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Trapeziectomy for trapeziometacarpal osteoarthritis

SYSTEMATIC REVIEW OF OUTCOMES AND COMPLICATIONS AT MINIMUM FIVE-YEAR FOLLOW-UP

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Aims

The objective of this systematic review was to describe trapeziectomy outcomes and complications in the context of osteoarthritis of the base of the thumb after a five-year minimum follow-up.

Methods

Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were used to guide study design, and 267 full-text articles were assessed for eligibility. After exclusion criteria application, 22 studies were included, involving 728 patients and 823 trapeziectomies. Outcomes included pre- and postoperative clinical and radiological characteristics. Complications and revisions were recorded.

Results

All the studies reported good results regarding pain and range of motion at the last follow-up of 8.3 years (5 to 22); the mean satisfaction rate was 91% (84% to 100%). It was difficult to assess the impact on metacarpophalangeal joint motion in extension with contrary results. The key pinch returned to its preoperative values, whereas tip pinch showed a modest improvement (+14%), with a mild improvement found in grip strength (+25%) at the last follow-up. The mean progressive trapezial collapse was 48% (0% to 85%) and was not correlated with pain, grip strength, or satisfaction. The most represented complications were linked to tendons or nerves affected during additional procedures to stabilize the joint (11.6%; n = 56). Mechanical complications included symptomatic scapho-M1 impingement (3.1%; n = 15/580), leading to nine surgical revisions out of 581 trapeziectomies. Meta-analysis was not possible due to study heterogeneity and limited data.

Conclusion

After a minimum five-year follow-up, trapeziectomy achieved high patient satisfaction and pain relief. However, strength seemed to be deteriorating with detrimental consequences, but this did not correlate with trapezial collapse. The issues related to underestimating mechanical complications and varying degrees of success should be highlighted in the information given to patients. Evidence-based analyses should help the surgeon in their decision-making.

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Keywords: Trapeziectomy, Trapezium, Osteoarthritis, Base of the thumb, Systematic review, Outcomes

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Introduction

Osteoarthritis (OA) of the base of the thumb and its management remains a controversial but relevant subject for the hand surgeon. Trapeziectomy has traditionally been the operation of choice after conservative failure.[1] Currently, trapeziectomy and its technical refinements compete with interposition implants but mostly with total trapeziometacarpal arthroplasties. First performed as a sole treatment by Gervis[2] in 1948, trapeziectomy later became the source for multiple technical modifications aimed at preventing thumb shortening that

triggered recurring pain and strength loss in the mid-term. Many studies with a short to medium follow-up of one to five years evaluated the clinical, functional, and radiological results, and most reported improvements in pain and patient satisfaction. Outcomes for trapeziectomy beyond five years are lacking. Several studies reported results with varied and potentially important follow-ups, but the long-term findings overlapped with shorter investigations.[3-6]

The aim of this systematic literature review was to analyze clinical and radiological results and complications for trapeziectomies with a minimum five-year follow-up, to allow for an objective eye without prejudice.

Methods

The authors met to establish the research protocol, including the choice of outcomes, resolution of possible conflicts, and to confirm the selection or exclusion of studies. At each stage of the process, consensus was obtained among the reviewers (MS, GC). The titles and abstracts were screened to select studies for full-text review, agreement was reached about which studies should be excluded, and extracted data were assessed to draw conclusions.

Literature search. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were used to design the study.[7] The reviewers searched the online databases PubMed (MEDLINE), EMBASE, ScienceDirect, and the Cochrane Library for literature related to trapeziectomy outcomes and complications. Database searches were conducted in March 2020 with no restrictions on publication date or journal. The following key terms were used: Trapeziectomy (Title/Abstract), Excision of the trapezium (Title/Abstract). English or French-Language studies were eligible for inclusion in the systematic review. All studies that reported on trapeziectomy in the context of OA were included, regardless of the additional procedures (ligament reconstruction (LR), tendon interposition (TI), ligament reconstruction with tendon interposition (LRTI), Kirschner (K)-wires), even when they were compared to other surgeries or if they reported clinical, functional, and/or radiological results. Articles with a mean follow-up longer than five years were included, as were studies with shorter times if the authors analyzed results beyond five years or if they reported complications beyond this period. Articles that only presented overall results were not included in the final analysis. Exclusion criteria were secondary trapeziectomy following failed surgery, other surgical procedures with no comparison with trapeziectomy (arthroscopic surgery, partial trapeziectomy, prostheses, bone fusion, biological or noninterpositional arthroplasties material), rheumatic disease, immune diseases, and post-traumatic OA. The following exclusion criteria were also applied: animal and cadaveric biomechanical studies; surgery techniques; unsuitable formats (abstracts, case reports, book chapters); and studies of patients reviewed before five years or with incomplete data.

Quality assessment. Both reviewers assessed study quality using criteria described by Coleman et al[8] adapted by Aujla et al.[9] It assesses the methodology of the study (A) and the outcome measures (B) to calculate an absolute score (T). Those scoring < 45 were excluded based on quality.

Data extraction and analysis. Data were extracted independently by both authors, and disparities were discussed until consensus was obtained. Results were pooled, and duplicate searches were excluded. Participant-specific demographic details extracted included the number of patients and thumbs, sex distribution, mean age at surgery (years), and mean length of follow-up (years). Operative techniques were described. Outcomes extracted included clinical characteristics: pain (visual analogue scale, VAS), range of motion (ROM), pinch and grip strength, satisfaction, and patient-reported outcome measures (PROMs). Complications and surgical revisions were also included. Pre- and postoperative records where recorded when possible. Given the considerable variability in measurements among studies, we accepted all measurement scales that clearly explained the scoring. For each parameter, final follow-up at a minimum of five years was detailed only if it was significantly different from the mean length of the series. Data availability (DA) was specified for all parameters. The abstracted evidence were collected and analyzed using Microsoft Excel 2017 (Microsoft, USA). Statistical analyses focused on descriptive statistics, with results presented as means and ranges.

Results

A total of 1,978 studies were identified, and 944 duplicates were removed. After title and abstract review, 767 were excluded. The full texts of 267 studies were reviewed, and 245 were then excluded: 242 studies did not have sufficient follow-up or did not present specific analyses of patients or their complications and eventual revisions beyond five years. The full data were extracted from 22 studies that involved 728 patients and 823 trapeziectomies.[10–31] The PRISMA flowchart is shown in Figure 1. The characteristics of the included papers are given in Tables I and II.

Most studies (19/22; 86%) were retrospective, including six comparative studies.[18,23,27-29,31] Three were prospective,[14,15,18] including two comparative studies.[14,18] Regarding the quality assessment, 16 studies (76%) were categorized with a score up to 50. Operative techniques were trapeziectomy as a sole treatment in 106 cases (12.9%), with LR in 248 (30.1%), TI in 161

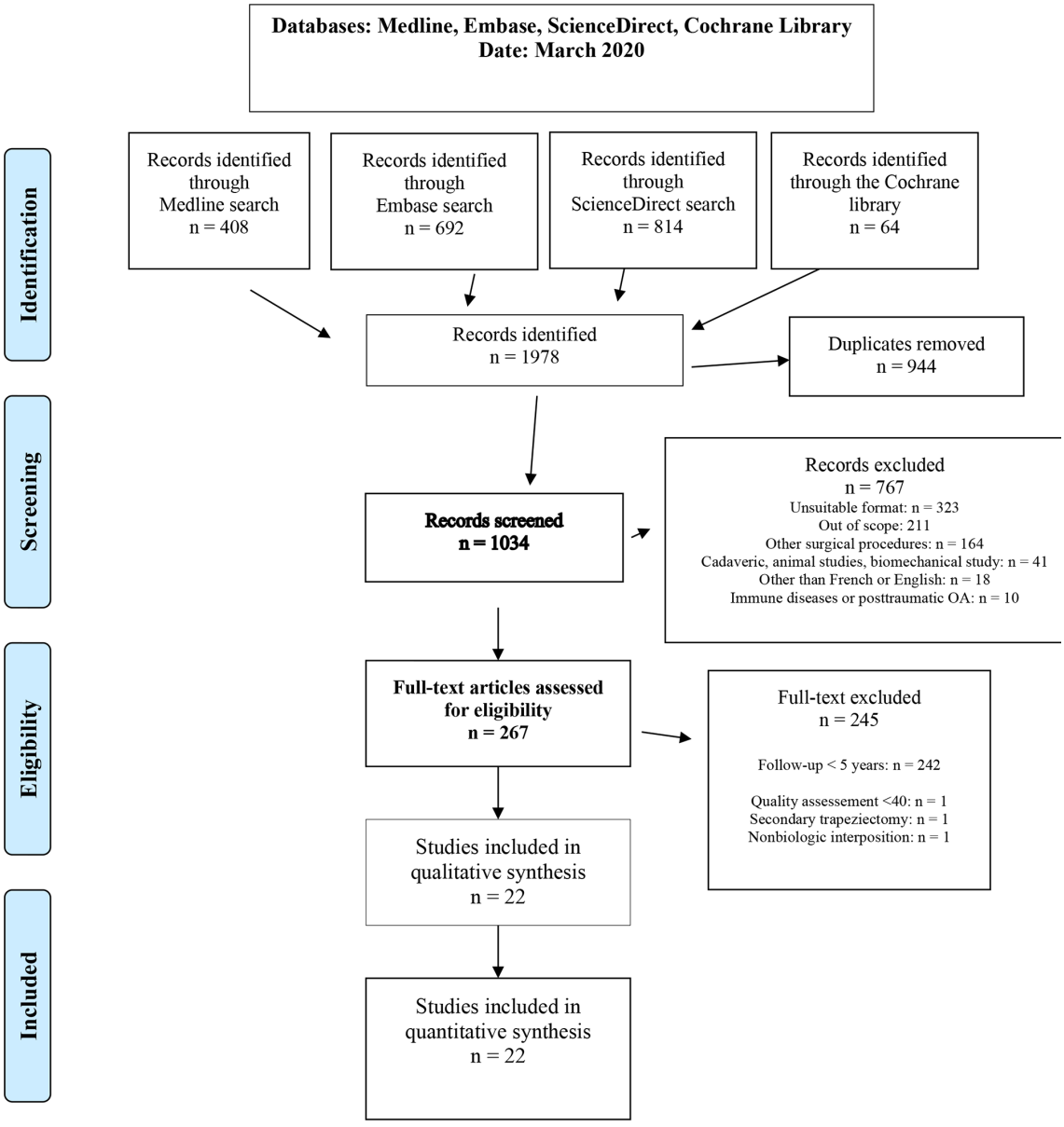

Fig. 1

Preferred Reporting Items for Systematic Reviews and Meta-Analyses study flowchart.

(19.6%), and LRTI in 308 (37.8%). K-wires were used in 282 cases (34.3%). The mean follow-up period was 8.3 years (5 to 22),[5-22] and mean age at the time of trapeziectomy (T) was 58 years (38 to 90; DA: 100%. Of the participants, 90% were female (DA: 91.8%).

Pain. In total, 21 series reported results on pain (805 T). Of these, 12 used a VAS from 0 to 10 (least to most) (411 T). Four studies gave a preoperative evaluation[13,18,20,22] with a significant improvement in pain at the last follow-up of seven years (DA: 24%) versus preoperative.[6–19] All studies reported reduced pain at the final follow-up. The median VAS score was 1.5 (0 to 6) (DA: 51%).

ROM. In total, 21 studies reported results on thumb mobility (Table III). Three only analyzed the metacarpophangeal (MCP) joint motion in flexion and were excluded from analysis.[20,21,23] Thumb opposition was the most analyzed sector of mobility, using a Kapandji score (0 to 10) (15 studies).[32] The other analyzed sectors were palmar abduction, radial abduction, thumb extension, and MCP joint ROM. In terms of opposition, at the final follow-up, 15 studies (428 T) analyzed the Kapandji score, but the means were only given in 13 (408 T) with a median score of 9.2 (interquartile range (IQR) 6 to 10) (DA: 55%). Three studies with preoperative values reported improvement in the other analyzed sectors.[12,16,28] Thumb extension (118 T) decreased at final follow-up compared to full extension, with a mean Kapandji score of 2.4 (1.8 to 4; DA: 15%).[16,17,27] Regarding MCP joint mobility, four studies

Table I. Details of included studies.

Authors	Year	Quality assessment,* A/B/Total	Patients, n	T, n	Additional procedures, n	Comparative studies, n
Tomaino et al[10]	1995	20/37/57	22	24	LRTI (FCR or APL)	
Le Dû et al[11]	2004	20/31/51	40	44	LRTI (FCR) + KW	
Sai et al[12]	2004	20/31/51	22	22	LRTI (FCR) (+ APL)	
Illaramendi et al[13]	2006	20/41/61	19	19	LRTI (ECRL) + KW	
Raven et al[14]	2006	27/24/51	15	17	TI (FCR)	Arthrodeses: 28 R Arthropl.: 18
Gray et al[15]	2007	27/38/65	22	22	KW	
Moineau et al[16]	2009	20/51/71	42	51	LRTI (FCR, PL)	
Ferrière et al[17]	2010	20/44/64	18	22	LRTI (FCR or PL)	
Gangopadhyay et al[18]	2012	42/51/93	132	153	T + KW: 53 TI (PL) + KW: 46 LRTI (FCR) + KW: 54	
Bidwai et al[19]	2013	20/29/49	41	43	LR (FCR)	
Vinycomb et al[20]	2013	15/25/40	15	15	LRTI (FCR, APL, PL)	
Avisar et al[21]	2013	20/37/57	13	15	TI (APL)	
Miller et al[22]	2013	15/34/49	12	12	T: 4 LRTI: 7 TI (PL): 1	
de Smet et al[23]	2013	20/28/48	32	32	LRTI (FCR)	Prostheses: 23
Yaffe et al[24]	2014	20/36/56	21	18	LR (FCR)	
Klein et al[25]	2015	25/30/55	54	50	LR (FCR)	
Givissis et al[26]	2016	20/36/56	24	31	TI (FL+ KW)	
Pomares et al[27]	2016	25/36/61	54	67	TI (PL): 51 LR (APL): 16	
Rhee et al[28]	2018	25/41/66	57	57	LRTI (FCR): 18 LR (FCR) : 39	
Barthel et al[29]	2018	20/26/46	35	46	T: 27 LR (APL): 19	
de Maio et al[30]	2019	20/25/45	40	50	LR (FCR)	
Froschauer et al[31]	2019	20/34/54	13	13	LR (ECRL) + KW	Prostheses : 32

*Quality assessment according to Coleman et al,[8] revised by Aujla et al.[9]
APL, abductor pollicis longus tendon; ECRL, extensor carpi radialis tendon; FCR, flexor carpi radialis tendon; KW, Kirschner wires; LR, ligament reconstruction without tendon interposition (sustentoplasty); LRTI, ligament reconstruction tendon interposition; PL, palmaris longus; R arthropl, resection arthroplasties; T, trapeziectomy; TI, tendon interposition.

gave preoperative MCP extension values.[16,18,22,28] MCP extension was stable or decreased in three.[18,20,24]

Strength. Strength was studied in 16 series with a preoperative comparison and at last follow-up in seven. Six studies analyzed these parameters compared to the contralateral side, and four performed statistical analyses and concluded that there was no difference with the contralateral side.[18,19,21,25] The mean preoperative values for key, tip, and grip strength for 347 T (DA: 54%) were 4.1 kg (1.8 to 7.3), 2.8 kg (1.4 to 5.9), and 16.1 kg (7 to 32.3), respectively. The corresponding mean final follow-up values were 4.1 kg,[1-19] 575 T, DA: 89%; 3.8 kg,[1-13] 479 T, DA: 74%; and 20.9 kg (8 to 53), 601 T, DA: 93%. For the seven series where comparative measures were available (347 T, DA: 54%), the gain at a minimum of five years follow-up was 0.25 kg (-0.1 to 2.6), 0.48 kg (0.2 to 1), and 5.3 kg (2.4 to 10), respectively. The improvement percentages at the final follow-up were 6% (-2.9 to 19.6), 14% (3.8 to 20), and 25% (10 to 41), respectively (Table IV).

QuickDASH scores. Almost all series assessed the outcome but used very different scales. One developed a scale in terms of multiple criteria collected with other validated scales.[16] A total of 11 different scales were identified. The most frequently used was the DASH (Disabilities of the Arm, Shoulder, and Hand),[33] but only one study provided the preoperative value[19] with a significant result between the preoperative DASH and the final follow-up of 10.1 years.[10-13] The mean DASH at the final follow-up for 403 T was 21 (0 to 81), DA: 49%.

Satisfaction. Ten studies assessed patient satisfaction at the final follow-up.[10–13,15,16,20,25,27,31] The evaluations were subjective, and three studies used a VAS,[14,19,23] yielding a mean satisfaction rate of 91% (T: 327, DA: 74%). The function in daily activity at the last follow-up was studied in five series with various criteria.[10,11,15,19,25] It was improved or normal in 89% of cases (T: 183, DA: 48%).

Radiological outcome. Overall, 13 studies reported evaluations with various radiological views, which made it possible to measure thumb shortening, TM subdislocation, and first web retraction. Eight series did not have a radiological assessment or were incomplete.[30] Rhee et al[28] was excluded due the long-term findings overlapping with shorter investigations. Proximal

Table II. Demographic information.

Authors	T, n	Mean length of follow-up, yrs (range)	Mean age at surgery, yrs (range)	Sex, F:M
Tomaino et al[10]	24	NR (8 to 18)	56 (36 to 67)	19:3
Le Dû et al[11]	44	8.4 (5 to 12)	59.7 (42 to 74)	41:6
Sai et al[12]	22	9 (6 to 11)	65 (53 to 74)	20:2
Illaramendi et al[13]	19	8 (5 to 12)	58 (46 to 73)	14:5
Raven et al[14]	17	7.3 (7.0 to 8.5)	65 (47 to 80)	14:3
Gray et al[15]	22	7.5 (5.0 to 11.5)	65 (52 to 82)	17:5
Moineau et al[16]	51	6.5 (5 to 9)	61 (41 to 77)	NR
Ferrière et al[17]	22	6 (5 to 18)	69 (60 to 82)	16:2
Gangopadhyay et al[18]	153	6 (5 to 18)	57 (40 to 75)	132:0
Bidwai et al[19]	43	10.1 (9 to 12)	64 (46 to 82)	31:10
Vinycomb et al[20]	15	13.5 (10.5 to 17.5)	74 (62 to 83)	13:2
Avisar et al[21]	15	15 (13 to 17)	72 (56 to 82)	NR
Miller et al[22]	12	9 (6 to 13)	62 (51 to 74)	11:1
de Smet et al[23]	32	10.1 (9 to 12)	58 (49 to 67)	32:0
Yaffe et al[24]	18	9.6 (5.5 to 16)	58.1 (54 to 62)	19:2*
Klein et al[25]	50	13 (11 to NR)	71.8 (60 to 77)	31:8
Givissis et al[26]	31	12.5 (10 to 15)	60 (51 to 81)	24:0
Pomares et al[27]	67	13.2 (10 to 22)	61 (43 to 89)	51:3
Rhee et al[28]	57	10.4 (5 to 16)	49.6 (38 to 55)	49:8
Barthel et al[29]	46	NR (6 to NR)	69 (45 to 90)	38:8
de Maio et al[30]	50	8 (5 to 12)	62 (49 to 74)	40:0
Froschauer et al[31]	13	13.6 (1 to 15)	58 (51 to 54)	12:1

*Total ratio.
NR, not recorded; T, trapeziectomies.

metacarpal migration was measured as the percentage of diminution in the height of the arthroplasty space compared with early postoperative radiographs (trapezial index), the measure between the distal scaphoid pole and the base of the first metacarpal (trapezial height), or calculated by dividing the trapezial space by the proximal phalangeal length to minimize magnification errors (trapezial space ratio (TSR)). Arthroplasty stability was assessed in four series according to the percentage of subluxation of the base of the metacarpal relative to the scaphoid.[10,15,19,27] Thumb web space restoration was assessed in only one case.[17] All studies reported a decrease of the trapezial space with an average of 48% (0 to 85), 381 T, DA: 78%), a mean height of the trapezial lodge of 7.2 mm (1 to 8.1, 150 T, DA: 39%), and a mean TSR of 0.4 (0.15 to 0.63, 289 T, DA: 76%) at the final follow-up. The main radiological results are summarized in Table V.

Complications. The complications are listed in Table VI and were distinguished as intraoperative and late due to mechanical origins. Complex regional pain syndrome (CRPS) of multifactor origins was treated separately. There were 11.6% intraoperative complications (13 series) for 484 T (DA: 59%). CRPS occurred in 5.3% of cases (491 T, DA: 60%). There were 15 mechanical complications for 480 T (3,1%, DA: 58%). No infectious complication was reported. The estimated overall complication rate was 77 for 453 T (17%, DA: 55%) in series that reported complications. There were nine surgical revisions for 581 T (1.5%, DA: 71%) due to scapho-M1 impingement.

Discussion

Thumb shortening and its impact on the function has long been highlighted for trapeziectomies. This systematic literature review sought to group clinical, functional, and radiological results for trapeziectomies. A minimum five-year follow-up seemed essential for two reasons: changes to outcomes over time and the possibility to compare this study with implants that require a five-year follow-up. This would influence the surgical decision-making process, based on evidence-based results.

Overall, the studies reported good pain relief regardless of the scale used, and ROM improvements were found at a minimum five-year follow-up. More than 90% of patients were satisfied. Unsatisfied patients were generally those who required good hand strength[20,25] or who experienced complications. Concerning ROM, only one study with preoperative values reported a significant improvement in opposition.[26] Thumb showed a reduction or less extension at the final follow-up (by 40%) compared to normal extension,[16,17,27] with possible functional effects as suggested by Moineau et al.[16] It is difficult to reach a conclusion on the impact of trapeziectomy on MCP mobility in extension. De Maio et al[30] concluded that MCP joint extension increased significantly at the final

Table III. Range of motion.

		Thumb opposition Kapandji scale (0 to 10)		Palmar abduction, °		Radial abduction, °		Extension Kapandji scale (0 to 4)	MCP joint extension, °	
Authors	**T, n**	**Preop**	**Last FU**	**Preop**	**Last FU**	**Preop**	**Last FU**	**Last FU**	**Preop**	**Last FU**
Tomaino et al[10]	24	NR	8.9 (NR to 9)			28	41			
Sai et al[12]	22	NR	10	42	50 (45 to 55)	40	44 (39 to 48)			
Illaramendi et al[13]	19	NR	14 = 10/10 (74%)		55 (38 to 80)		55 (28 to 75)			
Raven et al[14]	17						64			
Gray et al[15]	22	NR	9.8							
Moineau et al[16]	51	9.1 (5–10)	9.6 (6 to 10)	36 (15 to 45)	36.5 (20 to 45)			1.8	26 (10 to 45)	26 (5 to 50)
Ferrière et al[17]	22	NR	9.4/10			35		2*	> 30°(8) < 30°(14)	> 30°(7) < 30(15)
Gangopadhyay et al[18]	153	NR	137/153 > 8/10 (89.5%)						10 (0 to 20)	5 (0 to 15)
Bidwai et al[19]	43				5 cm (3.0 to 6.5)					
Miller et al[20]	12	8.75 (7.5–10)†	8.75 (7.5 to 10)†						45 (30 to 70)	30 (15 to 40)
Yaffe et al[22]	18	NR	8.75 (7.2 to 10)		49		47			2
Klein et al[25]	50	NR	8.6 (6 to 10)		64 (40 to 85)		69.5 (40 to 95)			
Givissis et al[26]	31	6 (5–8)	7.5 (6 to 9)							
Pomares et al[27]	51 TI	NR	9.9 (9.8 to 10)					2.9 (2 to 4)		Arc of motion
	16 LR		9.6 (9.5 to 9.7)					2.6 (2 to 3)		
Rhee et al[28]	57			45* (33.4 to 56.8)	49* (34.5 to 63.5)	42*(31.5 to 54.1)	44* (30 to 59)		0.1°	10.8°
Barthel et al[29]	46	NR	9.5 (8.7 to 10)							
de Maio et al[30]	50	NR	9.3 (8 to 10)							
Froschauer et al[31]	13	NR	8.8 (6 to 10)		5.7 cm (5 to 7)					

*To suit the format.
†Modified Kapandji scores were converted into Kapandji scores.
FU, follow-up; MCP, metacarpophangeal; T, trapeziectomies.

follow-up; aggravation seemed to occur when preoperative MCP hyperextension was > 30°. In this case, MCP joint stabilization was suggested. Hyperextension increases to compensate for possible trapeziometacarpal subluxation and thumb shortening. Decreased MCP extension was reported by Gangopadhyay et al[18] with identical findings for two other studies,[22,28] but a MCP joint capsulodesis was systematically added with a MCP capsulodesis lengthening at the last follow-up.

Strength was not studied in eight series. Of the seven studies that compared pre- and postoperative values, one to three parameters were slightly improved four times, which was statistically significant.[10,15,26,28] In the longest follow-up, key pinch seemed to have returned to its preoperative values,[15] whereas tip pinch showed a modest improvement (+ 14%), and a mild improvement was found in grip strength (+ 25%). For studies with intermediary strength measurements, there was a progressive decrease in patient reviews, including for Gangopahdhyay et al[20] which reported reduced thumb strength compared to the one-year postoperative values, but there was no difference with the opposite side at the last follow-up. In Vinycomb et al[20] study, 60% of patients complained of subjective lack of strength, compared to 56% in the Klein et al[25] study, which was not significantly correlated with objective values. The lack of strength improvement seems to be related to thumb shortening, even though Gray et al[15] did not find a correlation (without statistical analysis). No additional procedure seemed to significantly impact pain, ROM, or strength.[11,18,27]

Most studies were descriptive or suggested PROMs improvement when the preoperative scores were given, but the statistical analyses were missing. Studies comparing different processes associated with trapeziectomy did not show significant differences

Table IV. Strength.

Authors		Key pinch, kg		Tip pinch, kg		Grip, kg	
	T, n	Preop	Last FU	Preop	Last FU	Preop	Last FU
Tomaino et al[10]	24	4.8	4.9	2.9	3.8	14.6	24.6
Sai et al[12]	19	3.3	3.4	2.5	2.6	13.6	17.6
Illaramendi et al[13]	17		7 (1 to 19)		6 (1 to 13)		26 (13 to 53)
Raven et al[14]	22				3		20 (8 to 37)
Gray et al[15]	51	5	5	4	5	19	23
Ferrière et al[17]	22		4.4				18.55
Gangopadhyay et al[18]	53 T	3.6 (2.3 to 4.5)	4.1 (2.7 to 5.0)	2.3 (1.4 to 3.2)	2.7 (1.8 to 3.2)	14 (11 to 18)	20 (14 to 25)
	46 TI	3.5 (2.2 to 5.5)	3.4 (1.8 to 5.5)	2.3 (1.4 to 3.6)	2.5 (1.4 to 3.6)	13 (7 to 20)	18 (8 to 26)
	54 LRTI	3.2 (2.0 to 4.1)	3.6 (2.7 to 5.0)	2.3 (1.4 to 2.7)	2.7 (1.8 to 3.3)	13 (9 to 17)	20 (12 to 24)
Bidwai et al[19]	43		4.6*		4.6*		19.6*
Avisar et al[21]	15		4.3 (2.9 to 5.7)				25.4 (17.1 to 33.6)
Miller et al[22]	12	3.5 (1.8 to 5.2)	4.0 (2.9 to 5.2)	2.7 (1.6 to 3.7)	3.3 (2.3 to 4.2)	18.1 (8.9 to 27.3)	23.5 (17.4 to 29.7)
Yaffe et al[24]	18		3.7 (2.1 to 5.1)*				21.7 (13.8 to 33.4)*
Klein et al[25]	50				4.9		10.1
Givissis et al[26]	31	4.5 (2.9 to 7.3)	5.6 (3.9 to 8)	3.7 (2.7 to 5.8)	4.6 (3.6 to 7.9)	17 (10 to 31)	23.6 (16.3 to 32.7)
Pomares et al[27]	51 TI		3.6 (2.1 to 5.1)				25.7 (17.8 to 33.6)
	16 LR		3.4 (2.2 to 4.6)				22.8 (14.6 to 31)
Rhee et al[28]	57	4.7 (2.3 to 7.1)	4.7 (1.6 to 7.8)	4.1 (2.3 to 5.9)	4.2 (2 to 6.4)	21.7 (11.1 to 32.3)	24.1 (12.2 to 32.3)
Barthel et al[29]	27 T		4.25 (2.3 to 6.2)				
	19 LR		4 (2.7 to 5.3)				

*Converted from lbs into kg to suit the format.
FU, Follow-up; LR, ligament reconstruction without tendon interposition (sustentoplasty); T, trapeziectomies; TI, tendon interposition.

Table V. Radiological outcomes.

Authors		Scaphometacarpal space			Average subdislocation of the base of the metacarpal, %
	T, n	Trapezial index, %	Trapezial height, mm	Trapezial space ratio	
Tomaino et al[10]	24	13			55
		3 > 20%			8.3% > 50%
Le Dû et al[11]	44	58		0.58*	
Sai et al[12]	22	44 (41 to 48)	8.1	0.55*	
Illaramendi et al[13]	16	14 (4 to 44)		0.63	
Gray et al[15]	19	77	8*	0.2*	0 (rest)
		81	0.4 forceful pinch		0 (forceful pinch)
Moineau et al[16]	51	50 (0 to 85)			
Ferrière et al[17]	22	27	3.2	0.33*	4.5
Avisar et al[21]	15			0.52*	
Yaffe et al[24]	17		5.9 (1 to 8)		
Klein et al[25]	50			0.60	
Givissis et al[26]	31	48		0.21 (0.15 to 0.28)	
Pomares et al[27]	51 (TI)	57	3.7	0.28 (0.2 to 0.32)*	+8
	16 (LR)	55	3.6	0.26 (0.15 to 0.5)*	-5

*To suit the format.
LR, ligament reconstruction without tendon interposition (sustentoplasty); T, trapeziectomies; TI, tendon interposition.

between the groups and the scales used,[28,29] with same conclusion when comparing the postoperative DASH between trapeziectomies and prostheses.[23,31] We can only suggest administering QuickDASH before and after treatment, no matter the methods.

Trapezial collapse occurred regardless of the treatment methods, without any significant difference in studies using stabilization procedures. The trapezial space gradually decreased within five[27] to 15 years.[26] However, the clinical consequences were rarely described. There was no correlation between trapezial collapse and clinical and functional parameters in four studies.[11,15,17,28] Nonetheless, two reported that hand function diminished if the trapezial space decreased, and this was significant in one study.[10,16]

Table VI. Complications during and after trapeziectomy, revisions.

Authors	Tn	Intraoperative, n	CRPS	Scapho-M1 impingement OA	Symptomatic subdislocation	Revisions
Tomaino et al[10]	24	2	0	0 (OA)	1/24 subdislocation > 50% (bad result)	0
Le Dû et al[11]	44	NR	12	NR		0
Illaramendi et al[13]	19	3	1	NR		0
Raven et al[14]	17	4	1	NR		0
Gray et al[15]	22	5	NR	0		0
Moineau et al[16]	51	3	6	1		1
Ferrière et al[17]	22	0	2	NR		NR
Gangopadhyay et al[18]	53 (T)	7 (4)	1(0)	1	1 (no radiographs)	2
	46 (TI)	13 (5)	0	0		0
	54 (LRT)	10 (8)	1 (0)	2		2
Bidwai et al[19]	43	1	0	0	NR	NR
Vinycomb et al[20]	15	6	NR	NR	NR	NR
Avisar et al[21]	15	0	0	NR	NR	0
Yaffe et al[24]	18	NR	NR	NR	NR	0
Givissis et al[26]	31	NR	NR	0	NR	0
Pomares et al[27]	51 (TI)	NR	NR	1	11	1
	16 (LR)			2	6	1
Rhee et al[28]	18 (LTRI)	2 (total)	2 (total)	1 (revision)		1
	39 (LR)			1 (revision)		1
Barthel et al[29]	27 (T)	0	0	NR	NR	0
	19 (LR)	0	0	NR	NR	0
de Maio et al[30]	50	NR	NR	4 (OA)	Increased in 43 thumbs	NR
Froschauer et al[31]	13	NR	NR	1	1	0

CRPS, complex regional pain syndrome; LR, ligament reconstruction without tendon interposition (sustentoplasty); LTRI, ligament reconstruction tendon interposition; NR, not recorded; OA, osteoarthritis; T, trapeziectomies; TI, tendon interposition.

The overall rate of complications was unclear because of incomplete data or partial results. No complications were mentioned in ten series (246 T). The intraoperative complications were in most cases linked to additional procedures concerning tendons (pulling sensation or tendinitis) or superficial sensory nerves. Only one case, in Gangopahdhyay et al[18] series required surgical revision (neuroma) combined with scapho-M1 impingement. We can recommend dissections that would allow the nerves to be visualized and protected during ligamentoplasties or K-wire placement. The number of CRPS cases was comparable to the rates observed in the literature for hand surgery. Le dû et al[11] used a K-wire stabilization that resulted in a higher than average CRPS rate (27%). Excessive distraction could be the cause, but given that the CRPS rate for the only series using distraction is not mentioned,[15] the reason is uncertain.

The mechanical complication rate with possible revisions as a consequence appears to be under-reported, with most evidence coming from case reports. Conolly et al,[34] which was excluded, reported four revisions for four cases. No series reported carpal instability, which is probably underestimated as any disruption of the scaphotrapezoid ligament complex appears to increase risk for developing carpal instability over time. The number of cases is too small to understand the efficiency of the interpositions or ligament reconstructions in the scapho-M1 impingement. Four studies reported cases of Scaphoid-M1 OA with nine surgical revisions.[16,18,27,28] Painful scapho-M1 impingement remains a therapeutic challenge with varied surgical methods and contrasting results.[16,28] A revision delay was not always found, but several took place ten years after the initial surgery.[18,28] Gangopahdhyay et al[18] treated four patients by hemi-arthroplasty in pyrocarbon. Moineau et al[16] performed scapho-M1 arthrodesis with bone graft interposition. Patients were not satisfied with the results. Two painful scaphometacarpal impingements required revision sustentoplasty ten years from the index procedure.[15] TMC joint subdislocation may have functional (first web retraction) and aesthetic implications.

Limitations of this study included the lack of a meta-analysis. This was not possible given the lack of patient-level data or measures of spread presented, mainly of poor quality, with limited numbers of cases considering the multiple additional procedures. Most included studies were retrospective, which reduces the quality of evidence. This highlights the need for large prospective studies of this common procedure. The measurement method was not clearly stated for some outcomes, which could introduce errors when combining the results and making it difficult to draw meaningful conclusions.

Trapeziectomy as a sole treatment or combined with ligamentoplasty achieves good results at minimum five years follow-up in terms of pain relief, satisfaction, and ROM. Strength did not increase over time, and there was no correlation between strength and trapezial collapse. Complications seem under-reported, specifically scapho-M1 impingement that is difficult to treat. Comparison with different treatments such as prostheses, with a minimum five-year follow-up in a prospective study, would help guide surgeon decision-making.

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