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Complications of Cervical Disc Prosthesis Dislocation: A Retrospective Clinical Study

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ABSTRACT

Objective: The most commonly used method for the surgical treatment of cervical disc herniation (CDH) is anterior disc excision with Smith-Robinson's approach. Following the excision of pathological disc space, disc prosthesis is placed if a continuation of dynamic movement in the disc space is desired and a cervical cage is placed for the purpose of fusion. Cervical disc prosthesis seems superior to cervical cage; however, it is not suitable for every patient and can cause serious complications. Our study include data of patients who developed complications following the dislocation of cervical prosthesis and who were referred to our clinic. The aim of our study is to emphasize that the cervical prosthesis is not suitable for every patient and may cause serious complications.

Methods: Data of the patients who were operated due to the diagnosis of CDH in other centers and underwent revision surgery for the development of cervical prosthesis dislocation between 2013 and 2020 were collected.

Results: This study analysed the data of four male and three female patients. The median value of patient ages was 42 (28-53). Neck pain and swallowing difficulty were the most common reasons for admission to the clinic. Dislocation was found to develop after trauma in three patients. Anterior and posterior dislocations were found to develop in five and two patients, respectively. Seven patients underwent revision surgery. All these patients were found to have dislocations at the C5-6 level.

Conclusion: The prosthesis to be placed in the surgical treatment of CDH should be determined based on the patient. Detailed information should be provided to the patient for whom cervical disc prosthesis is to be placed and prosthesis of the most appropriate size for disc space should be placed properly.

Keywords: Cervical disc herniation, cervical prosthesis, prosthesis dislocation

INTRODUCTION

Cervical disc herniation (CDH) is a disease that affects the spinal cord and spinal nerve roots and it most commonly arises at ≥30 years age. It may result in radiculopathy or myelopathy. Anterior cervical discectomy was first described by Smith and Robinson in 1955 and Cloward in 1958. Since then, the anterior approach has become the preferred and frequently used modality for the treatment of CDH (1). The necessity of implant placement in the intervertebral space has been discussed with the widespread use of the anterior approach. Following long-lasting research, it has been found that the implant placed in the intervertebral space provides expansion in the neural foramina and, therefore, it should be used (1-3). Today, research on this subject has mostly focused

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on which implant is more suitable for patients. The placement of cervical prosthesis that allows dynamic movements in the disc space or cervical cage that provides cervical spine fusion. There are studies reporting that cervical prosthesis allows minimal dynamic movement and prevents the development of the adjacent segment disease. Furthermore, cervical prosthesis has several advantages, such as early return to work, no requirement for neck collar and better clinical outcomes, compared to other implants (4,5). However, in literature, the number of studies reporting the complications caused by the use of cervical prostheses is limited. This study aimed to investigate and present data of patients who developed complications following the dislocation of cervical prosthesis and who were referred to our clinic.

METHODS

This study presented the data of seven patients who were operated for cervical prosthesis dislocation in the Neurosurgery Clinic of Hatay Mustafa Kemal University Tayfur Ata Sökmen Medical Faculty Hospital between 2013 and 2020. After the patients' data were evaluated retrospectively, they were found suitable for the purpose of the present study and were included in this study. Preoperative neurological examination information, radiological examinations and operative reports of all patients included in the study were reviewed. Patients who met the study criteria were included in the study. Written consent was obtained from the participants for their records to be included in the study. All data were collected in accordance with the principles of Declaration of Helsinki. This retrospective study was approved by the Non-Interventional Clinical Research Ethics Committee of Hatay Mustafa Kemal University (approval number: 17, date: 03/09/2020).

Statistical Analysis

Basic complementary statistical methods were applied using Microsoft Office Excel 2010. Results were expressed as mean for average or percentage (%) for frequency.

RESULTS

Data of four male and three female patients who were operated due to diagnosis of CDH in other centres and underwent surgery for the placement of a cervical prosthesis in the disc space were analysed (Figure 1). The median value of patients age was 42 (minimum: 28, maximum: 53). Neck pain and swallowing difficulty were the most common reasons for admission in the clinic. Cervical prosthesis dislocation was found to occur after trauma in three patients. One patient developed posterior dislocation and associated spinal shock after trauma, while one patient developed C6 vertebral fracture. Five and two patients developed anterior and posterior dislocations, respectively. Analysis of the early post-operative examinations showed that the prosthesis was closer to the anterior in the sagittal plane in three patients and it was not in the midline in the coronal plane in one patient (Figure 2). All the seven patients underwent revision surgery. After the dislocated cervical prosthesis was removed, cervical cage was placed in six patients and corpectomy cage was placed in one patient, since there was a vertebral fracture (Figure 3A). Dislocation was found to be at the C5-6 cervical disc level in all patients. One patient with anterior dislocation died due to mediastinitis induced by oesophageal perforation (Figure 3B) and another patient with posterior dislocation died due to spinal cord injury. One patient developed cerebrospinal fluid (CSF) fistula (Figure 3C) and one patient had C6 corpus fracture. Dislocation was found to occur in

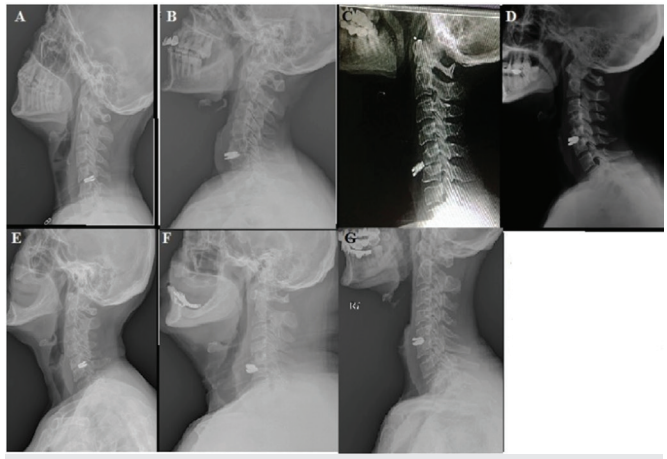

Figure 1. (A-G) Lateral cervical radiographic examination of patients

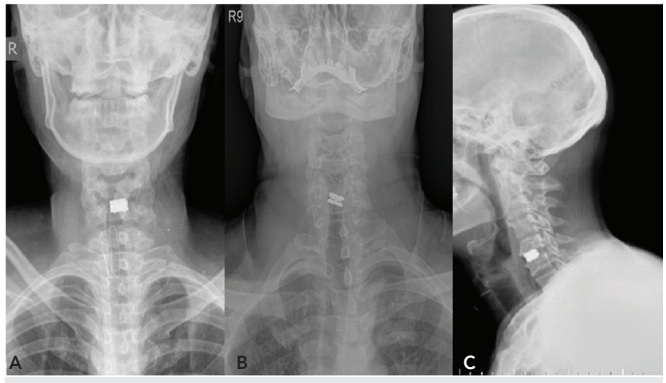

Figure 2. Prosthesis not located in the midline in the coronal plane on anteroposterior radiograph (A), prosthesis migrated anteriorly (B) and early image of post-operative cervical prosthesis is not located in the midline in the sagittal plane (C)

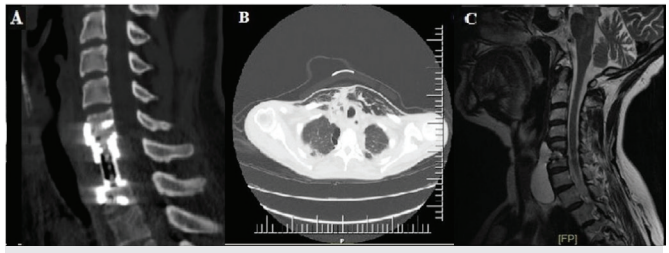

Figure 3. Sagittal computed tomography (CT) image following the development of C6 corpectomy (A), axial thoracic CT showing the development of mediastinitis (B), sagittal T2-weighted magnetic resonance imaging image showing the development of cerebrospinal fluid fistula (C)

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the first post-operative year in five patients and occurred after the first post-operative year in two patients with a history of trauma. Three patients were found to undergo two-level CDH operation and cervical cage was used at the other level.

DISCUSSION

Regardless of the aetiology, pain can be relieved by conservative treatment in patients suffering from neck pain. However, as in the present study, a treatment approach that requires a comprehensive differential diagnosis and adherence to evidence-based instructions are imperative in the presence of conditions accompanying neck pain, such as swallowing difficulty, acute paraparesis and a history of spinal surgery. This is because the implants used today are designed to allow motion at the joints and can dislocate in cases of forceful motion or trauma (5).

The decision on the most appropriate surgical technique for cervical disc diseases has been a controversial issue for a long time. Anterior discectomy is a surgical technique successfully performed for the treatment of radicular and myelopathic cervical disease that causes nerve root and spinal cord compression. Decompression, stabilisation, or both procedures can be performed in the surgical treatment. Following decompression, spinal fusion is performed in the disc space (1). A revision surgery is required for the treatment of complications and adjacent segment disease that develop after the fusion surgery. In light of these data, there have been rapid advances in disc prosthesis implantation following decompression in the cervical region. Cervical disc prosthesis seems to be a more advantageous procedure, since there is no limitation of movement at the level where the prosthesis is placed and due to the fact that complications resulting from fusion surgery are eliminated (4,5).

Surgery for placement of cervical disc prosthesis is also called cervical arthroplasty. Recent studies have focused on cervical arthroplasty. In a study by Yalcin et al. (6) on cervical arthroplasty indications, the prosthesis was reported to be contraindicated for patients with rheumatological diseases, advanced spondylosis, multiple cervical disc pathologies, severe degeneration of cervical lordosis and a history of trauma. In the present study, analysis of the preoperative examinations of the patients showed that three patients underwent two-level CDH surgery. Furthermore, preoperative severe osteodegenerative findings were detected in two elderly patients (aged 51 and 53 years). It was observed that cervical lordosis flattened and that kyphosis started to develop in three patients.

Researches about cervical prosthesis complication increase in literature, as in our study, whether biomechanical studies are sufficient or not has become a matter of debate. Brooke et al. (7) reported that dislocation may also occur in the use of cervical prostheses with carbon fibre technology. Subsequent studies have mostly focused on the need for prostheses with better adhesion to the endplates. Therefore, screwed cervical prostheses have been investigated, but it was found that they increase the operative time and may damage the vertebral bodies. While prostheses that fit between the endplates have been reported to be sufficient in several studies, some studies have shown that porous-coated implants prevent fusion development and mobilisation of prosthesis in the endplates (5,7,8). The prostheses removed in the present study were observed to be implants with a sharp tip attached to the endplates and they were procured from four different medical brands. Furthermore, the physicians who performed the first operations were different.

Post-traumatic dislocations of the cervical prosthesis were observed in three patients included in this study. Cervical prostheses may be dislocated in cases of exposure to excessive vibration or high-energy traumas, since they do not support fusion between the vertebrae (9). Yang et al. (10) demonstrated that the prosthesis was loosened and malposed in the disc space after trauma in some patients. In a case report by Niu et al. (11), the prosthesis dislocated after strain was shown to cause serious complications in a sea sports athlete. Therefore, not only spinal indications, but the patient's profession, or exercises or sports that the patient does should be questioned in cases where surgical treatment for CDH is planned.

In the present study, anterior dislocation was found to develop in five patients. The most common complication accompanying neck pain was observed to be swallowing difficulty in these patients. One patient developed oesophageal injury and mediastinitis. After posterior migration, one patient developed CSF fistula and another patient developed spinal shock. Posterior migration was observed to be more dangerous and was found to have a more mortal course, while serious complications were observed in anterior dislocation.

The present study mostly focused on the dislocation of cervical prosthesis, which is an early complication of cervical prosthesis. Mehren et al. (12) found that fusion developed in the long-term follow-up of patients who underwent cervical arthroplasty and that although it prevented adjacent segment disease pathology in the early period, there was no difference in the later period when compared to the fusion. Our study focuses on early complications caused by cervical prostheses. There is a need for longer-term studies that include larger patient groups.

Study Limitations

This study was not conducted in a clinic where cervical prosthesis operation is conducted and only complicated cases were treated. Therefore, this study does not provide sufficient information about the incidence of complications or other effects.

CONCLUSION

Cervical disc prosthesis seems superior to cervical cage placement; however, it is not suitable for every patient, as it may lead to serious complications. Detailed information should be provided to the patient for whom cervical disc prosthesis is to be placed and prosthesis of the most appropriate size for disc space should be placed properly.

Ethics Committee Approval: This retrospective study was approved by the Non-Interventional Clinical Research Ethics Committee of Hatay Mustafa Kemal University (approval number: 17, date: 03/09/2020).

Informed Consent: Written consent was obtained from the participants for their records to be included in the study. All data were collected in accordance with the principles of Declaration of Helsinki.

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