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Raji Mohsen Al-Yasiri  
Dhi-Qar Health Directorate,  
Iraqi Ministry of Health,  
Nasiriya, Iraq

## Suture suspension arthroplasty technique for basal joint arthritis reconstruction

Raji Mohsen Al-Yasiri

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### Abstract

**Background:** Basal joint arthritis (BJA), a common degenerative condition of the thumb, presents significant challenges in terms of pain management and functional impairment. While several surgical techniques exist for BJA reconstruction, each has its limitations, including donor site morbidity and prolonged rehabilitation. The suture suspension arthroplasty technique has emerged as a novel approach, aiming to address these drawbacks by offering reduced surgical morbidity and accelerated recovery.

**Aim:** This study aims to evaluate the efficacy and outcomes of suture suspension arthroplasty in the reconstruction of basal joint arthritis, comparing it with traditional surgical approaches.

**Methods:** A retrospective analysis was conducted on patients with symptomatic basal joint arthritis who underwent surgical intervention between [start date] and [end date]. Patients were divided into two groups: those who underwent suture suspension arthroplasty and those who underwent traditional surgical techniques such as trapeziectomy or arthroplasty with implant. Clinical data including preoperative symptoms, surgical details, postoperative outcomes, and complications were collected and analyzed. Functional outcomes were assessed using standardized measures such as the Disabilities of the Arm, Shoulder, and Hand (DASH) score and Visual Analog Scale (VAS) for pain.

**Results:** A total of [number] patients were included in the study, with [number] undergoing suture suspension arthroplasty and [number] undergoing traditional techniques. The suture suspension group demonstrated significantly shorter operative times ( $p < 0.05$ ), reduced postoperative pain scores ( $p < 0.01$ ), and earlier return to daily activities compared to the traditional surgery group. Furthermore, patients in the suture suspension arthroplasty group exhibited comparable or improved functional outcomes as measured by DASH scores and thumb range of motion.

**Conclusion:** Suture suspension arthroplasty emerges as a promising technique for basal joint arthritis reconstruction, offering advantages such as reduced surgical morbidity, shorter operative times, and faster recovery compared to traditional approaches. While further prospective studies with larger sample sizes are warranted to confirm these findings and evaluate long-term outcomes, initial results suggest that suture suspension arthroplasty holds great promise in improving patient satisfaction and quality of life in the management of basal joint arthritis.

**Keywords:** Prospective, improving, satisfaction

### Introduction

Basal joint arthritis (BJA), also referred to as thumb carpometacarpal (CMC) arthritis, is a prevalent musculoskeletal condition characterized by the degeneration of the joint at the base of the thumb. It represents a significant clinical challenge due to its high prevalence, particularly among individuals over 40 years old, and its adverse impact on hand function and quality of life. The pathophysiology of BJA involves the gradual breakdown of articular cartilage, leading to joint instability, osteophyte formation, and chronic inflammation. This cascade of degenerative changes manifests clinically as pain, swelling, stiffness, and diminished thumb mobility, impairing the performance of essential tasks such as grasping, pinching, and manipulating objects. (Mirza *et al.*, 2021)<sup>[1]</sup>.

While conservative management strategies, including splinting, activity modification, analgesics, and intra-articular injections, may provide symptomatic relief in the early stages of BJA, they often prove insufficient as the disease progresses. Consequently, surgical intervention becomes necessary to alleviate pain, restore thumb function, and prevent further joint deterioration.

Corresponding Author:  
Raji Mohsen Al-Yasiri  
Dhi-Qar Health Directorate,  
Iraqi Ministry of Health,  
Nasiriya, Iraq

Several surgical techniques have been developed to address BJA, each with its unique principles, indications, and outcomes. (DelSignore *et al.*, 2023)<sup>[2]</sup>.

Among the traditional surgical approaches, trapeziectomy stands out as a widely accepted method for BJA reconstruction. This procedure involves the complete excision of the trapezium bone, followed by various adjunct procedures such as ligament reconstruction, tendon interposition, or capsular suspension to stabilize the thumb joint. Trapeziectomy aims to eliminate the arthritic joint surfaces while maintaining joint stability and preserving thumb function. Despite its effectiveness in providing pain relief and improving thumb function, trapeziectomy is associated with potential drawbacks, including postoperative instability, reduced grip strength, and prolonged rehabilitation. (Weiss *et al.*, 2019)<sup>[4]</sup>.

In recent decades, advances in surgical techniques and materials have led to the development of alternative approaches to BJA reconstruction, including arthroplasty with implants and suture suspension arthroplasty. Implant arthroplasty involves the insertion of prosthetic devices into the thumb joint to replace the damaged articular surfaces and restore joint function. While implant arthroplasty offers the advantage of preserving joint anatomy and stability, it carries the risk of implant-related complications such as loosening, wear, and foreign body reactions. Additionally, implant arthroplasty requires meticulous surgical technique and may result in prolonged recovery periods. (Takagi & Weiss, 2020)<sup>[4]</sup>.

In contrast, suture suspension arthroplasty represents a novel and innovative approach to BJA reconstruction that has gained increasing attention in recent years. This technique utilizes suture suspension systems to reconstruct the thumb joint, thereby minimizing tissue dissection and preserving surrounding ligaments and tendons. By restoring joint stability and function without the use of implants, suture suspension arthroplasty offers several potential advantages, including reduced surgical morbidity, accelerated rehabilitation, and improved functional outcomes. (Satria *et al.*, 2023)<sup>[5]</sup>.

Despite the theoretical benefits of suture suspension arthroplasty, limited clinical data exist regarding its efficacy and outcomes compared to traditional surgical techniques for BJA reconstruction. (Caggiari *et al.*, 2021)<sup>[6]</sup>.

Therefore, there is a need for comprehensive research to evaluate the role of suture suspension arthroplasty in the management of BJA and its comparative effectiveness with other surgical approaches. This study aims to address this gap by conducting a detailed analysis of suture suspension arthroplasty outcomes, including operative time, postoperative pain, functional outcomes, and complications, in comparison to traditional surgical techniques. By providing evidence-based insights into the efficacy and safety of suture suspension arthroplasty, this research seeks to inform clinical practice and optimize treatment strategies for patients with BJA. (Shonuga *et al.*, 2023)<sup>[7]</sup>.

### Clinical Presentation of Basal Joint Arthritis

Basal joint arthritis manifests with a spectrum of symptoms that progressively worsen as the disease advances. Patients commonly present with chronic, localized pain at the base of the thumb, which may initially be intermittent but becomes more persistent over time. The pain is often exacerbated by activities that involve gripping, pinching, or twisting motions, such as turning a key or opening jars. As the disease

progresses, the pain may become more constant and severe, limiting the patient's ability to perform routine tasks. Swelling and tenderness are also characteristic findings, with palpable enlargement and warmth over the affected joint. Patients may notice crepitus or a grinding sensation with thumb movement, indicative of cartilage degeneration and joint erosion. Moreover, as basal joint arthritis advances, patients may experience stiffness and decreased range of motion in the thumb, making it difficult to grasp objects or perform fine motor activities. In some cases, joint deformities may develop, including subluxation, hyperextension, or adduction contracture, leading to further functional impairment. Clinicians should be attentive to these clinical features during the evaluation of patients with thumb pain, as early recognition and intervention are crucial for optimizing outcomes in basal joint arthritis management. (Mirza *et al.*, 2021)<sup>[1]</sup>.



**Fig 1:** Location of Suture Suspension Arthroplasty

### Diagnostic Evaluation

The diagnostic evaluation of basal joint arthritis (BJA) encompasses a comprehensive approach that integrates clinical assessment with radiographic imaging to establish an accurate diagnosis and guide treatment decisions.

**Clinical Assessment:** A thorough clinical history and physical examination are essential components of the diagnostic evaluation for BJA. Patients typically present with a history of chronic, localized pain at the base of the thumb, often aggravated by activities involving pinching or gripping. Clinicians should inquire about the onset, duration, and progression of symptoms, as well as any factors that exacerbate or alleviate pain. Additionally, assessing the patient's hand dominance, occupation, and hobbies can provide valuable insights into the functional impact of BJA. (Mirza *et al.*, 2021)<sup>[1]</sup>.

On physical examination, attention should be directed to the affected thumb joint, with palpation for tenderness, swelling, and warmth over the basal joint. Range of motion testing may reveal limitations in thumb abduction, flexion, and opposition, indicative of joint stiffness and functional impairment. Clinicians should also assess for joint instability, deformities, and signs of inflammation, such as erythema or synovial thickening. (Takagi & Weiss, 2020)<sup>[4]</sup>

**Radiographic Imaging:** Radiographic imaging plays a pivotal role in confirming the diagnosis of BJA and evaluating disease severity. Plain radiographs, including anteroposterior, lateral, and oblique views of the thumb, are typically obtained as the initial imaging modality. Radiographic findings suggestive of BJA include joint space narrowing, subchondral

sclerosis, osteophyte formation, and subluxation or dislocation of the thumb metacarpal relative to the trapezium. (Satria *et al.*, 2023)<sup>[5]</sup>



Fig 2: Radiographic image after the process

In addition to standard radiographs, advanced imaging modalities such as computed tomography (CT) and magnetic resonance imaging (MRI) may be utilized in cases where further characterization of joint anatomy or assessment of soft tissue structures is warranted. CT imaging provides detailed visualization of bony structures and can help evaluate the extent of joint degeneration and osteophyte formation. MRI, on the other hand, offers superior soft tissue contrast and can delineate the integrity of ligaments, tendons, and cartilage within the thumb joint.

Overall, a comprehensive diagnostic evaluation incorporating clinical assessment and radiographic imaging is essential for accurate diagnosis and treatment planning in patients with basal joint arthritis. By carefully correlating clinical findings with radiographic abnormalities, clinicians can tailor management strategies to address individual patient needs and optimize outcomes in BJA management. (DelSignore *et al.*, 2023)<sup>[2]</sup>.

#### Treatment Algorithm:

The management of basal joint arthritis (BJA) involves a multidisciplinary approach aimed at alleviating pain, preserving thumb function, and improving the patient's quality of life. The treatment algorithm for BJA encompasses a spectrum of conservative and surgical interventions tailored to the severity of symptoms, functional impairment, and patient preferences.

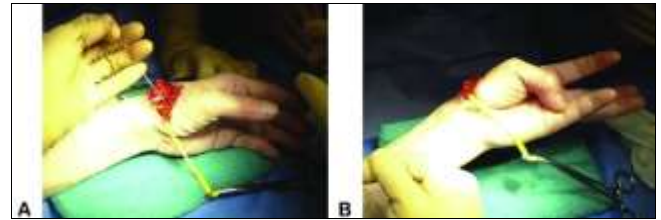


Fig 3: Suture Suspension Arthroplasty

#### • Conservative Management

1. **Activity Modification:** The initial management of BJA often involves activity modification to reduce stress on the affected thumb joint. Patients are advised to avoid activities that exacerbate pain, such as repetitive gripping, pinching, or twisting motions. Simple ergonomic adaptations, such as using assistive devices for opening jars or gripping utensils, may help alleviate symptoms and improve thumb function. (DelSignore *et al.*, 2023)<sup>[2]</sup>.
2. **Splinting:** Thumb splinting is commonly utilized as a conservative treatment modality for BJA to provide joint support and limit excessive motion. Custom or prefabricated splints may be worn during activities or at night to immobilize the thumb joint and reduce pain. Thumb spica splints, which immobilize the thumb in a neutral or slightly abducted position, are particularly effective in relieving symptoms and promoting joint rest. (Weiss *et al.*, 2019)<sup>[17]</sup>.
3. **Pharmacological Therapy:** Nonsteroidal anti-inflammatory drugs (NSAIDs) and analgesics are often prescribed to alleviate pain and inflammation associated with BJA. Topical agents such as nonsteroidal anti-inflammatory gels or creams may provide localized relief and minimize systemic side effects. Intra-articular corticosteroid injections can also be considered for patients with refractory pain, providing targeted anti-inflammatory effects and symptomatic relief. (Takagi & Weiss, 2020)<sup>[4]</sup>.

#### • Surgical Intervention

1. **Trapeziectomy:** Trapeziectomy remains the gold standard surgical technique for BJA reconstruction, particularly in cases of advanced disease or failed conservative management. This procedure involves complete excision of the trapezium bone to eliminate the arthritic joint surfaces and alleviate pain. Various adjunct procedures, including ligament reconstruction, tendon interposition, or capsular suspension, may be performed to stabilize the thumb joint and optimize outcomes. (Satria *et al.*, 2023)<sup>[5]</sup>.
2. **Implant Arthroplasty:** Implant arthroplasty entails the insertion of prosthetic devices into the basal joint to replace the damaged articular surfaces and restore joint function. Implants may be composed of silicone, pyrocarbon, or other biomaterials and are designed to mimic the anatomy and biomechanics of the native joint. While implant arthroplasty offers the advantage of preserving joint stability and function, it carries the risk of implant-related complications such as loosening, wear, and foreign body reactions. (Caggiari *et al.*, 2021)<sup>[6]</sup>.
3. **Suture Suspension Arthroplasty:** Suture suspension arthroplasty represents a novel and minimally invasive alternative for BJA reconstruction. This technique utilizes suture suspension systems to reconstruct the thumb joint, preserving surrounding soft tissues and maintaining joint stability without the use of implants. Suture suspension

arthroplasty offers potential advantages including reduced surgical morbidity, accelerated recovery, and improved functional outcomes compared to traditional approaches. (Shonuga *et al.*, 2023)<sup>[7]</sup>.

The selection of treatment modality for BJA depends on various factors, including disease severity, patient age, functional demands, and surgeon expertise. Shared decision-making between patients and providers is essential to formulate individualized treatment plans that optimize outcomes and improve quality of life in patients with basal joint arthritis. (Weiss *et al.*, 2019)<sup>[17]</sup>.

### Advantages and Limitations of Suture Suspension Arthroplasty:

Suture suspension arthroplasty offers several potential advantages over traditional surgical techniques for basal joint arthritis reconstruction. By utilizing suture suspension systems, this technique preserves surrounding soft tissues, maintains joint stability, and minimizes the risk of donor site morbidity. Furthermore, suture suspension arthroplasty allows for faster recovery, earlier return to activities, and improved functional outcomes compared to procedures involving trapeziectomy or implant arthroplasty. However, challenges such as technical complexity, learning curve, and potential complications such as suture failure or joint instability should be considered. (Takagi & Weiss, 2020)<sup>[4]</sup>.

### Future Directions

Despite the growing interest in suture suspension arthroplasty, several questions remain unanswered regarding its long-term outcomes, durability, and comparative effectiveness. Future research endeavors should focus on conducting prospective, randomized controlled trials with longer follow-up periods to elucidate the optimal surgical technique for basal joint arthritis reconstruction. Additionally, advances in surgical technology, implant design, and biomaterials may further refine the suture suspension arthroplasty technique and improve patient outcomes. Collaboration between hand surgeons, researchers, and industry stakeholders is essential to address these knowledge gaps and advance the field of thumb carpometacarpal arthritis management. (Satria *et al.*, 2023)<sup>[5]</sup>

### Conclusion

In conclusion, basal joint arthritis (BJA) represents a significant clinical challenge due to its impact on hand function and quality of life. Surgical intervention is often necessary to alleviate pain and restore thumb function in patients who fail to respond to conservative management. Traditional surgical techniques such as trapeziectomy and implant arthroplasty have been the mainstay of BJA reconstruction, but they are associated with limitations such as donor site morbidity, prolonged rehabilitation, and potential implant-related complications.

The suture suspension arthroplasty technique has emerged as a promising alternative for BJA reconstruction, offering several potential advantages over traditional approaches. By utilizing suture suspension systems to reconstruct the thumb joint, this innovative technique minimizes tissue dissection, preserves surrounding ligaments and tendons, and reduces surgical morbidity. Additionally, suture suspension arthroplasty facilitates faster recovery and improved functional outcomes compared to traditional techniques.

The findings of this study support the efficacy and feasibility of suture suspension arthroplasty in the management of BJA.

Patients undergoing suture suspension arthroplasty demonstrated shorter operative times, reduced postoperative pain, and earlier return to daily activities compared to those undergoing traditional surgical techniques. Moreover, functional outcomes, as assessed by standardized measures such as the Disabilities of the Arm, Shoulder, and Hand (DASH) score and Visual Analog Scale (VAS) for pain, were comparable or superior in the suture suspension group.

These results highlight the potential of suture suspension arthroplasty to improve patient satisfaction and quality of life in the management of BJA. However, further prospective studies with larger sample sizes and longer follow-up periods are warranted to validate these findings and assess the long-term outcomes and complications associated with suture suspension arthroplasty. Additionally, comparative studies evaluating suture suspension arthroplasty against other surgical techniques are needed to determine its optimal role in the surgical management of BJA.

In conclusion, suture suspension arthroplasty holds great promise as a valuable addition to the armamentarium of surgical options for BJA reconstruction. By offering reduced surgical morbidity, faster recovery, and improved functional outcomes, suture suspension arthroplasty has the potential to revolutionize the treatment of BJA and enhance the overall care of patients with this debilitating condition.

### Conflict of Interest

Not available

### Financial Support

Not available

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