

Analysis of the Clinical Efficacy of Anterior Cervical Decompression and Posterior Cervical Decompression with Internal Fixation in the Treatment of Cervical Spinal Cord Injury

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Abstract: This paper aims to explore the appropriate treatment plan for cervical spinal cord injury. Retrospective analysis of the treatment of 30 patients with cervical spinal cord injury in our hospital was carried out, with 15 patients treated with anterior cervical decompression and internal fixation as the study group, and 15 patients treated with posterior cervical decompression and internal fixation as the control group. There was no significant difference in postoperative and follow-up Japanese Orthopaedic Association (JOA) scores, and the incidence of postoperative complications between the two groups. The blood loss and the improvement of cervical lordosis in the study group were better than those in the control group. For patients with cervical spinal cord injury, both anterior and posterior decompression and internal fixation can achieve good clinical results, but anterior decompression and internal fixation can better maintain cervical lordosis and reduce blood loss.

Keywords: Cervical spinal cord injury; Decompression and internal fixation; Anterior approach; Posterior approach

Online publication: September 22, 2023

1. Introduction

Cervical spinal cord injury is mostly caused by asymptomatic cervical spondylosis, under the condition of external force, the degenerated frontal intervertebral disc tissue, posterior longitudinal ligament, even bone fragments, posterior laminar bone tissue, and ligamentum flavum protrude into the patient's vertebral body. Inside the canal, it compresses on the spinal cord and the blood vessels related to spinal cord. Common clinical symptoms are numbness of extremities, decreased muscle strength, defecation dysfunction, and significantly reduced quality of life^[1]. The morbidity rate is high, and surgical intervention is required in time. The surgical plan for the treatment of cervical spondylosis mainly includes anterior and posterior decompression and internal fixation. Anterior surgery can remove intervertebral disc tissue and vertebral bone tissue, relieve spinal cord compression, and combined with internal fixation to achieve therapeutic effect. Posterior surgery

uses hemilaminectomy or total laminectomy + screw-rod system fixation, and single-door and double-door laminoplasty are the main methods^[2,3]. For simple cervical spinal cord injury, there are few articles comparing the anterior and posterior approaches. In this study, 30 patients with cervical spinal cord injury were selected as the sample to compare and analyze the clinical effects of anterior and posterior decompression and internal fixation.

2. Materials and methods

2.1. General information

Retrospective analysis of the treatment of 30 patients with cervical spinal cord injury in our hospital was done from January 2018 to December 2021. 15 patients were treated with anterior cervical decompression and internal fixation as the study group, and 15 patients were treated with posterior cervical decompression and internal fixation as the control group. Criteria for excluding cases from the anterior cervical study group were patients with spinal tumors, other types of cervical spondylosis, and patients who could not tolerate surgical treatment, patients with cervical spinal cord injury who underwent single-space anterior cervical discectomy and fusion (ACDF) decompression, patients with severe cervical trauma combined with paraplegia, and patients who underwent combined cervical spine surgery before and after. Inclusion criteria included patients with 2 or more segmental spaces through the anterior cervical approach. For posterior cervical approach, the inclusion criteria were patients with cervical posterior approach equal to or greater than 2 segments who underwent single-door and full-laminar decompression screw-rod fixation. Exclusion criteria were combined cervical 1 and 2 fracture fixation patients, conservative treatment patients, combined cervical spine surgery before and after surgery. Both groups had a clear history of trauma. The average age of the 15 patients in the study group was 52.1 ± 9.3 years old, 8 cases underwent subtotal resection of the vertebral body + titanium cage plate fixation, there were 2 cases of intervertebral space decompression + zero-profile fusion cage fixation, and 5 cases of space decompression + titanium cage and cage fixation. The lesion segment is C2–C7. The average age of the 15 patients in the control group was 55.4 ± 9.4 years old, among which 8 cases were fixed with single door + support plate (6 cases from C3–C6, 1 case from C4–C7, 1 case from C3–C7), 7 cases were fixed with compression + posterior screw-rod system (5 cases in C3–C7, 1 case in C3–C6, 1 case in C4–C7).

2.2. Evaluation criteria

The evaluation criteria of the two groups, such as Japanese Orthopaedic Association (JOA) score, cervical lordosis, intraoperative blood loss, hospitalization time, and other surgical related indicators, and the incidence of complications were compared.

2.3. Statistical methods

SPSS23.0 software was used to analyze the research data, measurement data ($\bar{x} \pm s$) was *t* test, count data % was χ^2 test, $P < 0.05$ indicated statistical difference.

3. Results

3.1. Comparison of JOA score and cervical lordosis

Based on **Table 1**, there was no significant difference in JOA score between the two groups before operation, after operation, and at the last follow-up ($P > 0.05$). The degree of postoperative and final cervical lordosis in the study group was higher than that in the control group ($P < 0.05$).

Table 1. Comparison of JOA score and cervical lordosis between the two groups ($\bar{x}\pm s$)

Group	JOA score			Cervical lordosis		
	Preoperative	3 months after surgery	Last follow-up	Preoperative	3 months after surgery	Last follow-up
Study group ($n = 15$)	9.44±1.25	14.19±2.57	14.53±1.84	11.62±2.75	17.94±1.53	16.88±1.72
Control group ($n = 15$)	9.48±1.19	14.41±2.55	14.73±1.89	12.48±2.77	15.11±0.86	12.89±1.15
<i>t</i> value	0.090	0.235	0.294	0.853	6.245	7.469
<i>P</i> value	0.929	0.816	0.771	0.401	0.000	0.000

3.2. Comparison of intraoperative blood loss and hospital stay

The intraoperative blood loss and hospital stay in the study group were lower than those in the control group ($P < 0.05$), as shown in **Table 2**.

Table 2. Comparison of intraoperative blood loss and hospital stay between the two groups ($\bar{x}\pm s$)

Group	Intraoperative blood loss (ml)	Length of hospital stay (d)
Study group ($n = 15$)	143.35±5.38	14.26±1.77
Control group ($n = 15$)	181.64±9.25	17.29±2.28
<i>t</i> value	13.858	4.066
<i>P</i> value	0.000	0.000

3.3. Comparing the incidence of complications

The two groups were followed-up after operation. In the study group, there was 1 case of hoarseness and 1 case of coughing, accounting for 13.3%. Both groups showed significant improvement after 6 months. In the control group, there was 1 case of neck pain, which was relieved after follow-up, and no surgical intervention was required again. C5 nerve root palsy occurred in 1 case and recovered 3 months after operation. The ratio was 13.3%, and there was no significant difference between the two groups ($P > 0.05$).

4. Discussion

The cervical spinal cord injuries refer to cervical spinal cord injuries stemmed from cervical spondylosis in middle-aged and elderly patients. Therefore, the number of diseased segments in patients is large, and the degree of spinal cord compression varies [4]. It is necessary to relieve the compression through surgical treatment as soon as possible to improve related symptoms [5]. At present, the main surgical options include anterior and posterior decompression and internal fixation. The surgical procedure of posterior decompression and internal fixation is relatively simple, which is familiar to most doctors. After compression, the spinal cord can also be moved backward to increase the distance between the spinal cord and the intervertebral disc herniation, and other compressive objects, and the effect of indirect decompression can be achieved with internal fixation [6]. Posterior decompression and internal fixation surgery does not require removal of the anterior tissue that compresses the spinal cord, and the risk of surgery is relatively low. Its main drawback is that complete decompression cannot be achieved, and complications such as C5 nerve root palsy and cervical spine instability are prone to occur when the cervical spinal cord moves backward. Anterior decompression and internal fixation surgery can remove the herniated intervertebral disc, thickened posterior longitudinal ligament, and hyperosteoecy at the posterior edge of the vertebral body, thereby achieving the effect of direct

decompression and promoting the recovery of cervical spinal cord function. At the same time, the slightly overextended position of the patient in the anterior approach and the use of intervertebral space distractors during the operation can partially restore the height and physiological curvature of the intervertebral space, expand the spinal canal space, and strengthen the decompression effect^[7,8]. For the decompression of the spinal cord, either direct decompression without wheels or indirect decompression through the posterior approach can achieve ideal clinical results. In this study, a total of 30 patients underwent anterior and posterior decompression + internal fixation, and the improvement of JOA score was higher than that of the previous study. There was a significant improvement before operation, and there was no statistically significant difference between the two groups. Therefore, a good grasp of surgical indications and a sound surgical plan can benefit patients with cervical spinal cord injury.

The postoperative follow-up of the cervical spine physiological curvature of the study group was better than that of the control group, suggesting that anterior surgery can improve the cervical spine physiological curvature and body function recovery effect. This could be due to the fact that the posterior muscle structure is more damaged in the posterior operation mode. After total laminectomy or open-door laminoplasty, the original mechanical stability of the cervical spine is disrupted, and the physiological curvature of the cervical spine is lost during the follow-up process. During the anterior surgery, the supine position with the back of the neck raised and slightly extended, according to the preoperative imaging examination, the main vertebral body subtotal resection + titanium plate fixation, or the hybrid intervertebral fusion and internal fixation scheme was adopted. The application of the intervertebral spacer can restore part of the height of the intervertebral space and lordosis, implanting a titanium cage for fixation, and strengthening the fixation with the front steel plate, thereby maintaining the normal curvature and height of the cervical spine, and then improving the overall effect of cervical spine function recovery^[9,10]. It can significantly improve and maintain the normal physiological curvature of the cervical spine, and enhance the decompression effect.

Moreover, the blood loss and hospitalization time of the study group were also less than those of the control group. The possible reason is that the posterior incision of the cervical spine is longer, and too much muscle tissue needs to be stripped. At the same time, the internal environment and blood coagulation mechanism of trauma patients are changed in an emergency state, while the muscle tissue in the posterior exposure is less, which may lead to more bleeding than the anterior approach. However, the number of samples in this group of patients is small, and follow-up studies with a large sample size are needed to confirm these findings.

In summary, both anterior and posterior decompression and internal fixation can achieve good clinical results in patients with cervical spinal cord injury. Anterior decompression and internal fixation can maintain the curvature of the cervical spine, with less blood loss and hospitalization, which can be applied in clinical practice. The number of patients included in this study is small, and the mechanism of anterior and posterior decompression and internal fixation in patients with cervical spinal cord injury still needs further analysis and research.

Disclosure statement

The author declares no conflicts of interest.

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