TRANSMANDIBULAR APPROACH TO CERVICAL SPINE-CASE REPORT

M. ZİLELİ * M. ETİ * E. SONGÜR * H. MİZRAİ *

ABSTRACT:

Anterior cervical deformity extending to the lower retropharyngeal level needs to be explored in a wider fashion than conventional transoral approach. This could be obtained with transmandibular incision. This report describes transmandibular approach to mid-cervical region in a patient with basilar invagination.

The patient had a short neck and khyphosis with severe spastic tetraparesis predominant on his left side. Radiologic investigations showed basilar invagination, severe cervical lordosis with maximum on C5-6 levels and severe cord compression on mid-cervical levels. He was operated on two consecuent sessions; first a C1-C7 posterior laminectomy, and after 2 weeks a second operation: anterior decompression, deformity correction, anterior fusion and plating. After tracheostomy, a midmandibular, paralingual swing approach was done. After a C5-6 anterior osteotomy and cord decompression, a wedge bone graft from iliac crest was inserted on the resection space and cervical plate with 4 screws from C3-C6 was applicated in the resected anterior spine. During postoperative follow-up period for 10 months his tetraparesis improved quite well and he could walk without external supports. He weared an external support with Halo vest for 6 months.

Transmandibular approach to anterior cervical spinal pathologies with extended deformities not possible to be dealed with conventional anterior cervical or transoral approaches seems to be a reliable method without significant morbidity.

Key Words: *high cervical spine - basilar invagination - transmandibular approach - cervical plates*

INTRODUCTION

There are two main approaches to the cervical spine: anterior and posterior. Anterior exposure to the upper cervical spine is limited due to anatomical bariers such as tongue, mandible and pharynx. Several operative approaches are described for that reason: transoral (1, 7, 11, 12, 20), transcervical (19, 22, 24), transcondylar (4, 22), tarnssphenoidal (16, 26), transmaxillar (6, 13, 17) and inftratemporal (4, 22) approaches. Most of these approaches are very limited and not possible for surgical aims with wide exposure such as fusion and instrumentation.

Mandibulotomy is an alternative for wide exposure of high cervical region. It gives a view from clivus to mid cervical region. There are two alternative routes after mandibulotomy: first is through the midline with a median glossotomy, second is a mandibular swing approach in a paramedian position with a paralingual extension through the floor of the mouth (2, 3, 9, 10, 14, 15, 18, 19, 21, 23, 24, 25).

This report describes transmandibular approach to mid-cervical region in a patient with basilary invagination.

* Departments of Neurosurgery and Plastic and Reconstructive Surgery, Ege University Faculty of Medicine, Izmir, TÜRKİYE

CASE REPORT

A 56 years old male patient has admitted to our neurosurgical department with a complaint of progressive tetraparesis for 1 year. On physical examination he had a short neck and khyphosis with severe spastic tetraparesis predominant on his left side (Figure 1). Neurologically his tetraparesis was so severe that he was unable to walk and use his hands for eating and wearing clothes. He had also urinary incontinence.

Direct X-rays (Figure 2), CT and MR imaging (Figure 3) showed basilar invagination, severe cervical lordosis with maximum on C5-6 levels and severe cord compression on mid-cervical levels. Cervical lordosis was about 70° and maximum cord compression was on this level both from posterior and anterior. Functional cervical spine X-rays showed a 15° angulation during extension. There was an additional compression of pontomedullary junction from dysplastic odontoid process. He had however no symptoms and signs of cerebellar and brain stem involvement.

We operated him on two consecuent sessions. First we performed a C1-C7 posterior laminectomy. 2 weeks after laminectomy a second operation was performed: transmandibular anterior decompression on C5-6 levels, deformity correction, anterior fusion and plating.

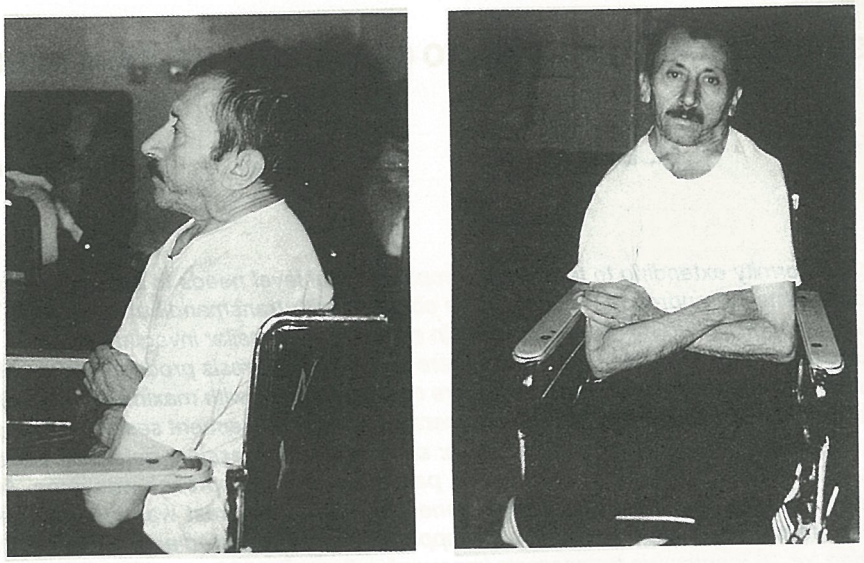

Figure 1a - b. Patient from side and front.

Figure 2. Lateral cervical x-ray showing basilary invagination and severe lordotic angulation.

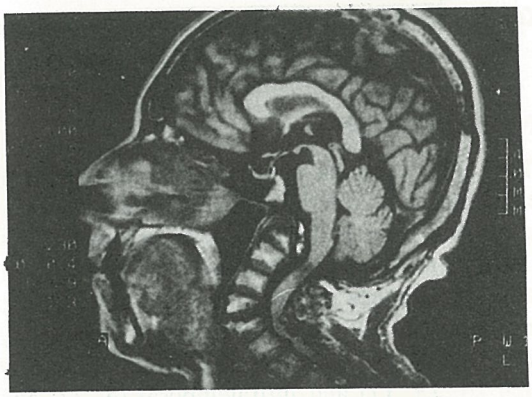

Figure 3. Sagittal T1-weighted MR image showing severe cord compression on midcervical levey, deformed and rudimented odontoid process and C1 arch, some compression to the pontomedullary junction. Note that C5-6 level is just behind the tongue.

OPERATION

At the beginning of this second operation a Gardner Wells traction with 2 kg weight was applicated. After tracheotomy, a midmandibular incision converging to the right cervical skin incision was done (Figure 4). Mandible was transected on midline with a Gigli saw (Figure 5). Two halves of the mandible were retracted laterally. A silk suture helped to retract the tongue to the left side (Figure 6). The incision was followed in a paralingual fashion submucosally. Lingual gingiva was incised at the side of the mandibulotomy and this incision was extended laterally through the floor of the mouth up to the anterior pillar of the soft palate. A lateral swing of the mandible permitted exposure of the underlying sublingual gland and the mylohyoid muscle. Mylohyoid muscle is divided.

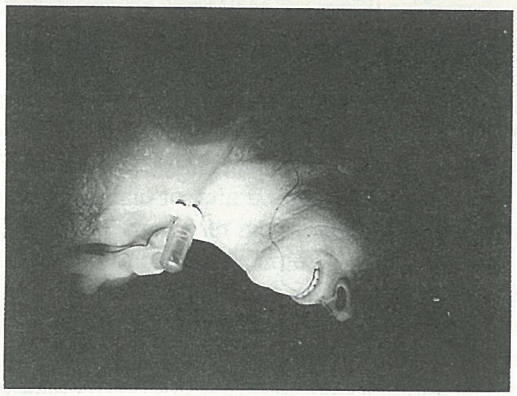

Figure 4. Incision line after tracheostomy.

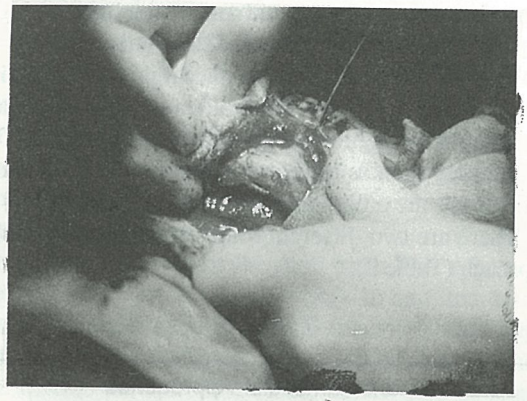

Figure 5. Midmandibular osteotomy with Gigli saw.

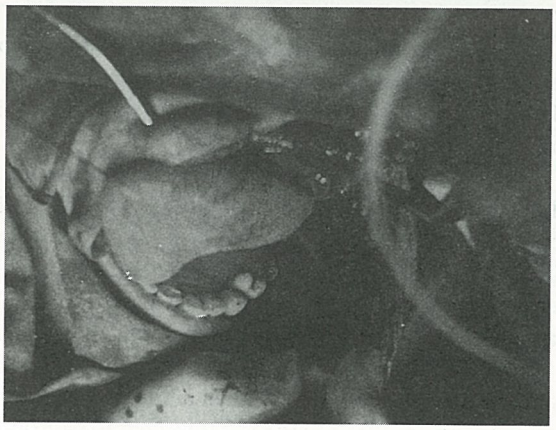

Figure 6. Mandibular swing approach to the paralingual area with retraction of the tongue. Transected right half of the the mandible is retracted with fingers of the surgeon.

Similarly styloglossus muscle is divided. With finger palpation and dissection, the muscular attachment between the tongue base and lateral pharyngeal wall is divided up to the hyoid bone. At the end of this dissection, tongue and epiglottis were retracted medially, pharynx and mandible were retracted laterally. Two self retaining retractors were used for exposure (Figure 7).

After a C5-6 anterior osteotomy and cord decompression, a wedge bone graft from right iliac crest was

Figure 7. At the end of exposure the lordotic angulation was shown between the blades of self-retaining retractors. Uvulae, tongue and retropharyngeal spaces are under retractors.

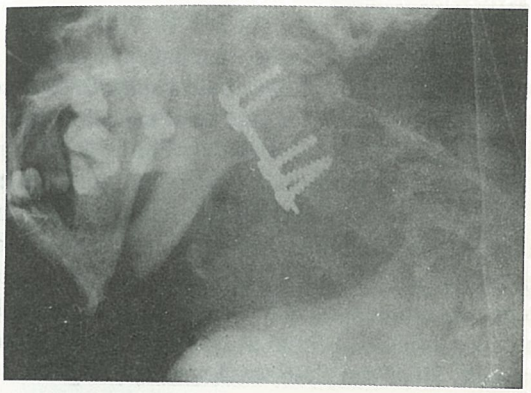

Figure 8. Postoperative lateral x-ray showing anterior plate with some correction of the deformity and wire stitches on the mandible.

inserted on the resection space and cervical plate with 4 screws from C3-C6 was aplicated from C4-C6 onto the resected anterior spine. Screw fixations on the distal end were done from lower dissection site without convering deep layers of two dissections. After closure of the mucosal incision mandible was fixated with two stainless steel wires (Figure 8).

Postoperative period was uneventful except a transient difficulty on swallowing. Intensive oral irrigations and cleaning and frequent oral suctioning was done for the first 10 days postoperatively. Due to difficulty on swallowing, he could begin regular oral intake after 3 weeks. In addition to tracheostomy care, nasogastric tube feeding was maintained for two weeks. During postoperative follow-up period for 10 months his tetraparesis improved quite well and he could walk without external supports. He weared an external support with Halo vest for 6 months. On follow-up x-rays the lower screws of the plate were loosened and a slight increase in the angulation was observed.

DISCUSSION

This case report describes one patient with basilar invagination, stenosis of the cervical spine in the mid-cervical level (actually higher than expected due to basilar invagination) and severe deformity at this level. Since we first performed a posterior laminectomy for decompression and there was instability at this lordotic level, an additional stabilization was necessary. We could reach this aim with a wedge osteotomy plus anterior decompression and instrumented fusion at the top of lordotic level through transmandibular swing approach. Since the C5-6 level was very high due to invagination and transoral route could obtain a limited area which would not permit an effective resection and plating, we preferred transmandibular approach.

Becasue exposure of the anterior surfaces of the upper cervical spine is difficult by the standard prevertebral route, some surgeons (3, 9, 19) have developed retropharyngeal approaches to the upper cervical spine (Table 1). These techniques are useful for ventrally placed tumors, for fusion of unstable interspaces at C1-C2 and C2-C3, and for resection bone compressing the cord, including anomalies and fracture fragments of the odontoid process. The same approaches are also used for pathologies of the skull base and clivus area (2, 4, 5, 6, 8, 13, 16, 17, 22).

Table 1.

Anterior Surgery of the Upper Cervical Spine
1. Transoral
2. Transcervical retropharyngeal
3. Transsphenoidal
4. Transmaxillar
5. Transcondylar
6. Subtemporal
7. Transmandibular

The subtemporal approach offers excellent exposure of the infratemporal fossa and of the infralabyrinthine space. The exposure of the clivus and C1 body is mainly lateral; and inferior extension is lacking. There is good control of the carotid artery, the internal jugular vein, and the ninth through 12th cranial nerves.

Various tumors involving the high cervical spine or the rostrum of the sphenoid and clivus are approachable through a mandibulotomy approach. The deformities such as basilar invagination and romatoid arthritis are the other indications for this approach.

There are two different routes for transmandibular approach (Table 2):

Table 2.

Transmandibular Approaches
1. Median labiomandibular glossotomy
2. Mandibular swing approach = median mandibulotomy + paralingual extension

1. Median labiomandibular glossotomy. One of the great disadvantages of this route is massive edema of the tongue which could be seen occasionally following median glossotomy (18, 23).

2. Mandibular swing approach = Median mandibulotomy with paralingual extension (23, 24, 25). It offers extensive exposure of the midline and lateral (ipsilateral to the exposure) compartments of the upper cervical spine and the skull base. The particular disadvantage of this lateral approach is that there is a potential risk for damage to cranial nerves and the carotid arteries. Transection of the lingual nerve and 12th cranial nerve may be necessary.

Among the extensive approaches to the upper cervical spine, the median labiomandibulotomy with glossotomy affords excellent visualization of the entire length of the clivus and C1, C2 vertebral bodies,

which is; however, limited to the midline. There is no neurovascular control, and access to the surrounding areas, other than the upper cervical spine, is lacking. The morbidity associated with this procedure is limited to a temporary tracheostomy and gastrostomy.

We preferred the first route to avoid from edema of the tongue, and to gain access to the lower levels which is not so easy with median glossotomy. It also give as short distance to the target.

The salient features of the procedure we used in this case report are represented by a mandibulotomy and by detachment of the pharynx from the skull base through a combined oral and cervical approach. Ammirati at al (2) has modified the original approach of Krespi (9, 10) for wider exposure of the skull base. In this situation, there is full neurovascular control of the internal carotid artery and lower cranial nerves with the possibility of complete exposure of the intrapetrous and intracavernous segments of the internal carotid artery on the side of the opening. This approach which may be regarded as an expansion of the original work of Krespi, with sacrificing the lingual nerve should be considered when dealing aggressively with extensive skull base lesions invading the midleni and lateral compartments of the skull base. This approach was also used for oral tumors (25). In addition to clivus and anterior cranio-cervical junction, other adjacent areas, such as the infratemporal and pterygopalatine fossae, the sphenoid sinus, the cavernous sinus, the anterior cranial fossa may be readily accessible. The morbidity of this technique is represented by temporary tracheostomy and gastrostomy tubes, and oral prosthesis.

This approach, like all other complex skull-base exposures, has built-in morbidity. Consequently, the indications for its use should be carefully considered and it should probably be reserved only for those cases when a surgical cure or a significant palliation may be achieved. For example it should only be performed for benign pathologies like deformity correction and tumors like chordoma and maningioma. As with all complex skull-base procedures, this approach should only be used by a specialist team that has extensively familiarized itself with the complex anatomy of this region and surgical techniques described. It is a long lasting operation, it needs tracheostomy and a long lasting postoperative nasogastric feeding. Postoperative infection rate is a potential hazard, and it has higher morbidity and mortaility rates compared to the other approaches. But as in this case report it is an effective and safe method of anterior decompression and fusion of the high cervical pathologies.

In conclusion, transmandibular approach to anterior cervical spinal pathologies with extended deformities not possible to be dealed with conventional anterior retrophayngeal or transoral approaches seems to be a reliable method.

REFERENCES:

1. Apuzzo, MLJ, Weiss MH, Heiden JS. Transoral exposure of the atlantoaxial region. Neurosurgery 3: 201-207, 1978.
2. Ammirati M, Ma J, Cheatham ML, Mei ZT, Bloch J, Becker DP. The mandibular swing-transcervical approach to the skull base; anatomical study-technical note. J. Neurosurg. 78: 673-681, 1993.
3. Arbit E, Patterson, RH. Combined transoral and median labiomandibular glossotomy approach to the upper cervical spine. Neurosurgery 29: 672-674, 1981.
4. Bertalanffy H, Wolfgang S. The dorsolateral, suboccipital, transcondylar approach to the lower clivus and anterior portion of the craniocervical junction. Neurosurgery 29: 815-821, 1991.
5. Biller HF, Shugar JMA, Krespi YP. A new technique for wide-field exposure of the base of the skull. Arch Otolaryngol 107: 698-702, 1981.
6. Cocke, E.W. Jr., Robertson, J.H., Robertson, J.T. et al.: The extended maxillotomy and subtotal maxillectomy for excision of skull base tumors. Arch Otolaryngol Head Neck Surg 116: 92-104, 1990.
7. Crockard, H.A., Sen, C.N.: The transoral approach for the management of intradural lesions at the craniovertebral junction: review of 7 cases. Neurosurgery 28: 88-98, 1991.
8. Derome, P.J.: The transbasal approach to tumors invading the base of the skull, in Schemidek; H.H., Sweet W.H. (eds): Operative Neurosurgical Techniques, Indications, Methods, and Results. New York: Grune and Stratton, vol. 2, 1982, pp 357-379.
9. Fang, H.S.Y., Ong, G.B.: Direct anterior approach to the upper cervical spine. J. Bone Joint Surg. 44A: 1588-1604, 1962.
10. Fang, H.S.Y., Ong, G.B., Hodgson, AR.: Anterior spinal fusion: the operative approaches. Clin. Orthop. 35: 16-33, 1964.
11. Greenberg, A.D., Scoville, W.B., Davey, L.M.: Transoral decompression of atlantoaxial dislocation due to odontoid hypoplasia - report of two cases. J. Neurosurg, 28: 266-269, 1968.
12. Hadley, M.N., Spetzler, R.F., Sonntag V.K.H.: The transoral approach to the superior cervical spine, a review of 53 cases of extradural cervicotnedullary compression. J. Neurosurg 71: 16-23, 1989.

13. James, D., Crockard, H.A.: Surgical access to the base of skull and upper cervical spine by extended maxillotomy. Neurosurgery, 29: 411-416, 1991.
14. Krespi, Y.P., Grady, H.E.: Surgery of the clivus and anterior cervical spine. Arch Otolaryngol Head Neck Surg. 14: 73-78, 1988.
15. Krespi, Y.P., Sisson, G.A.: Transmandibular exposure of the skull base. Am J. Surg. 148: 534-538, 1984.
16. Laws E.R. Jr.: Transsphenodial surgery for tumors of the clivus. Otolaryngol Head Neck Surg.: 92: 100-101, 1984.
17. Lorenzo, N.D.: Transoral approach to extradural lesions of the lower clivus and upper cervical spine: an experience of 19 cases. Neurosurgery 24: 37-42, 1989.
18. Martin, H., Tollefsen, R., Gerold, F.P.: Median labiomandibular glossotomy. Am. J. Surg. 102: 755-759, 1961.
19. Mullan, S., Naunton, R., Hekmatpanah, J., Vailati, G.: The use of an anterior approach to ventrally placed tumors in the foramen magnum and vertebral column. J. Neurosurg. 24: 536-543, 1966.
20. Pastzor, E.: Transoral approach for epidural craniocervical pathological processes. Adv. Tech. Stand Neurosurg. 12: 125-170, 1985.
21. Price, J.C., Holliday, M.J., Johns, M.E. et al.: The versatile midface degloving approach. Laryngoscope 98: 291-295, 1988.
22. Samii, M., Draf, W.: Surgery of the Skull Base. An Interdisciplinary Approach. Springer-Verlag, Berlin, 1989, pp 429-458.
23. Shah, J.P. Shaha, A.R.: Transmandibular approaches to the upper cervical spine. in: Tumors of the Spine-Diagnosis and Clinical Management. edts. N. Sundaresan, H.H. Schmidek, A.L. Schiller, D.I. Rosenthal. W.B. Saunders Co., 1990, pp 329-335.
24. Southwick, W.O., Robinson, R.A.: Surgical approaches to the vertebral bodies in the cervical and lumbar regions. J. Bone Joint Surg. 39A: 631-644, 1657.
25. Spiro R.H., Gerold, F., Strong, E.W.: Mandibular swing approach for oral and orophayngeal tumors. Head Neck Surg. 2: 371-378, 1981.
26. Stevenson, G.C., Stoney, R.J., Perlans, R.K., Adams, J.E.: A transclival approach to the ventral surface of the brain stem for removal of a clivus chordoma. J. Neurosurg. 24: 544-551, 1966.