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The Evaluation of Bony Union after Posterior Occipitocervical Fusion

Han Chang, M.D., Jong-Woo Chae, M.D., Jong-Bum Park, M.D.[#],
Tae-Yong Bae, M.D., Myung-Sang Moon, M.D.

*Spine Center, Department of Orthopaedic Surgery, Sun General Hospital, Daejeon, Korea,
Department of Orthopaedic Surgery, The Catholic University of Korea, College of Medicine[#], Seoul, Korea*

– Abstract –

Study design: The results of posterior occipitocervical fusions were analyzed retrospectively based on the results of post-operative radiographs.

Objectives: To investigate subjective methods for the evaluation of occipitocervical stabilization by posterior fusion.

Summary of Literature Review: Few studies have been performed that describe the methods utilized for the evaluation of the union of the instrumented segments.

Materials and Methods: Occipitocervical fusions were performed in 16 patients from 1995 to 2004. The patients underwent occipitocervical fusions with autogenous iliac bone grafting and wire fixation (5), loop and sublaminar wire fixation (3), C-D occipitocervical rod (2), and contoured reconstruction plate (6). The stability and failure of the instrumentation in the fusion sites were evaluated with flexion/extension lateral radiographs. The stability was evaluated by a change in the degrees and distances between the occiput and cervical vertebrae.

Results: Two of five patients who had undergone wire fixation with autogenous bone grafting were considered to have a nonunion because of persistent segmental instability: greater than 2° and 2 mm three months postoperatively. In the other patients, we were unable to determine the presence of a solid fusion mass at the fusion site, because of overlapping of the instrumentation devices and graft bones. However, since there was no definite motion that indicated segmental instability and instrumentation breakage or loosening on flexion and extension radiographs, we considered these as stable fixations.

Conclusion: It was difficult to evaluate whether or not the grafts were incorporated into the recipient sites, due to the complexity of the occipitocervical junction and the overlapping of the instrumentation. After removal of the external immobilization 3 months postoperatively, although flexion/extension radiographs taken 6 months postoperatively, demonstrated no motion at the fusion site, the occipitocervical fusions were judged to be stabilized rather than fused.

Key Words: Posterior occipitocervical fusion, Evaluation of fusion, Stabilization

Address reprint requests to

Jong-Woo Chae, M.D.

Department of Orthopaedic Surgery, Sun General Hospital

10-7, Mok-dong, Chung-gu, Daejeon 301-725, Korea

Tel: 82-42-220-8150, Fax: 82-42-220-8159, E-mail: hc5771@chollian.net

1 가 가 16 (7 , os odontoideum 5 , 2 2 (assimilation) 1 , 1-2 1) , 가 6 , 가 10 . 28 75 52 . 가 5 , Loop 3 , CD 2 , Contoured reconstruction plate 6 3 (Halovest 6 , Minerva 10) 6 1 3 , 3 2 , / , 가 가 . / 1 () (2°; 2 mm)가 (Fig. 1C) 가

os odontoideum, , , . 1927 Foerster가 Bohlman Triple wire 80~90% , 가 가 가 .

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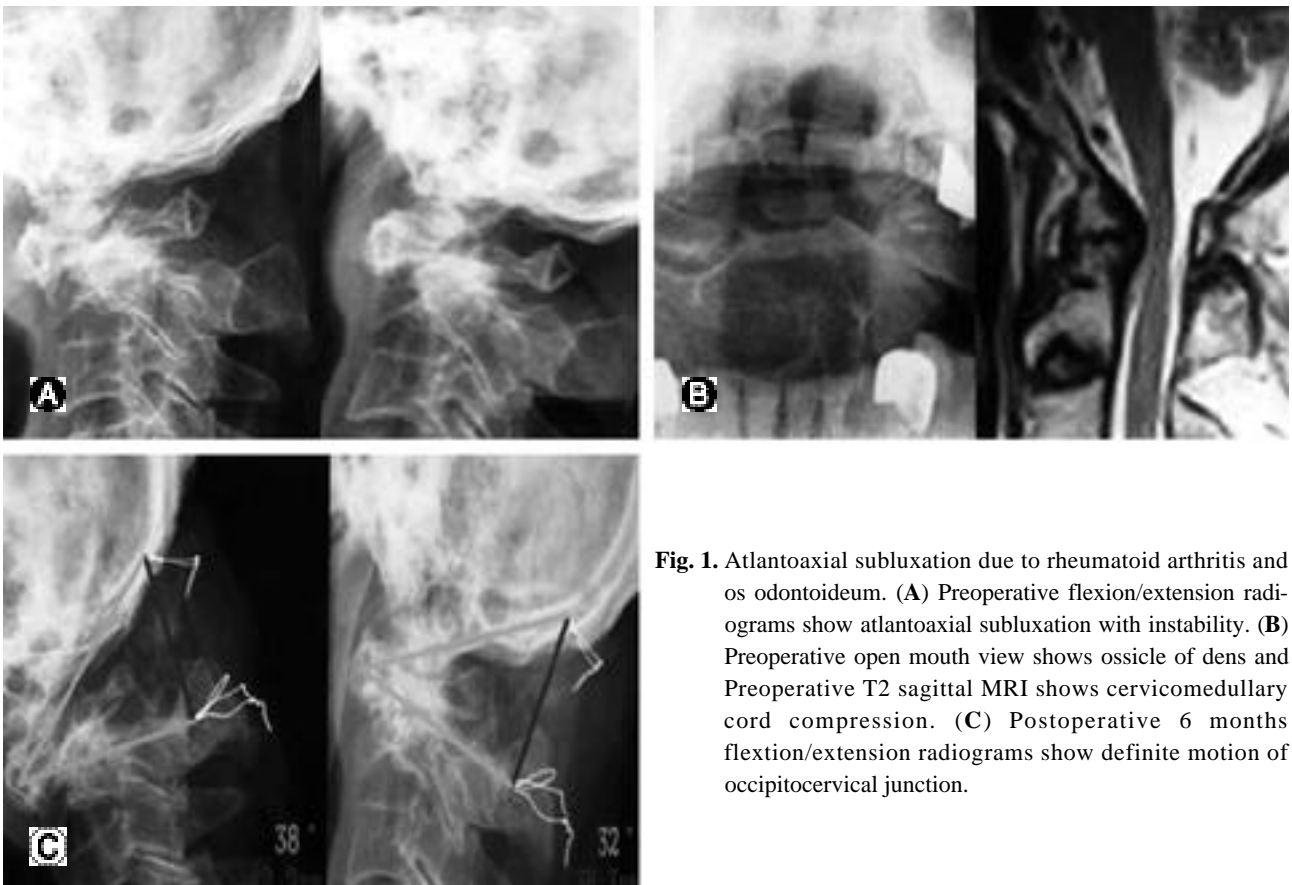


Fig. 1. Atlantoaxial subluxation due to rheumatoid arthritis and os odontoideum. (A) Preoperative flexion/extension radiographs show atlantoaxial subluxation with instability. (B) Preoperative open mouth view shows ossicle of dens and Preoperative T2 sagittal MRI shows cervicomedullary cord compression. (C) Postoperative 6 months flexion/extension radiographs show definite motion of occipitocervical junction.

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3 /
2 °, 2 mm
(Fig. 1C),

1 3
2

가 , 가
(only graft)

1,2,3)

가 (Fig. 2C).

11

Luque ring

Hartshill-Ransford rectangle^{4,5,6,7)}

(6) / , 3

가
(Fig. 3). 6
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(Roy-Camille plate, AO reconstruction plate)

Cotrel-Dubousset occipitocervical rod

가 8,9,10,11,12,13)

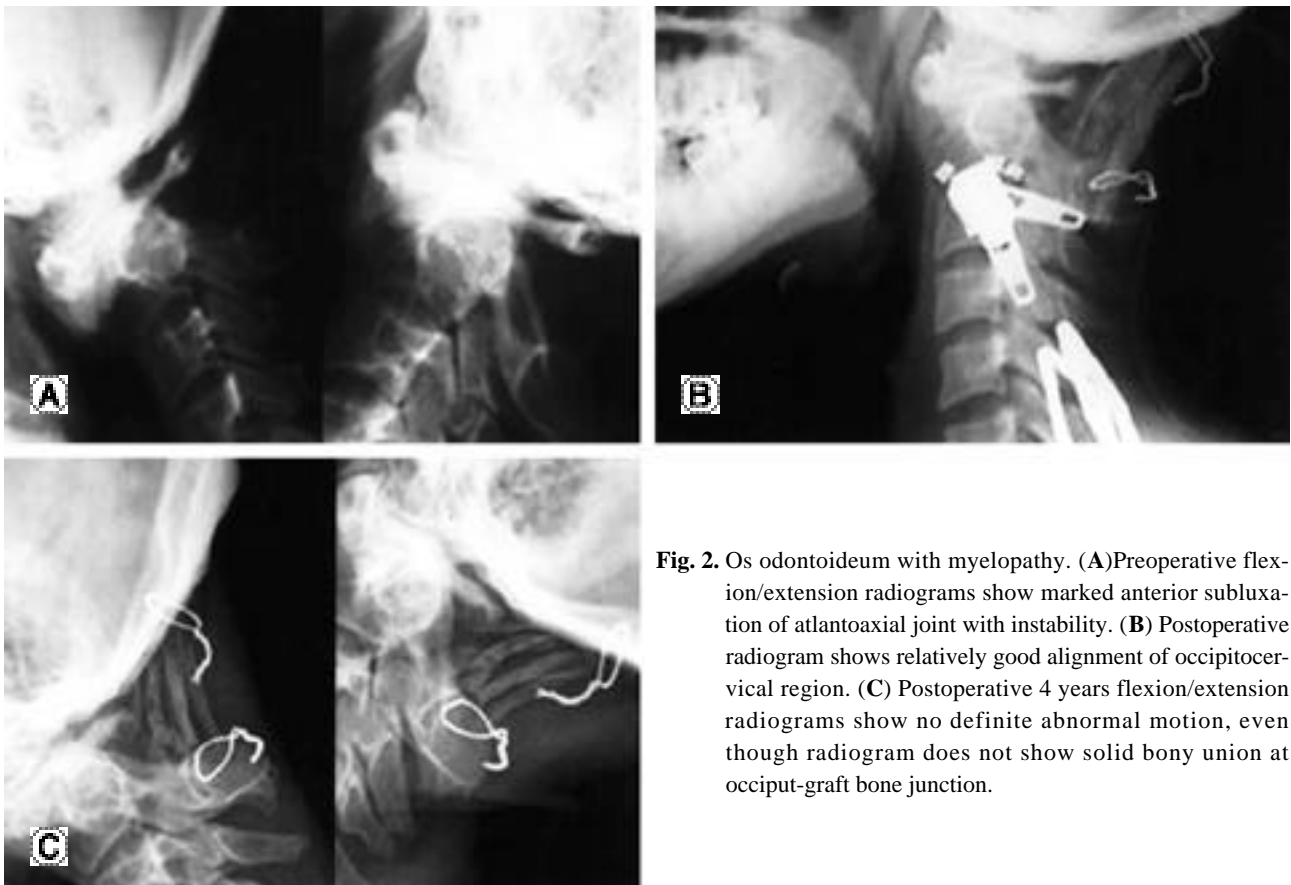


Fig. 2. Os odontoideum with myelopathy. (A) Preoperative flexion/extension radiographs show marked anterior subluxation of atlantoaxial joint with instability. (B) Postoperative radiogram shows relatively good alignment of occipitocervical region. (C) Postoperative 4 years flexion/extension radiographs show no definite abnormal motion, even though radiogram does not show solid bony union at occiput-graft bone junction.

가 Itoh⁴⁾ Luque rod 13
 12 , 4.2
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 Y /
^{2,8)} 가 가 ,
 가 가 가
 ,
 Clark^{1,14)} 가
 5 2 , , 가
 3 (60%) 11 (100%) 가
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 가 (Fig. 3). 가 5 2 가
 가 (sclerotic) 가
 가 /
 Sakou Matsunaga⁷⁾ rectangular rod
 2 가 (callus) ,

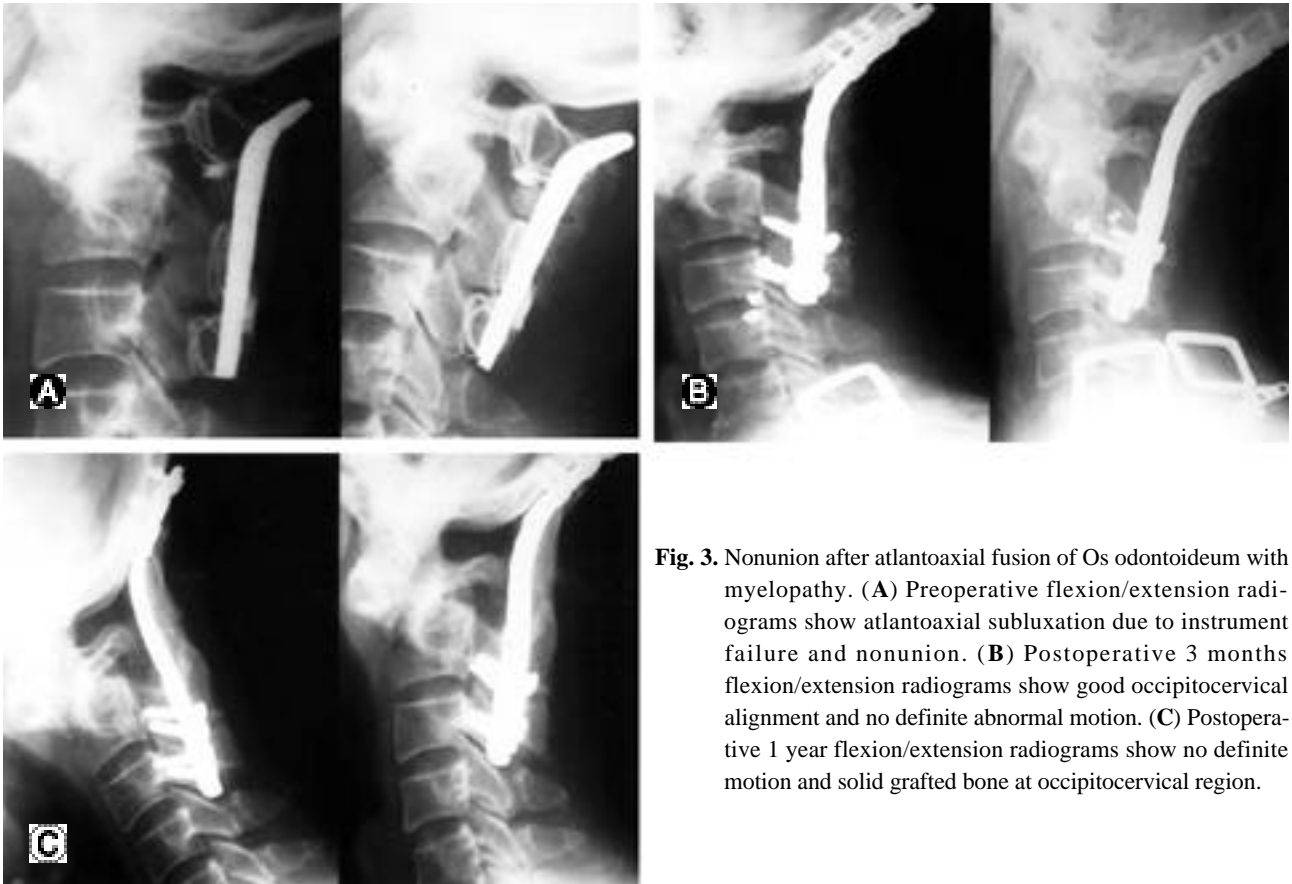


Fig. 3. Nonunion after atlantoaxial fusion of Os odontoideum with myelopathy. (A) Preoperative flexion/extension radiographs show atlantoaxial subluxation due to instrument failure and nonunion. (B) Postoperative 3 months flexion/extension radiographs show good occipitocervical alignment and no definite abnormal motion. (C) Postoperative 1 year flexion/extension radiographs show no definite motion and solid grafted bone at occipitocervical region.

- (Fig. 2C).
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 (2), Contoured reconstruction plate (6) 6 1
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Tel: 82-42-220-8150 Fax: 82-42-220-8159 E-mail: hc5771@chollian.net