

Brief Short Reports

Endochemical Venous Ablation with Foam Prepared with Pure Oxygen, Excellent and Easy Alternative

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Abstract

Sclerotherapy with Polidocanol Foam prepared with room air causes some side effects which can become dangerous. In order to decrease or even avoid such adverse effects, the Foam with pure oxygen was prepared. The study was approved by the ethics committee, with the informed consent of the patients. The sclerotherapy was made with polidocanol Foam prepared with the gas-liquid proportion of Tessari's method. Two groups were formed, one was treated with polidocanol-room air foam and the other with polidocanol-oxygen foam, which used pure oxygen (O₂) instead Room air (Ra). No special exclusion criteria between groups.

Results: Patients = 1300, adverse effects: Cough (0.15% O₂, 3.7% Ra), Dizziness and migraine (0%, O₂, 0.53% Ra), Visual disturbances (0%, O₂, 0.13% Ra), Back pain (0%, O₂, 0.73% Ra). The effectiveness of treatment was the same in both groups, but the Foam prepared with oxygen had better performance. Although Dr. Frullini has demonstrated that endothelin is the cause of the neurologic side effects, the use of physiological gases can prevent most of the undesirable effects of the sclerosing Foam. In conclusion, Foam sclerotherapy performed with Oxygen is a good option to reduce or even prevent adverse effects of polidocanol, easy to performance and with better stability in the Foam.

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Introduction

Sclerotherapy is a technique that has rapidly spread throughout the world, especially because it is ease and economic [1]. Liquid sclerosis has been reserved for telangiectasias and reticular veins whereas that FOAM has become more important for large trunks [2]. The study of sclerosis with FOAM has extended not only for the quality of the sclerosant agent but also because of the way that bubbles interact with the venous endothelium. The formula $TP = \frac{1}{4} r^2 d / 2D Sf$ (where **TP** is the time of persistence of the bubbles, **r** the radius of the microbubbles, **d** the density of the gas inside the microbubble, **D** the diffusibility of the gas through the membrane of the microbubbles and **Sf** the saturation factor of the gas in the blood, summarizes the most important factors that interfere with the time of the bubbles stability [3]. Sclerotherapy may require several sessions, especially when there is an abundance of telangiectasias in legs and thighs, therefore the application of high volumes would be necessary. CO₂ bubbles are 50 times more diffusible than nitrogen bubbles through the endothelium of the venous capillary and the membrane, thus the use of CO₂ provides greater diffusion in the blood compared to oxygen. In another hand, the mixture of CO₂ and O₂ produces smaller bubbles. Experimental and clinical studies with polidocanol bubbles show a clear reduction of the size of the microbubbles with CO₂ but its half-life decreased significantly. When CO₂ and O₂ were combined, the average life of the bubbles increased markedly and the diameter decreased compared with room air [4]. In a study conducted by Dr. Nick Morrison, sclerosant Foam in volumes of 2 to 42 ml was injected, with an average of 17.5ml (± 7.8ml) for the mixture CO₂-O₂ and 17ml (± 9ml) for room air [5]. Dr. Morrison also reported on the use of CO₂ as the only gas to prepare the foam, succeeding in reducing the complications [6]. In 2009 we started a study on post-sclerotherapy complications using pure oxygen to prepare the polidocanol Foam reporting the first results at the Phlebology Congress in Mexico in 2010. We found that the concentrations and volumes used were to much higher than those we currently use. The results so far have been good [7].

Methods

From 2010 to 2017, 1,300 patients without distinction of sex or age were injected with oxygen Foam and were compared against 1,500 patients who were injected in the office with room air. Polidocanol foam in different concentrations using only pure oxygen as a gas was used prepared with the Tessari technique using a three-way stopcock (1ml of liquid and 4ml of oxygen) [8]. With this Foam different sizes of veins were injected from telangiectasias to saphenous trunks in different volumes. It was done in the operating room with monitoring of Electrocardiography, Oximetry and vital signs for high volumes. After the procedure, the patient was released to the recovery room where was monitored for 3 hours and then were discharged to home. The subsequent control visits were once a week, monthly and after a year. The side effects of polidocanol were evaluated and compared with those of patients injected under the similar conditions with room air. The study was approved by the ethics committee and was performed with the informed consent of the patients (Figure 1).

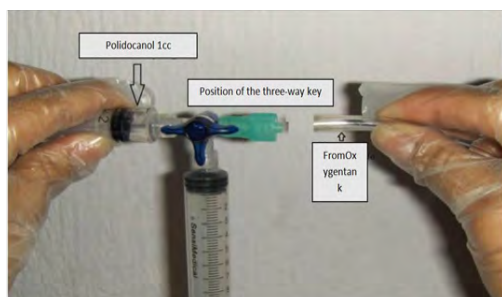


Figure 1: Way to connect the tube from the oxygen tank to prepare the foam.

Results

The sample general description is in tables 1,2. The FOAM prepared with pure oxygen was more stable than that prepared with room air and increased the duration of the bubbles, it was also a little brighter.

The side effects were practically eliminated and although at present it is not necessary, different volumes were applied having a maximum volume of 60 ml of Foam with average of 14ml.

The veins injected were the following:

	Oxygen group (1,300)		Room air group (1,500)	
Age (mean)	54 years	(28-80 y)	60	(26-82 y)
Male	32%	416 p	28%	418 p
Female	68%	884 p	72%	1082 p
Size	1.6 m	1.43-1.72	1.56 m	1.40-1.83
Weight	71 Kg	43-120	75 Kg	45-125
Right	68 %	884 legs	58.4%	876 p
Left	76 %	988 legs	41.6%	624 p
Volume (mean)	14 ml	3-60 ml	2.8 ml	1-15 ml
Concentration (mean)	1.5%	(0.5-3)%	1.5%	(0.5-3)%

Table 1: General description of the population.

In the Oxygen group there were no side effects, in the room air group there were minor side effects. The effectiveness of the treatment was the same in both groups. We had not secondary neurological effects (Table 3).

Discussion

For a period the enthusiasm for applying high volumes was generalized, but in recent years this has changed since some neurological problems derived from sclerosing injection have been reported [9,10]. Minor effects have also been reported and studied such as visual disturbances without attributing the effect to the gas used but to the vasoconstrictor effect of endothelin [11]. The stability of the Foam is very good with mixed CO₂ and O₂, Dr. Morrison reported a decrease of side effects using CO₂ to prepare the sclerosing Foam [5].

Dr. Frullini and Cols. demonstrated that endothelin is the cause of neurological side effects [12]. We know that the use of physiological gases reduces significantly the side effects, which may be due to some special interaction of nitrogen with the endothelium, which does not occur when CO₂ or Oxygen is used [13]. Especially the prevention of neurological effects justifies the use of oxygen as a way to prevent easily these events. Beckitt et al. used a mixture of O₂ and CO₂ foam with physiological gases to prevent effects such as thrombophlebitis [14]. Although our series are small we must continue the use of physiological gases to prepare foam. It is believed that oxygen is more accessible than CO₂, since it is a gas commonly used in doctors' offices and hospitals. Likewise the Central Nervous System works better with Oxygen than with CO₂ and if there are bubbles in some important area, it could be a factor for having or not neurological effects due to transient hypoxia. The duration of the foam with Oxygen is greater than with room air and it is an advantage when working with endovenous chemical ablation (sclerotherapy). More research is needed, although there is sufficient evidence that physiological gases are better than ambient air [15].

Conclusion

Sclerotherapy with Foam prepared with O₂ is a good alternative ahead to prevent or diminish the adverse neurological effects and if necessary, allows the injection of large volumes of Foam with safety. This foam is easy to prepare in any medical office, is not expensive and offers longer duration in its stability for the treatment of sclerotherapy, so we strongly suggest its use.

Veins	Varicules	Magnus Saphena	Accessory saphena	Cockett I	Cockett II	Cockett III	Boyd	May perf.	Giacomini	Hunter
%	74	16	10	30	12	7.5	42	17	8	10
Patients	2,072	448	280	840	336	210	1,176	476	224	280

Table 2: Veins more frequently affected.

Side effects	Cough	Dizziness and migraine	Transient blindness	Back pain	Fainting	Patients
Room air	56 (3.7%)	8 (0.53%)	2 (0.13%)	11 (0.73%)	2 (0.13%)	1500 (100%)
Pure oxygen	2 (0.15%)	0	0	0	0	1300 (100%)

Table 3: Side effects after injection of polidocanol at different concentrations, Foam prepared with pure oxygen and room air with Tessari technique.

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