Adjacent Level Ossification Disease (ALOD) Secondary to Anterior Cervical Plates
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INTRODUCTION: There are few studies concerning the association of osteophyte formation and anterior cervical plates. It has been the senior author’s empiric experience that peri-plate ossification of the adjacent segments occurs commonly following anterior cervical plating for degenerative cervical conditions. Our hypothesis was that the closer the adjacent disc space, the greater the ossification.

METHODS: 118 patients, who had no previous cervical surgery and achieved a solid fusion following anterior cervical arthrodesis with a plate for the management of degenerative cervical conditions, with a minimum of one year follow-up were identified from a database for inclusion in this study. All of the procedures were performed by the senior author and all of the radiographic analyses were independently performed by 2 experienced spine surgeons who were uninvolved in the patients’ care. The mean age of patients at the time of surgery was 51.8 years (range, 32-76 years). The mean duration of postoperative follow-up was 25.7 months (range, 12–76 months). Thirty-six patients underwent a 1-level arthrodesis; 47 a 2-level; 32 a 3-level; and three had a 4-level arthrodesis. The distance between the tip of the plate and the caudal as well as the rostral adjacent disc (plate-to-disc distance) was measured on postoperative lateral radiograph of the cervical spine. The distance was used to divide the patients into two groups: group A, the plate-to-disc distance < 5 mm and group B, the plate-to-disc distance ≥ 5 mm. The severities of ALOD at the two adjacent disc spaces were classified on lateral radiographs, which were taken at the last follow-up, using the following grading system: grade 0 (none); none; grade 1 (mild): extends across less than 50% of the disc space; grade 2 (moderate); greater than or equal to 50% of the disc space; grade 3 (severe): complete bridging of the adjacent disc space. Each observer determined the grade twice and the average of the four measurements was used as the final grade. Eighteen patients were excluded from the measurement of severity of caudal ALOD due to bony overlapping of the shoulder and cervicothoracic junction.

RESULTS: The Spearman correlation coefficients for inter- and intra-observer variabilities of measurement technique of severity grade of ALOD were r = 0.96 and r = 0.98 (p < 0.001), respectively. An alarming 59.5% (70 of 118) developed ALOD at the rostral adjacent disc space while 29% (29 of 100) developed it at the caudal adjacent disc space (p < 0.001) The mean severity grade of rostral
ALOD was 0.83 ± .086 (mean ± standard deviation) while that of caudal ALOD was 0.44 ± 0.80 (p < 0.001). The mean rostral plate-to-disc distance was 2.86 ± 1.78mm while the mean caudal plate-to-disc distance was 4.02 ± 1.89mm (p < 0.001). The incidence of rostral ALOD was 67% (65 of 97) in group A versus 23.8% (5 of 21) for group B (p < 0.001). The mean severity grade of rostral ALOD was 0.96 ± 0.88 in group A versus 0.24 ± 0.44 for group B (p < 0.001). The incidence of caudal ALOD was 45% (27 of 60) in group A versus 5% (2 of 40) for group B (p < 0.001). The mean severity grade of caudal ALOD was 0.67 ± 0.90 in group A versus 0.10 ± 0.44 for group B (p < 0.001).

CONCLUSIONS: We believe that the current findings definitely demonstrate that if the anterior cervical plate is placed less than 5mm from the rostral or caudal adjacent disc space, there is a markedly increased risk of moderate to severe ALOD. Based on our data, we now strive to keep the plate as far away from the adjacent disc space as possible. In conclusion, the rates of ALOD following anterior cervical plates are alarming, and its relationship to the plate-to-disc distance has not been previously reported. We recommend that anterior cervical plates be placed at least 5mm away from the adjacent disc space in order to decrease the likelihood of moderate to severe ALOD. More attention should be considered to be paid to the rostral adjacent disc space. A greater initial distance would be necessary when using subsidence plates.