Analysis of influence factors of anterior bone loss after cervical disc arthroplasty and its effect on postoperative outcomes

Junbo He[1], Tingkui Wu, Chen Ding, Kangkang Huang, Ying Hong, Hao Liu, Beiyu Wang*

Department of Orthopedic Surgery, West China Hospital, Sichuan University, No. 37 Guo Xue Rd, Chengdu, 610041, China

1 Presenter. Email: hejunbo.scu@foxmail.com.

* Corresponding author. Email: dove-baker@163.com.

Objective

To explore the influence factors of anterior bone loss (ABL) after cervical disc arthroplasty (CDA) and effects of ABL on the clinical and radiographic outcomes.

Methods

One hundred and fifty-five patients who underwent single-level Prestige-LP CDA between January 2008 and December 2017 and met the inclusive criteria were enrolled in the study. Perioperative data of patients were collected. The Japanese Orthopaedic Association (JOA) score, Neck Disability Index (NDI), and the visual analogue scale (VAS) score were used for clinical outcomes evaluation. Radiographic parameters including cervical lordosis, C2-7 range of motion (ROM), disc angle, segmental ROM, and the lengths of the upper and lower endplates were assessed on the X-ray films.

Device-related complications, including ABL, subsidence, radiographic adjacent segment pathology, and heterotopic ossification, were recorded. Univariate analysis was used to analyze the related factors, and logistic regression analysis was used to screen the influence factors. Patients were grouped according to whether ABL occurred after operation, and the differences in clinical and imaging evaluation parameters were compared.

Results

There were 94 cases (60.6%) in the ABL group and 61 cases (39.4%) in the non-ABL group. Univariate analysis showed the significant differences in age, body mass index (BMI), and intraoperative blood loss between the two groups ($P<0.05$). However, there was no significant difference in gender, bone mineral density (T value), preoperative blood calcium level, preoperative blood phosphorus level, preoperative alkaline phosphatase level, operative segment, operative time, and follow-up time between the two groups ($P>0.05$). Multivariate analysis showed that the age and BMI were influence factors for ABL after CDA ($P<0.05$). The JOA score, NDI, and VAS score significantly improved in both groups at 3 months after operation ($P<0.05$), and the scores were further improved at last follow-up ($P<0.05$). There was no significant difference in JOA score, NDI, and VAS score between the two groups before and after operation ($P>0.05$). The preoperative cervical lordosis was significantly smaller in the ABL group than in the non-ABL group ($t=-2.402$, $P=0.018$). At last follow-up, the segmental ROM was significantly greater in the ABL group than in the non ABL group ($P<0.05$), and the lengths of the upper and lower endplates were less in the ABL group than in the non-ABL group ($P<0.05$). No significant difference in the other radiographic parameters between the two groups were found ($P>0.05$). Prosthesis subsidence occurred in 5 cases

(3.2%), including 3 cases in the ABL group and 2 cases in the non-ABL group; the difference between the two groups was not significant (P=1.000). Heterotopic ossification occurred in 67 cases (43.2%), including 32 cases in the ABL group and 35 cases in the non-ABL group; the difference between the two groups was significant ($\chi 2$=8.208, P=0.004). High-grade heterotopic ossification was detected in 26 cases (13 cases in the ABL group and 13 cases in the non-ABL group). Twenty-nine cases (18.7%) had radiographic adjacent segment pathology, including 15 cases in the ABL group and 14 cases in non-ABL group; the difference between the two groups was not significant ($\chi 2$=1.190, P=0.276).

Conclusion

The incidence of ABL after CDA was relatively high, which mainly occurred within 3 months after operation, and no longer progressing with stable radiographic features after the first 12 months. Age and BMI were independent influence factors for ABL. ABL does not affect the clinical outcomes but may preserve more ROM of prostheses.

Keywords

Cervical disc arthroplasty; anterior bone loss; bone remodeling; heterotopic ossification