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Treatment of Osteoarthritis in Basilar Thumb Joints – A Review Article



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## Treatment of Osteoarthritis in Basilar Thumb Joints – A Review Article

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### Abstract

Osteoarthritis of the hand is a significant problem, with the most recent results published by Arthritis UK showing 6% of people over 45 have sought treatment in 2010. The carpometacarpal joint (CMCJ), or base of thumb, is particularly susceptible to degenerative changes in articular cartilage. Manual workers are predisposed to developing issues, but the condition is also observed in postmenopausal women without a history of increased functional demands. Morphological changes of the joint result in pain, subluxation and instability that have significant impacts on dexterity and consequently productivity. Whilst improvements of symptoms are often noted with immobilising the joint or intra-articular steroid injections, these are merely temporising, with pain returning when normal functionality of the CMCJ is resumed.

Surgical intervention should be offered to those who have not gained adequate pain relief through non-operative measures, in those whom instability is an issue, or in those who have particularly high functional demands meaning non-surgical interventions are unlikely to yield significant and enduring improvements. There is, at present, no golden standard to surgical intervention. Trapeziectomy is the most commonly used procedure. However, even with this, there are many different variations of this technique, suggesting the best approach is still unclear.

### Key Words

Osteoarthritis; Basilar Thumb Joint, Carpometacarpal Joint; Hand; Surgery

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### Introduction

Osteoarthritis is a degenerative disease of the synovial joints that causes progressive loss of articular cartilage. Arthritic changes at the carpometacarpal joint (CMCJ), or base of thumb, occur as a separate disease entity to that which is observed in the other joints of the hand. It particularly affects manual workers undertaking repetitive work. However, it may also be observed in up to 25% of post-menopausal women without any history of repetitive strain<sup>1</sup>.

The management of CMCJ osteoarthritis is primarily non-operative and can therefore largely be achieved in primary care. However, failure in resolution of symptoms or unacceptable impact on quality of life should prompt referral to a hand surgeon for consideration of surgical intervention.

### How Does It Develop?

The water content of healthy cartilage is a finely balanced interplay of compressive forces from

collagen which act to drive water out, and the hydrostatic and osmotic pressures of proteoglycans that draw water in. In OA, the collagen matrix becomes more disorganised and proteoglycan content is subsequently decreased. Loss of the protective effect of proteoglycans ensure collagen fibres are susceptible to degradation, which results in a net increase in the total water content in cartilage. Consequently, cartilage is softer and is more easily and rapidly eroded, until ultimately the bone ends are exposed. Inflammation occurs in response to the degradation, and the presence of cartilage debris further exacerbates the problem.

The articular cartilage of the thumb metacarpal joint is designed to decrease friction and distribute the loading forces across the joint. Anatomically the CMCJ appears particularly susceptible to degenerative change due to the sloping nature of its surface, which is required for the thumb's multiplanar gliding function. The trapeziometacarpal joint is saddle shaped, further enabling the

movements that define our dexterity. Pincher and grasp grips are provided by a complex arrangement of ligaments encasing the joint. The articular cartilage is initially lost from the volar radial surface of the trapeziometacarpal joint. However, with progression of the disease, the dorsal surface is also affected. Deficiency of the ligamentous complex, particularly the intra-articular palmar beak ligament, has been demonstrated to exacerbate the progression of the disease by subtle shifts in articular contact areas<sup>2</sup>.

### **Presentation**

Diagnosis will be made largely on history and examination. It is important to rule out other possible causes of pain at the base of the thumb, including (but not limited to) acute injury to the scaphoid or scapholunate ligament, tenosynovitis, tendinopathies or unrecognised injuries to the thumb or adjacent joints. Insidious onset in the absence of trauma is characteristic, although minor injuries to the thumb may result in an acute exacerbation of symptoms. Up to 50% may present with concomitant carpal tunnel syndrome<sup>3</sup>.

The CMCJ will often exhibit swelling and crepitus. Pain may be reproduced by applying axial loading and circumduction forces to the first phalanx, otherwise known as the CMC grind test. Tenderness on forced manipulation of the CMCJ, may be accompanied by atrophy of the adjacent thenar muscles. On general inspection, a classical rounded appearance at the base of thumb known as 'shouldering' may be present. This is a consequence of subluxation of the joint, adjacent muscle wasting and the persistent pull of abductor pollicis longus on the first metacarpal. Instability within the joint may be reproducible by gentle application of pressure at the base of the metacarpal and attempting to move it over the trapezium.

Finally, radiological diagnosis is demonstrated by the presence of classical OA features, which may specifically include narrowing of trapeziometacarpal joint space and subluxation, as well as sclerosis, osteophyte formation and cystic change. In those cases where the diagnosis is still ambiguous, infiltration of local anaesthetic and corticosteroid can serve as a diagnostic technique, as well as therapeutic procedures.

### **Treatment**

#### **Non-Operative**

The mainstay of treatment should be non-operative, and can be largely done in the primary care setting. Exceptions to this would include cases of particularly severe disease &/or in patients who have high functional demands. Rest and reducing the

functional demands on the affected joint generally yield good results, especially when used in conjunction with regular non-steroidal anti-inflammatories. However, the pain typically returns when a normal level of function is resumed.

A well applied splint will limit movement and enforce rest. Custom made thermoplastic splints can be relatively easily made by hand therapists, and anecdotally patients appear to report good symptom control. However, the evidence basis for splinting is limited with only one multi-centre randomised control trial demonstrating reduced pain at one year with positional splinting<sup>4</sup>. The optimal splinting position should maintain the thumb metacarpal in pronation, flexion and palmar abduction<sup>5</sup>. Whilst grip strength may not improve, a reduction in pain can help reduce the need for surgery.

Infiltration of corticosteroids into the trapeziometacarpal joint space may not be definitive, but there are several studies to suggest that up to two thirds of patients will gain significant pain relief from this procedure<sup>6,7</sup>. Furthermore, despite the fact that some aspect of pain is likely to reoccur in the majority, it has been demonstrated that most patients are satisfied with their long term outcome by the simple overall reduction in symptoms that corticosteroid injections may offer<sup>7</sup>. However, for those who gain good but transient control of symptoms, there is still a lack of clarity regarding how many injections can be given and over what period of time, with in vitro studies raising concerns about the chondrotoxic effects of corticosteroid on articular cartilage<sup>8</sup>. Clinicians may choose to consider hyaluronate injections for symptomatic control. However, no objective improvement in analgesia and function has been demonstrated when compared to placebo and corticosteroids.<sup>9</sup>

#### **Operative**

Failure of non-operative management with persistent, worsening pain, and/or weakness and instability of the joint that negatively impacts on the patient's quality of life, should prompt a referral to a hand surgeon. There are many variations in operative techniques. These can largely be attributed to surgeon preference or skill, as well as the need to tailor surgical intervention in targeting specific symptoms.

#### **Mild Disease**

##### **Abduction-Extension Osteotomy**

Early disease may be managed by removing a small wedge of bone from the first metacarpal. This aims to redirect the loading force on the trapeziometacarpal joint more dorsally to a lesser

affected portion of the joint, thus avoiding the more degenerate areas. Outcomes are often very good, although patients frequently present with disease too advanced to ensure that this surgery is effective and therefore its use is limited.

### **Ligament Reconstruction**

For those whom pain is as a consequence of instability or a hypermobile joint, the supporting ligaments may be reconstructed using a portion of the flexor carpi radialis (FCR) tendon or biosynthetic material. The major ligament that contributes to the stability of the trapeziometacarpal joint is the palmar beak ligament (deep anterior oblique ligament), and attenuation of this ligament leads to subluxation. The widely accepted approach to palmar beak ligamentous reconstruction is the Eaton-Littler technique, in which a drill hole is made in the base of thumb metacarpal. The FCR slip is released distally until it's insertion on the index metacarpal, and is then re-routed through the drill hole under the abductor pollicis longus insertion, before being secured on the radial aspect of the joint<sup>10</sup>. One disadvantage of this procedure is that its long-term success is dependent on the articular surfaces being eburnation-free, which can only be adequately assessed by arthrotomy and inspection of the joint surfaces intraoperatively.

### **Mild to Moderate Disease**

#### **Trapeziometacarpal Arthrodesis**

Arthrodesis refers to fusion of the joint, which is often achieved using mini plates and screws, tension banding or compression screws. The optimal position for the CMC joint to be fused in is 30° palmar abduction, 35° radial abduction and 15° pronation. This position allows for perseveration of pinch grip, therefore this technique is often indicated in younger manual workers for whom grip strength is particularly important. It is important to note that the benefits in terms of improvement in pain, stability and preservation of the length of the digit, may be offset by a reduction in range of movement. Furthermore, if degenerative change extends beyond the trapeziometacarpal joint, isolated arthrodesis is unlikely to provide significant relief of symptoms.

#### **Arthroscopic Surgery**

Arthroscopic debridement and synovectomy within the trapeziometacarpal joint is, at present, not a procedure that is commonly undertaken by many hand surgeons. However, increased skills and expertise in the field of arthroscopic surgery may mean that adequate control of pain and relief of symptoms using minimally invasive operative techniques, may become more readily available in

the near future.

### **Moderate to Severe Disease**

#### **Trapeziectomy**

This is the most commonly performed procedure for basilar thumb osteoarthritis. There are several different approaches, which suggests that the best approach is still unclear. However, trapezial excision to remove the arthritic joint is the most important common denominator regardless of other specifics of arthroplasty. Although pain is often relieved, loss of thumb strength and stability may be experienced by the patient due to subsequent collapse and shortening of the thumb metacarpal into the empty joint space. The trapeziectomy has been repeatedly modified in an attempt to combat these issues including concurrent metacarophalangeal joint stabilisation, distraction pinning of the first metacarpal and tendon interposition of palmar beak ligament reconstruction. Reviews of evidence have shown that no one surgical intervention is superior but that a simple trapeziectomy generally yields fewer complications<sup>11</sup>.

#### **Joint Replacement Surgery**

Prosthetic TMJ arthroplasty may be broadly divided into three categories:

- (i) those that involve resurfacing either the trapezium or the metacarpal base
- (ii) trapezium replacement arthroplasties
- (iii) whole joint replacement.

More traditional silicone prostheses are no longer used due to their susceptibility to mechanical wear. Development in biomaterials and operative technique means that replacement surgery may be an intervention that is considered more readily in the future. However, replacing the joint has not yet been demonstrated to be superior in terms of improvement of pain, impairment and disability when compared to trapeziectomy and ligament reconstruction<sup>12</sup>. Furthermore, given the implant's greater cost, it should not be recommended as a first line choice in the management of basal joint osteoarthritis of the thumb.

### **Conclusion**

Of the operative techniques considered, trapeziectomy is most commonly used to manage CMC joint pain associated with basilar thumb osteoarthritis. However, at present there is no gold standard to managing this condition, given that no single technique appears to be superior in terms of both post-operative pain control and functionality. Arthrodesis may offer superior post-operative pain control. However, it has an overall prolonged recovery time (due to a period of immobilisation in plaster and subsequent rehabilitation). Furthermore,

it may also lead to limitation of the mobility of the thumb, especially in retropulsion, thus decreasing overall manual dexterity.

With advances in operative techniques and surgical biomaterials, we may begin to see the novel surgical interventions become more common place, in an attempt to establish a rigorous evidence basis in providing specific treatment recommendations. However, in the interim once non-operative interventions have failed, as a universal rule a range of surgical interventions should be considered and tailored according to the patient's age, occupation and level of functional demand, as well as on the features (clinical and radiological) of the arthritic process.

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