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# Surgical Treatment of Trapeziometacarpal Joint for Osteoarthritis by Trapezeotomy and Interposition of Poly-lactic Acid Arex Trapezium Implant(Arex®615R).

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**Abstract:** Osteoarthritis of trapeziometacarpal joint (TM joint), typically presenting with pain, reproducible tenderness in the region of the TM joint, restricted the range of motion, deformation(shoulder sign) and grind test that causes repentance and pain, is relatively common and affects 50% of postmenopausal women and up to 25% of elderly men. The aim of this study was to evaluate author's experience with arthroplasty as opposed to surgical treatment of degenerative disease of the TM joint. Authors have used Poly-lactic acid (PLA) braid rolled on itself AREX trapezium implant(Arex®615R) in Assuta Medical Center as part of surgical option together with trapeziectomy and arthrodesis in patients with Eaton type III-IV of TM joint osteoarthritis. Methods: 12 patients (11 female/1 male) were operated in Assuta Medical Center between 2009 and 2011. Pre-operation average DASH score were 80.4 (88-74). Following operation, the average degree of improvement in DASH score at six weeks was 32.8 (42-22), three months-20.7 (31-12) and one year-10.6(5-13). All patients significantly improved after operation as measured with the VAS scale and DASH score. At one year follow-up all patients were free of pain. Two patients had complication as acute-on-chronic autoimmune reaction due to PLA degradation. It appears that trapezeotomy and interposition arthroplasty using AREX trapezium implant is efficacious for treating of osteoarthritis Eaton type III-IV of TM joint.

**Keywords:** Trapeziometacarpal joint Osteoarthritis, Interposition Arthroplasty, Poly-lactic acid implant, Foreign body giant cells inflammatory response, Poly-lactic acid implant degradation

## INTRODUCTION

Trapeziometacarpal joint (TM joint) is a diarthrodial saddle joint that repeatedly stressed at the daily activity. Due to hyperlaxity or repeated stress the dorsoradial and volar beak ligaments can develop synovitis that leads to attenuation and tear of the ligaments and as a result instability of the joint with progressive destruction of the articular cartilage. TM joint is one of the most common sites of arthritis. It affects 50% of postmenopausal women and up to 25% of elderly men [1]. Patients complain of an insidious pain at the base of thumb that worsens with the activity and of decreased thumb strength. Diagnosis is made based on history, physical examination and radiographic evaluation. Tenderness over TM joint, instability, deformity that appears as "shoulder sign", "positive grind test, repentance, loss of pinch strength and diminished thumb motion that limits activities of daily living are the clinical signs of TM joint osteoarthritis. Standard radiographs show joint space narrowing, osteophyte formation and dorsal-radial subluxation of the joint. Approximately 25% of women and 8% of men will develop radiographic evidence of

degeneration of the TM joint, remain asymptomatic [2]. The Eaton classification based on radiographic changes is most useful in clinical practice. Finally, rheumatoid arthritis, rheumatoid synovitis, tenosynovitis, septic arthritis, systemic lupus erythematosus, psoriatic arthritis, Reiter syndrome, scleroderma, gout and pseudogout, gamekeeper's thumb, carpal tunnel syndrome, de Quervain disease and trigger thumb must all be excluded [3,4]. Choice of treatment modalities bases on the stage of TM osteoarthritis. Patients with Eaton type 1 and some cases type 2 treat conservatively. Patients with advanced disease who have failed conservative treatment modalities have multiple surgical options including ligament reconstruction, resection arthroplasty, different kinds of implant (silicone, Artelon, PLA, costochondral interposition allograft, acellular dermal allograft implantation, tendon interposition, or total joint arthroplasty [5, 6, 7]. At this time, no surgical procedure is proven to be superior to another [8].

## METHODS

### Patients

This is a retrospective evaluation of a 12 patients that operated in for osteoarthritis Eaton type III-IV of trapeziometacarpal joint. M/W ratio was 1/11. One patient was operated bilaterally. The average age was 54 (range 45-72 years). The diagnosis made according to history, physical examination, and radiographic evaluation. All patients treated conservatively by NSAID (oral or topic), physiotherapy and thumb immobilization one to two month before surgery was done.

### INCLUSION CRITERIA

Patients diagnosed as TM osteoarthritis Eaton type III-IV without response to conservative treatment.

### Exclusion Criteria

All patients who received any past intervention on TM joint other than conservative therapy. Patients who operated on the same area for other reasons, or had a systemic or rheumatological disease, de Quervain disease, trigger thumb, tenosynovitis, septic arthritis, gamekeeper's thumb and patients who unable to understand the questionnaires were excluded from the study.

### Surgical technique and postoperative program.

Authors' used shot straight 2.5-3.0 cm incision (fig.1) from distal forth of base first metacarpal over radial side of abductor policis longus (APL) toward radial styloid for minimized injury superficial sensory branch of radial nerve. Through interval between APL, that retracts volary, and extensor polices brevis (EPB), which retracts dorsally, a capsulotomy of TM joint was performed. The dorsal branch of radial artery was protected at time of the capsulotomy. Trapezium was divided and fragmented for four parts by osteotomy with an oscillating saw and narrow osteotome and then was removed in pieces with a rongeur. The next important step was revision of wound and excision of loose bodies, bone fragments and osteophytic bone around the TM joint to avoid postoperative pain especially during key pinch. Flexor carpi radialis (FCR) tendon was identified at the base of the space. Arex Trapezium Implant (Arex®615R)(fig. 2) was irrigated by saline and sized according to the size of the space by removal of parts from the free end of the implant. The implant was inserted into the space and the free end of the implant encircled the FCR and sutured to the implant itself with 4.0 Vicryl. The capsule was tightly closure by pants-over-vest suture (3.0 Vicryl). Authors recommend adding another running stitch in and out suture (purse string like suture) around previous suture of the capsule that was tight and closed slowly until needed stabilization of the joint is achieved. It is important that the radial artery and branches of SBR be protected to avoid damage. Running intracuticular suture of wound was made (Fig. 3). Dry bally thumb spica dressing was placed. The hand was elevated for 2-

3 days postoperatively. At 10 days patient came back to the outpatient clinic for removal of dressing and thumb stabilizing orthosis for protection is placed. At 2 weeks the patient started physiotherapy program in hand therapist clinic gradually.

### Treatment Effect Assessment

Patients were assessed using a back -translated DASH version (Hebrew, Russian and Arabic). The questionnaire was self -filled by the patients, and a research assistant verified questionnaire filling. In addition, a standardized VAS scale filled out in answer to the question: "What number would you give your pain right now?" Palmar and radial abduction and grip and pinch strength measurements also observed.

## RESULTS

Average DASH score before operation was 80,4 (88-74). All patients improved after operation as measured with the DASH score six weeks, three months and one year. The average degree of improvement in DASH score at six weeks was 32.8 (42-22), three months-20.7 (31-12) and one year-10.6 (5-13). Average VAS score before operation was high-9 (10-7) but significantly improved after surgery and was determined as 3.2 (2-4) at six weeks and 1.5 (0-3) at three months. All patients were free of pain at one year after surgery. Thumb palmar abduction averaged 60 degrees (55-70) was achieved at three months after surgery in all patients and thumb radial abduction averaged 65 degrees (58-75) at the same time (fig.4 A-B). Thumb opposition to the base of the small finger was presenting eight patients (62%) at six weeks and in five patients (38%) at three months after surgery (fig.4C). The average key pinch strength was 2.1 kg (2-3) at six weeks (39% of non-affected side), 2.8 kg (2-4)-three months (52% of non-affected side), 4 kg (3-6)-one year (76% of non-affected side) (fig. 4D). The average grip strength was measured as 14.8 kg (12-20) at six weeks (53% of non-affected side), 20.7 kg (16-29) at three months (75% of non-affected side) and 23.1kg (20-37) at one year (fig. 4E). It is important that all patient come back to their work activity between six weeks to three months after surgery. Two patients developed "acute-on chronic" foreign body immune inflammatory reaction (8%) due to Polylactic acid implant degradation. One of them underwent revision surgery for removal of the implant and was pain-free after surgery without any limitation in daily activity living although some proximal migration of first metacarpal. Another patient treated by NSAID with good response to the treatment.



**Fig-1:** Line of surgical incision



**Fig-2:** Poly-lactic acid Arex Trapezium Implant (Arex®615R).



**Fig-3:** Postoperative picture shows scar three months after surgery.



**Fig-4A:** Postoperative picture shows thumb abduction without hyperextensibility of the MP joint three months after arthroplasty.



**Fig-4B:** Postoperative picture shows radial abduction three months after arthroplasty.



**Fig-4C:** Postoperative picture shows thumb opposition three months after arthroplasty.



**Fig-4D:** Postoperative picture shows fine pinch without longitudinal collapse deformity three months after arthroplasty.



**Fig-4E:** Postoperative picture shows excellent grip without longitudinal collapse deformity three months after arthroplasty.



**Fig-5: One year postoperative PA radiograph of the LT hand 72 years old female patient shows excellent arthroplasty space after trapezectomy and interposition of Poly(lactic acid) Arex Trapezium Implant(Arex@615R).**

TM joint arthritis has been commonly treated with some combination of resection of the trapezium and interposition of a spacer using either a biologic or artificial material plus tenodesis to reconstruct the volar oblique ligament. According to biomechanical testing of joint stability on cadaver arm specimens, there was no significant difference in stability measures between trapeziectomy and LRTI or ligament reconstruction without tendon interposition [9]. Kuhns CA. et al published results of a prospective study after hematoma and distraction arthroplasty for thumb basal joint osteoarthritis that report complete relief of pain at 24 months in 92% of patients [10]. Peimer CA et al report series of seven patients that all had radiographic evidence of generalized implant and intramedullary bone destruction after silicon arthroplasty [11]. Cheval D. et al followed up of 23 patients at 15 months after pyrocarbon Pi2® implant arthroplasty and reported about 30% implant subluxation [12]. Maru M. related to Cheval D. et al in his early results of Pi2 arthroplasty show a high complication rate compared with trapeziectomy without any identifiable benefit [13]. Adams BD. et al reported about high complication rate in patients after spherical ceramic trapezium-metacarpal arthroplasty and stopped use this implant [14]. Same conclusion about spherical inter position arthroplasty to be reported by Athwal GS. et al [15]. Costochondral interposition allograft is recommended by Trumble, as highly effective for the treatment of TM osteoarthritis, despite 14% trapeziometacarpal subluxation was described [7]. Functional outcome of surgical treatment for TM joint osteoarthritis with 523 synthetic PLA anchovy interposition implant that reported by Dautel G. et al was related to other operations with tendon interpositions, but without autograft harvesting morbidity [16]. Only two cases had palmar migration of the implant in reported study. Semere A. et al described nine out of 68 absorbable L-Polylactic anchovy implants (13%) that displayed a prolonged resorptive gigantocellular immune inflammatory reaction, leading the patients to undergo revision surgery for removal of the implant before the end of the third postoperative year [17].

The current study appears to demonstrate that there is successful surgical intervention of thumb TM joint osteoarthritis by trapezectomy and interposition of Poly(lactic acid) Arex Trapezium Implant (Arex@615R) without any ligament reconstruction. The operation is simple, fast and maintains the space between scaphoid and metacarpus (Fig. 5). Evidence of joint or implant instability in this study was not present. The implant design and fixation over FCR tendon and suture of the capsule as described above prevents insertion of KW and application of thumb spica cast and allows early mobilization and exercise. All patients in this study significantly improved after operation as measured with the DASH and VAS score. The pain relief appears to be significant in a short period after surgery. Important improvements in web space with increased palmar and radial abduction and grip and key pinch strength measurements were observed. It's known that fibrous interposition tissue replaced polymeric core by process of hydrolysis. In this study, two patients developed foreign body immune inflammatory response due to PLA degradation. One of them undergoes revision surgery for removal of the implant due to local tissue damage one year after insertion of the implant [18].

#### 5. Conclusion

The current study appears to indicate that trapezectomy and interposition arthroplasty using AREX trapezium implant (Arex@615R) is efficacious for treating of osteoarthritis Eaton type III-IV of TM joint. However, patients should be informed of the potential foreign body immune inflammatory response as late complications of this procedure. Limitations of the current study were the small size of the group.

#### DISCLOSURE

No author who contributed to this article has any conflict of interests to declare. The study conducted in compliance with the current laws applying in the country of the authors.

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