Original Article [CNSJ]

Surgical outcome of patients with Foramen Magnum Meningioma

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ABSTRACT

Purpose: In this study we aimed to investigate the benefits of far-lateral approach without partial condylectomy in patients with foramen magnum meningiomas over surgical approach with condylectomy.
Methods: From 1980 to 2011, a total of 17 patients with foramen magnum meningiomas were treated surgically via far-lateral approach without condylectomy. The follow up period of this study was 6 to 24 months.
Result: In this study, most of the tumor removals were done as complete resection. Operative deaths and significant complications were not noticed during procedure. Although all of the patients improved in their motor function, sensory deficits were resolved in 85% of patients by microsurgical far-lateral approach without partial condylectomy.
Conclusion: Results of this study revealed that far-lateral approach without condylectomy is safe and effective in resection of foramen magnum meningiomas.

Keywords: Magnum Meningiomas; Far-lateral approach; Condylectomy

ICNSJ 2015; 2 (2):71-73 www.journals.sbmu.ac.ir/neuroscience

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Received: 5, March, 2015 **Accepted:** 18, July, 2015

INTRODUCTION

Among all meningiomas which accounts for 14.3 to 19% of all intracranial tumors [1], only 1.8 to 3.2% arise from foramen magnum [2]. Foramen magnum is a zone delimited anteriorly by the lower third of the clivus, anterior arch of atlas and odontoid process; laterally by the jugular tubercle, occipital condyle, and lateral mass of atlas; and posteriorly by the lower part of the occipital bone and posterior arch of C1 and C2. However 70% of these tumors are benign [3-5].

Slow growing rate and indolent development leads to long interval of the first symptom, so patients complain of a long history of occipitocervical pain associated with long tract signs and lower cranial nerve deficits [6]. Since localization of the tumor determines the surgical approach, there are multiple classification methods suggested by authors for Foramen Magnum Meningiomas (FMM); dural base classification states that mostly these tumors are intradural, 10% have an extradural extension presenting as intra and extradural tumors and, more rarely, strictly extradural [7-11]. Boulton et al used spinal dentate ligament as an outline for the anterior and posterior compartments with most of the lesions (68%-98%), arising anterolaterally, followed by postolateral, purely posterior and, more rarely, purely anterior [6,12].

Basically two surgical approaches are mainly used to resect these lesions: the far-lateral and transcondylar approach. In this study we investigated the effectiveness

of microsurgical far-lateral approach on FMM with no partial condylectomy.

MATERIALS AND METHODS

Patients' data

Seventeen patients with FMM were included in our study during the period from 1980 to 2011 who treated microsurgically in a large teaching hospital. The series included 12 women and 5 men. The patient's ages ranged from 16 to 69 years, with an average age of 49 years. Diagnosis of FMM was established by a set of clinical manifestations and neurological imaging. Nine patients presented with headache and neck pain, 10 with motor weakness, 7 with sensory deficits, 4 with sphincter disturbance, 5 with lower cranial nerve deficits, and 1 with respiratory dysfunction. In neuroimaging we found that all tumors in this group of patients originated between the level of the lower clivus and second cervical vertebra (C2). Additionally in all of the patients, meningioma arose in either anterior or antero-lateral foramen magnum and brainstem was pushed predominantly in a posterolateral fashion. Displacement of the vertebral artery was also observed in 12 cases and encasement in 5 cases.

Surgical approach

All of the patients were operated via a posterior approach with lateral extension. The craniectomy of the inferior part of the occipital bone and laminectomy of C1 and C2 were performed. It could be extended as far lateral as to the occipital condyle and lateral mass of atlas. In most cases bone structures could be preserved since displacement of the brainstem by the tumor provided enhanced anterior view for the surgeon. However dentate ligament was sectioned in case of urgency. Cranial nerves or the vertebral artery was embedded in the tumor, thus in these situations, no attempt was made to remove the tumor radically to avoid any injury of the important structures.

RESULTS

Complete removal of the tumor was performed in 11 patients (64%), subtotal resection in 4 cases (24%) and partial resection in 2 cases (12%). There was no operative death and significant postoperative complication in this series.

The patients had been followed up for 6-24 months. All the patients improved in their motor function. Paresthesia and sensory deficits resolved completely in 6 patients. The improvement in motor power was early and marked as compared with improvement in sensory deficits and lower cranial nerve paresis, which were delayed and incomplete. In addition, respiratory dysfunction in one patient resolved completely.

DISCUSSION

FMM are challenging lesions for surgeons due to their anatomic location, close relation with lower cranial nerves and vertebral artery [13]. Although some authors delineate anatomic safe margins for resection of FMMs, there are multiple variables affecting the selection of appropriate surgical approach. These factors which need to be considered are size, location of the tumor and anatomic relation (e.g., superior or inferior) to the vertebral artery [14-16]. As suggested by Boulton et al an anatomical study to compare the area of surgical exposure achieved using retrosigmoid or far lateral transcondylar approaches. Thirteen embalmed cadaveric heads were dissected bilaterally via the retrosigmoid approach on one side and the far lateral approach on the other. The area of surgical exposure was also expressed as a percentage of the total area of the lower clivus [6]. The authors conclude that the far lateral transcondylar approach gives more room to work at the lower clivus and foramen magnum areas and it should be the best route for removing FMM [17]. Most of the articles agree that far lateral approach should be the first choice in these cases. Even so, there are multiple suggestions about how much of the occipital condyle should be removed. Selection of appropriate surgical approach should be individualized for every patient. Some cases require no removal [18-20], while others benefit from resection of posterior third or even half of the occipital condyle [21-22].

CONCLUSION

In our study, we found that with careful microsurgical techniques it is possible to resect FMMs with no partial condylectomy. In the meantime, the surgical team should be able to do it when the patient benefits from it. It is our impression that the transcondylar extension should be reserved to small tumors that do not displace the neural structures enough to create an adequate surgical corridor.

REFERENCES

1. Wara WM, Sheline GE, Newman H, Townsend JJ, Boldrey EB. Radiation therapy of meningiomas. Am J Roentgenol Radium Ther Nucl Med. 1975;123(3):453-8.
2. Arnautović KI, Al-Mefty O, Husain M. Ventral foramen magnum meninigiomas. J Neurosurg. 2000;92(1 Suppl):71-80.

3. George B, Lot G, Boissonnet H. Meningioma of the foramen magnum: A series of 40 cases. Surg Neurol.1997;47(4):371–9.
4. Samii M, Klekamp J, Carvalho G. Surgical results for meningiomas of the craniocervical junction. Neurosurgery. 1996;39(6):1086–94. discussion 1094-5.
5. Yasargil M, Mortara R, Curcic M. Meningiomas of basal posterior fossa. In: Krayenbuhl U, editor.Advances and technical standards in neurosurgery. Berlin: Springer; 1980. pp. 3–115.
6. Boulton MR, Cusimano MD. Foramen magnum meningiomas: Concepts, classifications, and nuances. Neurosurg Focus. 2003;14(6):e10.
7. Cohen L. Tumors in the region of the foramen magnum. In: Vinken PJ, Bruyn GW (eds) Handbook of clinical neurology. North Holland, Amsterdam; 1975. pp 719–729
8. George B. Meningiomas of the foramen magnum. In: Schmidek HH (ed) Meningiomas and their surgical management. Saunders, Philadelphia; 1991. pp 459–470
9. George B, Lot G. Foramen magnum meningiomas. A review from personal experience of 37 cases and from a cooperative study of 106 cases. Neurosurg Quat. 1995;5:149–167
10. George B, Lot G. Surgical approaches to the foramen magnum. In: Robertson JT, Coakham HB, Robertson JH (Eds) Cranial base surgery. Churchill Livingstone, New York; 2000. pp 259–279.
11. Ibrahim AW, Satti MB, Ibrahim EM. Extraspinal meningioma. Case report. J Neurosurg. 1986;64(2):328-30.
12. Bruneau M, Cornelius JF, George B. Antero-lateral approach to the V3 segment of the vertebral artery. Neurosurgery. 2006;58(1 Suppl):ONS29-35; discussion ONS29-35.
13. Bruneau M, George B. Foramen magnum meningiomas: Detailed surgical approaches and technical aspects at Lariboisiere Hospital and review of the literature. Neurosurg Rev. 2008;31(1):19–32. discussion 32-3.
14. Samii M, Klekamp J, Carvalho G. Surgical results for meningiomas of the craniocervical junction. Neurosurgery. 1996;39(6):1086-94; discussion 1094-5.
15. George B, Lot G, Boissonnet H. Meningioma of the foramen magnum: a series of 40 cases. Surg Neurol. 1997;47(4):371-9.
16. Arnautovic' KI, Al-Mefty O, Husain M. Ventral foramen magnum meningiomas. J Neurosurg. 2000;92(1 Suppl):71-80.
17. Suhardja A, Agur AM, Cusimano MD. Anatomical basis of approaches to foramen magnum and lower clival meningiomas: comparison of retrosigmoid and transcondylar approaches. Neurosurg Focus 2003;15;14(6):e9.
18. Goel A, Desai K, Muzumdar D. Surgery on anterior foramen magnum meningiomas using a conventional posterior suboccipital approach: a report on an experience with 17 cases. Neurosurgery. 2001;49(1):102-6; discussion 106-7.
19. Nanda A, Vincent DA, Vannemreddy PS, Baskaya MK, Chanda A. Far lateral approach to intradural lesions of the foramen magnum without resection of the occipital condyle. J Neurosurg. 2002;96(2):302-9.
20. Bassiouni H, Ntoukas V, Asgari S, Sandalcioglu EI, Stolke D, Seifert V. Foramen magnum meningiomas: clinical outcome after microsurgical resection via a posterolateral suboccipital retrocondylar approach. Neurosurgery. 2006;59(6):1177-85; discussion 1185-7.
21. Gupta SK, Sharma BS, Khosla VK, Mathuriya SN, Pathak A, Tewari MK. Far lateral approach for foramen magnum lesions. Neurol Med Chir (Tokyo). 2000;40(1):48-52; discussion 52-4.
22. Pamir MN, Kiliç T, Ozduman K, Türe U. Experience of a single institution treating foramen magnum meningiomas. J Clin Neurosci. 2004;11(8):863-7.