

Technical Note & Surgical Technique

Preservation of paraspinal muscle after transmuscular approach using a tubular retractor for lumbar decompression surgery



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ABSTRACT

Objective: The objective of this study was to determine the outcome and the rate of paraspinal muscle preservation in patients who received decompression surgery with the transmuscular approach using a tubular retractor as compared to the conventional subperiosteal approach using a Caspar speculum.

Materials and methods: Forty-one patients with lumbar disc herniation or lumbar spinal stenosis who received decompression surgery were reviewed from medical records. Tubular retractors (METRx MD large tube, 22 mm) were used in 19 patients (TR group), while a Caspar speculum was used in 22 patients (CS group). Clinical outcomes were assessed by JOA score. MR images were used to assessment of paraspinal muscle preservation after operation.

Results: The preoperative JOA score in the TR group and the CS group was similar. The JOA score in both groups improved 1 year after operation. The preservation of paraspinal muscle was significantly greater in the TR group than the CS group ($103 \pm 10\%$ and $89 \pm 13\%$, respectively; $P < 0.05$).

Conclusion: The preservation of paraspinal muscle was greater in patients with a tubular retractor than with the subperiosteal approach. Detaching the paraspinal muscle from the lamina may cause partial denervation of the paraspinal muscle and muscle atrophy. Therefore, the transmuscular approach using a tubular retractor may be a less invasive approach for the preservation of paraspinal muscle.

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1. Introduction

The tubular retractor was introduced for minimally invasive lumbar decompression surgery. It can be used with the paramedian transmuscular approach instead of the conventional midline subperiosteal approach which may cause denervation of the paraspinal muscle [1]. Therefore, using a tubular retractor may be beneficial for preservation of paraspinal muscle.

The objective of this study was to determine the outcome and the amount of paraspinal muscle preserved in patients who received decompression surgery with the transmuscular approach using a tubular retractor as compared to the conventional subperiosteal approach using a Caspar speculum.

2. Material and methods

2.1. Patients, data collection and statistical analyses

Consecutive forty-one patients with lumbar disc herniation (LDH) or lumbar spinal stenosis (LSS) who received unilateral microscopic decompression surgery except patients who received previous lumbar surgery or lumbar fusion surgery between 2008 and 2011 were included in this study, and their medical records were reviewed retrospectively. Tubular retractors (METRx MD large tube, 22 mm, Medtronic Sofamor Danek USA, Inc. TN, USA) were used in 19 patients (TR group) (Fig. 1 and Fig.2), and Caspar speculums with counter retractor (Aesculap Implant System, Inc. PA, USA) were used in the remaining 22 patients (CS group). It was not a random selection. Operators chose which procedure was used on each patient.

The evaluation factors for comparison were the following; full score (29 points) of the Japanese Orthopaedic Surgery Association score for low back pain (JOA score), low back pain components in the subjective symptoms section of the JOA score (JOA-L: 3 points, no low back pain; 2 points, occasional mild pain; 1 point, continuous mild pain or occasional severe pain; 0 points, continuous severe pain) [2].

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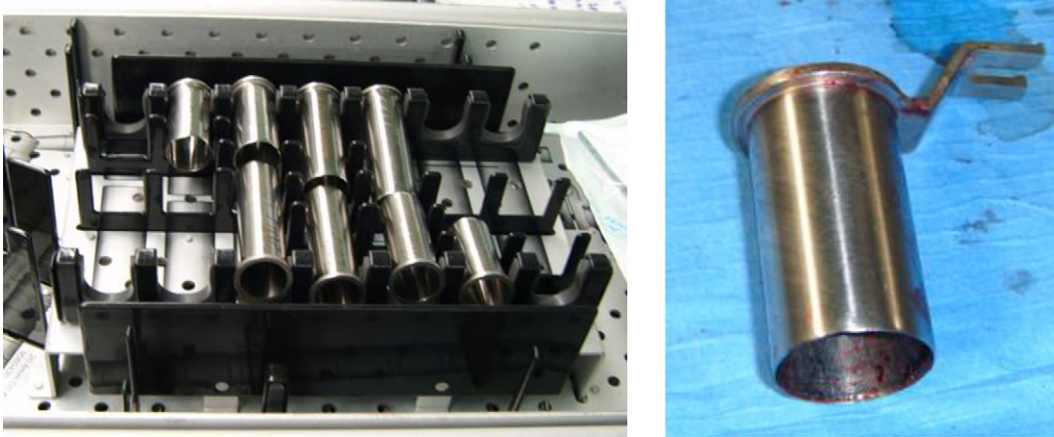


Fig. 1. Tubular retractors (METRx MD large tube, 22 mm).

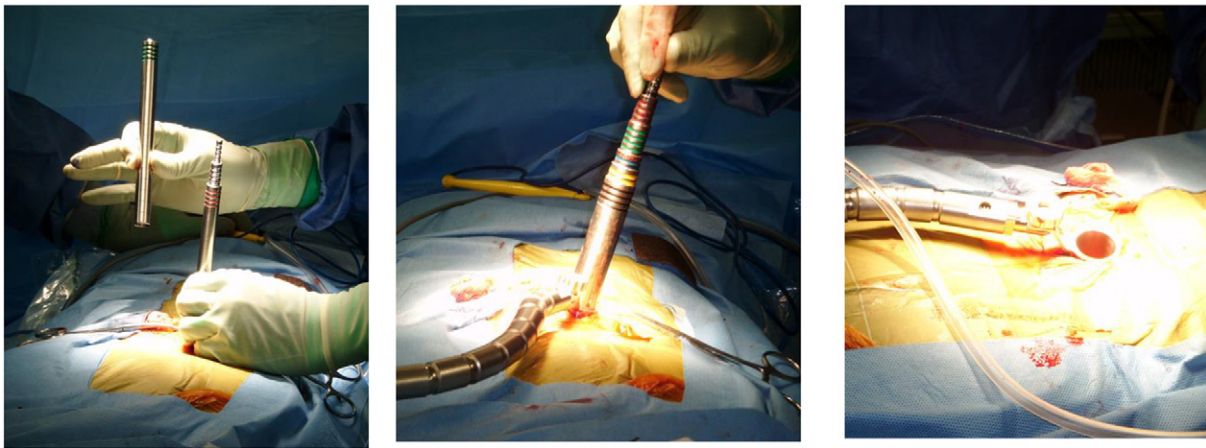


Fig. 2. Dilators were used for making a transmuscle corridor, then a tubular retractor was placed in the correct position for unilateral decompression surgery.

In 11 patients in the TR group and 11 patients in the CS group who had MR images taken >2 months after operation, the cross-sectional area of the paraspinal muscles (multifidus) was measured on T1-weighted axial MR images using the ImageJ software (the Windows version of NIH Image) (Fig. 3). The axial images were obtained from a single slice of the decompressed intervertebral level. In cases of two-level decompression, the caudal level was chosen for the evaluation of muscle atrophy. The rate of muscle preservation was calculated using

the following formula: Muscle preservation = (total affected side area/total contralateral side area) \times 100 [3].

The length of stay, intraoperative blood loss, operation time were not mentioned in this study.

In the statistical analysis, the *t*-test was performed with Excel (Microsoft Corporation, Redmond, WA, USA), and the chi square test was performed using SPSS (SPSS, Chicago, IL, USA). A *P*-value of <0.05 was considered to indicate significance.

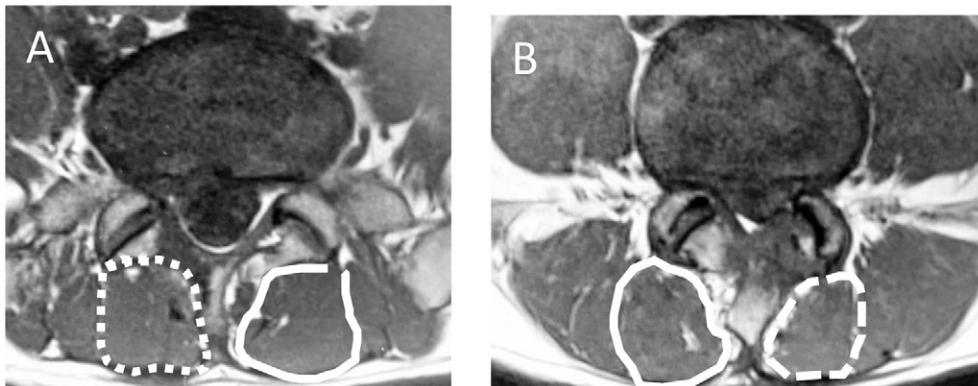


Fig. 3. A: A T1-weighted axial MR image of the TR group. B: A T1-weighted axial MR image of the CS group. The dotted line indicates the multifidus muscle on the affected side. The solid line indicates the multifidus muscle on the contralateral side.

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