

Neurolysis of the Median Nerve to the Carpal Canal by the Way Mini-Open: Review of 68 Files at Brazzaville University Hospital

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Abstract

Objective: To evaluate the results of neurolysis of the median nerve to the carpal tunnel in patients operated by the mini-open technique. **Methods:** The prospective study included 68 patients (16 men and 52 women) aged 43 to 80 years (mean age: 64 years). Patients were evaluated in pre- and post-operative by a questionnaire. The mini open technique with cutaneous approach to the heel of the hand following the 4th ray was performed in all patients under local, locoregional or general anesthesia. **Results:** The results were evaluated in 3 consultations, in the 1st, 3rd and 6th month. We obtained very good results in 54.4% of the cases (n = 37) and 30.9% (n = 21) of good results and 14.70% (n = 10) of poor results. No vascular, tendinous or neurological complications were noted. Two patients were reoperated for incomplete resection of the carpal ring ligament. The mini-open technique has achieved good results in all neurolysis despite the delay in surgical management. **Conclusion:** The results of the surgical treatment of the carpal tunnel syndrome depend on the precocity of the diagnosis and the surgical indication.

Keywords

Neurolysis, Median Nerve, Carpal Tunnel, Mini-Open Technique

1. Introduction

Described by Pierre Marie and Charles Foix [1], carpal tunnel syndrome is the

most common of the canal syndromes [2] [3] [4] [5]. It is characterized by compression of the median nerve at the wrist. This syndrome occurs in the aftermath of wrist trauma with or without associated bone lesions. It is often related to the increase of pressure in the carpal tunnel. The clinical picture is dominated by paresthesia (tingling, numbness, feeling of dead fingers) in the thumb, forefinger and middle finger. These are found in most cases during the night and morning. Carpal tunnel syndrome (CTS) can be diagnosed by most clinicians through symptomatology and clinical testing [6]. Although electromyogram (EMG) is recognized as the gold standard for diagnosing and evaluating the severity of compression [7], the false-negative rate is 10% to 20% [7] [8]. In addition, EMG does not provide information about the nerve itself and its environment, which may be important for etiological research. Magnetic resonance imaging (MRI) and ultrasound have emerged in recent years as alternative examinations. Ultrasound evaluation makes it possible, with very good reproducibility, to perform quantitative measurements of the median nerve, thus constituting an objective method of evaluation. Carpal tunnel infiltrations are often performed for therapeutic purposes [8]. The most common complication of these infiltrations is to prick the median nerve with or without intraneural injection [9]. This very painful accident can lead to a lasting or even definitive sensory deficit. Prevention is based on good positioning of the needle, but there is no consensus on this in the literature [10] [11]. Surgical treatment (neurolysis of the median nerve) occurs only after failure of medical treatment [12] [13]. The neurolysis of the median nerve in the wrist has undergone significant advances in recent years, ranging from open wrist surgery to endoscopic resection of the annular carp ligament and minimally invasive techniques. We report our experience with 68 cases of acute carpal tunnel syndrome operated at the Teaching University Hospital of Brazzaville.

The purpose of this work is to evaluate the results of the surgical treatment of this syndrome and to show the interest of the “mini-open” technique.

2. Material and Methods

The study, prospective, was conducted from January 2012 to January 2016 in the Orthopedics-Traumatology and Multipurpose Surgery departments of the University Hospital of Brazzaville. During this period, 68 patients and 110 hands were operated on by the mini-open technique. There were 16 men and 52 women (sex ratio: 0.31). We excluded patients who presented a pathology that could interfere in the analysis of our results (post-neoplastic vasculitis, renal failure, anatomical anomaly, cervicothoracic parade, ulnar nerve involvement, generalized neuropathy, disease inflammatory). We also excluded patients who could not be followed by the same examiner for material reasons of availability.

A preconceived data sheet made it possible to record all patients' pre- and post-operative data. On the anesthetic level, the patients benefited from either loco-regional anesthesia (axillary block); either a general anesthesia or local

anesthesia. Surgically, the procedure was identical for all patients. It boiled down to the mini-open technique. During the operative procedure, all the patients were placed in the supine position. The upper limb under the withers at the root of the arm was placed on a hand table. The operator was located on the thumb side for the right hand and on the 5th ray side for the left hand.

The entry of the carpal tunnel was made by a cutaneous incision at the heel of the palmar face of the hand following the 4th ray (**Figure 1**). After dissection of the subcutaneous plane, the palmar aponeurosis was exposed and then sectioned. Subsequently, the carpal ligament is exposed and then sectioned towards the wrist (**Figure 2**), thus allowing the neurolysis of the median nerve and the release of the tendons accompanying this nerve.

All patients were reviewed by the surgeon and an independent observer the day. Evaluation of the clinical outcome was performed using the classification proposed by Alnot and Frajman [14]. Preoperatively, the interview consisted of proposing the Levine and Katz questionnaire [15] which is divided into two parts: a functional score and a severity score. These two scores are rated 1 when



Figure 1. Landmark of the carpal tunnel.



Figure 2. Section of the ring ligament.

they are normal. A clinical examination was performed (loop test, Weber test, Kapandji test, Vainio test, Tinel test, Phalen test). An electromyogram was performed four times (after the procedure, and to a decline of 1 month, 3 months and 6 months).

The evaluation of the subjective result was obtained by a questionnaire completed by the patient, allowing a classification in four stages of the result: cured, relieved, unchanged and aggravated. An electromyogram of control was performed in patients to a decline of 1 month, 3 months and 6 months by the neurophysiologist of our institution. The result was evaluated taking into account the norms usually used by the neurophysiologist, but also according to the clinical context (for example the existence of diabetes) and the comparison with the values obtained on the contralateral upper limb when this measure was performed. A change of more than 10% of the measurements was considered pathological. Complications and functional results were analyzed. The functional results were divided into 3 groups: very good, good and bad.

The results of the operative procedure were considered very good, when the signs disappeared the day after the operation. They were designated good when these signs disappeared at least 1 month later. If clinical signs persisted after six months, they turned out to be bad.

The data was verified, numbered and coded. In terms of statistical data processing, the calculation of the distribution frequencies of the various parameters was carried out on the Microsoft Excel 2010 software. Subsequently, the data was transferred to SPSS software (Statistical Package for Social Sciences), version 17.0 for appropriate analyzes. Comparing more than two averages used Sokal's S test. The threshold of statistical significance was set at $p < 0.05$.

3. Results

1) Epidemiological aspects

The predominant side was reached in 74.6%. There were 58 patients (86%) with significant manual activity in their professional activities, or in their daily activities.

The distribution of patients by sex and age group is reported in **Table 1**.

More women (76.5% of cases, $p < 0.05$) underwent carpal tunnel syndrome. The majority of patients were aged 60 to 80 years ($n = 50$ or 73.5%); more than

Table 1. Distribution of patients by sex and age group.

Age range (years)	Men n (%)	Women n (%)	Total n (%)
41 - 50	0 (0)	5 (100)	5 (7.3)
51 - 60	0 (0)	13 (100)	13 (19.1)
61 - 70	11 (28.9)	27 (71.1)**	38 (55.9)*
71 - 80	5 (41.7)	7 (58.3)	12 (17.7)
Total	16 (23.5)	52 (76.5)**	68 (100)

* $p < 0.05$; ** $p < 0.05$.

half of the cases are in the 61 - 70 age group (55.9%, $p < 0.05$).

Forty-eight patients (70.6%) were referred from the Rheumatology Department. In total, 89.7% ($n = 61$) of these patients had at least 2 intra-canal infiltrations of corticosteroids.

Regarding the operability delay, 54 patients (79.4%) were operated more than one year after the onset of symptoms.

More women (76.5% of cases, $p < 0.02$) underwent carpal tunnel syndrome. The majority of patients were aged 60 to 80 years ($n = 50$ or 73.5%); more than half of the cases are in the 61 - 70 age group (55.9%, $p < 0.05$).

Forty-eight patients (70.6%) were referred from the Rheumatology Department. In total, 89.7% ($n = 61$) of these patients had at least 2 intra-canal infiltrations of corticosteroids.

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2) Type of anesthesia

At the anesthetic level, 82.3% ($n = 56$) of patients underwent locoregional anesthesia; 11.8% ($n = 8$) of general anesthesia and 5.9% ($n = 4$) of local anesthesia. The distribution of patients according to the laterality of neurolysis is shown in **Table 2**.

3) Complications

In operation, no neurological or vascular complications were noted.

Postoperative complications are reported in the table below. Postoperative complications are reported in **Table 3**.

Postoperative complications were mainly related to pain in the palm of the hand ($n = 31$, 45.6% of cases). These persisted for up to 3 months.

Table 2. Patient distribution by laterality.

Laterality	n	%
Right unilateral neurolysis	18	26.4
Left unilateral neurolysis	8	11.8
Bilateral neurolysis	42	61.8*
Total	68	100

* $p < 0.05$; Bilateral neurolysis was found in 61.8% of cases ($p < 0.05$), followed by right unilateral neurolysis ($n = 18$ or 26.4%).

Table 3. Post operative complications.

Postoperative complications	N
Suppuration	2
Pain of the palm	31
Paresthesia in the nerve territory	4
Hematoma	2
Algodystrophy	2

4) Functional results

The operative procedure produced very good results in 54.4% of patients (n = 37). The functionality of the hand was good in 30.9% of cases (n = 21) and poor in 10 patients (14.7% of cases). In sum, the results were satisfactory overall in 58 patients, *i.e.* 85.3% of cases.

5) Recurrences

With a follow-up of 6 months, no case of recurrence was observed. Nevertheless 2 patients were re-exploited for persistence of clinical signs due to incomplete resection of the reticular ligament. The open-air technique was adopted twice.

4. Discussion

1) Epidemiology

Carpal tunnel syndrome is the most common of the canal syndromes [3]. His treatment is primarily medical. Neurolysis only occurs after failure of medical treatment and in severe forms [3] [6] [8] [9]. This syndrome is the prerogative of the adult. In our series, they were patients over 60 years old. It is rare at the child with a noisy clinical picture [10].

We noted a female predominance: 76.5% of cases; $p < 0.02$. This observation was also made by other authors, including Yasser El Miedany [11] and Krom [12]. Surgical treatment mainly concerned the dominant right hand, although it noted a superiority of cases for the bilaterality of this attack in 42 patients (61.8% of cases). Given the financial difficulties of the patients, we opted for the neurolysis of both hands in one operating time for all the patients who presented a bilaterality of the nerve compression. This bilateral treatment from the outset was beneficial for patients who were totally relieved of their pain with a relatively low cost (on average: 80.000 CFA francs).

2) Type of anesthesia

Several anesthetic techniques are possible to allow the surgical release of the carpal tunnel in ambulatory. The practice of loco-regional anesthesia by the particular use of plexic and truncal blocks has managed to take care of these patients of advanced age without too much anesthetic risks. Locoregional anesthesia was performed in 82.3% of the cases in this study. However, the literature reports that when it is intravenous, it does not provide any postoperative analgesia [13] [14] and also presents risks of systemic toxicity of local anesthetics [15].

The long-term general anesthesia (11.8% of the cases in our series) is being progressively downgraded for hand surgery in favor of locoregional anesthesia by the use of plexic and truncular blocks. Acquiring the skills of our Anesthetists in this area improves the surgery of the upper limb in general and in particular, that of the hand. These blocks have very few complications compared to general anesthesia [16]. They are indicated for outpatient surgery and allow better management of postoperative pain [17] [18].

Local anesthesia was performed in 4 patients (5.9% of cases) for financial reasons. This type of anesthesia actually exposes the median nerve to direct lesions

by the needle penetrating blindly [13] [19].

3) Surgical technique

Carpal tunnel surgery is the most common type of hand surgery [20]. We have not departed from the rule. Several techniques are allowed to carry out neurolysis of the median nerve at the wrist, among others, the open wide surgery approaching the entire palmar surface of the wrist; endoscopic resection and mini-open technique.

The open-air technique has long been unanimous. It remains a safe technique. Many series of the literature do not report any neuro-vascular complications [2] [21] [22]. The endoscopic resection described by Chow in 1989 and finally developed by Agée in 1992 [23] is not yet feasible at the CHU Brazzaville. In our context, we chose an aesthetic and less delusional technique called «mini open» by making a skin incision at the heel of the hand following the direction of the 4th radius flexed. This marker makes it possible to perform retrograde resection of the annular ligament of the carp on its ulnar slope, thus making it possible to avoid lesioning the thenar branch of the median nerve [2]. The skin incision should be distal enough to locate the distal edge of the retinaculum [24]. The use of a pneumatic tourniquet placed on the arm provides good visibility of the surgical field and avoids certain errors such as incomplete resection of the carpal ligament.

4) Observations

Postoperatively, pain in the palm was found in 45.6% in the 3rd month. Dumontier [25] found 43% of pain in the palm at 3 months for an open technique and 38.5% for an endoscopic technique. Minimally invasive techniques seem credited with earlier functional recovery compared to conventional surgery [7]. In our series, we obtained 85.3% overall satisfactory results. Chamas [7] meanwhile, reports in Montpellier (France) 90% of satisfactory results. Bouchard [9] and Benquet [2] scored respectively 75% and 98.5% of satisfactory cases. This discrepancy may be justified in our context by the endemic phenomenon of delayed consultation and ignorance of hand surgery in general and particularly that of carpal tunnel syndrome in our country. However, our patients should be followed for longer to evaluate the results.

The speed of recovery after neurolysis depends on the stage of gravity and the terrain [7]. Indeed, when the nerve is compressed for several years, the expected results are random.

Regarding the re-interventions, we took 2 neurolysis. These re-interventions for unsatisfactory results are the prerogative of the fibrosis that adheres in the carpal tunnel as well as technical errors such as the incomplete section of the retinacular ligament [26]; observations justifying our two occasions.

Finally, we did not note recurrences of carpal tunnel syndrome although they are not exceptional [27].

5. Conclusions

Patients with carpal tunnel syndrome are becoming more numerous due to the

growing presence of the number of rheumatologists. Its screening and management are therefore fast despite the delay in consultation. Surgical treatment occurs only after failure of the proper medical treatment. The results of surgical treatment depend on the early diagnosis and the age of the disease.

The extension of carpal tunnel surgery in Brazzaville, Congo should therefore, no doubt, improve the management of patients by limiting the infiltration of corticosteroids. Indeed they cure some patients and temporarily relieve.

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