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Original article

## Arthroscopic treatment of work-related lateral epicondylitis – prognostic factors

*Facteurs pronostiques des épicondylalgies d'origine tendineuse traitées sous arthroscopie dans le cadre de pathologies à caractère professionnel*

J. Guillou<sup>a,\*</sup>, C. Pougès<sup>b</sup>, M. Limousin<sup>c</sup>, G. Strouck<sup>c</sup>, C. Fontaine<sup>d</sup>

<sup>a</sup> Service d'orthopédie B, centre hospitalier de Valenciennes, hôpital Jean-Bernard, avenue Desandrouin, 59322 Valenciennes, France

<sup>b</sup> Service de traumatologie, pôle de l'appareil locomoteur, hôpital Roger-Salengro, CHRU de Lille, rue du Professeur-Émile-Laine, 59037 Lille cedex, France

<sup>c</sup> Clinique chirurgicale de Saint-Omer, 71, rue Ambroise-Paré, 62575 Blendecques, France

<sup>d</sup> Service d'orthopédie B, pôle de l'Appareil locomoteur, hôpital Roger-Salengro, CHRU de Lille, rue du Professeur-Émile-Laine, 59037 Lille cedex, France



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### ABSTRACT

Lateral epicondylitis is a condition whose pathophysiology is poorly understood and whose optimal treatment divides physicians. Arthroscopy has proven its worth, with results similar to or better than open surgery. The purpose of this study was to look for prognostic factors for the outcomes of arthroscopic treatment of lateral epicondylitis. This was a retrospective, single-center study involving 39 cases (36 patients). Patients were split into two groups based on the Mayo Elbow Performance score (MEPS). A good result was defined as a score of 75 or better. The variables of interest were gender, age, body mass index, smoking habits, recognition as an occupational disease, duration of absence from work, cartilage involvement, presence of a capsular lesion and length of follow-up. The mean follow-up at review was 37.2 months ( $\pm 17.4$ ). The average MEPS was 77.44 ( $\pm 15.51$ ). Smoking was statistically related to a poor result ( $P = 0.0422$ ) and a longer follow-up was statistically related to a good result ( $P = 0.0396$ ). We identified two prognostic factors for lateral epicondylitis treated by arthroscopy. Smoking has a negative effect and ideally, patients should quit before surgical treatment. Time has a positive effect; thus patients should be informed that it will take several months or even years for their ailment to improve. Taking these factors into consideration will improve the functional outcomes of this surgery.

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### R É S U M É

L'épicondylalgie latérale d'origine tendineuse reste à ce jour une pathologie «mystérieuse» dont la physiopathologie et le traitement divisent les thérapeutes. L'arthroscopie a prouvé son intérêt, procurant des résultats similaires voire supérieurs aux techniques à ciel ouvert. Le but de cette étude était de chercher des facteurs pronostiques du résultat du traitement arthroscopique des épicondylalgies d'origine tendineuse. Il s'agissait d'une étude rétrospective, monocentrique portant sur 39 arthroscopies (36 patients). Les patients étaient séparés en 2 groupes en fonction du résultat du score de la Mayo Clinic adapté au coude. Un bon résultat était défini par un score supérieur ou égal à 75. Les données étudiées étaient le sexe, l'âge, l'indice de masse corporelle, le tabagisme, la reconnaissance en maladie professionnelle, la durée de l'arrêt de travail, l'atteinte cartilagineuse, l'existence d'une lésion capsulaire latérale et le recul. Le recul moyen lors de la révision était de 37,2 mois ( $\pm 17,4$ ). Le score de la Mayo Clinic moyen était de 77,44 ( $\pm 15,51$ ). Le tabagisme était lié statistiquement à un mauvais résultat ( $p=0,0422$ ) et un recul important était statistiquement lié à un bon résultat ( $p=0,0396$ ). Nous avons pu mettre en évidence deux facteurs pronostiques des épicondylalgies latérales traitées par arthroscopie. Le tabagisme a un effet

\* Corresponding author.

E-mail addresses: [johan.g@wanadoo.fr](mailto:johan.g@wanadoo.fr) (J. Guillou), [cecilepouges@hotmail.com](mailto:cecilepouges@hotmail.com) (C. Pougès), [marclimousin@gmail.com](mailto:marclimousin@gmail.com) (M. Limousin), [gstrouck@gmail.com](mailto:gstrouck@gmail.com) (G. Strouck), [christian.fontaine@chru-lille.fr](mailto:christian.fontaine@chru-lille.fr) (C. Fontaine).

délétère et idéalement, un sevrage doit être obtenu avant l'intervention. Le temps a un effet bénéfique et les patients doivent être informés que l'amélioration se fera sur plusieurs mois voire plusieurs années. La prise en compte de ces facteurs permettrait d'améliorer le résultat fonctionnel de cette chirurgie.

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## 1. Introduction

Tendon-related lateral epicondylitis affects 1% to 3% of the general population [1]. It impacts men and women in equal amounts who range between 35 and 60 years of age [2]. However, its pathophysiology is not well understood. Several authors agree on the fact that a degenerative process is at the root of the condition, not inflammation [2–5]. Treatment is better understood. The first-line treatment is medication combined with reducing the loads on the elbow and functional rehabilitation. This improves symptoms in 90% of cases [6]. Surgical treatment is indicated in the 10% of lateral epicondylitis cases that do not respond to well-conducted medical treatment for a minimum of 6 months. Arthroscopic surgery, which has been used during the past 15 years by multiple surgeons [7–10], leads to outcomes comparable to open surgery with less morbidity and faster return to work and sports. Studies have been performed to look for prognostic factors for lateral epicondylitis treated by an open procedure [11]. To our knowledge, a similar study has not been performed for arthroscopic treatment.

The aim of our study was to look for prognostic factors for tendon-related lateral epicondylitis treated arthroscopically.

## 2. Patients and methods

### 2.1. Patients

This was a single-center, retrospective study of all patients treated arthroscopically for tendon-related lateral epicondylitis between April 2009 and January 2014. Thirty-eight patients were included: 17 men, 21 women. Three patients underwent bilateral surgery during the inclusion period, resulting in 41 operated elbows.

### 2.2. Methods

The Mayo Elbow Performance score (MEPS) was used as the primary outcome measure. A good result was defined arbitrarily as a score of 75 or better. A lower score was associated with a poor result. The following data were correlated with the outcome measure: sex, age at the time of diagnosis, body mass index (BMI), current smoking habits, tobacco exposure in pack-years, Fagerstrom Test for Nicotine Dependence [12], declaration of an occupational disease, time away from work after the surgery, cartilage damage discovered during procedure, capsule involvement according to the Baker classification [13] (Table 1) and length of follow-up at the final review visit. These data were extracted from the surgical reports and the final follow-up visit.

### 2.3. Statistics

The quantitative variables were summarized by the mean, standard deviation, maximum and minimum values, while the qualitative variables were summarized by their counts and percentages. Comparisons between qualitative variables were performed using the Chi<sup>2</sup> test or Fisher's exact test when the

**Table 1**

Backer et al. [13] classification for lateral capsule lesions/damage.

Type	Description
I	Intact capsule
II	Linear capsular tear
III	Complete capsular tear

expected counts were less than 5. The normality of the distribution of the continuous variables were analyzed using the Shapiro–Wilk test. Comparisons between quantitative variables were performed using Student's *t*-test or the non-parametric Mann–Whitney test. The threshold for statistical significance was set at 5%.

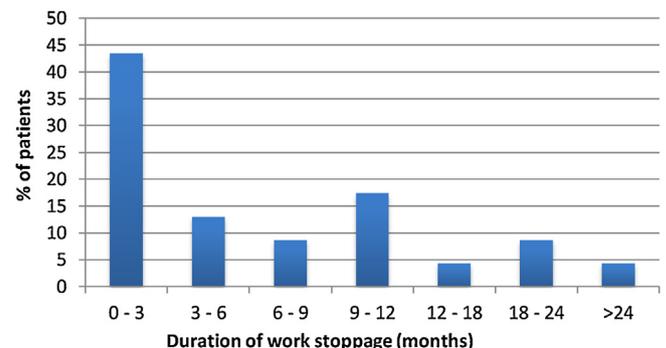
## 3. Results

Two patients were lost to follow-up out of the 38 included. This left 36 patients for analysis (16 men, 20 women). Three of these patients had undergone a bilateral procedure during the inclusion period, resulting in 39 cases for analysis. Patients were reviewed after an average follow-up of 37.2 months ( $\pm 17.4$ ; 16–74).

The mean age at the time of the lateral epicondylitis diagnosis was 43.7 years (34–53). Thirteen patients (36.1%) were smokers during the perioperative period. Most of the smokers were men (84.6%).

Among the 32 patients who were working at the time of the procedure, 27 had been classified as having an occupational disease (83.3%). Twelve patients (37.5%) had not returned to their occupation after the surgical treatment due to persistent disability or another medical condition. For the patients who returned to work, the mean duration of the postoperative work stoppage (Fig. 1) was 204.4 days ( $\pm 197.8$ ; 21–730). Before the surgery, the patients had been away from work for an average of 158.9 days ( $\pm 130.4$ ; 0–540).

The mean MEPS was 77.44 ( $\pm 15.51$ ; 50–100). Based on the above-defined criteria, 18 patients had a poor result (46.2%) and 21 patients had a good result (53.8%). We found no correlation between the outcome at the latest follow-up visit and age, BMI, occupational disease status, cartilage damage discovered at surgery, capsule involvement and duration of the postoperative work stoppage.



**Fig. 1.** Duration of postoperative work stoppage in months.

**Table 2**  
Distribution of the risk factors in the two groups of patients (good/poor result) and the significance level.

Data	“Poor result” group	“Good result” group	P-value
Sex: M/F	10/8	8/13	0.2755
Age (years)	42.9	44.3	0.4233
BMI	26.18	27.34	0.5170
Smokers (%)	55.6	23.8	0.0422
Amount (pack-years)	16.8	28	0.0801
Nicotine dependence			
Very low/Low/Moderate/High/Very high	2/2/2/2/0	2/0/2/1/0	0.7762
Occupational disease (%)	83.3	63.2	0.2691
Cartilage damage (%)	16.7	28.6	0.4642
Capsular lesions	4/5/3	6/10/4	1.000
Type I/II/III			
Postoperative work stoppage (days)	238.1	186.5	0.2703
Follow-up (months)	31.17	42.38	0.0396

M: male; F: female; BMI: body mass index.

In the subset of patients with a poor result, 55.6% were smokers, while only 23.8% of the patients with a good result were smokers. This difference was statistically significant ( $P = 0.0422$ ). A longer follow-up was also statistically related to a good result ( $P = 0.0396$ ). The mean follow-up as 31.17 months in the patients with a poor result and 42.38 in those with a good result (Table 2).

#### 4. Discussion

Surgical treatment of tendon-related lateral epicondylitis that does not respond to conservative treatment has been debated for many years. Arthroscopic techniques result in equal or better outcomes than open techniques, which allows for faster return to work and sports [14,15]. Long-term studies have shown these results are long-lasting [7]. Nevertheless, complete healing is rarely achieved and improvement takes several months to several years [10]. This time frame is comparable to the one obtained by conservative treatment in more than 90% of patients [15]. The surgical indication is tricky, and requires that clear, accurate and detailed information be given to patients beforehand.

Solheim et al. determined the prognostic factors for open surgical treatment of lateral epicondylitis [11]. Female gender, younger age, sudden pain occurrence, chronicity of the pain, and initial pain intensity all contributed to a poor prognosis. In our study of patients operated by arthroscopy, we found two factors related to the result: smoking and length of follow-up.

The length of follow-up is statistically related to a good result. This finding is consistent with published data [10] and can be explained by slow rate of postoperative improvement, which continues over several years.

Smoking is a factor for poor results. Over the past several years, the damaging effects of smoking on surgical outcomes have received increased attention. Smoking is responsible for local and general complications. It increases the risk of infection, vascular thrombosis, need for intensive care during the postoperative period and the length of hospital stay [16]. It lengthens the time for bone healing and increases the risk of nonunion [17]. In terms of tendon healing, studies have shown that smoking is correlated to an increase in the size of lesions in rotator cuff tears, with a negative effect of the amount of tobacco consumed [18]. Thus, it is crucial before initiating surgical treatment of lateral epicondylitis—and before any surgical procedure—to question patients about their smoking habits. If they are active smokers, the tobacco exposure in pack-years must be determined, the Fagerstrom Test for Nicotine Dependence [12] completed and the patient referred to a specialist for help with smoking cessation. The management of smoking in the surgery context is not optimal in France, as evidenced by the survey of the French Society of Orthopedic

Surgery & Traumatology (SOFcot) in 2012 [19]. Only 63% of surgeons questioned their patients about their smoking habits and only 5% evaluated nicotine dependence.

In our study, the mean postoperative work stoppage was 204 days (29.1 weeks), which is much longer than the 9.1 weeks in the Sauvage et al. study [14] and 2.2 weeks in the Baker et al. study [13]. This difference may in part be explained by the characteristics of our study cohort. The vast majority of our patients were laborers and their jobs required repetitive, high-force movements. Thus it was difficult for them to return to work quickly. The mean time away from work before the surgical procedure was 159 days (22.7 weeks). This long preoperative work stoppage is a sign of deconditioning and may also have contributed to the delayed return to work after the procedure.

We found no link between the outcome and the classification of an occupational disease. Bigorre et al. had shown that classifying the condition as an occupational disease negatively impacts the time needed for pain to diminish and strength to improve [20]. We did not find this difference in our study, likely because only a small number of patients did not have their condition classified as being work-related.

The intraoperative findings did not impact the outcome. We found a 23.1% rate of cartilage damage. This is lower than in other published studies. Sasaki et al. found that 65% of patients had capitulum cartilage damage and that 81% had radial head damage [21]. We may have underestimated the rate of chondral lesions and missed superficial lesions.

While arthroscopy is an appropriate technique for treating lateral epicondylitis, it is not free of risks. Some studies have reported complications in up to 14% of cases [22]. Open surgical techniques are still relevant because they allow for more extensive and complete debridement and offer the possibility of filling a defect with a muscle and/or fascia flap [23].

#### 5. Conclusion

Arthroscopic treatment of tendon-related lateral epicondylitis has improved the outcomes achieved by standard open techniques but has not solved all the problems associated with this condition, which is still not well understood. We need to better understand the pathophysiology and the progression of lateral epicondylitis, whether treated surgically or non-surgically. Our study emphasizes the precautions needed before operating on a patient with lateral epicondylitis that did not respond to conservative treatment. It is important to find out whether a patient currently smokes, how much he/she smokes and the intensity of their physical addiction to nicotine. If this information is obtained before the surgery, quitting will improve healing, recovery and the

functional outcome. Clear, detailed information must be provided to the patient about the typical postoperative course and the expected time frame for improvement. Lastly, the patient's care must not be limited to the perioperative period, as a professional reintegration program may be helpful. The integration of our findings into clinical practice should improve the care of patients with lateral epicondylitis.

#### Disclosure of interest

C.F.: clinical trials: co-investigator, non-primary researcher, study collaborator for Hospital & Healthcare Consulting Conferences: invited speaker by Allergan, IPSEN and MERZ.

The other authors declare that they have no competing interest.

#### Uncited reference

[6].

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