



# Tubular Microdiscectomy versus Conventional Surgery for Sciatica. A Comparative Prospective Enzyme Study

## *Microdiscectomia tubular versus cirurgia convencional para ciática. Estudo comparativo e prospectivo de enzimas*

Mandour Cherkaoui<sup>1</sup> Kasouati Jalal<sup>2</sup> Laaguili Jawad<sup>1</sup> Gazzaz Miloudi<sup>1</sup> El Mostarchid Brahim<sup>1</sup>

<sup>1</sup>Department of Neurosurgery, Military Hospital Mohammed V, Rabat, Morocco

<sup>2</sup>Epidemiology Laboratory and Clinical Research, Military Hospital Mohammed V, Rabat, Morocco

Address for correspondence Mandour Cherkaoui, Pr, Department of Neurosurgery, Military Hospital Mohammed V, Rabat, Morocco (e-mail: mandour1978@hotmail.com).

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### Abstract

**Objective** Muscle injury is inevitable during surgical exposure of the spine, and it is quantified by the release of creatine phosphokinase. The aim of the present study is to make a comparison between tubular microdiscectomy and conventional microdiscectomy by using the pre- and postoperative serum concentrations of creatine phosphokinase as an indicator of muscle injury.

**Materials and Methods** A total of 28 patients who underwent surgery for lumbar disc herniation were allocated into 2 groups: 12 patients (group A) operated by transflaval microdiscectomy, and 16 patients (group B) operated by tubular microdiscectomy. The serum concentration of total creatine phosphokinase was measured before surgery (creatin phosphokinase 1) and 1 day after surgery (creatin phosphokinase 2).

**Results** There were 12 women and 16 men; the mean age of the patients and the mean duration of the surgery were respectively 49.5 years and 56 minutes for group A, and 47.3 years and 60 minutes for group B. The *p*-values of creatine phosphokinase 1, creatine phosphokinase 2 and the creatine–phosphokinase ratio were respectively 0,34; 0,31; and 0,57 ( $p < 0.05$ ).

**Conclusion** The present study demonstrated that there was no significant difference between tubular microdiscectomy and conventional microdiscectomy according to the analysis of the levels of creatine phosphokinase.

### Palavras-chave

- ▶ enzima
- ▶ hérnia
- ▶ microdiscectomia
- ▶ ciática
- ▶ tubular

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**Resumo**

**Objetivo** A lesão muscular é inevitável durante a exposição cirúrgica da coluna vertebral, e é quantificada pela liberação de creatina fosfoquinase. O objetivo deste estudo é fazer uma comparação entre microdiscectomia tubular e microdiscectomia convencional usando creatina fosfoquinase sérica pré e pós-operatória como indicador de lesão muscular.

**Materiais e Métodos** Um total de 28 pacientes submetidos a cirurgia de hérnia de disco lombar foram alocados em 2 grupos: 12 pacientes (grupo A) operados por microdiscectomia transflaval, e 16 pacientes (grupo B) operados por microdiscectomia tubular. A concentração sérica de creatina fosfoquinase total foi medida antes da cirurgia (creatina fosfoquinase 1) e 1 dia após a cirurgia (creatina fosfoquinase 2).

**Resultados** Havia 12 mulheres e 16 homens; a média de idade dos pacientes e o tempo médio da cirurgia foram respectivamente de 49,5 anos e 56 minutos para o grupo A, e de 47,3 anos e 60 minutos para o grupo B. Os valores de  $p$  da creatina fosfoquinase 1, da creatina fosfoquinase 2, e a razão creatina-fosfoquinase foram, respectivamente, 0,34; 0,31; e 0,57 ( $p < 0,05$ ).

**Conclusão** Este estudo demonstrou que não houve diferença significativa entre microdiscectomia tubular e microdiscectomia convencional de acordo com a análise dos níveis de creatina fosfoquinase.

**Keywords**

- ▶ enzyme
- ▶ hernia
- ▶ microdiscectomy
- ▶ sciatica
- ▶ tubular

**Introduction**

Unilateral transflaval microdiscectomy is the gold standard surgical procedure for the treatment of patients with symptomatic lumbar disc herniation.<sup>1</sup> However, minimally-invasive procedures (such as tubular microdiscectomy) have gained increasing attention over the last decade, based on the concept of lower muscle damage.<sup>2</sup>

The level of serum creatine phosphokinase in the postoperative period has been considered a suitable parameter to estimate muscle injury in various spinal procedures;<sup>3</sup> for this reason, we used this marker to compare these two surgical techniques through a prospective study.

**Material and Methods****Patient Selection**

Between June 2019 and February 2020, 28 patients were surgically treated for sciatica due to lumbar disc herniation diagnosed by lumbar magnetic resonance imaging.

In total, 12 patients (group A) were operated by transflaval microdiscectomy, and 16 patients (group B) were operated by tubular microdiscectomy.

The inclusion criteria for the present study were no pathological history (no medical or surgical history or medication taken that may affect the levels of creatine phosphokinase, and a single-level disc herniation requiring a one-sided approach. All cases were operated by the same neurosurgeon.

**Surgical Procedure**

Surgery was performed under general anesthesia with the patient in the genupectoral position.

Group A: conventional microdiscectomy was performed after subperiosteal dissection of the ipsilateral paravertebral muscles. The herniated disc was removed by the unilateral transflaval approach with the aid of microscope magnification.

Group B: tubular microdiscectomy; the skin was retracted laterally, and the guide wire and sequential dilators were placed at the inferior aspect of the lamina under fluoroscopic control. The herniated portion of the disc was removed through the tubular retractor with microscopic magnification.

In both procedures, subtotal discectomy was intended, and bony removal was minimal, if necessary.

In the postoperative period, all patients were mobilized and discharged as soon as possible to resume their regular activities whenever possible.

Measurement of creatine phosphokinase: the serum concentration of total creatine phosphokinase was measured before surgery (creatine phosphokinase 1) and 1 day after surgery (creatine phosphokinase 2). The normal serum creatine phosphokinase concentration in our hospital is 24 IU/L to 195 IU/L.

**Results**

Demographics and surgical characteristics (– **Table 1**): a total 28 patients with lumbar disc-related sciatica were surgically treated by tubular microdiscectomy and unilateral transflaval microdiscectomy. The sample was composed of 12 women and 16 men, and there were 19 cases of hernia at the L4-L5 level, and 09 cases at the L5-S1 level.

The mean of age of the patients and the mean duration of the surgery were respectively 49.5 years and 56 minutes for group A, and 47.3 years and 60 minutes for group B.

**Table 1** Demographic data: age; gender; level and duration of the surgery

	Conventional microdiscectomy N = 12	Tubular microdiscectomy N = 16
Age (years)	60–28 (49.5)	63–27 (47.3)
Sex (female/ male:F/M)	03 F/09 M	09 F/07 M
Mean of duration of the surgery (minutes)	56	60
Disc hernia level and number of cases	L4-L5/L5-S1 06/06	L4-L5/L5-S1 13 / 03

Abbreviations: L4, fourth lumbar vertebra; L5, fifth lumbar vertebra; S1, first sacral vertebra.

The postoperative follow-up was simple for all patients, without complications, and with a similar clinical improvement regarding the two techniques.

Serum creatine phosphokinase (►**Table 2**): the mean concentration of creatine phosphokinase 1 was of 85.81 IU/L for tubular microdiscectomy, and of 105.66 IU/L for conventional microdiscectomy; the mean concentration of creatine phosphokinase 2 for tubular microdiscectomy and conventional microdiscectomy was of 289.06 IU/L and of 36025 IU/L respectively. The mean creatine–phosphokinase ratio (creatin phosphokinase 2/creatin phosphokinase 1) was of 4.01 for tubular microdiscectomy, and of 3.58 for conventional microdiscectomy.

The statistical analysis showed no significant difference between both procedures regarding creatine phosphokinase 1, creatine phosphokinase 2, and creatine phosphokinase ratio, because the statistical significance was set at the probability level of 0.05.

## Discussion

The most common cause of sciatica is a herniated lumbar disc; even though lumbar disc surgery is frequently performed, the preferred technique was until recently an important point of debate. Based on the hypothesis that “small is better,” efforts have been made to decrease tissue damage through smaller corridor approaches.<sup>2</sup>

The concept of minimally-invasive spine surgery comprises reduced muscle injury while achieving a good clinical outcome comparable with conventional open surgery.

The patients are expected to have less intense low-back pain, shorter hospitalization time, faster mobilization, and to recover.<sup>4</sup>

Several proteins have been widely used in medicine as markers of tissue damage, such as creatine phosphokinase, which is the most widely used blood parameter for the detection of striated muscle injury,<sup>5,6</sup> and it reaches a maximal concentration one day after surgery.<sup>7,8</sup>

A clear dose–response relationship between creatine phosphokinase and the extent of the surgical invasiveness has been shown,<sup>9</sup> as well as relationships with the pressure exerted by the retractors on the paraspinal musculature and the duration of this pressure (operating time).<sup>10</sup>

In the present prospective study, we performed a quantitative analysis of muscle injury measured by serum creatine phosphokinase. No significant differences were found regarding creatine phosphokinase 1, creatine phosphokinase 2, and the creatine–phosphokinase ratio between tubular microdiscectomy and conventional microdiscectomy.

This result is in line with other results published in the literature,<sup>11,12</sup> and we explain this non-significant difference by the fact that conventional microdiscectomy is performed through a small incision with lower muscle damage, especially in the case of single-level surgeries. Therefore, in our opinion, conventional unilateral transflaval microdiscectomy can be considered a minimally-invasive procedure as well.

The main limitation of the present study is the small sample, the lack of clinical evaluation in relation to serum creatine phosphokinase, and the lack of a postoperative evaluation of the functional outcome and pain intensity on the visual analog scale; therefore, the clinical significance of our results is not known.

## Conclusion

The release of creatine phosphokinase is an indicator of muscle injury during the surgical exposure of the disc hernia. The present study showed that tubular microdiscectomy is equally invasive as conventional microdiscectomy in terms of creatine phosphokinase for single-level surgeries, with similar surgical outcomes.

**Table 2** Serum concentrations of creatine phosphokinase

CPK	Conventional microdiscectomy N = 12	Tubular microdiscectomy N = 16	p-value (< 0.05)
Mean CPK 1	(200–57) 105.66 IU/L	(280–18) 85.81 IU/L	0.34 CPK1
Mean CPK 2	(843–123) 360.25 IU/L	(640–23) 289.06 IU/L	0.31 CPK2
Mean CPK ratio	3.58	4.01	0.57 CPK ratio

Abbreviations: CPK, creatine phosphokinase; IU/L, International unit per liter.

**Conflict of Interests**

The authors have no conflict of interests to declare.

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