Turkish Neurosurgery 2008, Vol: 18, No: 3, 271-275

Transmandibular Approach for Upper Cervical Pathologies: Report of 2 Cases and Review of the Literature

Üst Servikal Patolojilere Transmandibular Yaklaşım: 2 Olgu Sunumu ve Literatür Taraması

Deniz KONYA[1]
Serdar ÖZGEN[2]
Arzu GERÇEK[3]
Özhan ÇELEBİLER[4]
M. Necmettin PAMİR[5]

[1,2,5] Department of Neurosurgery, Marmara University Faculty of Medicine, Istanbul, Turkey
[3] Institute of Neurological Science, Marmara University, Istanbul, Turkey
[4] Department of Plastic and Reconstructive Surgery, Marmara University Faculty of Medicine, Istanbul, Turkey

ABSTRACT

In routine surgical practice, anterior approaches are not often used to treat upper cervical pathologies. Such lesions can be difficult to access surgically. This article describes 2 cases in which the transmandibular approach was used to address anterior upper cervical pathology. One case was a chordoma invading the C2-C3 vertebrae and the other case was atlanto-axial instability. Neurological examination revealed myelopathy in both cases. Each patient had already undergone occipito-cervical fusion at a different center and, thus, had limited neck extension and mouth-opening ability. In the first case, the tumor was totally excised. In the second, the dens was removed. We believe that the transmandibular approach is the best option for patients with limited neck mobility and restricted mouth-opening ability.

KEY WORDS: Atlanto-axial instability, Cervical chordoma, Transmandibular approach

ÖZ

Günlük cerrahi pratiğimizde üst servikal bölge patolojilerinin tedavisinde anterior yaklaşım cok fazla kullanılmamaktadır. Üst servikal bölgeye ulaşım güçlüğünden dolayı da bu tip patolojilere cerrahi müdahale zorluklar arz etmektedir. Bu çalışmada üst servikal bölge patolojisi olan 2 olgunun tedavisinde kullanılan transmandibuler yaklaşım tanımlanmaktadır. Olgulardan ilki servikal 2 ve 3 vertebralarını içine alan bir kordoma olgusu, diğeri ise atlantoaksiyel instabilitesi olan bir olguydu. İki olgunun da nörolojik muayenelerinde myelopati bulguları saptandı. İki olguyada farklı merkezlerde oksipitoservikal füzyon ameliyatı yapılmış olduğundan ikisinin de boyun hareketleri ve ağız açıklıkları kısıtlıydı. Transmandibuler yaklaşımla birinci olguda tümör total olarak çıkarıldı, ikinci olguda da dens rezeke edildi. Kliniğimizde sadece 2 olguda bu yöntemi kullanmış olmamıza rağmen, özellikle daha önce geçirilmiş bir operasyona bağlı boyun hareketleri veya ağız açıklığı kısıtlı olan olgularda transmandibuler yaklaşım en uygun cerrahi tedavi seçeneklerinden birisidir.

ANAHTAR SÖZCÜKLER: Atlanto-aksiyel instabilite, Servikal kordoma, Transmandibuler yaklaşım

Received : 31.05.2008
Accepted : 11.08.2008

Correspondence address:
Deniz KONYA
Acibadem Cad. Ibrahimaga Kon.
A6 Blok D:23 Kadikoy/Istanbul
34660 Turkey
Phone : 90-533-7351293
Fax : 90-216-3275249
E-mail : drdkonya@hotmail.com

INTRODUCTION

Pathologies of the anterior upper cervical region are extremely rare but can usually be surgically treated via a transoral, transmaxillary or high-cervical retropharyngeal approach (3,4,7,9,10). The main advantage of anterior approaches to the clivus and upper cervical vertebrae is that they provide direct access to the lesion. The most important disadvantages are limited exposure for operating, deep surgical field, and proximity of vital structures such as the carotid and vertebral arteries, trachea, phrenic nerve, and esophagus (8). Fang and Ong (4) introduced the transoral surgical approach in 1962. This technique requires full neck mobility and maximum mouth opening. Occipito-cervical fusion severely reduces neck extension and makes any subsequent operation via standard transoral approach difficult.

In this report, we present our initial experience with the transmandibular approach, a modified transoral technique, in 2 cases of upper cervical pathology. Both patients had limited mouth opening and neck extension because of previous occipito-cervical fusion.

CASE REPORTS

Case 1

A 51-year-old man was admitted to our hospital with complaints of neck pain, right arm weakness, and numbness on the right side of his body. The history revealed that he had been diagnosed with cervical chordoma and had undergone 2 surgeries on his cervical spine: one for biopsy and one for tumor excision and occipito-cervical fusion. He had subsequently undergone radiotherapy. The severity of the patient's neck pain increased with certain movements and his condition had steadily deteriorated since the second surgery. At the time of admission to our center, neurological examination revealed weakness of the right deltoid and biceps muscles, right hemihypoesthesia, hyperactive deep tendon reflexes, and positive Babinsky sign. Magnetic resonance imaging (MRI) demonstrated tumor tissue completely infiltrating the bodies of the second and third cervical vertebrae, and a mass compressing the anterior spinal cord in this area (Figure 1A). Computed tomography (CT) of this region demonstrated severe destruction of the C2 and C3 vertebrae (Figure 1B). Digital subtraction angiography revealed that the vertebral arteries in the area were narrowed and surrounded by tumor.

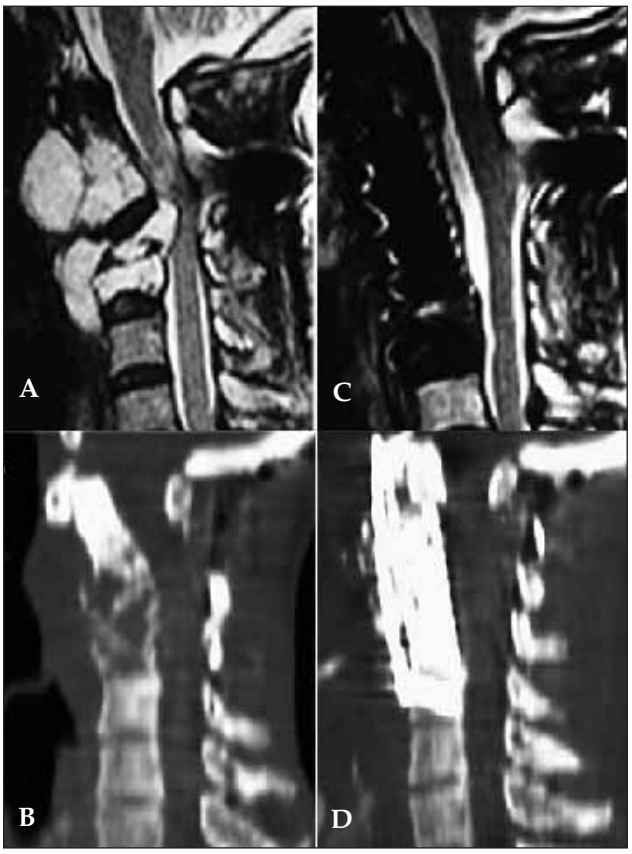

Figure 1: Imaging findings in Case 1: A) *(upper left) A preoperative T2-weighted sagittal cervical MRI;* ***B)*** *(lower left) Preoperative sagittal CT images of the cervical spine;* ***C)*** *(upper right) Postoperative T2-weighted sagittal cervical MRI;* ***D)*** *(lower right) Postoperative sagittal CT images of the cervical spine.*

Surgery was scheduled. The patient was placed in supine position and the transmandibular approach was used to access the upper cervical area. Initially, sedation was administered and tracheotomy was performed. Once the trachea was cannulated, general anesthesia was induced. After the surgical field was prepared with 10% povidone iodine and sterile drapes, a midline lip-split incision was made and the mandible was dissected at the midline with the aid of a high-speed drill (Anspach, Black Max, Palm Beach Gardens, FL, USA) (Figure 2). The tongue was displaced laterally to provide maximum exposure of the oro- and hypopharynx, and then a longitudinal incision was made in the pharynx wall to expose the tumor. Removal of the mass and both affected vertebrae eliminated the spinal cord compression. An interbody cage was placed in the defect site (between the first and fourth cervical vertebrae) and fixation was achieved with an

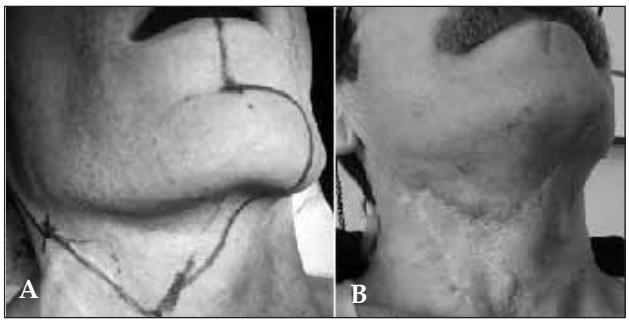

***Figure 2: A**) (left) Prior to surgery, the skin incision was drawn with a marker; **B**) (right) Postoperative incision healed.*

anterior cervical plate (DePuy Spine Inc, Raynham, MA, USA). Once the cage was secured, the pharyngeal defect was closed using a free flap from the patient's left forearm. The mandible was fixed with a microplate (Stryker, Portage, MI, USA).

Recovery from anesthesia was uneventful and the patient was transferred to intensive care for 24 hours of monitoring. Seven days after the operation, direct laryngoscopy and esophagoscopy were performed to assess for complications and the tracheotomy site was closed. MRI and CT on Day 8 confirmed total tumor excision and no spinal cord compression (Figure 1C,D). The patient was discharged 15 days post-surgery with full motor recovery but persistent right hemihypoesthesia. By 6 weeks, the hypoesthesia had completely disappeared.

Case 2

A 34-year-old woman was admitted with complaints of recurrent weakness in her arms and legs. She had previously undergone occipito-cervical fusion to correct atlanto-axial instability. Her symptoms had completely resolved after the surgery, but they returned gradually in the 5 months that followed. Neurological examination revealed right-sided hemiparesis and hemihypoesthesia, hyperactive deep tendon reflexes, and positive Babinsky sign. MRI of the cervical spine showed narrowing of the anterior aspect of the spinal canal due to compression by the dens (Figure 3A). CT confirmed that the dens was compressing the cord at this level (Figure 3B).

A decision was made to resect the dens via an anterior route. The patient was placed in supine position and the transmandibular approach was performed. As in Case 1, the first step was tracheotomy and tracheal cannulation under sedation. Then general anesthesia was induced. The surgical field was disinfected and draped as described above and a midline lip-split incision was made. The mandible was dissected at the midline using a high-speed drill and the tongue was shifted laterally. As in Case 1, the oro- and hypopharynx were clearly exposed and a longitudinal incision was made in the wall of the pharynx. This provided access to the corpus of the second cervical vertebra. The dens was resected with the aid of a high-speed drill. An interbody cage was placed in the defect site and fused to the C1 and C3 vertebrae using standard technique. The pharyngeal incision was closed with a free tissue flap from the patient's left forearm and the mandible was fixed with a microplate.

Recovery from general anesthesia was uneventful and the patient was transferred to intensive care for 24 hours. As in Case 1, on Day 7 direct laryngoscopy and esophagoscopy were performed to assess for complications and the tracheotomy was closed. MRI and CT the next day showed no spinal cord compression (Figure 3C,D). Ten days after surgery, the patient started a rehabilitation program. She was discharged on postoperative Day 15 with mild right hemiparesis and hemihypoesthesia.

DISCUSSION

Various features of upper cervical pathologies can lead to radiculopathy or myelopathy. Such clinical signs depend on lesion location and the degree of spinal cord compression that occurs. In both our cases, the myelopathy was directly related to the spinal cord compression.

For patients with atlanto-axial instability, the first step of radiological evaluation should be plain radiography with a lateral view and views with the neck in hyperflexion and hyperextension. The distance between the dens and atlas should also be measured. The joint is considered to be instable if this distance exceeds 5 mm (5). The atlas and axis should be evaluated with reconstructed sagittal CT, and MRI should be performed to check for cord compression prior to surgery in all cases of atlanto-axial instability. Digital subtraction angiography is valuable for demonstrating the relationship between the tumor and vertebral arteries in the vicinity, and we used this technique in our Case 1.

Pathologies in the upper cervical region are close to the foramen magnum and the clivus, and the surgical approach must provide good exposure of all

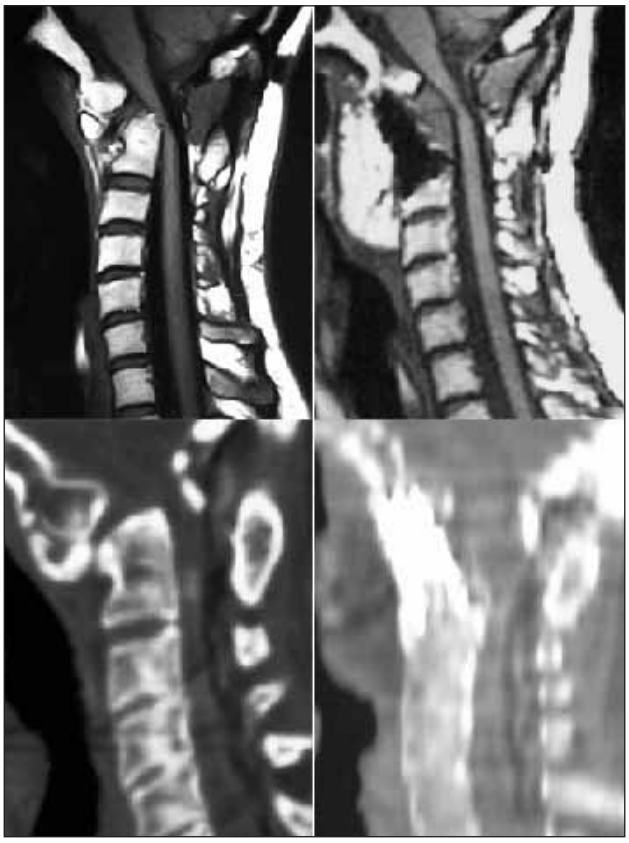

Figure 3: Imaging findings in Case 2: A) *(upper left) Preoperative T1-weighted sagittal cervical MRI;* ***B)*** *(lower left) Preoperative sagittal CT images of the cervical spine;* ***C)*** *(upper right) Postoperative T1-weighted sagittal cervical MRI;* ***D)*** *(lower right) Postoperative sagittal computed tomography images of the cervical spine.*

key structures. The operative plan will differ depending on lesion location. In the past, the only surgical option for these cases was posterior decompression and fixation, but today the choices include both anterior and anteroposterior approaches (8). There are 3 main anterior surgical techniques for managing lesions of the clivus, foramen magnum, or upper cervical vertebrae (3,4,7,9,10). One is the standard transoral approach, which is frequently used by neurosurgeons. The most important advantage of this method is that it provides direct access to the lesion. The transoral approach allows the surgeon to operate on any intradural or extradural lesion located between the clivus and the second and third cervical vertebrae (8). However, this technique does have disadvantages, specifically limited working space and high risk of surgical field contamination. If a patient has limited mouth-opening ability and restricted neck extension, the transoral approach does not provide adequate exposure for surgery. The second anterior technique is the transmaxillary approach. This method allows access to any intradural or extradural lesion located between the clivus and the first and second cervical vertebrae. In our Case 1, the chordoma had invaded the bodies of both the C2 and C3 vertebrae, and the transmaxillary approach was therefore inappropriate for this patient (1,3). The third main surgical option for accessing the upper cervical region is the high-cervical retropharyngeal approach (2). Compared with the other 2 techniques, this method offers the advantage of lower risk of infection because the oropharyngeal mucosa is left intact. The disadvantages of this approach are awkward trajectory, restricted depth of exposure, and lack of direct midline access to the upper cervical spine. Both our patients had undergone previous neck fusion, so neck extension and rotation were no longer possible. This meant that none of the 3 standard techniques noted above was suitable (6,8). We used the transmandibular approach, a modified transoral technique, to access the pathologies directly and achieve optimal surgical exposure. In this method, dissection of the mandible and lateral deviation of the tongue provide maximum surgical exposure (9). Some tumors (chordomas, for example) have a high incidence of local recurrence, and adequate surgical exposure is critical to allow total resection in such cases (11).

Good surgical exposure is the main advantage of the transmandibular approach. However, infection risk is an issue as this technique requires working inside the mouth and dissection of oropharyngeal mucosa (8). Also, the proximity of the surgical field to the trachea, esophagus, major vessels (vertebral and carotid arteries), and major nerves (hypoglossal, vagus, accessories) means there is risk of damage to vital structures (2).

Surgery on the upper cervical spine poses a real challenge for surgeons because of the depth of the surgical field and the proximity of important structures. When an anterior cervical approach is required, careful preoperative evaluation should be carried out to select the most appropriate technique. Our limited experience with these 2 patients suggests that the transmandibular approach provides good surgical exposure and is well tolerated in patients with limited neck extension and mouth-opening ability.

REFERENCES

1. Bhangoo RS, Crockard HA: Transmaxillary anterior decompressions in patients with severe basilar impression. Clin Orthop Relat Res 359: 115-125, 1999
2. Chang U, Henn JS, Lee MC, Rhoton AL: High Cervical Retropharyngeal Approach to the Craniocervical Junction. In: Kim DH, Henn JS, Vaccaro AR, Dickman AC: Surgical Anatomy & Techniques to the Spine. Philadelphia: Saunders&Elsevier, 2006: 22-31
3. Crockard HA, Pozo JL, Ransford AO, Stevens JM, Kendall BE, Essingman WK: Transoral decompression and posterior fusion for rheumatoid atlanto-axial subluxation. J Bone Joint Surg Br 68: 350-356, 1986
4. Fang HS, Ong GB: Direct anterior approach to the upper cervical spine. J Bone Joint Surgery Am 44: 1588-1604, 1962
5. Fielding JW, Cochran GB, Lawsing JF3rd, Hohl M: Tears of the transverse ligament of the atlas. A clinical and biomechanical study. J Bone Joint Surg Am 56: 1683-1691, 1974
6. German JW, Hart BL, Benzel EC: Nonoperative management of vertical C2 body fractures. Neurosurgery 56: 516-521, 2005
7. Halle JE, Denis F, Murray J: Exposure of the upper cervical spine for spinal decompression by a mandible and tongue-splitting approach. Case report. J Bone Joint Surg Am 59: 121-123, 1977
8. Henn JS, Lee MC, Rhoton AL: Transoral Approach to the Craniocervical Junction and Upper Cervical Spine. In: Kim DH, Henn JS, Vaccaro AR, Dickman AC (ed). Surgical Anatomy & Techniques to the Spine. Philadelphia: Saunders&Elsevier, 2006: 3-12
9. Honma G, Murota K, Shiba R, Kondo H: Mandible and tongue-splitting approach for giant cell tumor of axis. Spine 14: 1204-1210, 1989
10. Krespi YP, Har-El G: Surgery of the clivus and anterior cervical spine. Arch Otolaryngol Head Neck Surg 114: 73-78, 1988
11. Rhines LD, Fourney DR, Siadati A, Suk I, Gokaslan ZL: En bloc resection of multilevel cervical chordoma with C-2 involvement. Case report and description of operative technique. J Neurosurg Spine 2: 199-205, 2005