International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 14, No. 1, January 2025 Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_14.1.2025.4

ORIGINAL RESEARCH

Sclerotherapy in slow-flow vascular malformations of maxillofacial region

Dr. U Vignesh[1], Dr. Shilpi Gangwar[2], Dr. V.E. Shanthosh Kanna[3], Dr. Reading Well Kharmawlong[4]

[1]Assistant Professor, [4]Senior Resident, Department of Dentistry, Maharshi Vishwamitra Autonomous State Medical College, Ghazipur (U.P.), India
[2]Assistant Professor, Department of Dentistry, MPT Medical College, Siddharth Nagar (U.P.), India
[3]Assistant Professor, Department of Dentistry, Autonomous State Medical College, Auraiya (U.P.), India

Corresponding Author
Dr. U Vignesh
Assistant Professor, Department of Dentistry, Maharshi Vishwamitra Autonomous State Medical College, Ghazipur (U.P.), India
Email: vigneshss288@gmail.com

Received: 21 November, 2024 Accepted: 24 December, 2024 Published: 06 January, 2025

ABSTRACT

Introduction- vascular malformations represents localized defect in morphogenesis of the vessels and composed of inappropriate vasculature connections. In slow-flow lesions, sclerotherapy, laser therapy, surgery or combination of sclerotherapy followed by surgery is considered as treatment of choice. So, purpose of this case series study is to describe our clinical experience of staged sequential sclerotherapy using 3% sodium tetradecyl sulphate in slow flow vascular malformation maxillofacial lesions. **Materials and methods-** Seven patients of slow-flow oral vascular malformation maxillofacial lesions were included in this case series study. 0.1 to 1 ml of STS was injected firstly at the periphery of the lesion and then towards the center of the lesion at multiple sites using insulin syringes after providing surface anesthesia with 15% xylocaine spray. Injections were repeated after interval of 2 weeks whenever required, which varied from 1 to 5 sessions according to the size of the lesion. **Results-** Significant results were seen within 2 weeks in the post sclerotherapy session in terms of the lesion regression and esthetic outcome thereby improving the quality of life. **Conclusion-** Sclerotherapy has emerged as an altervative minimally invasive procedure with a low recurrence rate, good esthetic results, and reasonable morbidity.

INTRODUCTION

Vascular anomalies are a diverse group of congenital blood vessel disorders, which is subcategorized into vascular tumors and vascular malformations. Vascular tumors develop through the vessels' cell growth and proliferation[1-8]. Meanwhile, VMs are characterized as a defect in the vessels' maturation and vascular morphogenesis, caused mainly by a dysfunction in the regulation of the pathways in embryogenesis and vasculogenesis[1-10].

Pathophysiological Mechanisms: The pathogenesis of vascular malformations is multifactorial, involving disturbances in embryogenesis, angiogenesis, and vascular remodeling processes[11]. Aberrations in signaling pathways regulating vascular development, such as the Notch and vascular endothelial growth factor (VEGF) pathways, have been implicated in the pathophysiology of these anomalies[8-12]. Genetic mutations affecting genes involved in angiogenesis and vascular stability, such as TEK (TIE2), PIK3CA, and GNAQ, have also been identified in certain vascular malformations, providing insights into their molecular basis[13].

Disturbances in vasculogenesis, the process of de novo blood vessel formation from precursor cells, contribute to the formation of vascular malformations during embryonic development[14].

Classification: Vascular malformations are clinically sub-divided into slow-flow and high-flow type; based on hemodynamic nature of the lesion. High flow lesion includes arteriovenous malformation and slow-flow lesion includes capillary, venous, and lymphatic vascular malformations; based on the type of the vessels involved. In oral cavity it most commonly occurs in lips, anterior two-third of the tongue, palate, gingiva and buccal mucosa.[1-4]

In high-flow lesions, catheter angiography is the gold standard for evaluation and treatment planning and managed either by surgery or embolization through trans-arterial route or both is considered the treatment

DOI: 10.69605/ijlbpr_14.1.2025.4

of choice. In slow-flow lesions, sclerotherapy, laser therapy, surgery or combination of sclerotherapy followed by surgery is considered as treatment of choice[1-6]. However, when considered for head and neck lesions, surgery may lead to cosmetic and functional defect. So, in the present study, staged sequential sclerotherapy were done solely for treating seven cases of oral slow-flow vascular malformations using 3% sodium tetradecyl sulphate (STS) as a sclerotherapeutic agent.STS, acts by altering endothelial cell permeability and promoting thrombus formation through its detergent properties[12]. STS demonstrates rapid onset of action and localized tissue effects, making it suitable for sclerotherapy of superficial venous malformations and spider veins[13].

METHODS

Thisstudy involvessevenpatients of slow-flow oral vascular malformationlesions, who visited outpatient department in our hospital from august 2021 to December 2023. All the cases were diagnosed on the basis of clinical examination and treated with 3% sodium tetradecylsulphate (STS) injection. Slow flow vascular malformations were diagnosed on the basis of clinical evaluation of color, consistency, diascopy, auscultation and size of lesion. Patients having high-flow type lesion, and taking any other medications which interfere with wound healing were excluded from this study. 0.1 to 1 ml of STS was injected firstly at the periphery of the lesion and then towards the center of the lesion at multiple sitesusing insulin syringes after providing surface anesthesia with 15% xylocaine spray. Injections were repeated after interval of 2 weeks whenever required, which varied from 1 to 5 sessions according to the size of the lesion. After each session of injection, patient was given medication for pain and inflammation if required. All the patients were done after taking proper consent from the patient or patient's guardian. Figure 1 showing all the patients involved in this case series study.

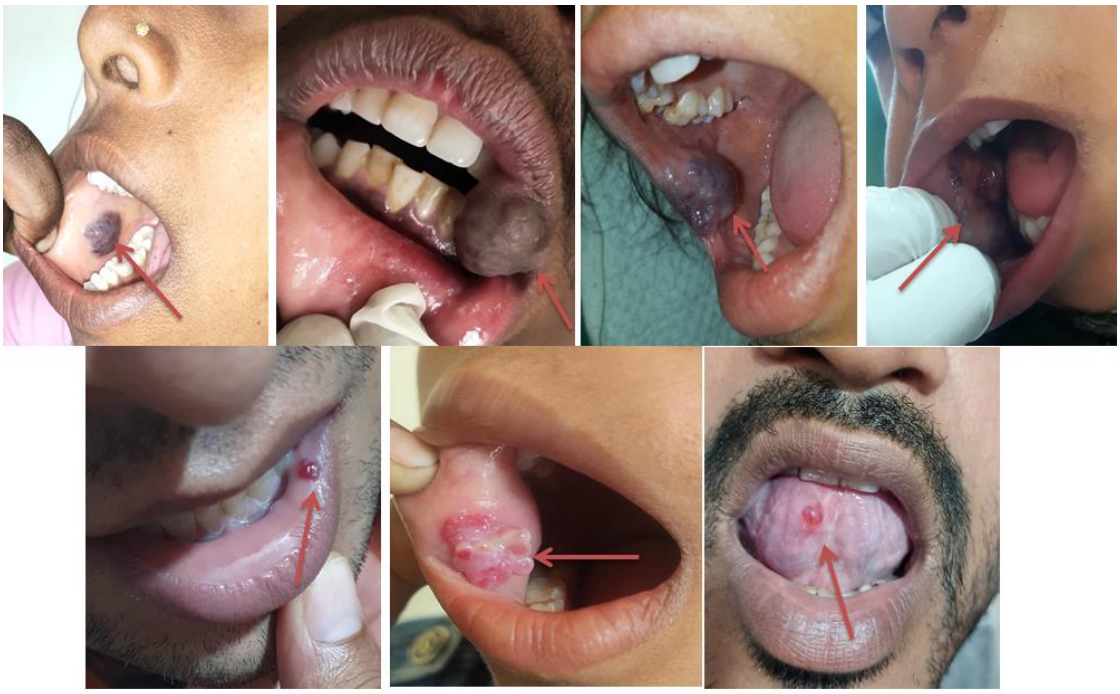

Figure 1: Showing all patients involved with slow-flow vascular malformation lesions in different locations of oral and maxillofacial region

RESULTS

Out of seven patients five were males and two females. Table 1 summarizes important demographic data of the involved patients and also shows number of sclerotherapy sessions required for complete regression of the lesion. Table 2 shows improvement in quality of life in all the patients after healing of the lesion as compared to pre-treatment status. Initially all the patients had minor to moderate swelling after giving injections, which gradually subsides within 5-10 days. After giving STS injections, all patients experienced reduction in the size of the lesion initially,which after successive therapy,the lesion gradually peels off from the base of the mucosa and leaves ulceration in the involved area for some days, which healed completely within 1-2 weeks without any scar.

DOI: 10.69605/ijlbpr_14.1.2025.4

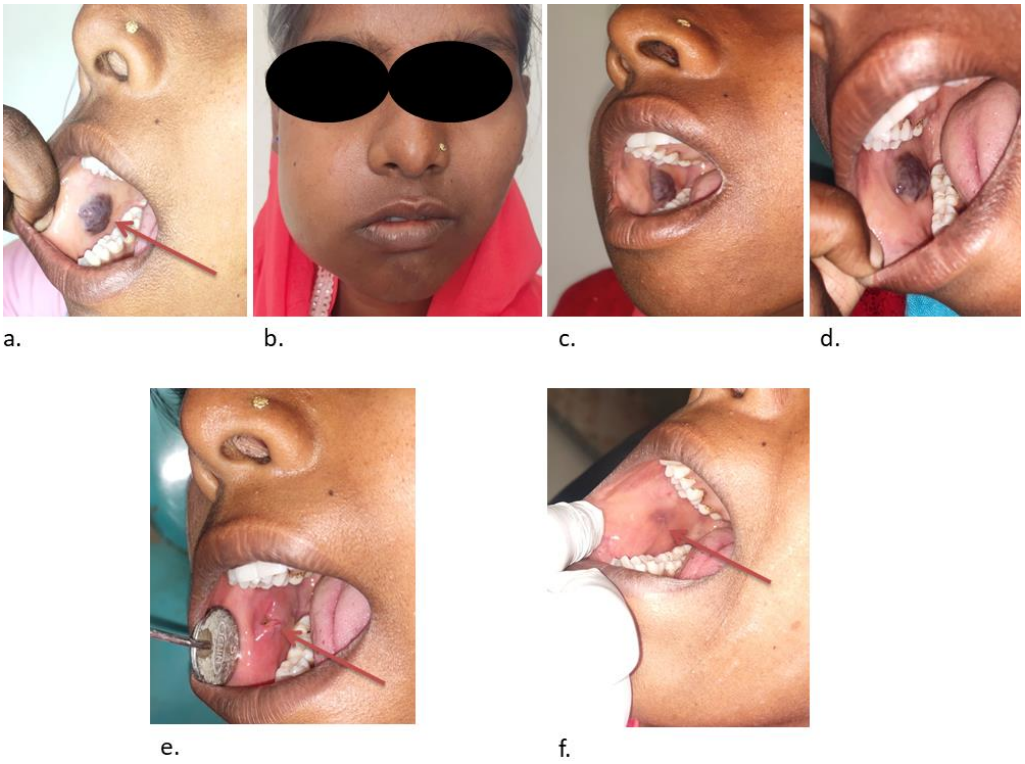

Figure 2:
a. showing lesion in right cheek region
b, c, and d figures showing swelling after first STS injection, which gradually subsides after few days without any complications
e. showing ulcerations after the vascular lesion peels off in follow-up visit of STS injection
f. showing complete resolution of the vascular lesion and healing of the involved area.

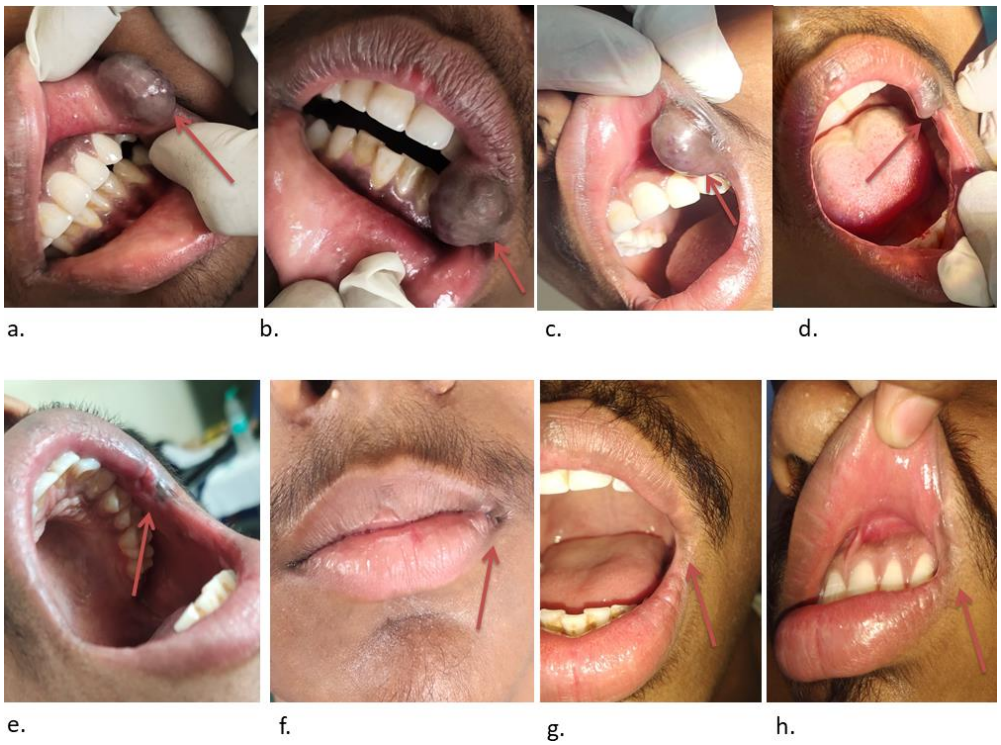

Figure 3:
a. and b. figure showing vascular lesion involved in upper lip left corner region
c. and d. figure showing lesion size regression during subsequent visit after STS injection
e. and f. figure showing mild ulceration and under healing after the vascular lesion peels off
g. and h. figure showing complete resolution of the vascular lesion and healing of the involved area.

DOI: 10.69605/ijlbpr_14.1.2025.4

Table 1- Demographic data of all the patients

Patient	Age	Sex	Site of lesion	Sessions of sclerotherapy needed	Pre-sclerotherapy size of lesion	Post-sclerotherapy size of lesion
A	14	F	Right cheek	2	2.3 cm X 2 cm	0
B	15	M	Upper lip corner	3	2 cm X 1.2 cm	0
C	13	F	Right side upperlipcorner of mouth	2	2 cm X 1.8 cm	0
D	11	M	Right cheek	5	2.5 cm X 2.5 cm	0
D	32	M	Lower lip	2	6 mm X 5 mm	0
E	14	M	Right cheek	4	2 cm X 2 cm	0
F	16	M	tongue	2	6mm X 6 mm	0

- Larger lesions needed more number of sclerotherapy injection sessions; all lesions healed completely after required number of sessions.

Table 2- Pre and post sclerotherapy improvements in Quality of Life (QoL)

	Patient A	Patient B	Patient C	Patient D	Patient E	Patient G	Patient H
Pre scrlelotherapy Bleeding	4	5	4	3	1	5	1
Post scrlelotherapy Bleeding	1	1	1	1	1	1	1
Pre scrlelotherapy chewing difficulty	4	5	4	4	2	5	1
Post scrlelotherapy chewing difficulty	1	1	1	1	1	1	1
Pre scrlelotherapy aesthetic difficulty	3	4	4	4	5	4	2
Post scrlelotherapy aesthetic difficulty	1	1	1	1	1	1	1
Pre scrlelotherapy stress	5	5	4	5	4	5	4
Post scrlelotherapy stress	1	1	1	1	1	1	1

- Here in QoL score; 1 represented the best and 5 the worst score

DISCUSSION

Vascular anomalies are previously referred as vascular birthmarks. The classification of VM has undergone significant changes since its first recognition by Mulliken and Glowacki (1982) until now a recent revision by International Society for the Study of Vascular anomalies (ISSVA) in 2018 was published[1-4, 15].They classified vascular anomalies into to vascular tumours and vascular malformations in which later is subdivided into simple, combined, associated with major named vessels, and associated with other anomalies. Vascular tumors include infantile, congenital, tufted angioma, and kaposiform hemangioendothelioma[1-8]. Hemangiomas are the most common vascular tumor which rarely obvious at the birth, then grows rapidly during first 6 months of life and then gradually regress with time but sometimes it can be destructive in nature[16]. Hemangiomas are also classified in to superficial, deep and compound based on the depth of the tumor. It mainly occurs in female and 60% affects mainly in craniofacial region. Diagnosis is mainly based on clinical history and physical examination; otherwise in unclear cases, best radiographic method is to use either a Doppler ultrasound or MRI[1-9].

In contrast to the hemangiomas, a vascular malformation appears at birth, slowly grows over time by infiltration and become destructive if not treated at earlier stage.Vascular malformations (VM) are nothing but lesions with thin endothelial wall surrounded by a layer of smooth muscle[16]. The patients included in the present study were all young patients with the mean age group of 16.33 years with the male to female ratio of 2:1 which is in contradiction with study by Rendon-Elias FG et al[18]with the ratio of 1:1.4. J Y Ryu et al showed that the incidence of VM is inversely proportional to the age with exception for lymphatic malformations (LM) which increases with age in both sexes with special scenarios of increased incidence in male below 20 years of age and vice versa with male to female annual incidence of 8.3:11.3 which is in contradiction with our study[19]. The management of the lesion depends upon the size, type, location, characteristics of the lesion with expected post-operative cosmetic and functional morbidity[20]. The most common sites for VM are lower lip, tongue followed by cheeks

DOI: 10.69605/ijlbpr_14.1.2025.4

while in our present study most of the lesions were found in buccal mucosa followed by lips, commissure of mouth and tongue, respectively[21, 22].

There are various management strategies for VM's out of which injections with sclerotherapy agents stands tall with 90% patient satisfactory outcomes and 70% improvements in the quality of life[23]. The percutaneous sclerotherapy agents however have minimal permanent morbidity and mortality with less long-term scar rates however it has high local temporary complications such as pain, discolouration, skin sores, oedema, inflammation, localised lymph stasis due to sclerotherapy induced chemical phlebitis and telangiectatic matting[24]. The outcome of sclerotherapy depends upon the angio- architecture of venous malformations, the agents used and the stay time of sclerosant within the malformation. The various agents such as ethanol, ethanolamine, sodium tetradecyl sulphate (STS), sodium morruahate, pingyangmycin and bleomycin[25].

There are various factors for regarding the choice of sclerotherapy agents which may include depth of the lesion from the mucosal surface and the ability to limit venous thrombosis. The management of VM's depends upon the nature of the lesion, the feeder vessels, location of the lesion and the surgeon's preference and comfort[26]. In the present case series, we used 3% of STS which showed excellent results. According to alakailly et al, the lesions lesser than 2.5 cm responds good to treatment due to the flow of blood and feeder vessels which corresponds to the size of lesions presented in our case series[24]. In our present case series, no radiographic guidance was used with good success rates which were like the studies by kandhpur et al and alakailly et al with 90-100% regression of the lesions[24, 27]. Various concentrations of the agents were used ranging from 0.1% to 3% where the usage of peak concentrations is directly proportional to the calibre of the lesions present.The composition of the solution used varies from manufacturer to manufacturer and in our study 1ml of the solution having 30mg STS was used. The patients were followed up for a period of 6 month after complete resolution of the lesion and no recurrence was observed. The outcomes were assessed based upon the regression in the size of lesion and all the lesions responded satisfactorily. In our case series, no serious complications were seen. Further, RCT need to be conducted with larger sample size and with larger size lesions to determine the outcomes and efficacy of STS injections in larger size slow flow vascular malformation lesions.

CONCLUSION

Sclerotherapy with 3% STS has shown to be effective in achieving lesion regression, symptom relief, and capable of providing acceptable esthetic results with relatively smaller number of sessions. It offers as an alternative treatment modality in the management of vascular malformations, providing hope for an improved quality of life and long-term outcomes.

REFERENCES

1. Agarwal, S. (2011) 'Treatment of oral hemangioma with 3% sodium tetradecylsulfate: Study of 20 cases', *Indian Journal of Otolaryngology and Head & Neck Surgery*, 64(3), pp. 205–207. doi:10.1007/s12070-011-0249-z.
2. Choi, B.-E. *et al.* (2016) 'Utility of sodium tetradecylsulfatesclerotherapy from benign oral vascular lesion', *Maxillofacial Plastic and Reconstructive Surgery*, 38(1). doi:10.1186/s40902-016-0094-9.
3. Min, H.-G. *et al.* (2015) 'Sclerotherapy using 1% sodium tetradecylsulfate to treat a vascular malformation: A report of two cases', *Journal of the Korean Association of Oral and Maxillofacial Surgeons*, 41(6), p. 322. doi:10.5125/jkaoms.2015.41.6.322.
4. M K, P. *et al.* (2013) 'Management of haemangioma with sclerosing agent: A case report', *BMJ Case Reports* [Preprint]. doi:10.1136/bcr-2013-200660.
5. Kaur, M. *et al.* (2021) 'Role of sclerotherapy in management of low flow vascular malformations', *International Surgery Journal*, 8(4), p. 1234. doi:10.18203/2349-2902.isj20211303.
6. Alakailly, X. *et al.* (2014) 'The use of sodium tetradecyl sulphate for the treatment of venous malformations of the head and Neck', *Journal of Maxillofacial and Oral Surgery*, 14(2), pp. 332–338. doi:10.1007/s12663-014-0623-y.
7. Richter, G.T. and Friedman, A.B. (2012) 'Hemangiomas and vascular malformations: Current theory and management', *International Journal of Pediatrics*, 2012, pp. 1–10. doi:10.1155/2012/645678.
8. Zeevi, I. *et al.* (2020) 'Sclerotherapy of vascular malformations in the oral cavity—minimizing postoperative morbidity', *Medicina*, 56(5), p. 254. doi:10.3390/medicina56050254.
9. Ramakrishnan, K. *et al.* (2021) 'Management of vascular malformations in the oral and maxillofacial region: A systematic review', *Journal of Stomatology, Oral and Maxillofacial Surgery*, 122(6), pp. 588–599. doi:10.1016/j.jormas.2020.12.010.
10. Clemens RK, Pfammatter T, Meier TO, Alomari AI, Amann-VestiBR. Vascular malformations revisited. Vasa. 2015;44:5---22
11. Dompmartin A, Vikkula M, Boon LM. Venous malformation: update on aetiopathogenesis, diagnosis and management. Phlebology. 2010;25(5):224-235.
12. Sarkar R, Garg VK. Sclerotherapy for venous malformations. J CutanAesthet Surg. 2012;5(3):141-144.
13. Legiehn GM, Heran MKS. Venous malformations: classification, development, diagnosis, and interventional radiologic management. RadiolClin North Am. 2008;46(3):545-597.
14. Perkins JA, Maniglia C, Magit A, et al. Percutaneous sclerotherapy of lymphatic malformations. Arch Otolaryngol Head Neck Surg. 2000;126(9):1073-1077.
15. Mulliken JB, Glowacki J. Hemangiomas and Vascular Malformations in Infants and Children. Plastic and Reconstructive Surgery. 1982 Mar;69(3):412–20.

DOI: 10.69605/ijlbpr_14.1.2025.4

16. Lyssy LA, Puckett Y. Oral Hemangiomas. [Updated 2023 Aug 8]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-.
17. Carqueja IM, Sousa J, Mansilha A. Vascular malformations: classification, diagnosis and treatment. International Angiology: A Journal of the International Union of Angiology [Internet]. 2018 Apr 1 [cited 2021 Nov 6];37(2):127–42
18. RendónElías FG, Hernández Sánchez M, Albores Figueroa R, Montes Tapia FF, Gómez Danés LH. Congenital vascular malformations update. MedicinaUniversitaria. 2014;16(65):184-98.
19. Ryu JY, Chang YJ, Lee JS, Choi KY, Yang JD, Lee SJ, et al. A nationwide cohort study on incidence and mortality associated with extracranial vascular malformations. Scientific Reports [Internet]. 2023 Aug 25 [cited 2024 Jan 4];13(1):13950
20. AL-QATTAN MM. Acquired Localized Subcutaneous Cavernous Vascular Malformations of the Hand. Journal of Hand Surgery. 2004;29(2):139-143. doi:10.1016/j.jhsb.2003.11.002
21. Buckmiller L, Richter G, Suen J. Diagnosis and management of hemangiomas and vascular malformations of the head and neck. Oral Diseases. 2010 Mar 9;16(5):405–18.
22. Chen W, Choi EJ, McDougall CM, Su H. Brain arteriovenous malformation modeling, pathogenesis, and novel therapeutic targets. Translational Stroke Research [Internet]. 2014 Jun 1;5(3):316–29.
23. Zeevi I, Chaushu G, Alterman M, Chaushu L. Sclerotherapy of Vascular Malformations in the Oral Cavity—Minimizing Postoperative Morbidity. Medicina. 2020 May 22;56(5):254.
24. Xena Alakailly, Raja Kummoona, Quereshy FA, Baur DA, González AE. The Use of Sodium Tetradecyl Sulphate for the Treatment of Venous Malformations of the Head and Neck. Journal of Maxillofacial and Oral Surgery. 2014 Mar 11;14(2):332–8.
25. Lee CH, Chen SG (2005) Direct percutaneous ethanol instillation for treatment of venous malformation in the face and neck. Br J PlastSurg 58(8):1073–1078
26. Whitehead KJ, Smith MC, Li DY (2013) Arteriovenous malformations and other vascular malformation syndromes. Cold Spring HarbPerspect Med 3(2):a006635
27. Khandpur S, Sharma VK (2010) Utility of intralesionalsclero-therapy with 3% sodium tetradecyl sulphate in cutaneous vascular malformations. DermatolSurg 36(3):340–346