Itaru Oda, MD, Kuniyoshi Abumi, MD, Manabu Ito, MD, Yoshihisa Kotani, MD, Kyoichi Hasegawa, MD (Sapporo, Japan), Takashi Oya, MD (Obihiro, Japan)

INTRODUCTION: Spinal cord lesions caused by metastatic tumors of the cervical spine are serious problems as they can lead to quadriplegia or paraplegia and significantly affect the quality of life. As well, severe neck pain due to vertebral collapse is sometimes uncontrollable by conservative treatments and bed rest is required in such cases. Thus, we conducted palliative spinal reconstruction using cervical pedicle screws to achieve better quality of life if the life expectancy is more than three to six months. The purpose of this study was to retrospectively evaluate the clinical outcomes of the spinal reconstructions using cervical pedicle screws in metastatic lesions of the spine.

METHODS: Since 1991, a total of thirty patients with metastatic tumors in the spine underwent reconstructive surgery using cervical pedicle screws. There were fifteen female and fifteen male patients. The average age at surgery was 57.4 years (range: 37 to 78 years). The most common primary tumors were breast (20%), kidney (13%), and lung cancers (13%). The number of affected vertebrae was one in eleven patients, two in eight, and three or more in eleven patients. Three patients presented upper cervical lesions and 27 patients had subaxial cervical or upper thoracic lesions. Both anterior and posterior columns were involved in 28 patients, while anterior column alone in two. All patients suffered from severe pain, 27 patients presented spinal cord lesions, and one patient had radiculopathy. Sixteen of 30 patients were unable to walk before surgery due to pain or spinal cord lesions. Spinal reconstruction using cervical pedicle screws was conducted in all patients as follows: posterior fixation alone in 23 patients; posterior fixation combined with anterior decompression and strut graft in seven patients. Occipitocervical fixation was conducted in three cases and cervical or cervicothoracic fixation was performed in 27 patients. Two-level reconstruction was conducted in four patients, three-level in four, four-level in five, and five or more in 17 patients. Five patients underwent autogeneous bone graft. The VSP (Depuy-AcroMed) was used for early four cases while Cervical Pedicle Screw System (CPS, Depuy-AcroMed) was utilized for latter 26 patients. The occipitocervical plate/rod (Aesculap) was used in conjunction with CPS for occipitocervical fixation.

RESULTS: The average operating time and intraoperative blood loss were 220 minutes and 529 ml for the posterior fixation alone, 291 minutes and 875 ml for...
combined anterior and posterior procedures, respectively. Two patients were alive at the latest follow-up, postoperative 12 months and 6 months, respectively. The average survival period for the remaining 28 patients was 11.3 months with a range from two weeks to 36 months. Two patients died within postoperative one month because of respiratory dysfunction or liver failure. No patients died due to complications directly related to the surgery. All patients postoperatively experienced pain relief or improvement. Of 28 patients with spinal cord or nerve root lesions 23 patients demonstrated neurological improvement and no patient presented neurological deterioration. Of 16 patients who were unable to walk, 13 patients could walk postoperatively. Postoperative complications were observed in five cases including a radiculopathy caused by pedicle screw perforation into the neural foramen in one case, which resolved during the course of the follow-up without screw removal. Other four complications were not directly related to pedicle screw insertion. Two patients presented displacement of anterior strut and required additional surgeries. Local recurrence or progression of the tumor was observed in four patients; two of them presented neurological deterioration; and one demonstrated screw loosening. No other instrumentation failure was found during the entire follow-up. Deep wound infection was observed in one case and resolved by closed continuous irrigation. Of five patients who underwent autogenous bone graft, two demonstrated bony union, however, three died before bony fusion was obtained. Overall, postoperative neurological function and spinal stability was maintained during the entire follow-up period in 28 of 30 cases.

CONCLUSIONS: Pedicle screws have been reported as the strongest fixation anchors of the cervical spine, however, no study to date has investigated the effectiveness of spinal reconstruction utilizing cervical pedicle screws for metastatic lesions of the spine. In this series, pain relief or diminution was obtained and neurological improvements were provided by pedicle screw fixations in most cases. Moreover, these improvements were maintained throughout the survival period in most cases. Furthermore, instrumentation failure was rarely observed even if the patients underwent posterior fixation alone in spite of anterior columns affected by the tumors -indicating appropriate spinal stability provided by the pedicle screw fixations. As previously reported, pedicle screw fixation enables one-stage posterior decompression and stabilization as well as correction of local kyphosis can be performed to some extent. Therefore, additional anterior decompression and strut graft can be avoided. However, anterior tumor resection and autogeneous bone graft should be considered to achieve long-term spinal stability if primary tumor is controllable by conservative treatment including chemotherapy and life expectancy is relatively long. In conclusions, spinal reconstruction using cervical pedicle screws provides significant pain relief and sufficient stability and maintains neurological improvement throughout the survival period.
Anterior strut is rarely necessary even if both anterior and posterior column are affected by the tumors.

- The FDA has not cleared the drug and/or medical device for the use described in this presentation (i.e., the drug or medical device is being discussed for an “off label” use). For full information, refer to the disclaimer information at the back of the book.