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Original article

Lumbar spinal stenosis: Which predictive factors of favorable functional results after decompressive laminectomy?

La sténose lombaire : quels sont les facteurs prédictifs de résultats fonctionnels favorables après laminectomie ?

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ABSTRACT

Background and purpose. – Long-term results of decompressive laminectomy in degenerative lumbar stenosis have been studied in only six prospective studies. The objective of our study was to evaluate the functional outcome at long term of patients after decompressive laminectomy in lumbar stenosis and to determine predictive factors of favorable outcome.
Methods. – A prospective cohort data were collected by an independent observer five years after decompressive laminectomy for degenerative lumbar stenosis. The endpoint was the assessment of the Beaujon score for functional evaluation. The result was considered as favorable if the Beaujon score increased by at last five points between the preoperative stage and at follow-up examination. Logistic regression was then performed with univariate and multivariate analysis to reveal predictive factors of good long-term outcome ($P \leq 0.05$).
Results. – The preoperative characteristic of our population ($n = 98$) was a mean age of 67.3 ± 8.8 years, a low comorbidity (mean Charlson score $= 2.8 \pm 1.5$), overweight status (BMI $= 29.4 \pm 6.3$) and the mean Beaujon score was 9.3 ± 3.1. At five years after surgery, the mean Beaujon score became 14.1 ± 4.2. Favorable functional outcome concerned 45.9% of our series. The predictive factor of favorable outcome identified in the univariate analysis the neurological deficit ($P = 0.05$) and in the multivariate analysis the low comorbidity ($P = 0.01$).
Conclusion. – The long-term results of surgical treatment of lumbar spinal stenosis were moderate with an improved outcome in 49.5% of cases in our study. The only independent factor to a favorable outcome was the low comorbidity.

Mots clés :
Sténose du canal rachidien lombaire
Laminectomie
Résultat fonctionnel à long terme
Facteur prédictif

RÉSUMÉ

Contexte et objectif. – Les résultats à long terme de la décompression en cas de sténose lombaire dégénérative ont été étudiés dans seulement six études prospectives. L'objectif de notre étude était d'évaluer les résultats fonctionnels à long terme de patients opérés d'une sténose lombaire et de déterminer les facteurs prédictifs d'un résultat favorable.
Méthodes. – Les données postopératoires ont été recueillies de façon prospective par un observateur indépendant, cinq ans après la décompression. Le résultat a été considéré comme favorable si le score de Beaujon avait augmenté de cinq points au minimum entre le stade préopératoire et le terme du suivi. Une régression logistique a été réalisée afin de révéler des facteurs prédictifs de bon résultat à long terme ($p \leq 0{,}05$).
Résultats. – La caractéristique de notre population ($n = 98$) en préopératoire était un âge moyen de $67{,}3 \pm 8{,}8$ ans, une comorbidité faible (score de Charlson $= 2{,}8 \pm 1{,}5$), une surcharge pondérale

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(IMC = 29,4 ± 6,3). Le score moyen de Beaujon était de 9,3 ± 3,1 en préopératoire et de 14,1 ± 4,2 à cinq ans. Le résultat fonctionnel était favorable dans 45,9 %. Les facteurs prédictifs d'évolution favorable identifiés était le déficit neurologique ($p = 0,05$) dans l'étude univariée et la faible comorbidité ($p = 0,01$) en multivarié.

Conclusion. – Les résultats à long terme du traitement chirurgical des sténoses lombaires sont modérés avec une amélioration des résultats dans 49,5 % des cas. Le seul facteur indépendant prédictif d'une évolution favorable était la comorbidité faible.

1. Introduction

Degenerative lumbar spinal stenosis is a very common compressive pathology to the spinal canal, the neuronal foramina and the nerve roots responsible for frequent surgical indication in patients past 65 years (Katz et al., 1999). Although numerous studies have been published, controversy still exists regarding the indication of surgical treatment (Athiviraham et al., 2011; Gibson and Waddell, 2005). During the last years, studies with high evidence have been published and report that the majority of the patients benefit from surgery both in reducing pain and improving function, faster and in larger extend than the conservative treatment approach (Atlas et al., 2005; Malmivaara et al., 2007; Weinstein et al., 2008). Indeed, surgery is required after the failure of conservative care (Jonsson et al., 1998). The literature shows heterogeneous results after the surgical treatment of spinal stenosis. In the short term, several prospective studies reported a functional benefit in 60 to 79% of cases (Amundsen et al., 2000; Gelalis et al., 2010; Iguchi et al., 2000; Javid and Hadar, 1998; Jonsson et al., 1998; Katz et al., 1999; Thornes et al., 2011). Few studies have examined long-term functional outcome of surgical treatment of degenerative lumbar spinal stenosis with a high variability of results (Amundsen et al., 2000; Atlas et al., 2005; Iguchi et al., 2000; Javid and Hadar, 1998; Jonsson et al., 1998; Yamashita et al., 2003). A meta-analysis conducted by Turner et al. reported a good outcome in a large range 26 to 100% (Turner et al., 1992). Moreover, predictive factors influencing long-term results are contradictory and poorly studied in the literature (Aalto et al., 2006; Atlas et al., 2005; Iguchi et al., 2000; Jonsson et al., 1998; Turner et al., 1992; Yamashita et al., 2003). The study of these criteria is a key issue to determine the best timing to propose the surgical management.

The objectives of this study were to evaluate in the long term setting the functional outcome after the surgery of lumbar spinal stenosis, and to determine predictive factors to a favorable outcome.

2. Patients and methods

2.1. Study design

This study involved a series of consecutive patients operated on for a degenerative lumbar stenosis. The goals were to analyze the functional outcome at five years and determine predictive factors of favourable outcome.

2.2. Population

The criteria for inclusion were:

- the lumbar spinal stenosis was defined by the presence of intermittent neurogenic claudication, or signs of chronic neurogenic compression and associated with the presence of a central or lateral compression of the cauda equina or spinal nerves on imaging;
- patients treated surgically of a degenerative lumbar spinal stenosis between January 2003 and December 2004 in the Department of Neurosurgery at Rouen University Hospital;
- control consultation in out-clinic patient in 2009 to prospectively evaluate the functional status and quality of life, by an independent physician.

The criteria of exclusion were:

- associated pathology responsible for functional disability (cervical myelopathy, peripheral neuropathy, cerebrovascular accident, peripheral arterial disease stage 2–4 according to the Leriche and Fontaine, inflammatory rheumatoid disease);
- a previous history of lumbar canal decompression.

Among the 143 eligible patients, 11 were excluded and 34 lost to follow-up. In total, 98 patients were included.

2.3. Endpoint

The functional outcome was graded according to the Beaujon score (Lassale et al., 1988). Questions covered the following topics: walking distance (three points), low back pain (three points), radicular pain at rest (three points) and radicular pain during motion (two points), neurological deficit (four points), analgesics (two points) and daily life (three points). The maximum possible score of 20 points is given to a subject with no functional impact.

2.4. Surgical treatment

Patients were placed in prone position. The median incision was centered on the spinous processes. Laminectomy was performed in all cases by a senior surgeon using a Kerrisson punch. The lateral spinal canal decompression was performed thanks to a partial arthrectomy associated to small foraminotomy to free the nerve roots. Zygapophysal facet joints were preserved up to avoid a secondary destabilization. The hypertrophied ligamentum flavum was resected too using a Kerrisson punch. Concomitant discectomy was performed in patients with an associated herniated disc. One patient underwent internal fixation combined with a laminectomy but no fusion had been achieved. The average time of surgery was 90 ± 11 minutes and the intraoperative blood loss averaged 115 mL ± 23 mL.

Two days after surgery patient were allowed to walk without orthesis with a sufficient analgesia. Rehabilitation performed by a physiotherapist consisted in isometric tonification of the lower limbs and trunk. It was started in the ward. At home (about five days), active physical therapy was also prescribed.

2.5. Variables

Pre- and peroperative variables were collected retrospectively through the study of the clinical records of each patient.

The variables identified preoperatively were biometric information (sex, age, BMI), walking distance, dominant symptom pain,