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Original Research

Unplanned Early Reoperation Rate Following Thumb Basal Joint Arthroplasty

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Purpose: Thumb basal joint arthritis is a common degenerative condition of the hand that is often managed with thumb basal joint arthroplasty (BJA). This procedure generally results in a high level of patient satisfaction; however, the rate and cause of early unplanned reoperation after thumb BJA are not well-understood. Therefore, we performed a review to better understand the rate and cause of early reoperation.

Methods: A retrospective review of all thumb BJA cases performed at a single private academic center between 2014 and 2016 yielded 637 patients and 686 primary thumb BJAs with a minimum 1-year follow-up (mean, 2.4 years). Data collection included patient demographics, surgical technique and type of thumb BJA performed, time to reoperation, reason for early reoperation (within 2 years), and type of reoperation.

Results: Of 686 patients undergoing thumb BJAs, 10 had unplanned early reoperation (1.5%). Mean duration between the index procedure and reoperation was 5.2 months (range, 0.5–14.3 months). Of the 10 unplanned early reoperations, 4 thumbs in 4 patients required revision arthroplasties owing to persistent pain. Time to reoperation for revision arthroplasty was 9.6 months (range, 3.9–14.3 months). Three of 10 reoperations resulted from early infection, 2 from unplanned early removal of symptomatic K-wires, and one from radial sensory neuritis.

Conclusions: In this series of nearly 700 consecutive cases, we identified an unexpected early reoperation rate of 1.5%, with only a 0.6% reoperation rate specifically for painful subsidence requiring a revision arthroplasty. Mean time to revision was 9.6 months. These rates are lower than those published previously and should be considered by patients and surgeons when planning thumb BJA.

Type of study/level of evidence: Prognostic IV.

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Osteoarthritis of the basal joint of the thumb, also known as the first trapeziometacarpal or carpometacarpal (CMC) joint, is a degenerative condition common in individuals of advancing age and is more common in women than men.¹ In part, this may be the result of laxity of the anterior oblique ligament, leading to high-stress loads on the joint and causing cartilage degeneration and bony impingement.^{2–4} Common first-line treatments for basal joint osteoarthritis include activity modification, hand therapy,

nonsteroidal anti-inflammatory drugs, placement of an orthosis, and intra-articular steroid injections.⁵ When nonsurgical management does not provide notable pain relief, many patients elect to undergo thumb basal joint arthroplasty (BJA).

Thumb BJA typically results in a high level of patient satisfaction.^{6–11} Although many surgical techniques exist, preferences vary among hand surgeons.¹² Most techniques involve partial or complete trapezium excision, followed by various stabilization or immobilization strategies of the first metacarpal. Stabilization techniques include ligament interpositions,¹³ ligament reconstructions,¹³ suture or button suspensionplasties,¹⁴ and/or short-term K-wire fixation.¹⁵ Currently, evidence is insufficient to support one technique over another.^{2,16}

Although most thumb BJA procedures are successful, the rate and cause of early unplanned reoperation after thumb BJA are not

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Table 1
Demographics: Unplanned Reoperation After Thumb Carpometacarpal Arthroplasty

Patient Study ID	Sex	Age, y	Hand	Diagnosis	Index Procedure	Reason for Reoperation	Reoperation Performed	Mo to Reoperation	MCP Procedure	Comorbidities
1	F	47	L	CMC OA; Eaton III	LRTI	Painful subsidence	Converted to TSBS	12.9	None	HTN, HLD, fibromyalgia
2	F	68	R*	CMC OA; severe	LRTI	Painful subsidence	Converted to TSBS	7.1	None	Osteoporosis
3	F	64	L	CMC OA; Eaton IV	Trapezium resection with pinning	Painful subsidence	Converted to TSBS	3.9	None	HTN, tobacco use
4	F	55	R*	CMC OA; end-stage	Trapezium resection with pinning	Postoperative infection	Irrigation and debridement	4.2	None	HTN, depression, sleep apnea
5	M	78	L	CMC OA; advanced	Trapezium resection with pinning	Symptomatic pin	Unplanned early ROH	1.8	None	HTN, HLD, sleep apnea
6	F	70	L	CMC OA; end-stage	Trapezium resection with pinning	Symptomatic pin	Unplanned early ROH	1.8	None	HLD, depression, asthma
7	F	53	L	CMC OA; Eaton III	TSBS	Painful subsidence	New TSBS added	14.3	None	HLD, anxiety disorder, depression, tobacco use
8	M	61	L	CMC OA; advanced	LRTI	Radial sensory neuritis	Neurolysis	3.9	None	Anxiety disorder
9	F	65	L	CMC OA; Eaton III	LRTI	Postoperative infection	Irrigation and debridement	1.1	None	Systemic lupus erythematosus, Crohn disease
10	M	61	R*	CMC OA; end-stage	LRTI	Postoperative infection	Irrigation and debridement	0.5	None	HTN, anxiety disorder, depression, chronic kidney disease, tobacco use

HLD, hyperlipidemia; HTN, hypertension; OA, osteoarthritis.

* Dominant hand.

well-understood. Only a handful of studies have assessed reoperation rates after this procedure, whether for revision arthroplasty or for another indication.^{17–19} Reoperation rates range from 2.6% to 4%, using cohorts amassed over approximately 1 decade; most majority revisions were performed within 1 year of the index procedure owing to persistent pain.^{17–19} As the optimal technique for thumb BJA continues to be developed, preferred surgical techniques continue to shift among surgeons. Considering this, we performed a retrospective review using a larger, contemporary cohort compared with those previously reported, with a focus on the first 2 postoperative years. The goal of this study was to better understand the rate and causes of early reoperation, as well as the time to early reoperation. This information can help patients and their surgeons in decision-making and surgical planning. We hypothesized that the rate of early revision of thumb CMC joint arthroplasty would be less than 2%.

Materials and Methods

This retrospective study was approved by the institutional review board at our single, large, private academic center before its commencement. We adhered to the Strengthening the Reporting of Observational Studies in Epidemiology guidelines. We identified 637 patients who underwent 686 consecutive primary thumb BJAs performed by 14 board-certified orthopedic hand surgeons, each with a Certificate of Added Qualification in Hand Surgery, over 3 year from January, 2014 through December, 2016. The surgical techniques used were based on surgeon preference. Ligament reconstruction and tendon interposition (LRTI) was the most commonly employed surgical technique and was used in 75% of cases (515 of 686). Trapeziectomy with suture-button suspension-plasty (TSBS) using the Mini TightRope (Arthrex, Inc, Naples, FL) was performed in 17% of cases (119 of 686). Trapezium resection with pinning was performed in 5% of cases (35 of 686), and resection without pinning in 2.5% (17 of 686).

Each hand was considered independently. The patient cohort was generated by searching our institution's electronic medical records (EMR) data for Current Procedural Terminology codes:

25447 (interposition arthroplasty, intercarpal or CMC joints) and 25210 (carpectomy; one bone). Chart follow-up was performed by reviewing all patient notes in our institution's EMR system. Exclusion criteria were less than 1 year of chart follow-up or primary thumb BJA procedures performed at an outside institution. Patients undergoing concurrent procedures were not excluded.

All 637 patient charts and EMRs were thoroughly reviewed with the primary outcome of early reoperation after the index procedure. Demographic information recorded included age and gender. Additional noted variables included laterality of the surgery, handedness, index thumb BJA procedure type, reason for early reoperation, time between procedures, and type of reoperation. Descriptive statistics were performed. Fisher exact test was performed to compare early reoperation and revision rates across surgical treatment groups. $P < .05$ was considered statistically significant.

Results

The study cohort consisted of 461 women (72%) and 176 men (28%). Mean age of the group was 61.5 years (range, 33–83 years; SD, 9.6 years). Mean chart follow-up duration after reviewing all EMR records was 2.4 years (range, 1–4 years; SD, 0.9 years). A total of 49 patients with bilateral arthroplasties during the study period. We assessed 686 primary thumb BJAs performed over 3 years.

Altogether, 10 of 686 primary thumb BJAs (1.5%) went on to have an early unplanned reoperation within 2 years; Table 1 lists demographics. Of the 10 patients, 7 were women, mean age 62.2 years (range, 47–78 years), which closely paralleled the demographics of the entire cohort overall. All surgeons who performed a reoperation were the surgeon for the index thumb BJA procedure. Mean duration between the index procedure and reoperation was 5.2 months (range, 0.5–14.3 months). Four of 10 unplanned reoperations were the result of persistent mechanical pain requiring revision arthroplasties. Thus, the overall revision arthroplasty rate for the cohort was 0.6% (4 of 686). Mean time to reoperation for these revision surgeries was 9.6 months (range, 3.9–14.3 months).

Table 2
Reoperation Data by Thumb Basal Joint Arthroplasty Surgical Technique

Parameter	LRTI	TSBS	Trapezium Resection With Pinning	Trapezium Resection	Total
Patients, n	515	119	35	17	686
Age, y (mean)	62.5	61.0	59.8	62.8	61.5
Age, y (range)	33–83	43–80	44–78	53–71	33–83
Female patients, n (%)	372 (72)	90 (76)	29 (83)	3 (18)	494 (72)
Male patients, n (%)	143 (28)	29 (24)	6 (17)	14 (82)	192 (28)
Reoperations, n	5	1	4	0	10
Reoperation rate (%)	1.0	0.8	11.4	0.0	1.5
Revisions, n	2	1	1	0	4
Revision rate (%)	0.4	0.1	2.9	0.0	0.6

The remaining 6 of 10 unplanned reoperations were for nonmechanical pain. Of these nonmechanical reoperations, 3 were because of early infection requiring irrigation and debridement, one was for neurolysis of neuritis (without neuroma) of the superficial radial sensory nerve, and 2 were for symptomatic K-wires that had migrated deep under the skin after trapezium resection with pinning. This precluded the ability to remove them in the office and required early unplanned removal in the operating room.

Table 2 presents a comparison of early reoperation data broken down by thumb BJA procedure type. Of the 515 LRTI cases, 5 eventually required a reoperation, equaling a rate of 1.0%. The second most commonly performed technique was TSBS, which had a reoperation rate of 0.8% (1 of 119). Trapezium resection with pinning had the highest rate of reoperation at 11.4% (4 of 35), which was significantly greater than LRTI and TSBS ($P < .01$). None of the 17 patients who underwent trapezium resections without pinning ultimately required a reoperation during the follow-up period.

A total of 4 revision arthroplasties were performed owing to painful subsidence of the thumb metacarpal after clinical evaluation as well as static and loading radiographs (Table 1). These patients experienced symptomatic thumb basal joint pain with loading and/or key pinch with associated proximal migration of the thumb metacarpal resulting in contact with the distal pole of the scaphoid. Two revision arthroplasties for mechanical symptoms were required in the LRTI group, yielding a revision rate of 0.4%. One revision for mechanical symptoms was required after TSBS, yielding a revision rate of 0.8%. Finally, one revision arthroplasty for mechanical symptoms was performed for a trapezium resection with pinning, yielding a revision rate of 2.9%. None of the 17 trapezium resections without pinning required a revision surgery. We found no significant difference in revision rates between groups ($P > .05$). Of note, there were no fractures of the metacarpals requiring an early reoperation in any group.

Discussion

Although thumb BJA is a common and effective surgery, approximately 12% of patients reported dissatisfaction with the surgical outcome in other studies, often because of residual pain.^{6–11} Management in this circumstance can be challenging. After other potential etiologies for recurrent pain have been ruled out, proceeding with a revision arthroplasty needs to be a shared decision between the patient and surgeon. Fortunately, revision arthroplasty and an unplanned return to the operating room are not often required. However, because of its relative rarity, the rate of early reoperation after a primary thumb BJA is not well-elucidated in the literature.

In the current series, we reviewed nearly 700 consecutive primary thumb BJA cases at one institution over 3 years. In addition, the study focused on a considerably more condensed period (3 years) than those published previously, which compiled cases over 7, 10, and 13 years, respectively.^{17–19}

The cohort was predominantly female (72%), mean age 62 years, which approximates the demographics of previous trapeziometacarpal osteoarthritis studies.^{3,4,19} Overall, the rate of an unexpected early reoperation after primary thumb BJA in the study was 1.5% (10 of 686). Four of the early reoperations were revision arthroplasties performed because of persistent mechanical pain, resulting in an overall revision rate of 0.6%. The remaining 6 unplanned reoperations took place within approximately 4 months and were composed of 3 early postoperative infections requiring irrigation and debridement, 2 cases of symptomatic K-wire removal, and one instance of radial sensory neuritis requiring a neurolysis procedure. Previously reported literature reported reoperation rates of 4% and 2.9%^{17,18} and revision rates of 2.8% and 3.8%^{17,19}; however, those studies used a lengthier follow-up than that in the current study, which makes direct comparison difficult.

The rate of reoperation after thumb BJA was published in 3 previous retrospective studies. Wilkens and colleagues¹⁷ performed a retrospective review of 458 thumb BJAs over 10 years and found that patients returned to the operating room 4% of the time. Within a 5-year follow-up period, the rate of revision arthroplasty for mechanical symptoms was 2.8%. The authors postulated that their reoperation rate may have been inflated because one surgeon in their group used bovine collagen graft interposition, which may have led to an inflammatory response in some patients. Megerle et al¹⁸ reported an overall reoperation rate of 2.9% after 343 primary thumb BJA cases over 7 years. A true revision rate could not be calculated from their published data because of the inclusion of revision procedures after primary surgeries performed at outside institutions. Cooney and colleagues¹⁹ reported a revision rate of 3.8% after 606 procedures performed at their medical center over 13 years. However, using their provided data, a revision rate of 2.8% can be calculated (17 of 606).

Wilkens et al¹⁷ reported that 68% of unplanned reoperations took place within 1 year of the index surgery, with a mean time to reoperation of 2 years. Megerle and colleagues¹⁸ reported that 75% of reoperations occurred within 1.2 years, with a mean duration between procedures of 1.4 years. An average of 2.3 years between procedures was published in the study by Cooney et al.¹⁹

In the current series, 80% of patients underwent reoperation within 1 year (mean duration, 5.2 months between procedures). Notably, LRTI was the most popular technique by a significant margin, representing 75% of all index procedures. Trapeziectomy with suture button suspensionplasty, a relatively new technique with generally positive short-term outcomes,²⁰ was the second most common procedure type (17% of cases). Regarding the 4 revision arthroplasties, there was an average of 9.6 months from index to revision surgery. Owing to the relatively brief follow-up (2.4 years on average), it is likely that these calculations are skewed to some degree. However, in totality, it is evident that most reoperations after thumb BJA are commonly performed within approximately 12 to 18 months. We attribute our early reoperation rate of 1.5% to a number of factors, including dedicated hand

therapy protocols for all patients, prudent clinical evaluation before return to the operating room, and our specific focus on the early postoperative period compared with previous studies.

Our study had several limitations. Because of the study's retrospective design and the size of the cohort, we were unable to contact all patients directly who underwent primary thumb BJA at our institution. Thus, patient-reported outcome measures data were not obtained, which limits the study's applicability to everyday practice and its ability to determine a superior surgical technique. Moreover, it is possible that patients might have sought treatment and reoperation at another institution. Because of the use of Current Procedural Terminology codes to identify thumb BJA cases, it is also possible that coding errors might have led to the exclusion of some patients. Also, we presume that certain surgeons have a lower threshold to return to the operating room than others, but with our large group, we believe our results are generalizable overall. Finally, the follow-up period used (1–4 years) was considerably shorter than that of previous comparable studies. Although most of the cohort had at least 2 years of follow up (64%), we suspect that allowing more time to pass would have added some unplanned reoperations. However, because the overwhelming majority of unplanned reoperations occur within the first postoperative year, we expect that the overall rate in this cohort will remain lower than that reported in previous studies with longer follow-up.^{17–19}

In this retrospective series of 686 consecutive thumb BJA cases, we identified an unplanned early reoperation rate of 1.5%, with 0.6% eventually undergoing revision arthroplasty for painful subsidence of the thumb metacarpal. Reoperation for symptomatic subsidence relative to thumb BJA technique was 0.4%, 0.8%, 2.9%, and 0% for LRTI, TSBS, resection arthroplasties with pinning, and resection arthroplasties without pinning, respectively. Overall early reoperation rate relative to thumb BJA technique was 1.0%, 0.8%, 11.4%, and 0% for LRTI, TSBS, resection arthroplasties with pinning, and resection arthroplasties without pinning, respectively. This information may be helpful in counseling patients when planning and preparing for a primary thumb BJA.

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