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Primary cubital tunnel syndrome – surgical treatment methods and their effectiveness

Authors

- **lek. Jakub Starownik[1]** –
  0009-0008-2711-2578,
  jakub.starownik2@gmail.com

- **dr n. med. Artur Szewczyk[1]**
  0000-0001-6416-9321,
  artur.jerzy.szewczyk@gmail.com

- **lek. Sylwia Kołpaczyńska[1]**
  0009-0003-6432-1102,
  skolpaczynska@wim.mil.pl

- **lek. Sylwiusz Niedobylski[2]**
  0000-0001-7266-623X,
  sniedobylski@gmail.com

- **lek. Lidia Bartoszek[3]**
  0009-0000-1656-7325,
  lidka.bartosz@gmail.com

- **lek. Dominika Orłowska**[4]
  0009-0001-9104-0459,
  dominikarachwal98@gmail.com

- **lek. Aleksandra Wójcik**[5]
  0000-0003-1669-7466,
  awojcik115@gmail.com

Affiliations:

1. Military Institute of Medicine - National Research Institute; Szaserów 128, 04-141 Warsaw, Poland
2. Independent Public Clinical Hospital No. 4 in Lublin; Kazimierza Jaczewskiego 8, 20-954 Lublin, Poland
3. National Medical Institute of the Ministry of the Interior and Administration; Wołoska 137, 02-507 Warsaw, Poland
4. Trauma Surgery Hospital of St. Anna; Barska 16/20, 02-315 Warsaw, Poland
5. Medical University of Lublin; Aleje Racławickie 1, 20-059 Lublin, Poland

Abstract

Cubital tunnel syndrome (CuTS) is one of the most common neuropathies of the upper extremity. This condition, if left untreated, can significantly impact patients' everyday functioning and quality of life. Diagnosis of CuTS is mostly based on clinical evaluation but can be supplemented by electrodiagnostic studies, and various imaging techniques. Conservative treatments such as physical therapy, splinting, and anti-inflammatory medications are often first-line interventions. However, surgical approach may become necessary when conservative measures fail to provide relief or in cases of severe compression. There are numerous surgical approaches to treating CuTS and there is no clear consensus on one best method. Simple decompression of the ulnar nerve and its subcutaneous transposition are the most popular surgical techniques employed. Each method has its advantages and drawbacks, with varying implications for nerve recovery and postoperative complications. This review aims to provide a comprehensive overview of CuTS, while focusing on available surgical treatment approaches, their popularity and outcomes. Further research is warranted to refine surgical techniques and develop more effective interventions for this debilitating condition.

Keywords

Cubital tunnel syndrome; Ulnar nerve compression; Hand surgery; Submuscular transposition, Decompression in situ

Introduction

Ulnar nerve compression neuropathy at the elbow (also known as cubital tunnel syndrome – CuTS) is the second most commonly occurring compression neuropathy of the upper limb after carpal tunnel syndrome [1]. In the idiopathic form of cubital tunnel syndrome, nerve damage occurs due to prolonged compression of this structure in the elbow area.

The mechanism in which ulnar nerve compression develops is closely related to the anatomical course of the discussed nerve.

Along the ulnar nerve's course from the arm to the forearm, the ulnar nerve passes through the cubital (ulnar) tunnel located in the dorsomedial part of the elbow. The boundaries of this tunnel are: the medial epicondyle of the humerus, the elbow joint capsule with the medial collateral ligament of the elbow, the olecranon of the ulna, and the cubital tunnel retinaculum, also known as Osborne's ligament. Osborne's ligament is a connective tissue band that runs between the olecranon and the medial epicondyle of the humerus. In addition to the ulnar nerve, the cubital tunnel also contains adipose tissue [1,2,3].

The cubital tunnel is the most common site of compression leading to ulnar nerve neuropathy [1,2]. During elbow flexion, the lumen of the cubital tunnel decreases, leading to increased pressure inside the said tunnel. Moving the elbow into full flexion from full extension reduces the cross-sectional area of the cubital tunnel by 30 – 41% and increases pressure sevenfold [3,6]. Therefore, prolonged upper limb flexion (e.g., during office work or sleep) and frequent leaning on the elbow (e.g., while driving) are major risk factors for ulnar nerve neuropathy [2]. Besides increased compression on the nerve during elbow flexion, the ulnar nerve also slides and stretches by approximately 5 mm to 10 mm. Prolonged excessive nerve tension, due to anatomical differences, can also lead to the development of ulnar neuropathy [4,6]. Additional risk factors for cubital tunnel syndrome include obesity, repetitive elbow flexion and extension movements, diabetes, and smoking [5]. Patient's gender has not been definitively confirmed as a risk factor.

Most common cause of CuTS is prolonged, idiopathic compression of ulnar nerve in it's tunnel. It is worth mentioning, that symptoms of ulnar nerve neuropathy can also occur due to compression in other anatomical locations besides the cubital tunnel, such as Struthers' arcade (located proximally in relation to the elbow) or the fascia connecting the two heads of the flexor carpi ulnaris muscle (distal to the elbow) [6]. Due to the complexity of the issue, this review article focuses on the most common causes of the ulnar nerve neuropathy, related to pathologies within the cubital tunnel. It is worth mentioning that specific injuries, such as fractures of the medial epicondyle of the humerus or rheumatoid diseases like rheumatoid arthritis (RA), can also lead to symptoms typical of cubital tunnel syndrome [6].

Symptoms and Diagnosis

Depending on the source, the incidence of cubital tunnel syndrome is estimated at approximately 25-30 cases per 100,000 person-years [6,7] or 18% - 59% of the general population [8]. Discrepancies in epidemiological data are due to non-standardized diagnostic criteria and the lack of large population-based studies. Diagnosis of cubital tunnel syndrome is usually based on characteristic clinical presentation, which may be supplemented by electrophysiological studies (nerve conduction study - NCS or electromyography - EMG) and imaging studies, most commonly ultrasound of the cubital tunnel [6]. However, it is important to emphasize that these studies only complement the diagnosis, which is primarily based on the history of typical symptom progression and physical examination of the patient.

To assess the severity of cubital tunnel syndrome, one of two scales is usually used – Dellon's classification or McGowan's classification [2,6].

Both scales divide the patient's symptoms into three groups – mild, moderate, and severe. This classification allows for some objectivity in symptom severity and appropriate therapeutic management.

McGowan's Classification	
Grade 1	Subjective, intermittent mild paresthesia/hypoesthesia, no motor disfunctions
Grade 2	Persistent paresthesia/hypoesthesia, noticeable weakness/atrophy of the muscles innervated by ulnar nerve
Grade 3	Persistent sensory symptoms, advanced motor deficit with visible muscle atrophy

Table 1. McGowan's scoring system of CuTS severity

Symptoms associated with cubital tunnel syndrome result directly from the location of the injury and areas supplied by the ulnar nerve below the compression site. The first symptom is often isolated paresthesia, felt as numbness of the fourth and fifth fingers of the hand. With minor nerve damage, these symptoms may occur periodically. Symptoms can worsen at night (due to arm positioning during sleep) and with significant elbow flexion, e.g. when conversing through a mobile phone. Unlike carpal tunnel syndrome, these paresthesia usually do not involve pain in the affected region – pain may be present around the medial epicondyle of the humerus, due to an active inflammatory process [3,5,6].

Over time and with progressive neuropathy, sensory symptoms may become constant. Additionally, motor symptoms may appear, perceived by the patient as a decline in overall hand dexterity and grip strength. These symptoms are due to progressive atrophy of the muscles innervated by the ulnar nerve, primarily the hypothenar muscles, the third and fourth interosseous muscles, the lumbricals, the adductor pollicis, and the palmaris brevis [3,5,6]. In long-term disease, muscle atrophy in the hand may be visible to the naked eye.

During the physical examination, in addition to the general assessment of the functions of the above-mentioned muscles, specific signs such as Froment's sign and Wartenberg's sign are evaluated. Provocative tests are also conducted, assessing the severity of symptoms during elbow and shoulder flexion in various positions and during tapping on the ulnar nerve around the medial epicondyle (Tinel's sign) [6,9,10]. A thorough examination is crucial due to other potential sites of compression of the ulnar nerve, such as nerve roots in the cervical spine, the brachial plexus, or Guyon's canal.

Available Treatment Methods

Similarly to diagnostic criteria, there is currently no scientific consensus on one, optimal treatment approach for cubital tunnel syndrome [11,12]. For CuTS with short-term, mild to moderate symptoms, conservative treatment should be considered. If symptoms do not resolve after several months of non-surgical treatment or if the initial symptoms are severe, surgical treatment should be undertaken.

Conservative Management

Non - surgical treatment of cubital tunnel syndrome primarily involves behavioral modifications and patient education about the nature of their condition. Patients should be instructed to avoid positions that increase ulnar nerve compression, such as leaning on the elbow and prolonged or repetitive elbow flexion. In addition to avoiding aggravating factors, it may be beneficial to recommend a specialized elbow brace for night use, which prevents elbow flexion above 45 degrees. Patients may also benefit from implementing specialized rehabilitation procedures, particularly ulnar nerve gliding exercises [13,14]. Besides behavioral and physiotherapeutic approaches, local corticosteroid injections around the ulnar nerve can be used, although studies show mixed results regarding their effectiveness compared to placebo [15].

Assessing the effectiveness of conservative management is challenging due to the limited number of sufficiently comprehensive studies conducted on large, adequately randomized samples. Some studies indicate significant symptom reduction in up to 90% of the patients undergoing various forms of conservative treatment, with nighttime elbow splinting being the most effective [14,16]. However, it should be noted that non-interventional treatment shows better results in mild to moderate cases of cubital tunnel syndrome [13], and an accurate overall number of patients not requiring future surgical treatment cannot be reliably determined based on available studies.

Surgical Treatment Methods

If no improvement occurs after several months of conservative treatment or if the initial CuTS symptoms are severe, a decision should be made to implement surgical intervention. The decision to cease conservative treatment or to opt for primary surgical treatment should always be made based on the individual case, considering factors such as patient age, comorbidities, expected therapeutic outcomes, and physical activity level. Surgical procedures for cubital tunnel syndrome can be divided into two main groups: ulnar nerve anterior transposition surgeries and simple in situ decompression without altering the physiological course of the ulnar nerve.

Within these groups, there are many specific methods differing in surgical technique. Just as with conservative treatment, there is no scientific consensus on the optimal surgical approach that would be most effective in all cases of ulnar nerve compression neuropathy [3,17,18]. Therefore, the choice of surgical method is often dictated by the experiences of a given hospital department and the preferences of individual surgeons [6,19].

Regardless of the surgical technique, the procedure can be performed under regional anesthesia (with brachial plexus block), segmental intravenous anesthesia (using a pressure tourniquet applied to the proximal part of the humerus, also called Bier’s block anesthesia), or short general anesthesia [6]. The choice of anesthesia type should be made by an anesthesiologist based on the patient's health assessment – it should be noted that the type of anesthesia does not significantly affect the surgical outcomes [20].

In Situ Ulnar Nerve Decompression

Simple in situ ulnar nerve decompression is one of the most commonly chosen surgical methods for primary cubital tunnel syndrome. Some studies present discrepant data regarding the exact frequency of use of different surgical methods, but in most comprehensive articles in situ decompression appears to be the dominant approach to treating primary cubital tunnel compression [19,21,22].

The goal of this procedure is to reduce pressure on the ulnar nerve by cutting the anatomical structures responsible for excessive tightness in the cubital tunnel while leaving the nerve in its original location. Due to the lack of re-securing the nerve in the groove, an alternative surgical technique should be considered for patients showing signs of ulnar nerve instability, visible as ulnar nerve subluxation over the medial epicondyle [6].

Techniques for performing in situ ulnar nerve decompression can be divided into three types: traditional open, minimally invasive open, and endoscopic. Regardless of the chosen surgical method, the effectiveness of in situ decompression and the frequency of postoperative complications remain similar [5,23], although some studies indicate higher patient satisfaction with endoscopic techniques compared to open techniques [24].

Open in situ Decompression of the Ulnar Nerve

The traditional open method is characterized by the lowest level of technical complexity among all available surgical procedures aimed at decompressing the ulnar nerve. Access to the ulnar nerve is obtained through an incision made at the roof of the cubital tunnel, between the medial epicondyle and the olecranon. The length of the incision that would distinguish between the traditional method and the minimally invasive open method is not generally agreed upon. For the traditional method, the skin is usually incised to a length of approximately 6 – 8 cm, while for the minimally invasive method, it is around 1.5 – 3 cm [25,26].

The traditional open method, compared to the minimally invasive open method, allows for better visualization of the nerve and a better assessment of its course along with possible compression sites. The obvious difference between these types of procedures is the size of the postoperative scar. Additionally, a long incision increases the risk of damaging the skin branches of regional nerves – for this reason, the current optimal method for in situ decompression of the ulnar nerve seems to be access with an "intermediate length" incision, which provides both adequate visualization of the surgical field, favorable safety profile and a satisfactory aesthetic effect [6,26].

Regardless of the incision length during the in situ decompression, after cutting the skin and dissecting the underlying tissues, the ulnar nerve should be identified and Osborne's ligament (which is the most common site of nerve compression) should be cut. Due to the frequent difficulty in precise pinpointing of the nerve compression site, it is recommended to perform a wider dissection of the tissues surrounding the ulnar nerve (approximately 5 cm proximally and distally from the medial epicondyle), which will allow for the removal of any additional compression sites (such as Struthers' arcade or the fascia connecting the heads of the flexor carpi ulnaris muscle) [6]. After releasing the nerve, the elbow joint should be moved through its full range of motion to assess the stability of the ulnar nerve in the groove deprived of one of its limiting walls.

If visible subluxation or dislocation of the nerve occurs (movement over the medial epicondyle during flexion), the surgical approach should be modified by performing an ulnar nerve transposition [6,25,26], although some studies suggest that ulnar nerve instability does not significantly affect treatment outcomes [44].

Endoscopic in situ Decompression of the Ulnar Nerve

In situ endoscopic release of the ulnar nerve is performed using specialized equipment designed for this type of surgery. Apart from the approach to accessing the ulnar nerve canal, this procedure has similar stages to surgeries conducted using the open technique. Some authors advocate for the advantages of endoscopic operations, pointing out less damage to soft tissues, the ability to precisely visualize nerve compression sites with the endoscope, and lower postoperative patient pain levels. Additionally, in endoscopic surgery, damage to the medial cutaneous nerve of the forearm is less frequently observed compared to the traditional form of the procedure [27]. The size of the postoperative scar is comparable to that of the traditional minimally invasive method. A disadvantage of the endoscopic technique is the increased difficulty in identifying the site of potential intraoperative bleeding and the poorer ability to effectively address such occurrences [27,28]. For this reason, one should always be prepared to convert the surgery to the traditional access method.

Available studies comparing methods of ulnar nerve decompression indicate similar, sometimes even more favorable outcomes with endoscopic access compared to the traditional method [5,23,24]. However, at this time, it is a less popular method than the traditional ulnar nerve release surgery, partly due to the established position of the traditional method, higher costs of endoscopic operations, and lack of definitive evidence of significant clinical benefits from endoscopic access [5,21,28]. Some studies comparing both methods directly indicate no advantage of the endoscopic method over the open surgical technique [29].

Medial Epicondylectomy

Some surgeons complement in situ ulnar nerve decompression with the resection of part of the medial epicondyle of the humerus (epicondylectomy) [5,6]. By modifying the bone surface in contact with the ulnar nerve, it is possible to ensure greater nerve stability in its canal and reduce the risk of nerve irritation resulting from excessive stretching or luxation of the nerve over the medial epicondyle [30]. Studies indicate the advantage of minimal intervention in the epicondyle over a more extensive resection of this structure – excessive bone removal can lead to more frequent ulnar nerve dislocations, medial instability of the entire elbow joint, and the occurrence of severe, chronic pain [6,31]. As with other interventions described in this paper, studies show inconclusive results regarding the efficacy, safety, and potential benefits of complementing in situ decompression with an epicondylectomy – therefore, it is not currently a routine procedure in the surgical treatment of cubital tunnel syndrome [6,25,32].

Ulnar Nerve Transposition

Ulnar nerve decompression with simultaneous anterior transposition involves relocating the nerve to a different anatomical location, anteriorly to the medial epicondyle of the humerus. Historically, this was one of the most commonly used methods to treat CuTS, although, in recent years, this trend seems to be shifting in favor of a simple nerve decompression without transposition [3,10,21,22].

There are several types of ulnar nerve transposition. This classification results from differences in the surgical technique and the subsequent new position of the nerve. Decompression with transposition should be considered especially in patients demonstrating ulnar nerve instability. This instability can be revealed both preoperatively and intraoperatively during a simple decompression procedure. Additional indications for this type of surgery include recurrent cubital tunnel syndrome (occurring after primary in situ nerve decompression) and a history of elbow bone injuries [6,33] – it should be emphasized again that the surgical treatment method should be individually selected for each patient.

The initial stages of ulnar nerve transposition are very similar to simple in situ nerve decompression. The incision length is comparable to the traditional open in situ decompression procedure, although some centers perform nerve transposition surgery with a minimally invasive approach (incision length of about 3 cm). Studies on a limited number of patients did not show a significant difference in the outcomes of procedures performed using the minimally invasive technique compared to the traditional access [34].

After making an incision in the skin, dissecting the underlying tissues, cutting the roof of the cubital tunnel, and exposing the ulnar nerve, it is completely separated from its base, allowing for its relocation. At this point, there is a risk of disrupting the continuity of small blood vessels nourishing the ulnar nerve, as well as mechanically damaging small nerve branches and the nerve sheath, which according to some surgeons may lead to secondary neuropathy [2, 6]. Therefore, the exposed nerve should be handled extremely delicately. Contact with any sharp-edged tools (such as surgical forceps) should be avoided. Depending on the further course of the operation, anterior ulnar nerve transposition methods can be divided into three groups, briefly described below.

Subcutaneous Anterior Transposition of the Ulnar Nerve

The subcutaneous transposition of the ulnar nerve is the most commonly performed type of transposition surgery of this nerve [22,33]. Many specialists primarily treat this surgery as a method for managing recurrent cubital tunnel syndrome when simple in situ decompression has not yielded satisfactory results [6] or as a primary treatment for cubital tunnel syndrome in patients presenting with severe symptoms [22].

During subcutaneous transposition, the ulnar nerve is relocated under the skin, on the muscle fascia, anteriorly to the medial epicondyle of the humerus. The nerve is secured in its new location by a small flap cut out from the surrounding muscle fascia and/or adipose tissue [6,33]. This procedure prevents the nerve from shifting around in the subcutaneous tissue. It also reduces the risk of excessive perineural scarring postoperatively. The exact surgical technique details depend on the past experiences of the specific center and the preferences of the surgeon.

Due to the new location of the nerve directly under the skin and subcutaneous tissue, it is susceptible to secondary mechanical injuries. Consequently, this transposition technique may yield less favorable results in thin individuals with limited subcutaneous tissue, necessitating consideration of alternative surgical approaches in such cases [10,33].

Intramuscular Transposition of the Ulnar Nerve

Some researchers suggest that subcutaneous transposition of the ulnar nerve not only exposes this structure to repeated injuries but also poses a risk of secondary neuropathy due to secondary compression by the protective flaps and the non-physiological, curved path of the nerve in its new location [35]. One alternative proposed method is the intramuscular transposition of the ulnar nerve. During this surgery, after appropriate dissection, the ulnar nerve is repositioned within the proximal part of the antebrachial flexor - pronator muscle mass [11,35,36].

Currently, intramuscular transposition of the ulnar nerve is the least commonly used method for treating cubital tunnel syndrome and is often omitted in many studies. This may be due to this technique’s similarity to the submuscular transposition of the ulnar nerve, which is better covered in scientific literature and vastly more popular.

Some comparative studies indicate relatively unsatisfactory results for intramuscular transposition of the ulnar nerve compared to other surgical approaches [36], although certain research suggests its effectiveness in specific cases [33,37,38].

Submuscular Transposition of the Ulnar Nerve

In clinical practice, submuscular transposition of the ulnar nerve is virtually the only transposition technique used alternatively to subcutaneous transposition. This procedure is more invasive, involving extensive tissue manipulation and a more complex surgical technique. Some authors recommend this type of surgery only when subcutaneous transposition fails to produce satisfactory results [6]. Additionally, this procedure may be proposed for thin patients with minimal subcutaneous fat, as subcutaneous transposition in this group is associated with a higher risk of secondary ulnar nerve injuries [3,33].

Submuscular ulnar nerve transposition involves placing the ulnar nerve beneath the entire proximal attachment of the flexor-pronator muscle group. Unlike intramuscular transposition, this procedure involves complete intraoperative cutting of the muscle group attached to the medial epicondyle of the humerus. After positioning the ulnar nerve underneath, the muscle continuity is restored using non-absorbable sutures. Due to the nerve's placement between large forearm muscle groups, there is a risk of secondary compression, which necessitates careful surgical technique and intraoperative verification of the nerve's position.

Another complication associated with submuscular transposition is the potential weakening of the muscle group attached to the medial epicondyle and a higher risk of complications typical of more extensive surgeries, such as postoperative wound infections or sensory disturbances in the operated area [10,40]. Compared to subcutaneous transposition, immobilization of the elbow joint in a cast is recommended postoperatively [6], although some surgeons advise against immobilization and emphasize the importance of early postoperative rehabilitation [39].

Comparison of the Effectiveness of Treatment Methods for Ulnar Nerve Syndrome

The effectiveness of different treatment methods should always be considered in the context of specific patient groups. For individuals presenting with short-term, mild CuTS symptoms, conservative treatment should be considered first, involving behavior modification, nighttime elbow immobilization, and exercises facilitating the sliding of the ulnar nerve in its groove [14]. Some authors recommend observing the patient for 3 to 6 months before the final assessment of the non-operative treatment's effectiveness, although there is no scientific consensus on the duration of this type of treatment [10,41]. The effectiveness of such an approach in some studies is estimated at 88 – 90% [14,42]. However, in cases of severe symptoms at diagnosis, surgical treatment should be planned immediately, as delays may result in poorer outcomes [2,10,13]. Surgical treatment should also be implemented for patients with moderate symptoms who do not improve with conservative treatment.

The two most commonly used surgical methods for treating primary cubital tunnel syndrome are simple in situ decompression of the ulnar nerve and decompression combined with anterior subcutaneous transposition [22]. In favor of in situ decompression are factors such as minimal tissue disruption, simplicity of the surgical technique, relatively low risk of serious postoperative complications, and a short recovery time. The disadvantages of this technique include an increased risk of ulnar nerve instability post-treatment and a higher risk of symptom recurrence compared to subcutaneous transposition of the ulnar nerve [3,5,10].

Some authors suggest supplementing in situ decompression with limited medial epicondylectomy [31,32], which can significantly reduce the risk of detrimental ulnar nerve instability. However, medial epicondylectomy currently is not widely used [22], possibly due to the limited research objectively assessing this surgical technique and its effectiveness, and the availability of equally effective, better-studied, and more popular methods like subcutaneous anterior transposition of the ulnar nerve.

Subcutaneous transposition of the ulnar nerve appears to be a more comprehensive operation than simple in situ decompression, as it allows simultaneous removal of several potential causes of neuropathy – compression in the cubital tunnel, increased traction leading to chronic irritation, instability of the nerve in its canal, and excessive stretching of the ulnar nerve [10,43]. The disadvantages of this operation, compared to simple in situ decompression, include more extensive tissue dissection, higher complexity of the surgical technique, increased risk of secondary injuries due to the nerve's new location directly under the skin and subcutaneous tissue, and potential conduction disturbances due to the nerve's new, non-physiological path [35]. Additionally, nerve transposition increases the risk of damage to its small branches and nourishing vessels, which may exacerbate the patient's symptoms [2,33].

Submuscular transposition of the ulnar nerve is most commonly used as a method for treating recurrent cubital tunnel syndrome, with its use in treating primary ulnar neuropathy being quite limited, though sometimes proposed for patients with minimal subcutaneous tissue [6,10]. A meta-analysis of randomized clinical trials indicated that while the effectiveness of submuscular and subcutaneous transposition may be comparable, various postoperative complications occur significantly more frequently with submuscular transposition [40,45].

Recurrence rate of cubital tunnel syndrome is relatively low. The recurrence of CuTS after surgical treatment was shown to be the highest when using submuscular anterior transposition method. It is believed that this happens due to creating a new compression site on the ulnar nerve – therefore some studies advice against using the said technique in most cases [45].

Conclusions and Discussion

Based on currently available scientific studies, it is impossible to establish a consensus on the optimal method for treating primary cubital tunnel syndrome. Currently, the most commonly used method is the decompression of the nerve in its canal without its transposition [19,22] and this trend seems to be on the rise. The data from study conducted by JM Adkinson in 2015 [19] is presented in table number 2. The findings of A Yaha study conducted in 2018 [22] regarding CuTS cases with present motor deficit symptoms are presented in table number 3 – it is important to note that presented prevalence of surgical methods is dependent on specific case scenarios described in the study.

Regardless of the chosen surgical method, the surgical treatment of primary ulnar neuropathy is highly effective and associated with a low incidence of postoperative complications [21,45].

Year / Approach	2006	2008	2010	2012
In situ release	70%	77%	84%	88%
Transposition	25%	19%	12%	9%
Other methods	5%	4%	4%	3%

Table 2. Popularity of surgical CuTS treatment methods in given years surveyed in "Surgical Treatment of Cubital Tunnel Syndrome: Trends and the Influence of Patient and Surgeon Characteristics" [19]

Approach	Response Rate
Open in situ decompression	51% - 65%
Endoscopic decompression	5% - 7%
Submuscular transposition	13% - 17%
Subcutaneous transposition	14% - 21%
Medial epicondylectomy	2% - 3%
Conservative management	0% - 7%

Table 3. Popularity of surgical approaches to treating CuTS in hypothetical scenarios with motor deficit symptoms involved as surveyed in "Trends in the Surgical Treatment for Cubital Tunnel Syndrome: A Survey of Members of the American Society for Surgery of the Hand" [22]

Comparative studies of the effectiveness of the two most popular methods for treating primary cubital tunnel syndrome indicate comparable effectiveness of subcutaneous transposition and simple in situ decompression [12]. Meta-analyses comparing the aforementioned surgeries suggest that due to lower complication rates and simpler surgical technique, simple in situ decompression of the ulnar nerve has an advantage over other surgical methods, even in cases of ulnar nerve instability [21,44,45].

It warrants further emphasis that the optimal treatment method must always be determined individually, considering the patient's specific health conditions and other factors, such as age, physical activity, and expected outcomes of the surgery. Achieving a scientific consensus on the surgical algorithm for treating primary ulnar neuropathy in the cubital tunnel requires more studies considering different patient groups and all available surgical techniques.

Authors' contribution:

Conceptualization JS, SN, and SK; methodology JS, LB; check AS, DR; formal analysis AS, AW; investigation JS, SK; resources SN; data curation SN, LB; writing - rough preparation JS, SK, SN, LB; writing - review and editing AS, DR, AW; visualization JS, SN, SK; supervision AS**.** All authors have read and agreed with the published version of the manuscript.

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