The Effect of Alcohol (ethanol) and Boiled Distilled Water in The Treatment of Oral Venous Malformations: A comparative study

Marwa A. Attyia [1], Imad S. Noorali [1], Mudher MB. Alsunbuli [3]

[1] Oral and Maxillofacial Surgery Unit, Al-Yarmouk Teaching Hospital, Baghdad, Iraq
[2] College of dentistry, Al-Bayan University, Baghdad / Iraq

Abstract

Introduction: The head and neck region are a common location for benign blood vessel lesions called vascular malformations. There is no well-established procedure for reducing the size of benign oral vascular lesions, even though the fact that sclerotherapy is one of the first-line treatments utilized for this goal. The current study's purpose was to assess and contrast the effectiveness of intra-lesion sclerotherapy injections of boiled distilled water and alcohol in treating superficial mucosal vascular malformations in the maxillofacial region.

Materials and methods: In the soft tissues of the craniofacial region, low-flow superficial vascular malformations were studied in cases that were treated between 2016 and 2021 at Al-Yarmouk teaching hospital in Baghdad, Iraq, in this retrospective analysis.

Results: There were 20 patients in total who received sclerotherapy, with the age range from 1 to 57 years, ten (50%) of the cases treated using boiled distilled water and 10 (50%) treated by alcohol injection. The majority (60%) of the participants were women. The tongue (30%) and lips (60%) were the two most affected body parts. 16 individuals (80%) in both groups experienced total regression. The lesions partially regressed in four patients (20%).

Conclusion: Sclerotherapy with alcohol or boiled water is an appropriate and cost-effective therapeutic method that, when carried out properly, exhibits effectiveness.

Keywords: Sclerotherapy, vascular malformations, water, Lip, Tongue

Introduction:

Vascular malformations are benign blood vessel lesions that are very typical in the head and neck area. The lips, tongue, buccal mucosa, gums, and palate are the oral regions most frequently affected by vascular lesions, which account for more than 60% of all cases. Preterm newborns, twins, and females (65%) have greater prevalence rates. (1). Both functionally and aesthetically, they can be highly damaging. They frequently disfigure functional regions because of their propensity to expand. (2). Vascular lesions are normally asymptomatic growths between a few millimeters and several centimeters in size that can cause facial asymmetry. The hue may range from red to purple depending on the location, depth, and vascular congestion of the invaded tissue (3).

The lesion may have a soft consistency, a sessile or pedunculated structure, a smooth or nodular surface, and defined edges (4). Congenital vascular malformations have historically been mistakenly referred to as "hemangiomas," but this term is misleading because these hemodynamically low-flow malformations, which form in the venous system, do not show any angio-neogenesis, unlike true hemangiomas, and they range in severity from benign birthmark to complex lesions without involuting (5). Mulliken and Glowacki differentiated vascular tumors, also known as haemangiomas, and vascular malformations in 1982 based on their clinical characteristics and endothelial cell characteristics (VMs). This thorough classification was recognized and formally adopted by the International Society for the Study of Vascular Anomalies (ISSVA) in 1996. In 2013 saw a further assessment of syndrome-based classification added to the ISSVA Classification, strengthening it (6, 7). The most frequent cutaneous tumor in children is a hemangioma, which grows quickly at first and

then slowly involutes or regresses over 5-7 years. While VMs grow along with the child's development, they do not spontaneously evolve. VMs are divided into "fast flow" (arteriole, arteriovenous, fistulae, or shunt) and "slow flow" (capillary, venous, lymphatic, or mixed) subtypes based on how quickly blood passes through them. Clinical symptoms used to diagnose vascular lesions are supported by further testing. The use of imaging techniques helps distinguish blood vessel abnormalities from several aggressive neoplastic processes. Doppler ultra- sonography (USG) is an effective tool, because it is not invasive, capable of showing images of high blood flow which mark hemangiomas. As a result, it can distinguish hemangiomas from solid tumors and determine the location of feeding vessels (8). Surgery, sclerotherapy, laser therapy, and cryotherapy are just a few of the therapeutic options available for VMs (9). One of the initial therapies for reducing the size of the lesions is sclerotherapy. (10) Sclerosing substances come in a variety of forms, such as ethanol, sodium tetradecyl sulfate (STS), bleomycin, boiling water, and nitrogen. These substances damage the vascular endothelium, which results in thrombosis and inflammation and causes the lesion to recur. Alcohol therapy is uncomfortable and perhaps dangerous for the patient's health. Even though the fact that ethanol is the most popular sclerotherapy due to its wide availability, affordability, and low recurrence rate, this type of treatment needs to be performed under anesthesia (11, 12). These treatments might be sufficient in the oro-facial region for superficial and minor lesions without the need for additional supplemental operations (13).

Objective:

To treat superficial mucosal VMs in the maxillofacial region, this study aimed to assess and compare the efficacy of intra-lesion Sclerotherapy injections of alcohol and boiled distilled water in terms of partial or complete lesion resolution, the time required for resolution, and the incidence of complications.

Materials and Methods:

The cases treated between 2016 and 2021 were included in this retrospective analysis, which was performed at Al-Yarmouk Teaching Hospital. Low-flow superficial vascular malformations affecting the craniofacial region's soft tissues were the inclusion criteria. Patients with additional diagnoses such as haemangiomas, high flow vascular lesions, and intraosseous venous malformations were not included in this study. 20 patients in all (8 men and 12 women) participated in the study. The range of ages was 1 to 57.

Every case had a pre-operative evaluation, which included a clinical examination and history. A compressible lesion that refills on release was discovered during physical examination. It can be possible to see bluish staining of the mucosa above. There were no pulsations, bruits, or thrills, and the temperature of the overlaying epithelium is normal. Valsalva's technique or dependent placement led to an expansion of the lesion. Following the study of the lesions using magnetic resonance imaging and ultrasound color doppler, a preliminary diagnosis of a Venous malformation was obtained for each of these individuals. Each patient's PT, PTT, INR levels, and blood profiles were all within normal limits. The patients had neither hypertension nor diabetes. The cases were divided in two groups according to the materials used for injections to treat the vascular lesions group A (patients treated with intra-lesion boiled distilled water injection) group B (patients treated with intra-lesion alcohol injection). For intra-lesional sclerotherapy injections using boiled distilled water or alcohol, informed written agreement was acquired from each patient in both groups.

Patients in Group A received treatment over several sessions in an outpatient setting using intralesional injections of boiled, distilled water. To maintain the boiling point of the distilled water before injection, a glass container of distilled water was heated in a water bath, aspirated into a 5 ml plastic disposable syringe, and the lesion was then aspirated. Next, 0.5-2 milliliters (ml) of heated distilled water were then slowly injected into the sides and the center of the lesion depending on its size. The water was heated to boiling before being injected into the lesions. To control sclerosant spill, lessen its diffusion into neighboring unaffected tissues, and also increase its contact with the

aberrant vascular channels' endothelial cells, black braided silk sutures were initially utilized to separate the lesions in Group B patients. Depending on the size of the lesion, 0.2-2 ml of undiluted alcohol (96%) was steadily injected into the lesion as soon as it was discovered to have grown engorged and expanded in size. The mucosa and deeper tissues in the two groups received 2% xylocaine and 1:80,000 adrenaline injections. It was made sure the lesions and surrounding tissues were properly anesthetized. The lesion immediately swelled and tightened after the injection. The per-mucosal puncture sites produced a small amount of blood that was noticed, but it quickly stopped after 3 minutes of local pressure application. Five days of antibacterial, anti-inflammatory, and analgesic medication were prescribed for the patients, and external application of a cold compress was also suggested. For a period of one to five years, all patients were monitored (figure -1). The follow-up consisted of clinical observation and periodic ultrasound every 3 months.

The statistical analysis was performed using GraphPad Prism version 6 for Windows (GraphPad Software, La Jolla, CA, USA). The categorical variables were reported as percentages for the descriptive analysis. The variables were examined for the inferential analysis utilizing Fisher's exact test and Chi-square. Statistics were used to determine whether a probability value was significant.

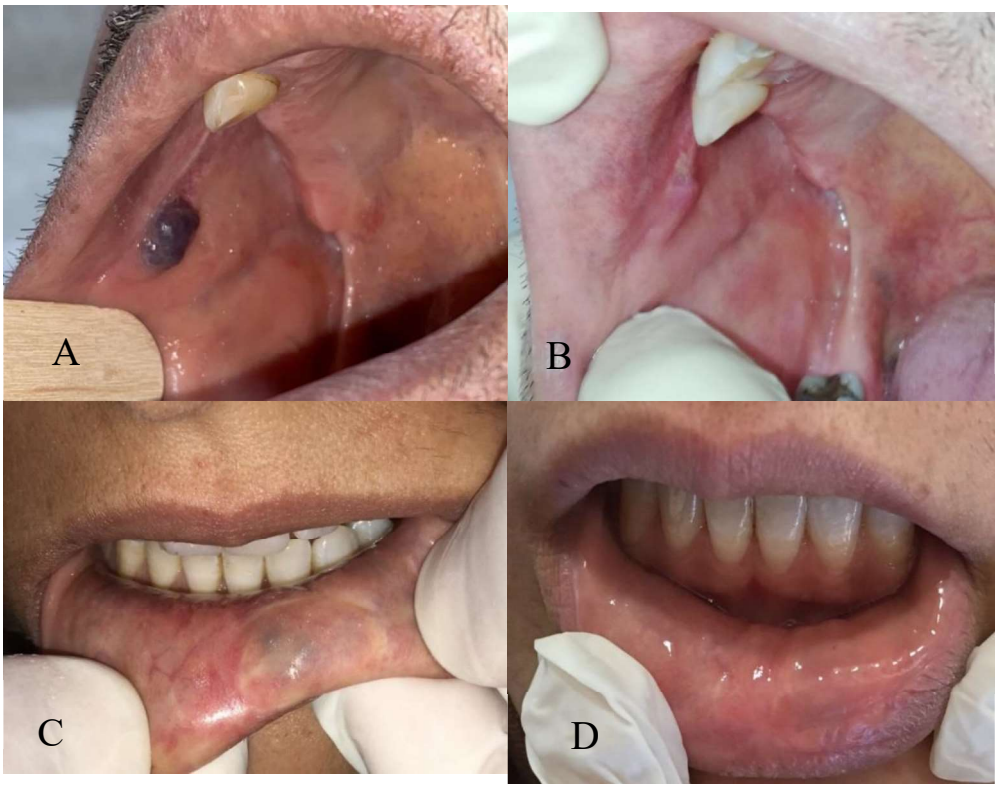

Figure 1: Intra-oral view for 2 patients involved in the study, (A) Pre-operative buccal mucosa vascular lesion treated by boiled distilled water injection. (B) the same previous patient after 2 sessions of injections. (C) pre-operative lower lip vascular lesion treated by alcohol injection. (D) same previous case after 2 sessions of injections

Results:

Retrospective identification of 20 patients who received sclerotherapy was done. Ten (50%) of cases treated using boiled distilled water and 10 (50%) treated by alcohol injection. The (median age: 28 years, range: 1-57 years). There was a predominance for female gender (60%). 50% of the patients reported having a lesion (complaint period) that lasted longer than four years. Regarding the site, the rate of occurrence was higher on the lips (60%) than on the tongue (30%) or the buccal mucosa (10%). The majority of the lesions—about 65%—were larger than 1.0 centimeters (cm) (Table 1).

Table 1. Distribution of patients treated by sclerotherapy according to age, gender, period of complaint, location and size of the lesions.

Age group	Number	Percentage
< 20	5	25%
<40	10	50%
< 60	5	25%
Total	20	100%
Gender	Number	Percentage
Male	8	40%
female	12	60%
Total	20	100%
Complaint period	Number	Percentage
< year	4	20%
1-3 years	6	30%
4 years or more	10	50%
Total	20	100%
Location	Number	Percentage
Upper lip	4	20%
Lower lip	8	40%
tongue	6	30%
Buccal mucosa	2	10%
Total	20	100%
Size (cm)	Number	Percentage
≤ 1.0	7	35%
>1.0	13	65%
Total	20	100%

From both groups, 9 patients (45%) indicated swelling as their primary symptom, making it the most prevalent.

Four of the five patients in Group A who received two sessions of injectable therapy saw their lesions completely disappear. The other 5 patients had more than 2 injections and the complete resolution occurred in 3 cases.

For the six patients in Group B, two sessions of alcohol injection were sufficient to produce an acceptable outcome. Two months following the application, the lesions completely disappeared. The other patients in the same group required more than two sessions, and just one patient experienced partial regression. The majority of lesions had positive outcomes. Of the two groups, 16 patients (80%) experienced total regression (i.e., a 100% return to the look of normal mucosa). Three of the four patients (20%) in Group A and one of the four patients (21%) in Group B demonstrated partial regression of the lesions; neither group needed additional surgery for functional or cosmetic restoration. During the follow-up period, there were no reported problems or recurrences.

Seven patients in Group A received a total dose of 1 to 2 ml of heated distilled water for lesions larger than 1.0 cm, whereas six patients in Group B received an injection of alcohol totaling 0.2-2 ml for lesions larger than 1.0 cm. The results were not significant when comparing the two groups in terms of the number of applications, total doses are given, size of the lesions, and outcome. (Table 2). Additionally, the link between several characteristics and the size of the lesions did not reach statistical significance (Table 3).

Table 2. Clinical variables in comparison between the two groups.

Variable	Group A	Group B	P value
Lesions size(cm)			
≤ 1.0	3	4	1.0000 * NS
>1.0	7	6	
Total	10	10	
Number of applications			
2	5	6	1.0000* NS
≥3	5	4	
Total	10	10	
Total dose (ml)			
≤1	5	8	0.3498* NS
>1	5	2	
Total	10	10	
Out come			
Complete resolution	7	9	0.5820* NS
Partial resolution	3	1	
Total	10	10	

* Fisher's exact test, S Significant, NS Not significant

Table 3. Association of clinical variables with lesion size.

Parameters	Lesion size		P value
	≤ 1.0	>1.0	
Gender			
Male	4	4	0.3563* NS
Female	3	9	
Age			
< 20	1	9	0.0554† NS
<40	4	2	
< 60	2	2	
Number of applications			
2	3	8	0.6424* NS
≥3	4	5	
Total dose (ml)			
≤1	6	8	0.3544* NS
>1	1	5	
Results			
Partial regression	2	2	0.5868* NS
Complete regression	5	11	

* Fisher's exact test, † Chi-square, S Significant, NS Not significant

Discussion:

Malformations of the cervicofacial vascular system are frequently present at birth but occasionally difficult to detect. This study accords with earlier reports (5) and varies from others in that there was a majority of head and neck vascular abnormalities in women as opposed to a roughly equal ratio in men. (6, 7). There are multiple different therapeutic options for oral vascular malformations that have been documented in the literature, including intralesional and systemic corticosteroid therapy, surgical excision, and sclerotherapy. Each form of treatment has its benefits and disadvantages. Over time, a wide variety of chemicals in liquid or foam form have been utilized in sclerotherapy to carry out this function. (13). Sclerotherapy provides several numbers of benefits over other forms of treatment, including the fact that it is easy to use, inexpensive, and widely accessible. It also has excellent efficacy, offering partial or complete regression of the lesion without bleeding. Sclerotherapy disadvantages include tissue necrosis, breathing impairment, postoperative pain, burning sensation, and a possible allergic reaction. (14)

Boiling water as a management tool for virtual machines is not a new concept. Oji et al. (15) have employed several methods for treating VMs, including boiling water. Since water itself lacks sclerosing properties, the heated water injection acts primarily as a result of heat injury. Heat energy negatively impacts the vascular endothelial tissues, leading to disruption, necrosis, and obliteration of the vessel's lumina, which promotes blood clotting and eventually results in the vessel collapsing (16). Because of its inexpensive cost, antiseptic properties, widespread availability, and simplicity of application, ethanol is the most used sclerosing agent. It is the most potent sclerosant currently on the market. Endothelial cells can be permanently destroyed by absolute alcohol (95–98%), limiting recurrence (17). The most beneficial functional and cosmetic outcomes for vascular malformations have been achieved with intra-lesion sclerosing injection using 96% alcohol, and this is consistent with results from previous studies, even though the results of this study were not significant due to the small sample size (5,18). The total number of applications, the lesion's response, and the treatment's outcome are all variable and dependent on a variety of elements, including the protocol followed and the size of the lesion. This study demonstrates that low-flow lesions, which are palpably soft and small in size, frequently respond well to treatment and shrink after only a few administrations. In the current study, 0.2-2 ml of alcohol or hot water was injected per session for lesions less than 1.0 cm. With two or more administrations, the lesion frequently completely regressed. Although just two treatments were required in 50% of cases in group A and 60% of cases in group B for an acceptable outcome, additional applications were required in some lesions. Even when higher dosages were necessary, the intralesional application of this chemical can be used safely when the applied dose is proportionate to the size of the lesion. Because of this, major issues like the necrosis of adjacent tissue or any type of systemic changes are avoided. The patient's weight, size, and location of the malformation, as well as other criteria, were used to calculate the appropriate amount of alcohol to inject. According to Akita et al. (19), the maximum acceptable dose of alcohol is 1ml /Kg1 of body weight and can be used safely but with caution due to the increased risk of developing numerous issues through repeated sessions in addition to temporary morbidity attributable to pulmonary hypertension.

Conclusions:

Oral vascular abnormalities were more common in women and affected people of all ages. Clinically, they mostly showed up as an asymptomatic swelling of varying size that frequently affected the lips, tongue, and buccal mucosa. Sclerotherapy with alcohol or boiling water is a reasonable and acceptable therapeutic method that, when performed correctly, yields satisfactory results and doesn't cause any major side effects. Sclerotherapy's potential side effects, such as mucosal ulcerations, swelling, infection, transient nerve palsy, blood loss, and anaphylaxis, were not present in the current case study. Instead, the use of ethanol and boiled water proved to be very successful and safe treatments, causing the lesion to respond significantly and shrink in size without any complications or differences in the results between the two techniques.

Declaration of interests:
The authors declare no conflicts of interest.

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