Case Series

Short term results of ligament reconstruction and tendon interposition resection arthroplasty for basal joint arthritis

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Abstract

Carpometacarpal (CMC) joint of the thumb is the second most common site afflicted by osteoarthritis. Non surgical measures forms the first line of treatment with aim of preventing progression of disease, however, surgery becomes an option when symptoms are refractory to nonsurgical methods. Different procedures have been described in literature. Ligament reconstruction with tendon interposition (LRTI) is the most commonly performed procedure in North America for this problem.

The Aim of study was to evaluate early results of ligament reconstruction and tendon interposition for CMC joint arthritis.

This is a case series of ten patients operated in a tertiary care hospital from December 2006 to December 2008. All cases were operated by a single surgeon. All of the patients were followed up using Quick DASH questionnaire filled preoperatively and 3 and 6 months postoperatively.

All of our patients were female. Mean duration of follow up was 34 weeks. Pain and residual laxity recorded at each clinical follow up visit after removal of thumb spica and Kirschner wire. Mean value for Quick DASH score is 31 in a 0 - 100 scale with 0 being no disability.

Ligament reconstruction and tendon interposition resection arthroplasy is an effective method of controlling symptoms with preservation of motion at CMC joint axis.

Keywords: Ligament reconstruction with tendon

interposition (LRTI), CMC joint, Quick DASH,

Introduction

The involvement of the first carpometacarpal joint, also referred to as trapeziometacarpal arthritis is the second most common degenerative joint disease in hand, predominantly in females in their fifth and sixth decades of life. Unlike the hinge-type joints that dominate the hand, the trapeziometacarpal or basal joint of the thumb is a uniquely structured biconcave-convex saddle joint. Because of the paucity of bony constraints, the caropometacarpal joint has to rely on the integrity of ligaments for its stability and because of the lack of osseous constraints, contact stresses within the basal joint are large with exceptional mobility of joint. Study of postmortem materal has provided evidence of this palmar pattern of wear of the joint in close association with degeneration of the palmar oblique ligament from the articular margin of the metacarpal.[4] Indeed, a mechanism for osteoarthrosis of the basal joint predicated on incompetence of this ligament is substantiated by the clinical observation that symptomatic relief and prevention of osteoarthrosis follows ligament reconstruction in thumbs with abnormal trapeziometacarpal laxity.[5] Several classification systems have been devised to stage the disease but there seems to be a poor correlation with symptoms.[6,7] Patient can have severe pain with a low radiographic stage or have no pain with pantrapezial involvement. Littler and Eaton have described a purely radiographic staging system that is the most common staging system used today.[4] The goals of operative treatment for painful osteoarthrosis at the basal articulation of the thumb are to relieve pain and restore stability. Tendon interposition with ligament reconstruction is more anatomical as it focuses on reconstruction of the torn ligament mechanism in addition to soft tissue interposition, to provide stability. To date no litertature has been published in our part of the region regarding ligament reconstruction, and this problem has mostly gone unnoticed without treatment.

Objective

This case series of 10 patients with CME joint arthritis will show the short term assessment of improvement in clinical symptoms in patients with CMC joint arthritis treated with ligament reconstruction and tendon interposition.

I will also determine the change in mean DASH score at 3 and 6 post operative months as compared to preoperative score in patients with CMC joint arthritis treated with ligament reconstruction and tendon interposition and finally will determine the complication rate in patients with CMC joint arthritis treated with ligament reconstruction and tendon interposition.

Case Series

This is a case series of 10 patients operated from March 2007 to Mar 2009 at the Department of Orthopaedics and Hand Surgery, The Aga Khan University Hospital Karachi. All surgeries were performed by a single surgeon using standardized technique. All cases were diagnosed and staged on the basis of radiographic and clinical presentation. Inclusion was based on convenience sampling. We excluded patients who were managed with medical treatment alone. Quick DASH (disability of arm, shoulder and hand) questionnaire were filled by all patients, preoperatively and 3 and 6 months after surgery, during their follow ups in the clinic, to assess subjective improvement of overall symptom and surgical outcome. Mean follow up of 34 weeks is available. Comparison of mean quick DASH score at 3 and 6 months with baseline was done by Wilcoxon Rankisum test.. A p-value of < 0.05 was considered as significant.

Surgical Technique:

All patients included in the study were seen in the outpatient department and identified to have basal joint arthritis according to their clinical presentation and classified on the basis of radiologic appearance. Patients were admitted a night before surgery for necessary preprations. Each one of them received prophylactic 1 gm of cefazolin at the time of induction, before inflation of tourniquet. Only one surgery was done under bier block, rest was done in GA. After standard preparation and draping, a 5 cm Wagner's/triradiate linear incision marked at junction of glabrous and non glabrous skin, centering over the trapezium was made. After carefully securing the dorsal branch of radial nerve and radial artery deep dissection was done to open the capsule with a scalpel and for the removal of the diseased trapezium with a rongeur. Another 2 cm linear incision was required at the volar aspect of the mid forearm to harvest the tendons of Palmaris longus (PL) and flexor carpi radialis (FCR). Complete length of Palmaris longus tendon was then released distally and proximally with a tendon stripper upto common origin from where it was detached using a small incision. Tendon of PL was removed completely and radial slip of FCR harvested and delivered into the triradiate incision. Anchovy is formed by Palmaris longus followed by passage of FCR slip through a bony channel at the base of the first metacarpal to its dorsum, where it is routed around and then back onto itself and sutured with the anchovy formed by PL and with the capsule under tension. This reinforces the volar, dorsal, and radial aspects of the trapeziometacarpal joint capsule. The capsule is then closed over it. Kirshner wire is passed from first to second metacarpal to provide temporary mechanical suspension. Wound closure is done in layers after securing hemostasis. Immobilization is carried out using a thumb spica.

Postoperative regimen consisted of immobilization with short arm thumb spica cast for 6 weeks followed by Kirshner wire removal. Range of motion excercises were begun with gradual progression to resistive pinch and grip strengthening by

12 weeks postoperatively. All of the patients were discharged on the first postoperative day. They were followed in clinic at three and six months post operatively and a Quick DASH score questionnaire was filled. DASH score is used as an outcome measure for upper limb pathology. The questionnaire comprises of several task each scored individually by patients themselves. The raw score obtained is converted into a 0 - 100 scale. The DASH has been extensively investigated with respect to its reliability, repeatability, internal consistency, validity as well as its degree of acceptance in clinical practice and proved to an appropriate tool in the evaluation of wrist and hand.

Results

This is a case series of ten patients, all were female in their sixth decade or beyond. Seven out of ten patients had symptoms involving the dominant hand. The most frequent symptom was pain (n=10/10) followed by reduced pinch strength (6/10) and stiffness (3/10). There was symptomatic improvement in patients, evident from decrease in DASH score from 58 to 40.5 and 31.3 at three and six months, respectively (P = 0.005) One patient required 28 weeks for rehabilitation with residual pain and stiffness, while the rest of the patients recovered in a mean time of 16 ± 2 weeks. One patient suffered from complex pain syndrome after the procedure which was managed with tricyclic antidepressants (TCA's) and this hampered recovery in optimum time.

Table: Demographics.

Variable	Number (n)
Gender	
Male	0
Female	10
Age	
50 – 60	4
61 – 70	3
71 – 80	2
81 – 90	1
Side	
Right	7
Left	3
Symptoms	
Pain	10
Reduced pinch strength	6
Stiffness	3
Eaton stage	
I	
II	2
III	6
IV	2
Quick DASH Score	
Preoperative	58.8
3 month postoperative	40.5
6 month postoperative	31.3
Complications	
Complex regional pain syndrome	1
Prolong rehabilitation duration	1

Discussion

CMC joint arthritis is a prevalent condition affecting upto 10% of middle aged women.[3] Furthermore, considering the great degree of variability of disease, it may not be prudent to propose that a single approach for all stages can provide satisfactory results to all patients. Various surgical procedures have been described for different stages of disease, each procedure has its own merits and demerits. There are many treatment options according to varying degree of severity. Excision of the trapezium (trapeziectomy) with ligament reconstruction, with or without tendon interposition arthroplasty, has been proved to be highly effective in restoring a pain-free, stable, and functional thumb in patients with advanced thumb CMC arthritis.[1,2]

Traditionally arthrodesis is an option for young and active individuals and ligament reconstruction with tendon interposition is reserved for less active elderly population.[13] In arthrodesis, stability is achieved at the cost of mobility; however patients do get benefit in terms of pain without significant disability in pinch and grip strength.[14]

Treatment of CMC arthritis involves a step ladder approach based on the Eaton staging system. Conservative management with NSAIDs and short opponens splints works in stage I and early Stage II disease.[4,5] As the eburnation and joint wear increases, trapezial excision is done with or without ligament reconstruction. In stage III and IV trapezial excision (whole or partial), with or without interposition material (tendon, allograft, autograft), and with or without ligament reconstruction is required. Recently, some surgeons have returned to trapezial excision alone referred to as 'haematoma arthroplasty'[10-12] and have had favourable short term results, although loss of trapezial height with subsequent scaphoid impingement is a feared long term consequence which may affect long term outcome. In an attempt to prevent this collapse several alternatives to the simple trapeziectomy have been popularized. These include interposing autogenous or alloplastic tissue between the carpometacarpal and the base of the metacarpal, reconstructing the supporting ligaments with various tendons, and CMC arthrodesis.

Many variants of LRTI have been described in the literature but all have three common principles which include trazpeziectomy, ligament reconstruction, and metacarpal suspension.

Our method of reconstruction includes anchovy formed by Palmaris longus and radial slip of flexible carpi radialis tendon after reconstructing the beak ligament mechanism. This double tendon anchovy is thought to be associated with a decreased incidence of late collapse however we do not yet have results of a long term follow up in our series.

Assessment of our patients was mostly subjective based on a Quick DASH scoring system. The DASH score is

a useful and reproducible tool but concomitant upper limb disorders can affect the overall results. Measurement of other objective parameters such as pinch and grip strength were made and compared to the opposite side with improvement postoperatively, but as our outcome measure was based on subjective assessment of symptomatic improvement and disability based on Quick DASH scores; we omitted the change in pinch and grip strength intentionally. Furthermore, recent studies indicate that higher objective measurements do not always correlate with higher patient satisfaction.

No functional deficit is recorded in patients with the use of Palmaris longus and flexor carpi radialis slip in order to make anchovy. As in our patients we have only used a split transfer of the flexor carpi radialis rather than the complete tendon and it should not theoretically interfere with routine function of muscle. We also did not encounter any patient with an absent Palmaris longus tendon which is the case in 24% of Caucasians population.[15]

Tomaino et al[16] evaluated the results of ligament reconstruction with tendon interposition arthroplasty on 24 thumbs with an average follow up of 9 years. They reported 95% of 22 patients studied as having excellent pain relief and satisfaction, even with activities that required significant lateral pinch (i.e. opening jars and using keys).

Other reports with shorter follow-up intervals have also shown positive outcomes with ligament reconstruction tendon interposition arthroplasty. Lins et al[17] studied 30 thumbs at 3.5 years' average follow-up and found an average of 50 percent improvement in grip strength and 43 percent improvement in key pinch. In 1997, Rayan and Young[18] reported results based on an average of 3.2 years' follow-up, with less impressive outcomes of 13 percent grip strength improvement with 27 percent decline in key pinch. However, the authors' results are based on contralateral hand measurements rather than same-hand preoperative values. Similar to other studies, 85 percent of Rayan and Young's[18] study patients experienced pain relief. Two of the largest series, by Nylen et al.[19] (100 procedures) and Varitimidis et al. (62 thumbs),[20] revealed findings similar to those of previous reports with respect to pain, function, and patient satisfaction.

Our series also shows results comparable to international literature regarding the outcome of ligament reconstruction with tendon interposition arthroplasty in terms of patient satisfaction and symptomatic improvement as apparent with gradual decrease in Quick DASH score at each follow up.

Conclusion

Ligament reconstruction — tendon interposition arthroplasty provides excellent relief of pain. The operative technique has evolved to include both routine excision of the entire trapezium and use of the full width of the flexor carpi radialis tendon. Based on our observation of Quick DASH scores, the results have remained encouraging in most cases with restoration of normal anatomy to provide a stable and functional thumb.

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