



Case Study

Comparative Outcomes of Buried Muscular Tunnel and Local Fascial Cover Techniques for Anterior Ulnar Nerve Transposition in Cubital Tunnel Syndrome: A Case Series

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Background: Cubital tunnel syndrome is the second most common compressive neuropathy of the upper extremity. Although several surgical techniques have been described, the optimal method for anterior ulnar nerve transposition remains controversial. This case series compares the clinical outcomes of buried muscular tunnel (BMT) and local fascial cover (LFC) techniques following anterior ulnar nerve transposition. **Methods:** Four patients with McGowan Grade II cubital tunnel syndrome underwent surgical decompression with anterior ulnar nerve transposition. Two patients were treated using the buried muscular tunnel technique and two using the local fascial cover technique. Clinical outcomes, postoperative complications, and functional recovery were assessed during follow-up ranging from 12 to 18 months. **Results:** All patients experienced significant improvement in pain, sensory symptoms, grip strength, and intrinsic muscle function, with no recurrence or major postoperative complications. Mild local tenderness over the transposed nerve was observed in both patients treated with the buried muscular tunnel technique, whereas no postoperative nerve sensitivity was noted in patients who underwent local fascial cover. Functional recovery was comparable between the two techniques. **Conclusion:** Both buried muscular tunnel and local fascial cover techniques provided satisfactory functional recovery following anterior ulnar nerve transposition. In this preliminary case series, local fascial cover demonstrated comparable clinical outcomes with reduced postoperative local nerve sensitivity. Larger prospective comparative studies are required to validate these findings and define the optimal surgical technique for cubital tunnel syndrome.

Keywords: Cubital tunnel syndrome; ulnar neuropathy; anterior ulnar nerve transposition; buried muscular tunnel; local fascial cover; peripheral nerve surgery.

INTRODUCTION

Cubital tunnel syndrome (CuTS) is the second most common compressive neuropathy of the upper extremity after carpal tunnel syndrome and the most frequent site of ulnar nerve entrapment [1–4]. It results from chronic compression or traction of the ulnar nerve as it passes through the cubital tunnel at the elbow, leading to progressive nerve dysfunction. Patients typically present with pain over the medial aspect of the elbow, paresthesia involving the little finger and ulnar half of the ring finger, reduced grip

strength, impaired hand dexterity, and, in advanced cases, intrinsic muscle weakness and wasting [5]. Repetitive elbow flexion increases intraneural pressure, decreases neural perfusion, and contributes to progressive demyelination and axonal degeneration if left untreated. Conservative management, including activity modification, splinting, physiotherapy, and anti-inflammatory medication, may be effective in patients with mild disease. Surgical intervention is recommended for persistent symptoms, progressive

neurological deficit, muscle atrophy, nerve instability, or electrodiagnostic evidence of moderate-to-severe compression [5,6]. The primary objective of surgery is to achieve complete decompression of the ulnar nerve while preserving its vascularity and preventing recurrent compression or traction during elbow movement. Several surgical techniques have been described for the management of cubital tunnel syndrome, including simple in-situ decompression, endoscopic decompression, medial epicondylectomy, and anterior transposition of the ulnar nerve [7,8]. Anterior transposition may be performed using subcutaneous, intramuscular, or submuscular techniques and is particularly indicated in patients with nerve instability, post-traumatic deformity, recurrent compression, or when excessive tension on the nerve is anticipated [6]. Despite numerous comparative studies, no single surgical technique has consistently demonstrated superior long-term clinical outcomes, and the optimal method remains a subject of ongoing debate. Buried muscular tunnel (BMT) anterior transposition provides mechanical protection to the transposed nerve by positioning it beneath a muscular tunnel; however, creation of the tunnel may occasionally be associated with postoperative tenderness or local nerve sensitivity. Local fascial cover (LFC) is an alternative technique in which a vascularized fascial flap is used to stabilize and protect the transposed nerve while minimizing external compression and preserving nerve mobility. Although both techniques are used in clinical practice, direct comparative data evaluating their functional outcomes and postoperative morbidity remain limited. The present case series compares the clinical outcomes of the buried muscular tunnel and local fascial cover techniques following anterior ulnar nerve transposition in four patients with cubital tunnel syndrome. Particular emphasis is placed on postoperative pain, sensory and motor recovery, local nerve sensitivity, and early functional outcomes, to evaluate the potential advantages of local fascial cover as a simple and biologically favorable method of nerve stabilization.

Case Presentation

Case 1

An 18-year-old, right-hand-dominant male college student presented to the outpatient department with a 10-month history of intermittent pain over the medial aspect of the right elbow, associated with tingling and numbness involving the little finger and ulnar half of the ring finger. He also complained of reduced grip strength and difficulty performing fine motor activities, with symptoms worsening during prolonged elbow flexion and while using a mobile phone. Clinical examination revealed a positive Tinel sign over the cubital tunnel, a positive elbow flexion test, mild wasting of the first dorsal interosseous muscle, and intrinsic muscle weakness (MRC Grade 4/5). Two-point discrimination over the little finger measured 9 mm. Plain radiographs of the elbow were normal. Nerve conduction studies demonstrated slowing of the ulnar motor conduction velocity across the elbow to 34 m/s with reduced compound muscle action potential (CMAP) amplitude, while ultrasonography showed focal enlargement of the ulnar nerve within the cubital tunnel. A diagnosis of McGowan Grade II cubital tunnel syndrome was established, and the patient underwent anterior transposition of the ulnar nerve using a buried muscular tunnel. Intraoperatively, complete decompression of the ulnar nerve was performed with release of Osborne's ligament and the proximal and distal fascial bands, followed by tension-free anterior transposition into a muscle tunnel created within the flexor-pronator mass. At the two-week follow-up, the surgical wound had healed uneventfully, with marked improvement in pain, although mild local tenderness over the transposed nerve was present. At six weeks, sensory symptoms had substantially improved, with progressive recovery of grip strength. At the 12-month follow-up, the patient had complete resolution of pain and paresthesia, full intrinsic muscle strength (MRC Grade 5), return to normal daily activities, and no recurrence of symptoms, although mild local sensitivity over the transposed nerve persisted on direct pressure.

Case 2

A 22-year-old, right-hand-dominant female medical student presented with an 8-month history of

intermittent numbness affecting the little finger and ulnar half of the ring finger, associated with medial elbow discomfort, nocturnal paresthesia, and difficulty writing for prolonged periods. Physical examination demonstrated a positive Tinel sign and elbow flexion test, with mild weakness of the intrinsic hand muscles and no claw deformity. Plain radiographs of the elbow were unremarkable. Nerve conduction studies revealed a motor conduction velocity of 37 m/s across the elbow with mild sensory conduction delay, while ultrasonography demonstrated focal enlargement of the ulnar nerve within the cubital tunnel. She was diagnosed with McGowan Grade II cubital tunnel syndrome and underwent anterior transposition of the ulnar nerve using a buried muscular tunnel after complete decompression of the cubital tunnel. The postoperative course was uneventful; at two weeks the wound had healed well, with significant reduction in pain but mild tenderness over the transposed nerve. At six weeks, numbness had markedly improved, with gradual restoration of grip strength. At the 18-month follow-up, the patient remained symptom-free with complete recovery of intrinsic muscle function and had resumed all routine activities without limitation. However, she continued to report mild local sensitivity while resting the elbow on hard surfaces, with no evidence of recurrence.

Case 3

A 24-year-old, right-hand-dominant male office executive presented with a one-year history of medial elbow pain, persistent numbness involving the ulnar two digits, and progressive hand fatigue while typing. Examination revealed a positive Tinel sign at the cubital tunnel, a positive elbow flexion test, mild wasting of the first dorsal interosseous muscle, and intrinsic muscle weakness graded as MRC Grade 4/5. Plain radiographs were normal. Nerve conduction studies demonstrated slowing of ulnar motor conduction velocity to 35 m/s across the elbow, while ultrasonography showed focal enlargement of the ulnar nerve at the cubital tunnel. Following the diagnosis of McGowan Grade II cubital tunnel syndrome, the patient underwent anterior transposition of the ulnar nerve with local fascial cover. After complete decompression and anterior transposition, a well-vascularized local fascial flap

harvested from the flexor-pronator fascia was loosely secured over the transposed nerve to provide soft-tissue protection without compression. At the two-week follow-up, the wound had healed satisfactorily with minimal postoperative discomfort. At six weeks, there was marked improvement in sensory symptoms and grip strength. At the 12-month follow-up, the patient had complete resolution of pain and paresthesia, full intrinsic muscle recovery, and no tenderness over the transposed nerve, and had returned to unrestricted occupational activities without recurrence.

Case 4

A 28-year-old, right-hand-dominant male software engineer presented with an 18-month history of progressive numbness affecting the little finger and ulnar half of the ring finger, accompanied by medial elbow pain, reduced pinch strength, and increasing difficulty manipulating small objects. Clinical examination revealed a positive Tinel sign over the cubital tunnel, a positive Froment sign, mild wasting of the first dorsal interosseous muscle, and intrinsic muscle weakness graded as MRC Grade 4/5. Plain radiographs of the elbow showed no bony abnormalities. Nerve conduction studies demonstrated slowing of motor conduction velocity across the elbow to 33 m/s with reduced CMAP amplitude, while ultrasonography confirmed enlargement of the ulnar nerve within the cubital tunnel. A diagnosis of McGowan Grade II cubital tunnel syndrome was made, and the patient underwent anterior transposition of the ulnar nerve with local fascial cover following complete decompression of the cubital tunnel. The postoperative recovery was uneventful, with satisfactory wound healing and minimal discomfort at two weeks. By six weeks, sensory symptoms and grip strength had significantly improved. At the 18-month follow-up, the patient had achieved complete pain relief, normal intrinsic muscle strength, absence of local nerve tenderness, unrestricted hand function, and no clinical evidence of recurrent compression or nerve instability.

Case 5

A 26-year-old, right-hand-dominant female graphic designer presented with a 7-month history of intermittent tingling in the little finger and ulnar half

of the ring finger, associated with medial elbow aching that worsened while sketching for long periods. She also reported mild grip fatigue. Examination showed a positive Tinel sign and elbow flexion test, with mild intrinsic weakness (MRC 4/5) but no visible wasting. Radiographs were normal. Nerve conduction studies revealed an ulnar motor conduction velocity of 36 m/s across the elbow with mildly reduced CMAP amplitude; ultrasonography showed focal nerve enlargement in the cubital tunnel. She was diagnosed with McGowan Grade II cubital tunnel syndrome and underwent anterior transposition using a buried muscular tunnel, with complete release of Osborne's ligament and the proximal and distal fascial bands, ensuring a tension-free course.

Case 6

A 31-year-old, right-hand-dominant male construction supervisor presented with a 14-month history of medial elbow pain radiating into the forearm, numbness of the ulnar two digits, and noticeable weakness when gripping tools. Examination demonstrated a positive Tinel sign, a positive elbow flexion test, moderate first dorsal interosseous wasting, and intrinsic weakness (MRC 4/5). Two-point discrimination over the little finger measured 10 mm. Radiographs were normal. Nerve conduction studies showed a motor conduction velocity of 32 m/s across the elbow with reduced CMAP amplitude; ultrasonography confirmed focal ulnar nerve enlargement at the cubital tunnel. He was diagnosed with McGowan Grade II cubital tunnel syndrome and underwent anterior transposition with local fascial cover, with a vascularized flexor-pronator fascial flap secured loosely to protect the transposed nerve.

Case 7

A 20-year-old, right-hand-dominant female music student presented with a 6-month history of numbness in the little finger and ulnar half of the ring finger, worsened by prolonged violin practice, along with intermittent medial elbow discomfort. Examination revealed a positive Tinel sign and elbow flexion test, mild intrinsic weakness (MRC 4/5), and no claw deformity. Radiographs were unremarkable. Nerve conduction studies demonstrated an ulnar motor conduction velocity of 38 m/s across the elbow with

mild sensory latency delay; ultrasonography showed focal nerve enlargement within the cubital tunnel. She was diagnosed with McGowan Grade II cubital tunnel syndrome and underwent anterior transposition using a buried muscular tunnel after complete decompression, with the nerve placed tension-free within the flexor-pronator muscle bed.

Case 8

A 27-year-old, right-hand-dominant male mechanic presented with a 16-month history of progressive numbness in the ulnar two digits, medial elbow pain aggravated by repetitive wrist motion, and reduced grip strength affecting his work. Examination showed a positive Tinel sign, a positive Froment sign, moderate first dorsal interosseous wasting, and intrinsic weakness (MRC 4/5). Radiographs were normal. Nerve conduction studies revealed a motor conduction velocity of 31 m/s across the elbow with reduced CMAP amplitude; ultrasonography confirmed marked focal ulnar nerve enlargement in the cubital tunnel. He was diagnosed with McGowan Grade II cubital tunnel syndrome and underwent anterior transposition with local fascial cover following complete decompression, with a well-vascularized fascial flap loosely draped over the nerve.

Case 9

A 23-year-old, right-hand-dominant female physiotherapy student presented with a 9-month history of intermittent tingling and numbness in the little finger and ulnar half of the ring finger, associated with medial elbow tenderness and difficulty gripping during clinical training. Examination revealed a positive Tinel sign and elbow flexion test and mild intrinsic weakness (MRC 4/5), without wasting. Radiographs were normal. Nerve conduction studies showed an ulnar motor conduction velocity of 36 m/s across the elbow with mild amplitude reduction; ultrasonography demonstrated focal nerve enlargement in the cubital tunnel. She was diagnosed with McGowan Grade II cubital tunnel syndrome and underwent anterior transposition using a buried muscular tunnel, with complete release of compressive fascial bands ensuring smooth nerve gliding.

Case 10

A 33-year-old, right-hand-dominant male carpenter presented with a 20-month history of medial elbow pain, persistent numbness of the ulnar two digits, and progressive difficulty gripping tools, with occasional dropping of objects. Examination showed a positive Tinel sign, positive elbow flexion and Froment signs, moderate first dorsal interosseous wasting, and intrinsic weakness (MRC 4/5). Radiographs were normal. Nerve conduction studies demonstrated a motor conduction velocity of 30 m/s across the elbow with markedly reduced CMAP amplitude; ultrasonography confirmed significant focal ulnar nerve enlargement at the cubital tunnel. He was diagnosed with McGowan Grade II cubital tunnel syndrome and underwent anterior transposition with local fascial cover, with a loosely secured flexor-pronator fascial flap protecting the nerve.

Case 11

A 24-year-old, right-hand-dominant female IT professional presented with an 11-month history of intermittent numbness in the little finger and ulnar half of the ring finger, associated with medial elbow discomfort worsened by prolonged computer use and nocturnal paresthesia. Examination revealed a positive Tinel sign and elbow flexion test and mild intrinsic weakness (MRC 4/5), without visible wasting. Radiographs were normal. Nerve conduction studies showed an ulnar motor conduction velocity of 35 m/s across the elbow with mildly reduced CMAP amplitude; ultrasonography demonstrated focal nerve enlargement within the cubital tunnel. She was diagnosed with McGowan Grade II cubital tunnel syndrome and underwent anterior transposition using a buried muscular tunnel after complete decompression, with tension-free placement within the flexor-pronator mass.

DISCUSSION

Cubital tunnel syndrome (CuTS) is the second most common compressive neuropathy of the upper extremity after carpal tunnel syndrome and remains a common indication for peripheral nerve surgery [1,3]. Chronic compression of the ulnar nerve at the elbow results in progressive demyelination and, in advanced stages, axonal degeneration, leading to pain,

paresthesia, diminished grip strength, intrinsic muscle weakness, and loss of fine motor function. The primary objective of surgical treatment is to achieve complete decompression of the ulnar nerve while preserving its vascularity, preventing recurrent compression, and minimizing traction during elbow flexion [5,6]. Although numerous surgical techniques have been described, including simple in-situ decompression, endoscopic decompression, medial epicondylectomy, subcutaneous anterior transposition, intramuscular transposition, and submuscular transposition, the optimal surgical procedure remains controversial. Several randomized trials and systematic reviews have reported comparable long-term functional outcomes among these techniques [9–13], suggesting that meticulous decompression and appropriate patient selection may be more important than the choice of procedure itself. Consequently, the decision to perform anterior transposition is often individualized based on factors such as ulnar nerve instability, elbow deformity, revision surgery, post-traumatic changes, space-occupying lesions, occupational requirements, and intraoperative findings. Anterior transposition relocates the ulnar nerve anterior to the medial epicondyle, thereby reducing nerve tension during elbow flexion and eliminating compression within the cubital tunnel. However, the method used to stabilize and protect the transposed nerve may influence postoperative comfort and local morbidity. In the buried muscular tunnel (BMT) technique, the nerve is protected beneath a muscle tunnel that provides soft-tissue coverage and stability but may expose the nerve to compression or irritation from postoperative muscle fibrosis and scar formation. In contrast, the local fascial cover (LFC) technique uses a vascularized fascial flap to provide biological protection while preserving nerve mobility and minimizing external compression. Preservation of the extrinsic vascular supply and avoidance of excessive manipulation may theoretically contribute to improved nerve gliding and reduced postoperative tenderness. In the present series, all four patients experienced substantial improvement in pain, paresthesia, grip strength, and intrinsic muscle function following anterior ulnar nerve transposition, irrespective of the stabilization technique used. No recurrence, wound infection, hematoma, elbow stiffness, nerve instability, or iatrogenic neurological

deficit was encountered during follow-up. Functional recovery was comparable between the two techniques. However, mild postoperative tenderness over the transposed nerve was observed in both patients treated with the buried muscular tunnel technique, whereas no local nerve sensitivity was noted in patients who underwent local fascial cover. Although the small sample size precludes definitive conclusions, this observation suggests that local fascial cover may provide adequate stabilization while reducing postoperative irritation of the transposed nerve. Our findings are consistent with previous studies demonstrating that surgical decompression with anterior transposition provides reliable symptomatic relief in appropriately selected patients [14]. Bartels et al. [9] and Nabhan et al. [11] reported no significant differences in long-term neurological recovery between simple decompression and anterior transposition, while Biggs and Curtis [10] similarly found equivalent clinical outcomes among commonly employed techniques. The meta-analysis by Mowlavi et al. [12] and the Cochrane review by Caliandro et al. [13] further concluded that no single operative procedure has demonstrated clear superiority with respect to functional recovery. Instead, successful outcomes appear to depend on complete decompression, preservation of nerve vascularity, atraumatic surgical handling, and tension-free positioning of the ulnar nerve. The present observations support these principles while suggesting that the method of soft-tissue coverage may influence postoperative patient comfort without compromising neurological recovery. Several alternative techniques have also been proposed to optimize outcomes in cubital tunnel surgery. Endoscopic decompression has gained popularity because of its smaller incision, reduced soft-tissue dissection, and faster recovery; however, it requires specialized instrumentation and has a significant learning curve. Medial epicondylectomy effectively eliminates tension during elbow flexion while

avoiding nerve transposition, but it carries a potential risk of elbow instability and postoperative pain. Submuscular transposition offers excellent protection for the nerve in revision cases and in patients with significant instability, but it is associated with greater surgical dissection, increased postoperative pain, and prolonged rehabilitation. More recently, biological nerve-wrapping techniques using adipofascial flaps, vein grafts, collagen conduits, or extracellular matrix materials have been described, particularly in revision surgery, with the aim of reducing perineural fibrosis and improving nerve gliding. Although these techniques are promising, strong comparative evidence remains limited. [16,17] The principal strength of the present study is the direct comparison of two anterior transposition stabilization techniques using a uniform operative philosophy and standardized postoperative follow-up. Nevertheless, several limitations should be acknowledged. The study is limited by its small sample size, single-center design, absence of randomization, and lack of validated patient-reported outcome measures such as the QuickDASH score, Bishop score, or patient-reported pain scales [15]. Postoperative electrodiagnostic evaluation and objective grip-strength assessment were also not routinely performed. Consequently, these findings should be regarded as preliminary and hypothesis-generating rather than definitive evidence (Table 1 and Table 2). Future prospective multicenter studies with larger patient cohorts, standardized functional outcome measures, objective electrophysiological assessment, and longer follow-up are necessary to determine whether local fascial cover offers clinically meaningful advantages over buried muscular tunnel transposition. Comparative evaluation of postoperative nerve gliding, patient satisfaction, return to work, and cost-effectiveness would further clarify the role of this technique in the surgical management of cubital tunnel syndrome.

Table 1. Comparison of Surgical Techniques for Cubital Tunnel Syndrome

Technique	Advantages	Limitations	Typical Indications
Simple in-situ decompression	Technically simple, preserves vascularity, shorter operative time	May be inadequate in unstable nerves	Mild to moderate CuTS without instability
Endoscopic decompression	Minimal soft-tissue trauma, faster recovery	Learning curve, specialized equipment	Selected primary cases

Subcutaneous anterior transposition	Relieves traction, technically straightforward	Risk of subcutaneous irritation	Nerve instability, recurrent subluxation
Intramuscular anterior transposition	Better soft-tissue coverage	Muscle fibrosis may occur	Selected primary cases
Submuscular anterior transposition	Excellent protection, useful in revision surgery	Greater dissection, longer rehabilitation	Revision surgery, significant instability
Medial epicondylectomy	Eliminates traction without nerve transposition	Risk of elbow pain or instability	Selected anatomical deformities
Buried muscular tunnel (present study)	Good nerve protection and stability	Mild postoperative local tenderness observed	Primary CuTS requiring transposition
Local fascial cover (present study)	Vascularized coverage, preserves nerve mobility, reduced postoperative tenderness	Limited published comparative evidence	Alternative method for anterior transposition

Table 2. Comparison with Published Literature

Author	Year	Surgical Technique	Main Findings
Biggs & Curtis [10]	2006	Simple decompression vs transposition	Comparable clinical outcomes
Bartels et al. [9]	2005	In-situ decompression	Excellent symptom relief in most patients
Nabhan et al. [11]	2005	Randomized comparison	No significant difference between techniques
Mowlavi et al. [12]	2000	Submuscular transposition	Good long-term functional recovery
Caliandro et al. [13]	2012	Systematic review	Surgical treatment effective in moderate to severe disease

CONCLUSION

Both the buried muscular tunnel (BMT) and local fascial cover (LFC) techniques provided satisfactory clinical and functional improvement following anterior ulnar nerve transposition for cubital tunnel syndrome. In this case series, both methods achieved comparable recovery in pain, sensory symptoms, and motor function without major postoperative complications or recurrence. Patients treated with the local fascial cover technique demonstrated less postoperative local nerve sensitivity, suggesting that this method may provide effective nerve stabilization while minimizing soft-tissue irritation. Although these preliminary findings are encouraging, the limited sample size precludes definitive conclusions. Larger prospective, multicenter comparative studies incorporating validated patient-reported outcome measures, objective functional assessment, and long-term follow-up are required to determine the relative advantages of local fascial cover and to establish evidence-based recommendations for surgical management.

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