 1.20 after surgery (**Table 5, 6**). There was no significant difference in Quick DASH or VAS scores between Groups 1 and 2 (**Table 5, 6**).

No complications, including infection, painful bone impingement, complex regional pain syndrome, or injury to the cutaneous branch of the radial nerve, were noted in

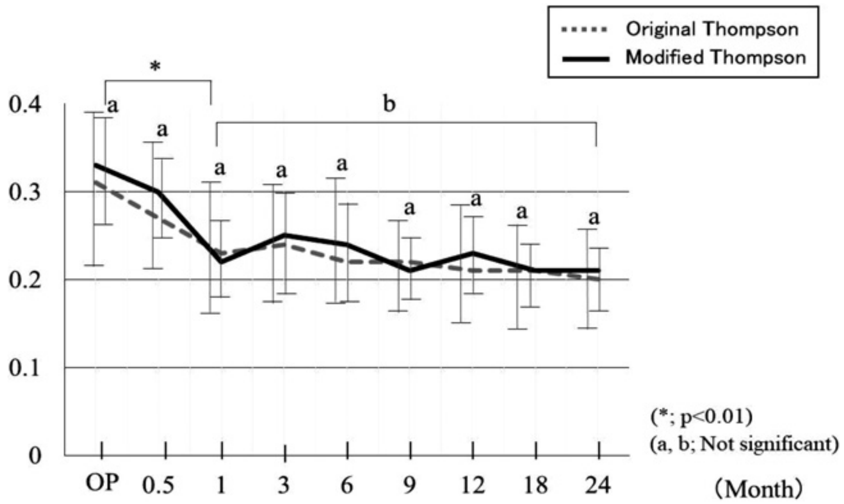

Fig. 3 Trapezial space ratio transition
Dotted line: Group 1
Solid line: Group 2

Group 1 or 2 at the final follow-up. In Group 2, all three patients with zig-zag deformation of the thumbs improved after surgery; however, in Group 1, neither of the two patients with zig-zag deformation of the thumb improved.

There was no statistically significant difference in TSR at 18 months after surgery between Groups 1 and 2 (**Fig. 3**). Average TSR decreased from 0.31 in Group 1 and 0.33 in Group 2 immediately after surgery to 0.21 in both groups at the time of the final medical examination; proximal migration of the thumb metacarpal was observed in both groups. Suspension of the thumb was maintained without a significant decrease at 1 month after surgery (**Fig. 3**). Both the modified and original procedures provided enough thumb support to prevent thumb subsidence.

Discussion

Recent reports have described several suspension arthroplasty techniques for achieving complete pain relief with restoration of thumb strength and stability in patients with advanced thumb CMC osteoarthritis[2–16]; several have reported good clinical results after the Thompson procedure. Avisar et al.[2] and Soejima et al.[11] found that the Thompson procedure yielded satisfactory long-term outcomes for patients with Eaton stage II-IV thumb CMC osteoarthritis.

Various tendons are used to reconstruct the CMC joint ligament when performing suspension arthroplasties, including the Thompson procedure. The reconstructed ligaments and their bone tunnel positions are thought to be particularly important in maintaining and stabilizing the thumb CMC joint.

In their studies of the complex ligamentous anatomy, Bettinger et al.[24] and Nanno et al.[21] described seven ligaments of the thumb CMC joint: the superficial anterior oblique ligament, deep anterior oblique ligament (dAOL), ulnar collateral ligament, DRL, posterior oblique ligament of the thumb CMC joint, vIML, and dorsal IML in the intermetacarpal joint[2,8]. These seven ligaments are generally considered to be the thumb CMC joint ligaments.

Numerous studies have examined the biomechanical and kinematic features of the DRL[12,21,24–30]. Strauch et al.[30] and Bettinger et al.[24] studied acute dislocation of the thumb CMC joint and reported that the DRL was the primary restraint to dorsal dislocation of the thumb metacarpal at the thumb CMC joint. In their anatomic and biomechanical studies, Najima et al.[27] and D'Agostino et al.[25] reported that the DRL was the strongest and stiffest of the thumb CMC ligaments and the main stabilizer of the thumb CMC joint. Pellegrini[29] and Bettinger et al.[24] reported that the dAOL is important in the stability of the thumb CMC joint. Halilaj et al.[26] used computed tomography to analyze motion and reported that the DRL and AOL had roles in joint stabilization. Nanno et al.[28] performed a kinematic analysis of the thumb CMC ligament and reported that, on the basis of changes in each component ligament length during thumb movement, the DRL was the primary stabilizer in preventing dorsoradial dislocation of the thumb CMC joint and that the dAOL was also important for joint stabilization, as it acts as a

Table 7 Transferred and reconstructed ligaments of the CMC joint, as detailed in past reports

Author	Year	Transferred ligament	Reconstructed ligament
Eaton et al.	1973	FCR	dAOL+DRL
Burton et al.	1986	FCR	dAOL+DRL
Weilby	1988	FCR	SAOL
Thompson	1989	APL	dAOL+DRL+IML
Atroshi et al.	1997	ECRL	IML
Yao et al.	2010	Mini TightRope®	IML

pivot point for circumduction motion of thumb CMC opposition. These findings suggest that the DRL and dAOL must be reconstructed to maintain thumb CMC joint function when performing arthroplasty. Additionally, Diao[6] reported that reconstruction of the IML is important in preventing thumb metacarpal subsidence after arthroplasty. Rayan and Young[9] noted that reinforcing the IML creates a strong sling to counteract the APL tendon pull and has a favorable effect on lateral subluxation. Thompson[13] reported that almost-normal thumb length could be maintained by reconstruction of a strong IML and described a procedure for ligament reconstruction in which a strip of the APL tendon was used to reinforce the DRL, dAOL, and IML and stabilize the thumb CMC joint[13]. Nanno et al.[31] reported that the ligaments reconstructed, in relation to surgical procedure, were the dAOL and DRL (by Eaton and Littler[7] and Burton and Pellegrini[4]), the superficial anterior oblique ligament (by Weilby[14] and Atroshi and Axelsson[3]), and the IML (by Yao et al.)[15]. In suspension arthroplasty, stabilization of the thumb CMC joint requires reconstruction of all three ligaments (dAOL, DRL, and IML) (**Table 7**). Therefore, we performed the Thompson procedure, which is used to reconstruct these three ligaments for thumb CMC osteoarthritis.

Soejima et al.[11] reported that after Thompson suspension arthroplasty 13 of 21 thumbs had no pain and five thumbs had only mild pain with hard work. Thompson[13] reported that mobility after his procedure was excellent, approaching full range of motion, and that pinch power in those patients improved to functional levels. However, no study has evaluated the importance of bone tunnel position in the Thompson procedure, and the few existing reports of the Thompson procedure did not detail bone tunnel positions[17–19]. In his original report[13], Thompson reported only that the bone tunnel of the thumb metacarpal was made with the inlet 1 cm distal to the APL attachment and the outlet to the center of the articular surface of the thumb metacarpal base and that the bone tunnel of the second metacarpal was made with the entrance on the volar side of the articular surface of the second metacarpal base (which is where the vIML attaches) and the exit on the dorsoulnar side of the second metacarpal base.

Our improvement of the bone tunnel in this modified Thompson technique aims to reconstruct all three CMC ligaments (DRL, dAOL, and vIML) to the greatest possible physiological extent and advance abduction of the thumb CMC joint. Concretely, we attempted to improve thumb radial and palmar abduction by setting the inlet of the thumb metacarpal as the DRL attachment region and the outlet on the radial side of the center of the articular surface; that is, we placed the inlet and outlet of the bone tunnel more dorsoradially than the original Thompson position (**Fig. 1, 2**). Moreover, the inlet of the second metacarpal bone tunnel was located at the vIML attachment, i.e., to improve thumb palmar abduction, the position of the inlet of the bone tunnel was more palmar than the original Thompson position (**Fig. 1, 2**). Consequently, thumb radial abduction was significantly improved by the modified procedure, and the good results remained stable over time. Thumb palmar abduction was nonsignificantly higher in the present modified procedure group than in the original procedure group. These findings suggest that the distance was short between the position of the bone hole created on the small joint surface of the second metacarpal in the modified and original techniques. However, this study had a small sample size; a larger sample size could yield more detailed conclusions.

In some recent studies[17–19] in which the Thompson procedure was performed, average improvement in thumb radial and palmar abduction angles was from −2.1° to 15.2° and from 5.7° to 13.7°, respectively. After our modified procedure, average improvement in thumb radial and palmar abduction angles was 16.5° and 10.7°, respectively; thus, improvement in thumb radial abduction angle was better after the present modified procedure than after procedures described in other reports. Although the extent of this improvement may be small, these results suggest that evaluation of bone tunnel position in the Thompson procedure is useful for improving thumb abduction.

Diao[6] reported that the Thompson procedure resulted in less proximal migration than did other ligament reconstructions with tendon interposition. Soejima et al.[11] reported that TSR decreased by approximately 0.20, similar to our study. In the present study, we observed proximal migration of the thumb metacarpal immediately after surgery, but the suspension was maintained from 1 month to at least 18 months after surgery. The current modified procedure was able to provide sufficient thumb support to prevent thumb subsidence.

Limitations

This study has some limitations. First, we examined a relatively small number of patients. Examination of a larger group of patients may yield more detailed conclusions. Second, the present data were collected retrospectively. Finally, few long-term studies have compared the clinical results of the current modified Thompson procedure with those of the original procedure. Future research should involve long-term comparisons between these two procedures in patients with advanced thumb CMC osteoarthritis.

Conclusions

The current study showed good clinical results for a new modified Thompson procedure in patients with advanced thumb CMC osteoarthritis. This simple, effective procedure results in immediate improvement of thumb abduction that is significantly better than the improvement after the original Thompson procedure. Additionally, it provides good pain relief of the CMC joint and high patient satisfaction and function and equals the original Thompson procedure in preventing thumb subsidence.

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Conflict of Interest: None declared.

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