

Treatment Of C2 Vertebral Body And Dens Tumors With Intraoperative Transoral Or Transpedicular Vertebroplasty And Occipito-cervical Posterior Fixation

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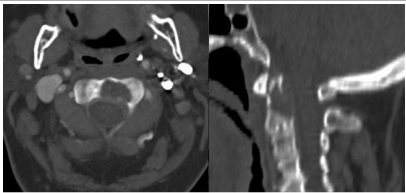
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Introduction

Malignant tumors of the upper cervical spine, - exactly the atlanto-axial spine- are uncommon. These tumors are mostly metastases originated from breast, lung and prostate neoplasms, and myeloma multiplex. The destruction of the lateral articular mass of C1, the odontoid process, and the body of C2 results pathological fractures and progressive subluxation. Due to the wide mid-sagittal diameter of spinal canal at the level of C1-C2 neurologic deficits are rarely present. The usual treatment of choice is combined radio,- and chemotherapy. Presence of neurological symptoms (due to the compression of the spinal cord), or severe neck pain (due to the instability) are the most important indications of surgical treatment. The development of new, combined surgical techniques providing stable fixation of the atlanto-axial spine, with lower intraoperative risks to the patient. The aim of our retrospective study was to evaluate the safety and efficacy of simultaneous intraoperative transoral or transpedicular vertebroplasty of the C2 vertebra and posterior fixation.



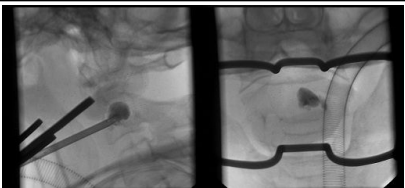
Preop CT: osteolytic C2 vertebral body lesion



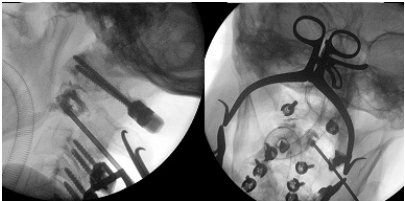
Preop CT osteolytic C2 vertebral lesion from myeloma multiplex

Methods

Five patients (3 female, 2 male) with osteolytic C2 vertebral body and dens metastases were treated. The mean age was 58.2 years (range, 43-74 years) The metastases originated from breast cancer in 2 cases, from lung cancer in 2 cases, and one from a myeloma multiplex. All patients underwent complex oncotherapy, determined by the oncologist. Non of our patients had neurological symptoms at the time of the presentation of the cervical spine metastases, but all of them had severe neck pain. Total spine imaging was performed before the surgery, and no other metastatic lesions were detected. The cervical spine was immobilized in HALO-device preoperatively. All patients underwent fiber-optic intubation, and the whole combined surgical procedures were done under general anesthesia. In three cases dorsal open C2 tumor biopsy and transpedicular vertebroplasty was done, in combination with C0-C5 posterior occipito-cervical fixation with occipital plate, screws and rods (Axon, CerviFix; Synthes, GmbH Switzerland). Two patients underwent transoral C2 biopsy and vertebroplasty and dorsal occipito-cervical fixation at the same session. All of the procedures were done under the guidance of fluoroscopy. The patients were followed with regular fluoroscopy, MRI, CT scans and neurological examinations. The HALO fixation device was removed after the first postoperative CT examination.



Transoral injection



Transpedicular injection

Results

The incidence of postoperative cervical pain was lower, within acceptable limits (VAS: 2 to 4). The average volume of PMMA injected was 4ml (2-5 ml).The average filling of body and dens of C2 vertebra was more than 60%. No leakage of cement into the spinal canal, or paravertebral region was detected except one case, when small amount of cement appeared in C1-C2 joint with no clinical significance. There were no complications or wound infections. The transorally treated patients complained some pharyngeal discomfort and pain, which disappeared within a few days postoperatively. No dural tear was detected. Early mobilization, in HALO-device was allowed. Average follow-up was 13 months, ranging from 8 to 19 months. Regular postoperative CT scans and radiographs detected spinal stability. No signs of implant loosening or fracture were detected.

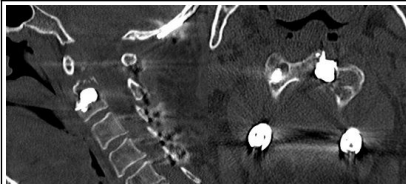


Postop CT: PMMA filled C2 and posterior fixation

Discussion

The cranio-spinal junction (occiput-C1-C2 complex) is responsible for 60% of cervical rotation and about 45% of cervical flexion-extension. Stability of atlanto-axial region depends mostly on the transverse ligament of C1, the odontoid process, and the lateral articular mass of C1 and C2. Osteolytic destruction of these structures leads to instability and atlanto-axial subluxation.

Painful limitation of neck and head motion, especially rotation, may be the first, and most of the cases, the only clinical sign of upper cervical metastases. Regular radiological control examinations recommended in patients suffering from malignances of the lung, breast, prostate, or kidney, to recognize early lesions. Immobilization of the affected spine region and irradiation therapy can provide symptomatic relief in the early stage, but surgical treatment is indicated if atlanto-axial instability or epidural tumor mass and consequent spinal cord compression detected. The percutaneous PMMA injection to the osteolytic vertebral metastases is well tolerated and effective treatment, even in patient with poor general condition. The injected bone cement prevents the pathological fracture, and compression of the involved vertebra. The screw-rod fixation is recommended for atlanto-axial tumor patients to achieve the maximum biomechanical stability. Ventral, epidural propagation of a C2 vertebral body tumor requires transoral exploration and tumor resection to decompress the spinal cord. The metastatic tumors of the C2 vertebral body and the odontoid process are very difficult to resect from the posterior mid-sagittal approach. The transoral exploration of the atlanto-axial region is difficult and potentially risky procedure. The narrow operating field makes the anterior fixation very difficult. The most frequent complications of the transoral approach are wound healing failure, infection, retropharyngeal haematoma, and even leakage of the CSF. Combination of the dorsal pedicle screw-rod fixation technique with the transoral/transpedicular PMMA injection is a treatment option for patients with osteolytic C2 vertebral body and/or dens tumors, and without epidural tumor propagation. The transpedicular PMMA injection is appropriate for the treatment the C2 vertebral body osteolytic lesion, while transoral PMMA injection is suitable for the treatment of the dens and C2 vertebral body lesions also. Posterior approach to the dens is very difficult, and dangerous, hence this is not recommended. The vertebroplasty provides ventral support for the atlanto-axial junction, preventing the pathological fracture of the dens and and compression of the C2 vertebral body.



Postop CT: PMMA in C2 body



Postop CT: PMMA in C2 vertebral body and in dens

Conclusions

Simultaneous intraoperative transoral or transpedicular vertebroplasty and dorsal occipito-cervical fixation is a safe and effective treatment for patients with osteolytic C2 tumors. The posterior approach and transpedicular vertebroplasty is recommended for patients with C2 vertebral body tumors. In contrast, the transoral PMMA injection is appropriate for patients with C2 vertebral body and/or dens tumors, because of the dens is difficult to reach posteriorly.

References

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