

Abstract #1732.docx

COMPUTED TOMOGRAPHY GUIDED C1-2 TRANSARTICULAR SCREW PLACEMENT USING A POWER DRILL FOR ATLANTOAXIAL SUBLUXATION IN RHEUMATOID ARTHRITIS

Introduction.

A combination of C1-2 transarticular screw fixation (Magerl) and interlaminar fusion with wiring (Brooks) (M&B procedure) is widely used to achieve rigid three-point fixation, but this surgery is technically demanding, and requires the utmost precision. We modified the conventional M&B procedure by performing computed tomography (CT)-guided unilateral C1-2 transarticular screw placement using a power drill and by employing an ultra-high molecular weight polyethylene (UHMWP) cable and tensioner. This study was performed to evaluate the accuracy of inserting C1-2 transarticular screws in patients with atlantoaxial subluxation by intraoperative CT (O-arm)-guided navigation.

Patients and Methods.

The subjects included 2 men and 15 women with a mean age of 67.5 years (range: 30-79 years). All 17 patients had rheumatoid arthritis. They were followed for a minimum of one year (mean: 2.3 years; range 1-3.5). The average operating time was 3.0 hours and blood loss was 118.7g. To assess the modified procedure, we evaluated symptoms, Ranawat grade, JOA score, AADI, C1-2 angle, C2-7 angle, and bone union.

Results.

In 2 patients, a screw could not be inserted due to a unilateral high-riding vertebral artery (VA) revealed by preoperative CT. All 17 patients had preoperative occipital headache or posterior neck pain, and their pain was relieved by surgery. In 13 patients, the Japanese Orthopedic Association score for cervical myelopathy improved from 9.5 to 13.7 (maximum score: 17). On radiographs, the average AADI decreased from 7.4 mm to 1.8 mm postoperatively, while the C1-2 angle improved from 12.2 to 23.0 degrees and the C2-7 angle decreased from 25.2 to 20.1 degrees. Bone union was achieved within three months in all patients. The modified technique achieved a shorter operating time and less blood loss with no VA injury.

Discussion.

Although the M&B procedure is one of the most useful methods of posterior C1-2 fixation, there is a high rate of VA injury. We considered that the causes of VA injury included bilateral screw insertion, inadequate identification of the artery, and insufficient assessment of screw direction. Therefore, we modified the conventional procedure by preoperative CT evaluation for a high-riding VA and use of a power drill with O-arm-guided navigation to create screw holes. We also employed a UHMWP cable and tensioner to reduce subluxation and maintain the reduction, in addition to unilateral C1-2 transarticular screw fixation.

Conclusions.

This study demonstrated that C1-2 transarticular screws can be placed precisely with O-arm-guided navigation and intraoperative CT can confirm screw positions. This method is safe, secure, less technically demanding, and achieves rigid three-point fixation while avoiding the serious complications of the conventional M&B procedure.