

Analysis of factors influencing the development of paravertebral ossification in the distant future after artificial disc replacement for cervical disc herniation

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Abstract. To investigate and analyze the factors that contribute to the occurrence of disc ossification in patients in the distant future when artificial disc replacement surgery is applied in the treatment of patients with cervical disc herniation, to explore the clinical characteristics and to provide a research basis for subsequent treatment work. **METHODS:** This study was conducted from September 2021 to June 2022, and a total of 504 patients with cervical disc herniation admitted by the medical staff in our hospital during this period were used as study subjects. After admission, all patients were treated with artificial disc replacement surgery and were followed up by the medical staff for one year after completion of treatment. Patients were divided into a control group (n=252) who recovered well without disc ossification and an experimental group (n=252) who developed disc ossification after treatment. The medical staff analyzed the individual conditions of the two groups to determine the differences between the groups and to analyze the risk factors for the development of disc ossification in the patients. **RESULTS:** The patients' imaging results were evaluated, and significant differences were found between the experimental group of patients and the control group ($p < 0.05$). **CONCLUSION:** Patients with cervical disc herniation are at risk of distant disc ossification after artificial disc replacement surgery. To improve the clinical efficacy of the patients, the treatment plan needs to be adjusted according to the individual conditions of the patients, thereby safeguarding the efficacy of the patients.

Keywords: cervical disc herniation; clinical analysis; artificial disc replacement; paravertebral ossification.

1. Introduction

With the continuous improvement of people's living standards and the popularity of various smart devices in recent years, people have gradually become inseparable from electronic products in their daily lives, whether they live or work, and low-headed people have become one of the most common phenomena in our society [1]. In low-headed people, people tend to maintain a single posture for a long time, and most people's posture is extremely poor, which will lead to slowing or fatigue of the local microcirculation in the function of the patient's body and lead to the emergence of cervical spine disease. With the emergence of various new mobile phone apps in recent years, the incidence of cervical disc herniation in the clinical trend has increased significantly, and the age of onset of patients is also decreasing and getting younger. Cervical and lumbar spondylosis is a series of signs and symptoms caused by degenerative lesions of the cervical and lumbar intervertebral discs and secondary degenerative lesions of the intervertebral joints leading to damage to the nerves, spinal cord and blood vessels and is very common in older age groups, with a higher incidence in older patients for physical reasons [2]. However, due to the increased pressure of life, the long-term sedentary nature of young people and the use of incorrect posture to play with mobile phones, the age of onset has been on a younger trend in recent years. Generally, treatment can alleviate and improve

the clinical symptoms of patients, but if the cause of the disease is not eliminated, then the chances of recurrence will be high. Body posture [3] is important for self-protection and improved self-awareness. With the continuous development of the times in recent years, the trend of aging in China is increasing, and the incidence of cervical spine disease in the clinic is increasing, with neurological cervical spine disease as the main type of morbidity. In clinical practice, the treatment plan is often adjusted accordingly to the individual condition of the patient [4]. Therefore, in this study, we investigated and analyzed the factors that contribute to long-term disc ossification when artificial disc replacement surgery is used in the treatment of patients with cervical disc herniation to explore the clinical features and to provide a basis for subsequent treatment.

2. General information

The study was set up with a total of 504 patients with cervical disc herniation admitted to our hospital during the period from September 2021 to June 2022. After admission, all patients were treated with artificial disc replacement surgery and were followed up by the medical staff for one year after completion of treatment. Patients were divided into a control group (n=252), who recovered well without disc ossification, and an experimental group (n=252), who developed disc ossification after treatment. In the control group, the gender ratio was (male:female=133:119), and the age range was 48-74 (66.52±7.14) years. In the experimental group, the male to female sex ratio was (M: F=125:127), and the age range was 47-75 (68.68±8.03) years.

The general information of the patients in this study was recorded by our statistician and entered into an Excel sheet, and the patient information was confirmed to be credible and comparable before being submitted to the ethics committee for review. The general information of the patients was comparable and not significantly different ($P > 0.05$).

3. Methods

The range of motion (ROM) and curvature were measured using the Cobb angle method on cervical hyperextension-hyperflexion radiographs for overall cervical ROM and surgical segment ROM and the Cobb angle method on neutral cervical radiographs for surgical segment curvature.

The artificial disc angle is measured between the upper and lower end plates of the artificial disc on a neutral lateral cervical radiograph.

The prosthetic coverage ratio was measured on a neutral lateral cervical radiograph as the ratio of the upper and lower endplates of the artificial disc to the upper and lower endplates of the vertebral body as follows: prosthetic coverage ratio = (upper endplate sagittal diameter + lower endplate sagittal diameter) / (upper endplate sagittal diameter + lower endplate sagittal diameter of the vertebral body).

4. Statistical methods

The statistical software chosen for the data was SPSS 21.00 for Windows to confirm the T and X² test values for the two groups of patients, to determine the correlation between the test values and the p values, and thus to assess the indicators in the results of this study and to confirm whether there were significant differences between the two groups.

5. Results

The patients' imaging results were evaluated, and it was found that there were significant differences between the indexes of the patients in the experimental group and the control group ($P < 0.05$).

Table 1. Comparison of imaging findings between the two groups (score, $\bar{x} \pm s$)

Group	N	Post-operative surgical segmental ROM	Postoperative cervical ROM	Surgical segmental curvature
Experimental group	252	9.15±2.12	47.0±1.43	1.14±0.56
Control group	252	12.55±2.94	56.93±2.25	2.59±1.21
T		8.1774	9.1654	10.0514
P		0.0000	0.0000	0.0000

6. Discussion

Cervical disc herniation is a relatively common and frequent clinical condition with symptoms varying from patient to patient. Patients with milder forms of the condition [5] are prone to numbness and dizziness in the limbs, and in severe cases, they may suffer from a lack of blood supply to the brain, which can have a significant impact on their recovery and daily life. The incidence of cervical disc herniation is over 50% of all cervical discs, usually in the 4th-7th cervical vertebrae [6], and occurs mainly in middle-aged people under 50 years of age and over 25 years of age, while the spinal type occurs mainly in middle-aged and older people over 40 years of age and is a very dangerous type of disc herniation that compresses the spinal cord and causes edema or inflammation. The sympathetic type is caused by irritation of the sympathetic nerve endings in the adjacent cervical spine due to lesions in the cervical spine, and the vertebral artery type is caused by compression of the vertebral artery or vascular abnormalities. [7]

Clinical studies have shown that artificial disc replacement has been the gold standard in the clinical management of patients with degenerative cervical spine disease and has a positive effect in improving clinical outcomes and reducing adverse effects in patients. Paravertebral ossification is a common complication of artificial disc replacement and refers to abnormal bone tissue growth in the intervertebral space of the operated segment and adjacent to the intervertebral space, including heterotopic ossification and vertebral redundancy. Researchers have found that high levels of paravertebral ossification can lead to compromised mobility of the patient's operative segment, leading to a reduction in the design benefits of the artificial disc, which can have a detrimental effect on the patient's treatment. Recent studies have found that the clinical incidence of paravertebral ossification after artificial disc replacement surgery is approximately 10% to 30%. The patient's condition needs to be analysed. In the evaluation of the patient's imaging results after surgery, the researchers concluded that the patient's surgical stage and postsurgical cervical ROM are important factors in the evaluation of artificial disc replacement. [8]

Patients with cervical disc herniation are at risk of distant disc ossification following artificial disc replacement surgery. To improve the clinical outcome of the patient, the treatment plan needs to be adapted to the individual patient's condition, thereby safeguarding the patient's outcome.

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