



# Effect of intervertebral disc height on the range of motion and clinical outcomes after single-level implantation of Prestige LP cervical disc prosthesis



Huibo Li, Jigang Lou, Hao Liu\*, Beiyu Wang

Department of Orthopedics, West China Hospital, Sichuan University, 37 Guoxue Road, Chengdu, Sichuan 610041, China

## ARTICLE INFO

### Article history:

Received 13 March 2016  
Received in revised form 16 May 2016  
Accepted 13 June 2016  
Available online 14 June 2016

### Keywords:

Artificial cervical disc replacement  
Disc height  
Range of motion  
Clinical outcomes

## ABSTRACT

**Objectives:** Cervical total disc replacement (TDR) is an emerging technology. Cervical arthroplasty theoretically reduces the risk of adjacent level disc degeneration and segmental instability. However, the factors that influence postoperative range of motion (ROM) and clinical outcomes are not fully understood. The aim of our study was to evaluate the effect of intervertebral disc height on the range of motion and clinical outcomes after single-level implantation of Prestige LP cervical disc prosthesis

**Methods:** A total of 160 patients with single-level Prestige LP cervical disc prosthesis were evaluated. Preoperative and postoperative disc height and ROM were measured from lateral and flexion-extension radiographs by the CANVAS, and the clinical outcomes were evaluated by Japanese Orthopaedic Association (JOA) and Neck Disability Index (NDI).

**Results:** Patients with less than 4 mm of preoperative disc height had a mean 1.4° increase in flexion-extension ROM after cervical arthroplasty, whereas patients with greater than 4 mm of preoperative disc height had no change in flexion-extension ROM. Patients with a 6–8 mm of postoperative disc height had significantly higher postoperative flexion-extension ROM ( $11.0^\circ \pm 2.9$ ) than those with less than 6 mm of postoperative disc height ( $8.7^\circ \pm 3.1$ ,  $p = 0.01$ ). Patients with greater than 8 mm of postoperative disc height have significantly lower postoperative flexion-extension ROM (mean,  $8.9^\circ \pm 3.2$ ) than those with 6–8 mm of postoperative disc height ( $p = 0.03$ ). No significant difference was found between patients with <6 mm of postoperative disc height and patients with >8 mm of postoperative disc height ( $p = 0.12$ ). The postoperative JOA and NDI both have significant difference compared with preoperation ( $p < 0.05$ ). No correlation could be found between disc height and the postoperative ROM, JOA or NDI.

**Conclusion:** Patients with less than 4 mm of preoperative intervertebral disc height have a larger ROM after cervical arthroplasty. A 6–8 mm of postoperative intervertebral disc height is the optimum range to maximize ROM. However, the optimal range did not translate into better clinical outcomes.

© 2016 Elsevier B.V. All rights reserved.

## 1. Introduction

Anterior cervical discectomy and fusion (ACDF) is the most common surgical treatment for the management of cervical spondylosis [1]. Most researchers consider that functional reconstruction is the most desirable process after anterior cervical decompression, but the effects of ACDF in adjacent segment degeneration cannot be ignored [2–4].

Cervical arthroplasty has been implemented worldwide as an alternative to anterior cervical discectomy and fusion (ACDF) for degenerative disc disease (DDD). The main purpose of cervical

arthroplasty is to maintain physiological kinematics at the index and adjacent levels. Cervical arthroplasty theoretically reduces the risk of adjacent level disc degeneration and segmental instability that may be seen after a cervical fusion [5–7].

The primary purpose of this study was to analyze the effect of intervertebral disc height on postoperative motion and clinical outcomes after single-level implantation of Prestige LP cervical disc prosthesis. We also assessed the effect of disc height on clinical outcomes. Finally, we examined the postoperative disc height and its influence on postoperative ROM.

\* Corresponding author.

E-mail address: [liuhao6304@163.com](mailto:liuhao6304@163.com) (H. Liu).

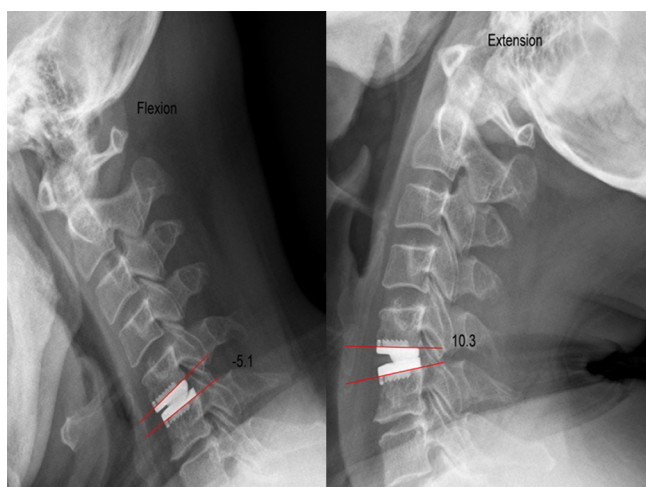


Fig. 1. The range of motion at the surgical level.

## 2. Materials and methods

### 2.1. Patients

A total of 160 patients (82 women and 78 men) with cervical degenerative disc disease (62 cases with radiculopathy, 48 cases with myelopathy, and 50 cases with both radiculopathy and myelopathy) underwent single-level cervical arthroplasty in this study. All of them had a single-level TDR performed in the same institution by the same surgeon (H.L.) between July 2010 and July 2015. The mean age was 46.6 years, and the mean follow-up time was 30 months.

### 2.2. Inclusion and exclusion criteria

Only those patients that received a single-level TDR were analyzed. The exclusion criteria of total cervical disc replacement were that patients with great loss of disc height (height loss exceeding 50% compared with adjacent asymptomatic discs), instability or loss of ROM ( $<3^\circ$ ) at lesion segment were excluded. Other exclusion criteria included patients with severe facet degeneration, osteoporosis, active infection, metabolic bone disease, and neoplasia. Static and dynamic standing radiographic images of upright neutral, flexion, and extension cervical spine were obtained.

### 2.3. Measurements

Radiographic evaluation included static and dynamic flexion–extension lateral images in standing position. Preoperative and latest postoperative neutral lateral, flexion extension, and lateral bending X-rays were collected. Preoperative and postoperative disc height and ROM were measured from lateral and flexion–extension radiographs by the Canvas 11 (ACD Systems International Inc, Seattle, WA, and Victoria, British Columbia, Canada) and the clinical outcomes were evaluated by Japanese Orthopaedic Association (JOA) and Neck Disability Index (NDI). Pre- and postoperative disc height and sagittal ROM from terminal flexion to terminal extension were measured (Fig. 1).

### 2.4. Statistics

SPSS 19.0 software (SPSS Inc., Chicago, IL) was used for statistical analysis. Mean values and standard deviations were determined for each parameter. For comparisons between preoperative and postoperative segmental ROM, JOA and NDI, the paired *t*-test was

**Table 1**  
Patient characteristic of Prestige LP cervical disc prosthesis.

Characteristic	Prestige LP
mean age in years (range)	46.6 (28–68)
Gender (n = 160)	
male	78
female	82
mean follow-up duration in months (range)	30 ± 5.5 (24–36)
Patterns (n = 160)	
radiculopathy	62
myelopathy	48
mixed	50

**Table 2**  
Radiographic results and clinical outcomes of pre- and postoperation.

Groups	Disc height (mm)	ROM ( $^\circ$ )	JOA	NDI
preoperation	4.6 ± 1.0	10.7 ± 3.2	13.1 ± 1.2	32.5 ± 3.8
postoperation	7.0 ± 0.9*	10.3 ± 3.3	16.0 ± 0.7*	11.7 ± 3.1*

\*  $P < 0.05$ .

**Table 3**  
Postoperative mean ROM and clinical outcomes of three groups.

Groups	Number	Mean ROM ( $^\circ$ )	JOA	NDI
<6 mm	28	8.7 ± 3.1	15.1 ± 0.9	11.8 ± 3.2
6–8 mm	110	11.0 ± 2.9*	16.3 ± 0.6	11.8 ± 3.1
>8 mm	22	8.9 ± 3.2	15.7 ± 0.8	11.3 ± 3.3

(Mean ROM: 6–8 mm vs. <6 mm,  $p = 0.01$ ; 6–8 mm vs. >8 mm,  $p = 0.03$ ; <6 mm vs. >8 mm,  $p = 0.12$ ).

used. For comparisons between postoperative ROM, JOA and NDI of three groups, one-way analysis of variance (One-way ANOVA) was used for data analysis. Pearson's correlation was used.  $P < 0.05$  was considered statistically significant.

## 3. Results

There was no significant difference in postoperative segmental ROM and preoperative segmental ROM ( $10.7^\circ \pm 3.2^\circ$  vs.  $10.3^\circ \pm 3.3^\circ$ ,  $P > 0.05$ , Table 2). The postoperative disc height was  $7.0\text{mm} \pm 0.9\text{mm}$ , the preoperative disc height was  $4.6\text{mm} \pm 1.0\text{mm}$  with statistical significance ( $P < 0.05$ ). No significant difference was found between preoperative and postoperative segmental ROM.

Patients with less than 4 mm of preoperative disc height had a mean  $1.4^\circ$  increase in flexion–extension ROM after cervical arthroplasty, whereas patients with greater than 4 mm of preoperative disc height had no change in flexion–extension ROM. Patients whose postoperative disc height were between 6 and 8 mm have significantly higher postoperative flexion–extension ROM ( $11.0^\circ \pm 2.9$ ) than those with less than 6 mm disc height ( $8.7^\circ \pm 3.1$ ,  $p = 0.01$ , Table 3). Patients with greater than 8 mm of postoperative disc height have significantly lower postoperative flexion–extension ROM (mean,  $8.9^\circ \pm 3.2$ ) than those with 6–8 mm disc height ( $p = 0.03$ ). No significant difference was found between patients with <6 mm disc height and patients with >8 mm disc height ( $p = 0.12$ ). The clinical outcomes were evaluated by Japanese Orthopaedic Association (JOA) and Neck Disability Index (NDI). Overall, there was a mean improvement of the JOA and NDI (Table 1). No correlation could be found between disc height and the postoperative ROM, JOA or NDI.

Download English Version:

<https://daneshyari.com/en/article/3039514>

Download Persian Version:

<https://daneshyari.com/article/3039514>

[Daneshyari.com](https://daneshyari.com)