

Multimodality Treatment of Arteriovenous Malformation of Head and Neck

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ABSTRACT

Introduction: Peripheral AVM is a locally aggressive disease with a high tendency to recur, its treatment is complex, especially in the anatomically delicate head and neck region. Here we report result of different modalities combining together and in some case individualization done to treat the patient, eg. Sclerotherapy + excision, or feeding vessel ligation+excision or primary ligation.

Material and Methods: We retrospectively assessed degree of AVM eradication, complications and clinical or imaging signs of recurrence for 20 patients treated with S+E, FVL+E and primary excision of head and neck.

Result: Of the 20 patients, 18 had complete eradication of AVM of head and neck with 1 recurrence (discolouration) and 1 patient left the treatment after 2 sclerotherapy session, 2 patient experienced 3 complications (small ulcer in 2 and alopecia in 1).

Conclusion: Sclerotherapy+surgical excision, Feeding vessel ligation+Surgical excision and Primary excision has potential for complete eradication of head and neck AVM with low recurrence after completion of treatment. Complete eradication may require several treatment sessions during which complication should be minimized with careful techniques.

Keywords: AVM, Sclerotherapy, Surgical excision, Feeding vessel ligation

INTRODUCTION

Direct communication between arteries and vein with the absence of capillary system in the area is called “Nidus” and if this is congenital it is called AV Malformation.¹ The behaviour of peripheral (extracranial) AVM is locally aggressive. Typically during puberty or adolescence, the initially quiescent lesion progresses to a expansive mass with cosmetic and functional disturbances, with later progression the AVM destroys normal tissues and eventually leads to complications, such as severe disfigurement uncontrollable bleeding, ulcerations, pain and cardiac volume overload.² Complete surgical excision of the nidus of AVM is the only treatment, but complete removal of the AVM may cause anatomical and physiological disturbances, particularly in the head and neck region, because of its penetration in different tissue planes.³ In a recent series of 272 head and neck AVM patients reported an 81% recurrence rate after surgical resection and 98% after embolization. Suggested recurrence mechanism includes a proangiogenic environment involving hypoxia, trauma and inflammation and canalization of the nidus vasculature. If any nidus remnant remains, these factors will lead to a recurrence, often with complex architecture and extensive vascular recruitment.^{4,5} Embolization can be done with many agents like gelatin

pledgets, ethanol hot water and many other embolic materials.⁶ NaTS being a toxic substance that induces extra-vascular inflammatory reactions and causes vascular fibrosis and occlusion. Baumash and Mandel reported allergic and anaphylactic reaction. NaTS sclerotherapy of head and neck AVM is challenging due to the delicate anatomy and descriptions of its results are infrequent. Our aim is to report treatment results, complications, and currently available follow up information for 20 patients with head and neck AVMs treated with NaTS+excision, FVL+excision and Primary ligation of feeding vessels and discuss potential use of these procedures for peripheral AVMs.

MATERIAL AND METHODS

For an overview of the literature, we conducted a detail search with the following keywords combinations: “Arteriovenous malformation” and “Sodium tetradeceyl sulphate and Sclerotherapy” we limited our searches to articles in English language only.(1988-2014)Patients: For the prospective study, we used clinical methods, radiological information to identify all the 20 patients with AVM located at head and neck region who visited our unit at RIMS, Ranchi until the number of patient reached 20 between 01/01/2007 to 12/02/2016.^{18,19} We recorded AVM location in head and neck region, clinical symptoms, clinical stage according to the Schobinger Staging System (Table 1), 3% NaTS sclerotherapy sessions, surgical excision and feeding vessel ligation, complications resulting out of these procedures.²⁰⁻²²

NaTS Sclerotherapy and Surgical excision: After proper cleaning and draping of the part in operation theatre we injected 0.5 ml-2 ml per session of NaTS into the nidus of the AVMs and tried to stop or occlude the flow out of the nidus with some compression around the AVMs, thou it is difficult

Stage	Clinical symptoms
I (Quiescence)	Skin warmth, discolouration
II (Expansion)	Enlargement, pulsation, bruit
III (Destruction)	Pain, ulcerating, bleeding
IV (Decompensation)	Cardiac failure due to volume overload

Table-1: Schobinger classification of arteriovenous malformation

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Patient	Age /M/F	AVM Location	Symptoms	Schobinger staging	Date of last treatment D/M/Y	Treatment received S and SE or FVL and SE or SE	Eradication /Recurrence (E/R)	Follow up period in years and month
1	11Y/M	Rt. cheek	Ulcer	3	1/1/7	S3 and SE	E	9Y1M
2	14Y/M	upper lip lt. side	Swelling and deformity	2	24/4/7	S2 and SE	E	8Y10M
3	38Y/M	Scalp	Big bleeding ulcer	3	6/6/7	FVL and SE	E Ulcer and alopecia	8Y8M
4	10Y/M	Upper 1/3 of neck rt. side	Swelling	2	30/9/10	S3 and SE	E	5Y5M
5	18Y/F	Tip of nose	Swelling and deformity	2	30/4/11	S2 and SE	E	4Y10M
6	52Y/M	From lt. side scalp upto lower border of mandible	Huge swelling and deformity	3	6/8/11	FVL and SE	E Ulcer	4Y6M
7	48Y/F	Lower lip and tongue	Swelling and deformity	3	20/8/11	S2*	Left after 2 nd session of Scl. (R)	4Y6M
8	10Y/M	Upper lip	Swelling	2	25/8/11	S3 and SE	E	4Y6M
9	10Y/M	Rt. side of nose	Swelling	2	21/10/11	S2 and SE	E	4Y4M
10	22Y/F	Lt. cheek	Swelling	2	17/9/12	S4 and SE	E	3Y5M
11	12Y/M	lt. side of neck middle 1/3	Swelling	2	4/7/11	S2 and SE	E	2Y7M
12	19Y/F	Lt. cheek	Swelling	2	8/8/14	S3 and SE	E	1Y6M
13	37Y/F	Lt. side upper 1/3 of neck	Swelling	2	20/2/15	S3 and SE	E	1Y0M
14	8Y/M	Rt. cheek	Swelling	2	26/3/15	S3 and SE	E	11M
15	24Y/F	Lt. side of nose	Swelling	2	11/5/15	S2 and SE	E	9M
16	28Y/M	Lt. side front of ear and below eyebrow	Swelling	2	16/6/15	S2 and SE	E	8M
17	25Y/M	Lt. malar prominence and lt. side of nose	Discolouration	1	17/7/15	S3 and SE	Still discoloured	7M
18	3Y/F	Scalp and forehead	Swelling	2	21/7/15	SE	E	7M
19	30Y/M	Lt. side upper lip	Swelling and deformity	2	8/1/16	S3 and SE	E	1M
20	2Y/F	Scalp	Swelling	2	12/2/16	S3 and SE	E	1M

S-Sclerotherapy, SE-Surgical excision, AVM-Arteriovenous malformation, FVL-Feeding vessel ligation, Na TS-Sodium tetracycle sulphate.

Table-2: Patient's master record

in head and neck region because of complex anatomy. We typically discharged the patient on the same day or the following day, post treatment swelling lasts for 1 to several days, it is rarely painful and if so they were given NSAIDs for 3-5 days. Sclerotherapy sessions repeated every 3 weeks. Surgical excision done 3 weeks after the last sclerotherapy session.

Feeding vessel ligation and Surgical excision: In two case we performed feeding vessel ligation in one case of scalp AVM which was bleeding and there was an ulcer, we ligated the preauricular vessels and in same sitting we excised the scalp AVM. In second case (which had a huge AVM extending from scalp left side up to the lower border of mandible) we ligated external carotid of the same side and after 2 weeks we excised the AVM which was reduced in size.

Primary surgical excision: In one case of scalp AVM which was very circumscribed was excised primarily and closure done with standard surgical techniques.

RESULTS

Entire result of eradication/recurrence is elicited in Table-2; column 8. Of the 20 patients, 18 had complete eradication of AVMs with mean follow up period (Table-2, Column 9) of 2.94 years (ranging from 1 month-9 years 1 month), and all the patients are still in our follow up programme. 1 patient left the treatment after 2 sessions of NaTS sclerotherapy Table 2, patient No. 7, 48 yrs, female, she had AVM of lower lip and tongue (huge) still in our follow up with no regression in size.

Complication: After 45 sessions of sclerotherapy 19 surgical excision 2 patients had ulcer and 1 patient among the 2 patients with ulcer left with alopecia of the scalp.

DISCUSSION

Head and neck AVM is a locally aggressive lesion in a delicate anatomic region and tends to recur after interventions. Our result suggests that NaTS sclerotherapy may have potential as a treatment technique for head and neck AVM, but should be implemented very carefully due to risk of complications. The most important factor in assessing the usability of any treatment method for peripheral AVMs are its success in complete nidus eradication, complication rate and long term recurrence rate. Reports on ethanol sclerotherapy of trunk and extremity AVMs have shown potential for total nidus ablation. For the head and neck area. 2 studies on auricular AVNs report success rate of 18% and 75%, Interpreting these percentage is difficult^{6,7} In the head and neck ethanol sclerotherapy Jeong and co-authors had a success rate of 50%, but they changed their treatment to surgical excision, if the AVM did not reduced more than 50% after 3 sessions of sclerotherapy.^{8-11,17} In our series of the 20 patients with head and neck AVMs at Schobinger stage I, II and III, 17 had complete eradication. For 2 there were small ulcer left and even if we call it failure as 1 patient left midway after 2 sessions of sclerotherapy with progression of the disease.¹² Acknowledging the potential of AVM stimulation by partial treatments, this has to be considered seriously, with NaTS several successive treatments are often the rule and every

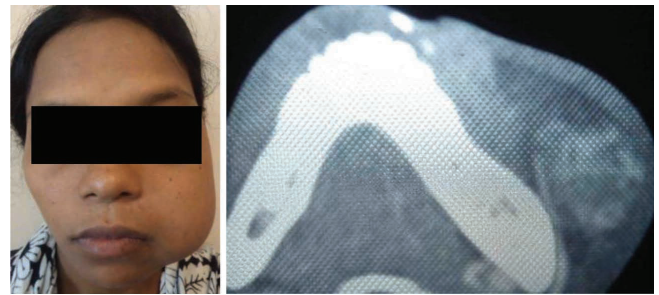


Figure-1: AVM of left cheek; **Figure-2:** CT scan showing AVM of patient No. 10



Figure-3: AVM of scalp with ulcer of Patient No. 3; **Figure-4:** Healed ulcer with alopecia of Patient No. 3



Figure-5: AVM of patient No. 6 from scalp upto mandible (Pre-op); **Figure-6:** Post-op photograph of Patient No. 6 (Feeding vessel ligation)

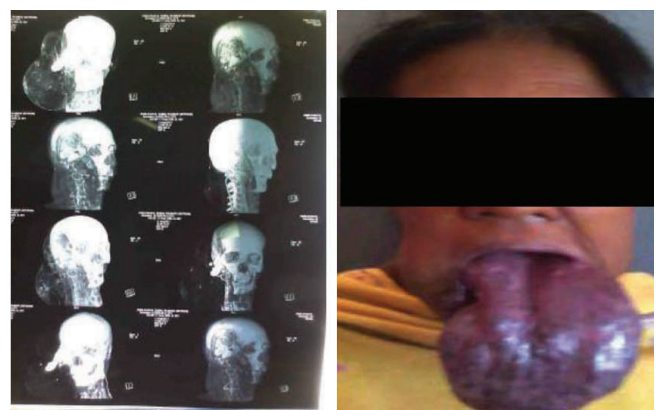


Figure-7: CT angio showing AVM of the Patient No. 6; **Figure-8:** AVM of lower lip and tongue

treatment carries a complication risk. Adding surgical excision with NaTS sclerotherapy has increased the eradication percentage to a great extent in our series i.e. 85%.¹³ Feeding vessel ligation and subsequent surgical excision also gave very good result in 2 cases with total eradication of AVMs.

Thus it is important to carefully assess any residual AVM after FVL or sclerotherapy and combining it with surgery gives good result. The most common complication of NaTS is local skin or mucosal surface necrosis, these should be minimized with careful technique, but completely avoiding them is impossible if the AVM itself affects the skin or mucosal surfaces. Our complication rate was in line with rates in other studies. All permanently visible complications include scarring after ulcer (n=2) and loss of hair (alopacia n=1) and discolouration resulted in one (n=1).¹⁴ Most AVM recurrences manifest within the first year after intervention, but a minimum of 5 years of follow up is necessary to assess long term control. The follow up periods in sclerotherapy case series vary, most reports a follow up of 1-2 years for mark the completely eradicated lesion with no recurrences. Our data document immediate, short and long term efficacy of NaTS sclerotherapy + excision, FVL+excision and primary excision of the AVMs, with mean follow up period of 2.94 years ranging from 1 month to 9 years 1 month, and all the patient are still in our follow up in a reasonable sized cohort of head and neck AVMs.^{15,16}

CONCLUSION

The message of this study is that NaTS, FVL and primary excision are very good modalities of treatment for AVMs of head and neck region, combining all these modalities with surgical excision makes these modalities a good tool. Meticulous techniques are necessary to avoid complications and long term follow up is vital for assessing permanence of the result.¹⁷

REFERENCES

1. Young AE, Mulliken JB. Arteriovenous malformations. In: Mulliken JB, ed. *Vascular Birthmarks: Haemangiomas and Malformations*. Philadelphia: WB Saunders. 1988:228–45.
2. Liu AS, Mulliken JB, Zurakowski D, et al. Extracranial arteriovenous malformations: natural progression and recurrence after treatment. *Plast Reconstr Surg*. 2010;125:1185–94.
3. Kohout MP, Hansen M, Pribaz JJ, et al. Arteriovenous malformations of the head and neck: natural history and management. *Plast Reconstr Surg*. 1998;102:643–54.
4. Bradley JP, Zide BM, Berenstein A, et al. Large arteriovenous malformations of the face: aesthetic results with recurrence control. *Plast Reconstr Surg*. 1999;103:351–61.
5. Wu JK, Bisdorff A, Gelbert F, et al. Auricular arteriovenous malformation: evaluation, management, and outcome. *Plast Reconstr Surg*. 2005;115:985–95.
6. Yakes WF, Haas DK, Parker SH, et al. Symptomatic vascular malformations: ethanol embolotherapy. *Radiology*. 1989;170:1059–66.
7. Lee BB, Bergan JJ. Advanced management of congenital vascular malformations: a multidisciplinary approach. *Cardiovasc Surg*. 2002;10:523–33.
8. Do YS, Yakes WF, Shin SW, et al. Ethanol embolization of arteriovenous malformations: interim results. *Radiology*. 2005;235:674–82.
9. Jeong HS, Baek CH, Son YI, et al. Treatment for extracranial arteriovenous malformations of the head and neck. *Acta Otolaryngol*. 2006;126:295–300.
10. Zheng LZ, Fan XD, Zheng JW, et al. Ethanol embolization of auricular arteriovenous malformations: preliminary results of 17 cases. *AJNR Am J Neuroradiol*. 2009;30:1679–84.
11. Jin YB, Lin X, Chen H, et al. Auricular arteriovenous malformations: potential success of superselective ethanol embolotherapy. *J Vasc Interv Radiol*. 2009;20:736–38.
12. Rodesch G, Soupre V, Vazquez MP, et al. Arteriovenous malformations of the dental arcades. The place of endovascular therapy: results in 12 cases are presented. *J Craniomaxillofac Surg*. 1998;26:306–13.
13. Liu D, Ma X, Zhao F, et al. Intraosseous embolotherapy of central arteriovenous malformations in the jaw: long-term experience with 8 cases. *J Oral Maxillofac Surg*. 2009;67:2380–87.
14. Yakes WF, Rossi P, Odink H. How I do it. Arteriovenous malformation management. *Cardiovasc Intervent Radiol*. 1996;19:65–71.
15. Do YS, Park KB, Cho SK. How do we treat arteriovenous malformations (tips and tricks)? *Tech Vasc Interv Radiol*. 2007;10:291–98.
16. Geibprasert S, Pongpech S, Armstrong D, et al. Dangerous extracranial-intracranial anastomoses and supply to the cranial nerves: vessels the neurointerventionalist needs to know. *AJNR Am J Neuroradiol*. 2009;30:1459–68.
17. Yakes WF, Krauth L, Ecklund J, et al. Ethanol endovascular management of brain arteriovenous malformations: initial results. *Neurosurgery*. 1997;40.
18. Sho-binger R. In: *Proceedings of International Society for the Study of Vascular Anomalies Congress*; Rome, Italy. 1996; 23–26.
19. Hideki Hyodoh, et al; *Peripheral vascular malformation; Imaging techniques, treatment approaches and therapeutic issues 2005*.
20. Matt W H Erdmann FRCS et al; *Multidisciplinary approach to the management of head and neck arteriovenous malformations*. *Ann R Coll Surg*. 1995;77: 53-59.
21. S.M. Manjunath et al; *Arteriovenous malformation of the oral cavity Hindawi P. Corporation case report in dentistry Vol. 2014, Article ID353580, 5 Pages*. Agarwal S, Agarwal N. *AV Malformation of tongue treated by sclerotherapy (3% sodium tetra-decyle sulfate)*. *Journal of dentofacial sciences.com*, 2014;1:51-54.

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