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Original Research

Prioritized cervical or lumbar surgery for coexisting cervical and lumbar stenosis: Prognostic analysis of 222 case

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HIGHLIGHTS

- Selective treatment of coexisting spinal diseases.
- Most of the patients 1 preferred cervical spondylotic surgery better than the priority of lumbar surgery.
- This is a retrospective analysis of a large sample of 222 patients.
- Significant statistical significance of large sample.

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ABSTRACT

Background context: Single-stage surgery is usually applied to improving the symptoms of coexisting cervical and lumbar stenosis. In most cases, patients' willingness, surgery affordability, surgical trauma, surgical complications and patients' tolerance to surgery all limit the application of single-stage surgery. For patients who cannot receive single-stage surgery, we hope that we can find out by weighing up merits and flaws of the two surgical sites in order to make decision of prioritize one of the two surgery, so as to bring more benefits to the patients.

Objective: To confirm which one of prioritized cervical surgery and prioritized lumbar surgery has a better effect in alleviating the symptoms of patients with coexisting cervical and lumbar stenosis.

Study design: A retrospective analysis and a cohort study for 15 years.

Patient sample: The information of 222 patients who were diagnosed with coexisting cervical and lumbar stenosis over the past 15 years was collected, including 144 patients who underwent prioritized cervical surgery and 78 prioritized lumbar surgery, thereafter the changes in the patients' postoperative neurological functions were evaluated.

Outcome measures: Primary outcome variables are the clinical diagnosis event and the event of surgical site positioning. Secondary variables are the event of postoperative function changes and the symptom improvement event.

Methods: The information about 222 patients with coexisting cervical and lumbar stenosis who had a follow-up of more than 1 year during January 2000 and December 2014 was collected. The effects of prioritized staged cervical and lumbar surgeries on the prognosis for the above-mentioned patients were respectively evaluated via relevant evaluation indexes.

Results: The follow-up time was 18–156 months (58.0 ± 36.5). The lumbar reoperation rate after prioritized cervical surgery was lower than the cervical reoperation rate after prioritized lumbar surgery (22.91% < 57.69%) ($P < 0.01$). The JOA score and Nurick grade significantly improved ($P < 0.01$) and the ODI score improved ($P < 0.05$) after prioritized cervical surgery. No obvious improvement in the JOA score and Nurick grade ($P > 0.05$) was shown but the ODI score markedly improved ($P < 0.01$) after prioritized lumbar surgery.

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Conclusions: For patients with coexisting cervical and lumbar stenosis, prioritized cervical surgery is safe and effective and is superior to prioritized lumbar surgery on the improvement of cervical and lumbar symptoms, the postoperative recovery of limb function and the rate of reoperation on another site.
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1. Introduction

As the society flourishes with each passing day, people are striving to keep up the pace of the society, and with the population ageing rapidly, the incidence of spinal diseases increases [1–3]. In our clinical practice, more and more coexisting multiple spinal diseases emerge, in addition to isolated single partial spine disease. According to statistics, the incidence of coexisting cervical and lumbar stenosis is 5%–25% [4–7].

Coexisting cervical and lumbar stenosis was first reported by Teng in 1964 [8]. Dagi et al. [6] were the first to define coexisting cervical and lumbar stenosis as tandem spinal stenosis (TSS) [4]. TSS of any segment may occur, but since thoracic spine has a small range of motion and relatively high stability, the problem on cervical and lumbar lesions appears to be particularly prominent [9]. The lumbar stenosis coexisting with any other stenosis could present as parallel nerve root symptoms caused by the injuries of the peripheral nerves independently dominated by cervical and lumbar spinal nerves, in addition to tandem cervical and lumbar symptoms. We could find it quite complex of the manifestations of clinically coexisting cervical and lumbar stenosis. Most patients with coexisting upper and lower motor neuron injury have the symptoms including intermittent claudication, progressive gait disturbances, the hypoaesthesia and muscle weakness of extremities, etc. [4,10,11], accompanied by peripheral nerve symptoms. All the symptoms above interfere with one another, further easily cause misdiagnosis and missed diagnosis. In that case, the application of MRI of the whole spine is conducive to acquiring a more accurate diagnosis. For the spinal canal stenosis which location has been clear and shows obvious symptoms, surgical intervention is recommended [12]. In the early stage of the disease, the symptoms and signs relatively match the imaging findings. However, as the disease progresses, the symptoms and signs and the imaging findings no longer fit so well, which makes it difficult to locate the segment responsible for the disease and complicates surgical decision-making, including decompression at priority level and the selection of surgical approach [1,4,13–15]. Recent studies showed that for patients with concurrent symptoms who were diagnosed definitely, single-stage surgery was satisfactory in safety and postoperative improvement rate [16]. However, for reasons of patients' willingness, surgical trauma, surgical complications and general condition tolerance, most patients tend to select surgery at a single site at first, and then decide whether to receive surgery at another site or not based on improvement in symptoms and their experience. Therefore, how to select the segment responsible for the disease for decompression in a more accurate way is a problem we concern a lot.

Therefore, in order for a better understanding the relationship between the intervention of the disease and natural disease progression, a retrospective analysis of the cases followed up over the past 15 years was made to comprehend the effect of priority of the surgical site on the prognosis for patients and summarize and make statistics to guide future protocols so as to minimize patients' injuries by iatrogenic mistakes.

2. Methods and materials

2.1. Case selection

The Institutional Review Board of Hospital approved this retrospective study. Retrospection of patients' images and medical records required no agreement or informed consent from the patients. Inclusion criteria: 1) Coexisting cervical and lumbar stenosis based on preoperative imaging diagnosis, with Kang grade of cervical stenosis $\geq$2 and Schizas grade of lumbar stenosis $\geq$ B as shown in MR images. 2) No improvement in symptoms after preoperative regular non-surgical treatment for 3–6 months. 3) Obvious and aggravating preoperative subjective symptoms of one site at least, affecting daily life and work. 4) Parallel nerve root symptoms of both upper and lower extremities. 5) Preoperative intermittent neurogenic claudication, progressive gait disturbances, decreased myodynamia etc. Patients with the following conditions are excluded from the study: 1) any psychological or mental disease; 2) thoracic spinal stenosis; 3) Parkinson's disease, lateral sclerosis, cerebral palsy or any other cranial nerve lesion; 4) ankylosing spondylitis, rheumatoid arthritis or any other immune system disease; 5) previous cervical, thoracic or lumbar injury, infection or tumor; 6) cobb angle for scoliosis>15°; 7) spinal cord or nervous system disease, diabetes or congenital developmental malformation.

2.2. Surgical approach

Patients undergoing prioritized cervical surgery: 18 underwent posterior cervical hemiexpansive laminoplasty, 9 simple laminectomy, 81ACDF and 36 ACCF; patients undergoing prioritized lumbar surgery: 24 underwent PLIF and 54 PLF.

2.3. Evaluation

All the patients who underwent cervical or lumbar surgery were given general anesthesia, and the surgeries of the two sites of the same patient were respectively performed by the one same experienced surgeon. Preoperative and postoperative clinical outcomes were evaluated by a surgeon who's not aware of the operations the patients had. For cervical indexes, Nurick grading system [17] and JOA scoring system [18] were applied. As for the lumbar region, patient satisfaction index [19] and ODI [20] were utilized. JOA score improvement rate (%) = (postoperative JOA score - preoperative JOA score)/(17 - preoperative JOA score) × 100% [21]. The follow-up time includes 3, 6 and 12 months after surgery.

2.4. Statistics

Demographic and clinical characteristic variables were analyzed. Upper and lower limits of normal values (mean ±2SD) were recorded. Pearson's correlations, paired and independent samples t-tests and SPASS 17.0 were used for the statistics and analysis of variables. $P < 0.05$ means there is a statistically significant difference.

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