CORRECTION OF CERVICAL KYPHOSIS USING PEDICLE SCREW FIXATION SYSTEMS.
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PURPOSES: The purposes of this report are to investigate the clinical results of correction of cervical kyphosis using pedicle screw fixation and to introduce our surgical techniques.

MATERIALS AND METHODS: Between 1991 and 1996, 31 patients with cervical kyphosis were treated using pedicle screw fixation. Causes of kyphosis were old cervical spinal injury in 11 patients, subaxial lesion of RA in nine, cervical spondylosis in five, postlaminctomy kyphosis in three, destructive spondyloarthopathy in two, and old pyogenic spondylitis in one. Kyphosis caused by flesh spinal injuries or spinal tumors was excluded from this study. Pedicle screw-plates system designed for the cervical spine (CPS) was used in 25 patients. VSP for thoracolumbar spine was utilized for two patients in the early phase of this series, and Isola rod for one patient. Occipitocervical fixation using occipitocervical rods and CPS screws was performed in three patient. Patients were classified into two groups according to surgical procedures. In 18 patients (Group I: average preoperative kyphosis was 28.5° range 14° to 45° ), kyphosis was corrected by posterior surgery alone. Remaining thirteen patients (Group II: average preoperative kyphosis was 30.7° ; range 15° to 52° ) required additional anterior surgery for correction of their rigid kyphosis or anterior spinal cord decompression and strut bone graft. Twelve of 31 patients underwent simultaneous laminctomy or supplemental posterior decompression of the spinal cord or nerve root. For correction of kyphosis by shortening of the posterior parts of the cervical spine, compressive force was applied between the inserted screws after bilateral partial facetectomies. Nineteen of 31 patients had previously undergone anterior or posterior surgery at the same or adjacent spinal levels. Rigid postoperative external supports, including a halo-vest, were not used in any patients.

RESULTS: Bony union was obtained in all patients. Kyphosis was corrected to 6.5° in average (range: -10° to 32°) in Group I, and to 0.5° in average (range: -10° to 16°) in Group II at the latest follow-up. Loss of correction during bony union was within 3° in all patients. Preoperative neurologic disturbance in 24 patients improved after surgery to some extent. The pedicle of the most cranial
vertebra of fusion was destructed in one patient during insertion of a screw, and postoperatively nerve root lesion developed. The screw was removed in this patient, and nerve root lesion healed completely. There were no instrumentation failure. There was one case of deep infection healed by continuous irrigation without metal removal.

DISCUSSION AND CONCLUSION: According to the past biomechanical study concerning the internal fixation of the cervical spine, internal stabilizing effect provided by pedicle screw fixation was proven to be higher than other fixation procedures including lateral mass screw/plate fixation, and pullout strength of pedicle screws was greater than those of lateral mass screws. In this series, the greater internal stabilizing capability and pullout strength of pedicle screw provided effective correction of cervical kyphosis. Combined anterior and posterior vertebral osteotomy is effective to correct rigid kyphosis. In addition, this procedure does not require the lamina for fixation anchor, thus, posterior stabilization and correction of the cervical kyphosis can be performed with simultaneous posterior decompression procedure (laminectomy or laminoplasty). On the other hand, the risks of neurovascular complications resulting from inadequate screw placement into the cervical pedicle can not be completely obviated. Thorough knowledge of local anatomy and application of established surgical techniques are essential for this procedure.