

A treatment of arteriovenous malformation on mandible

Mi-Sun Jung, Dong-Mok Ryu, Eui-Jong Kim*, Jeong-Hwan Oh

Department of Oral & Maxillofacial Surgery, School of Dentistry, Kyung-Hee University, Korea

* Department of Interventional Radiology, School of Medicine, Kyung-Hee University, Korea

Abstract

The treatment of intraosseous arteriovenous malformation in the jaw is difficult because of life threatening frequent bleeding tendency. The surgical resection of AVM may be mortal due to massive blood loss. In the growing pediatric patient, surgery may cause facial deformity and growth disturbance. So currently, the treatment of AVM is only embolization using various material through endovascular access, direct-puncture or embolization in conjunction with surgical resection. We report a case of combined techniques.

Key words

AVM, Arteriovenous malformation, Embolization

INTRODUCTION

In head and neck, AVM(arteriovenous malformation) rarely occurred. Specially intraosseous AVM of jaw is rare and sometimes mortal because of frequent bleeding tendency. Children are mostly commonly involved, if the movable tooth involved the lesion extracted, it cause massive bleeding. Intraosseous malformations have risk from life-threatening bleeding^{1,3)}.

We report a case of unilateral mandibular AVM in 14-year-old boy treated successfully by combined techniques.

CASE REPORT

In March 2005, a 14-year-old boy was referred for intermittent bleeding. There was no historic trauma. He had facial asymmetry by left mandibular swelling and facial skin color was pale. The bluish ecchymosis was on left buccal skin. Bruit could be audible by stethoscope over the area, and pulsations were palpable. The consistent oozing point was distal of left mandibular second lower

molar. The patient was smaller than normal, had light 30Kg weight. This could be presumed concerning of AVM.

Panorama and mandible PA view showed lytic expansion, septum, coarse trabeculae, root resorption, soap-bubble radiolucency inner lesion. Mandible bony cortex was continuity(Fig. 1).

In MRI view, high flow vascular mass existed from left mandibular angle to ramus, included buccal space and masseter muscle. The boundary with pterygoid muscle was not uncertain. The size of lesion was 40 × 35 × 45 mm(Fig. 2).

At first day, first angiography was done. By Seldinger method, right femoral artery was punctured, using guide wire, right common carotid artery was selected and approached to Left external carotid artery. High flow vascular mass was inner left mandible. Bone remodeling and some destruction was showed in bony cortex(Fig. 3).

Hypervascular mass supplied by facial artery and maxillary artery was observed on left mandibular angle area. Facial artery branched to mental artery, submental artery and so on. The diameter of multiple branching artery was larger and showed tortuosity.

The lesion had large nidus and aneurysmal sac. In arterial phase, the lesion was early venous shunted to internal jugular vein. Intraoral bleeding was showed at molar area(Fig. 4).

* Corresponding author

Mi-Sun Jung

Dept. of OMFS, Kyunghee University Medical center
1 Hoegi-dong Dongdaemun-gu, Seoul, 131-702, Korea
Tel: 82-2-958-9441 Fax: 82-2-966-4572
E-mail: aiyak@naver.com

One month later, repeated angiogram and embolizations was done by trans arterial approach. Angiogram showed AV(arterio-venous) shunting and flow decreased, but still contrast filled vascular mass and

aneurysmal sac was observed. The branches of internal maxillary artery; Inferior alveolar artery, buccal artery, lesser descending palatine artery was dilated(Fig. 5). For one month, many bleeding tendency was occurred, so embolization was decided.

Using microcatheter and microguide wire, above three arterial branches was by turns superselected and confirmed as feeder by angiography. Embolization was done by contour(250-350 micron)(Fig. 6).

After each artery was embolized, blood filling was seldom occurred from this artery. Flow was lower than before, at the same time lower AV shunting and underflow of contrast media was showed. However still blood filling in vascular mass by unknown small branches was showed(Fig. 7).



Fig. 1. Lytic expansion in left mandible.

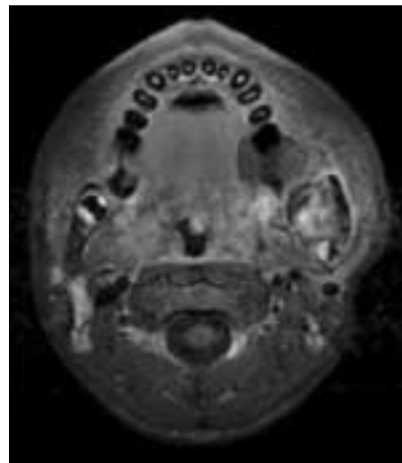
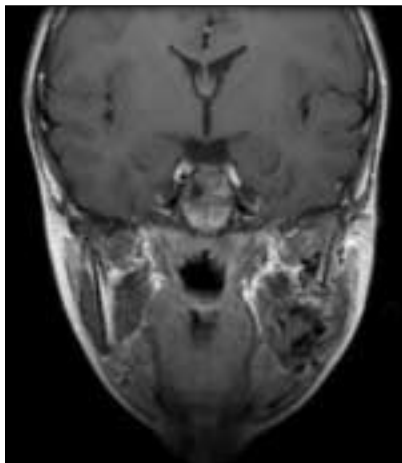


Fig. 2. Boderline with soft tissue.

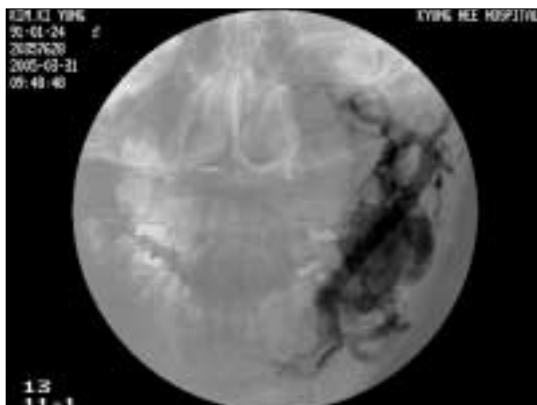


Fig. 3. AVM in front view.

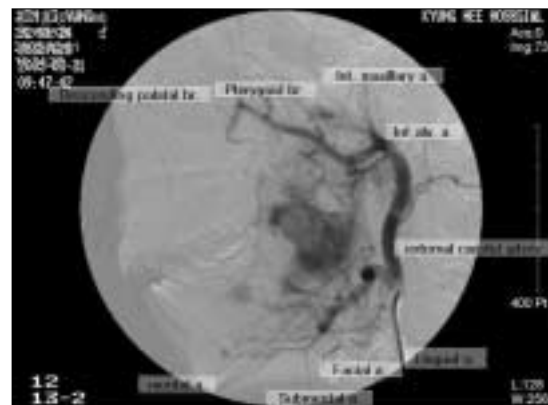


Fig. 4. Feeding vessels into nidus.

After first embolization, the amount of intraoral bleeding was decreased extremely, however intermittent bleeding was sometimes occurred for an week.

We decided to perform repeated embolization by transvenous approach and transarterial approach.

Inflow from internal maxillary artery into aneurysmal sac was decreased remarkably. However still feeding from jugal branch of facial artery and small branches of internal maxillary artery, small AV shunting was noted(Fig. 8).

Because of drain from aneurysmal sac to internal jugular vein, we decided to approach to internal jugular vein and obliterate aneurysmal sac, in which area to intercept flow to internal jugular vein. By this transvenous approach embolization method was selected and guiding

catheter was set into internal jugular vein. Using microcatheter and microguide wire we approached venous drainage route, but failed for proceeding of jugular bulb, fast flow and formation of venous drain route.

Therefore using microcatheter two jugal branches; feeder branch of facial artery was embolized by contour(Fig. 9).

After performing of transarterial embolization, in angiography, almost flow of large feeder was decreased, too small to be superselected multiple branch filled, instead of many decreasing AV shunting was slightly existed.

Two weeks later, intraoral bleeding was decreased much, but for interval sometimes small intraoral bleeding was occurred.



Fig. 5. Redilated internal maxillary artery.



Fig. 6. Superselection and embolization with microcatheter and microguide.



Fig. 7. After embolization reduced filling nidus.



Fig. 8. Redilated facial artery.

In angiography, flow from feeder vessel was dropped greatly, still contrast media was fed by small branched and AV shunting was noted.

For impossible to approach by arterial route, percutaneous approach was selected.

Under ultrasound induce, puncture was tried to near most thin cortical bone; angle area, needle tip was located in aneurysmal sac. In angiography, from large aneurysmal sac through variated vein fast filling was noted to internal jugular vein.

To prevent to embolic material move for internal jugular vein, inside aneurysmal sac using nine J shaped detachable coil, mesh was made, through Percutaneous route 40 variant size of microcoil was inserted and sac was filled out (Fig. 12~14). Inside sac, there was no

vacant space but still slow and mild AV shunting was exist. Therefore using 20% Glue(mixed with lipiodol) 2 vial, aneurysmal sac was injected(Fig. 11).

Patient had not other abnormal symptom during procedure.

In July 2005, follow-up angiography was performed. After last embolization during 2 months there was no problem, but recently intraoral bleeding was occurred.

The branch of internal maxillary artery; inferior alveolar artery, buccal artery, lesser descending palatine artery, was re-dilated again. Facial artery branches were also redilated a little. Before aneurysmal sac was almost blocked, however in posterior portion filling of contrast media was noted. Entirely comparing last embolization AV shunting was more larger(Fig. 15, 16).



Fig. 9. Embolization with contour.



Fig. 10. Marking on puncture site.

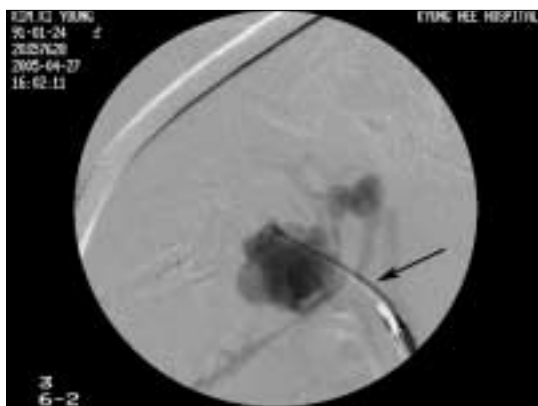


Fig. 11. Insert needle tip into nidus



Fig. 12. Insert microcoil by percutaneous route.

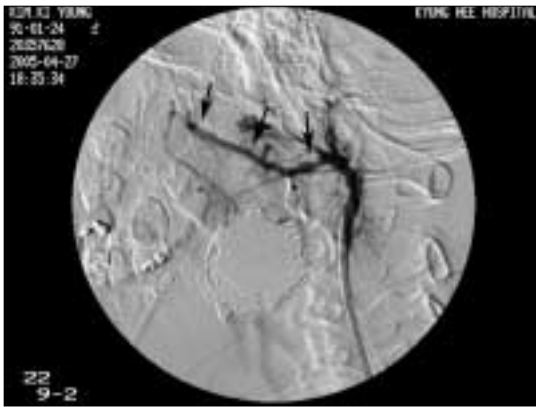


Fig. 13. Blocked lesion by microcoil. No more feeding internal maxillary artery.



Fig. 14. No more feeding facial artery.



Fig. 15. Slightly dilated facial artery.



Fig. 16. Slightly dilated internal maxillary artery.



Fig. 17. Well-located microcoil in lesion.

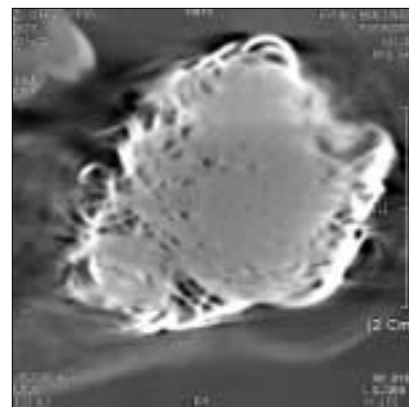


Fig. 18. Dental CT view.

Above three branch arteries was superselected by turns, in angiography, feeder was embolized by contour (250-350 micron) therefore that supply was almost

blocked was confirmed.

By dental CT, successful embolization was affirmed (Fig. 18).

DISCUSSION

Angiography most be used to diagnose this AVM; especially feeding vessels, collateral circulation, multiple anastomoses.

The varix is a pool of blood with high pressure supplied by many arterial branches. Feeding artery goes directly into the nidus(enuerismal sac) of the lesion. The varix causes intraosseous lytic changes, resorption of tooth roots, and mobile teeth. Mandibular AVMs often drain to the inferior alveolar venous system. The approach to the varix of intraosseous AVM via direct puncture is one of accessible treatment.

The treatment of AVM is two method. One is surgical method; partial resection of the mandible, ligation of the

feeding artery. In 1970' s surgical resection was preferred but this could not cause cosmetic result to child. Ligation of feeding artery is too difficult to control bleeding successfully. If feeder would be many, this is not effected and after ligation many new feeder could grow into. From 1980' s transarterial embolization was started, however could not fill nidus enough independently, in high flow case catheter' s accessibility was not good³⁾. Recently direct injection independently or mixed method with endovascular embolism is good resulted from many literature. However especially to mix with surgical method, after embolization must be operated within 8 days, because of ability to control bleeding⁶⁾.

Direct puncture embolization can be performed in most instances. Direct percutaneous puncture in conjunction



Fig. 19. Microcoil insertion.



Fig. 20. Glue injection.

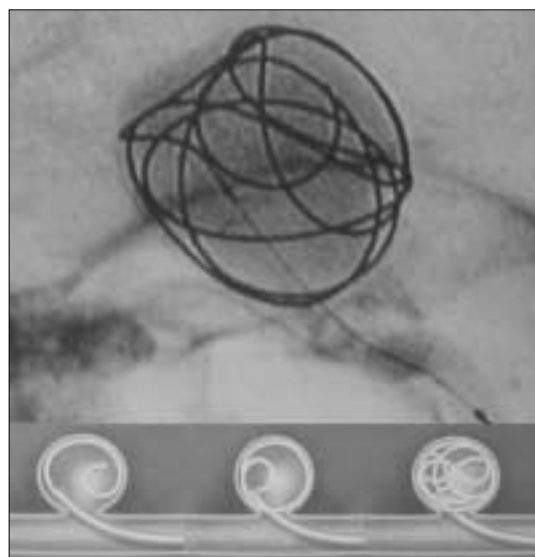


Fig. 21. The principle of microcoil insertion.

with endovascular therapy is effective and safe^{5,6}.

In addition the treatment of AVM is considered size, evaluated flow characteristics.

High-flow AVM is arterial or arteriovenous type and low-flow AVM is capillary, venous, lymphatic. Microcatheter location be able to control high blood flow³. All about this considered, when embolizations being done, proper embolic material is important.

The embolic material be selected for high thrombogenicity, permanence of vascular blockade. Different emboli were used, gelfoam soaked in thrombotic agent (Avitene), balloon, fiber coils, polyvinyl alcohol polymer = PVA = large sized particle= Contour(250~350 micron), platinum coil, microcoil, glue (N-butyl-2-cyanoacrylate) = NBCA, Ethibloc^{1,4,6}.

Mandible is much denser and thicker than that of the maxilla, so blood pressure in the varix of mandible is higher. More widely diffused involvement in the mandible, difficulty in controlling emergency bleeding in the AVM of the mandible by local pressure⁴. If the AV shunting existed, embolic material could passed through the int. jugular vein, resulting in pulmonary embolism^{1,7}.

So that direct-puncture embolization using microcoil accompanied with endovascular embolization is more effective.

CONCLUSIONS

In our case, patient was growing up and had big nidus with high flow and early AV shunting. In the management of such patient, catastrophic bleeding is the most severe problem, and this can be achieved by mixed techniques.

Transarterial embolization and percutaneous approach

was more successful to blockage nidus and to prevent feeders growing into nidus.

Undoubtedly the boy is growing up, and recurrence rate is high in high-flow type³. Therefore follow-up check required for a long time.

REFERENCES

1. Kaneko R, Tohnai I, Ueda M, Negoro M, Yoshida J, Yamada Y: Curative treatment of central hemangioma in the mandible by direct puncture and embolization with n-butyl-cyanoacrylate (NBCA). *Oral Oncology* 2001;37:605-608.
2. Yoshiga K, Tanimoto K, Okui T, Kobayashi M: High-flow arteriovenous malformation of the mandible: treatment and 7-year follow-up. *British J Oral Maxillofac Surg* 2003; 41:348-350.
3. Giaoui L, Princ G, Chiras J, Guilbert F, Bertrand JC: Treatment of vascular malformations of the mandible: a description of 12 cases. *Int J Oral Maxillofac Surg* 2003;32:132-136.
4. Siu WWY, Weill A, Garipey JL, Moret J, Marotta T: Arteriovenous Malformation of the Mandible: Embolization and Direct Injection Therapy. *J Vasc Interv Radiol* 2001; 12:1095-1098.
5. Fan X, Zhang Z, Zhang C, Tang Y, Hu Y, Mao Q, et al: Direct-Puncture Embolization of Intraosseous Arteriovenous Malformation of Jaws. *J Oral Maxillofac Surg* 2002; 60:890-896.
6. Corsten L, Bashir Q, Thornton J, Aletich V: Treatment of a Giant Mandibular Arteriovenous Malformation With Percutaneous Embolization Using Histoacrylic Glue: A Case Report. *J Oral Maxillofac Surg* 2001;59:828-832.
7. Persky MS, Yoo HJ, Berenstein A: Management of Vascular Malformations of the Mandible and Maxilla. *Laryngoscope* 2003;113:1885-1892.
8. Ziyeh S, Schumacher M, Strecker R, Rössler J, Hochmuth A, Klisch J: Head and neck vascular malformations: time-resolved MR projection angiography. *Neuroradiology* 2003; 45:681-686.
9. Wong IYC, Batista LL, Alvarez H, Lasjaunias PL: Craniofacial arteriovenous metameric syndrome (CAMS) 3-a transitional pattern between CAM 1 and 2 and spinal arteriovenous metameric syndromes. *Neuroradiology* 2003;45:611-615.