The Efficacy of Polidocanol foam Sclerotherapy in Treatment of Infantile Hemangioma and Slow-Flow Vascular Malformation

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ABSTRACT

Background: Sclerotherapy is a simple treatment modality for treatment of infantile hemangioma and slow-flow vascular malformations; Polidocanol is a mild sclerosing agent that is traditionally used in treatment of varicose veins. This study aims to evaluate the effectiveness, treatment outcome, and complications of polidocanol foam sclerotherapy for infantile hemangioma and slow-flow vascular malformations.

Materials and methods: Between March 2013 and December 2014, seventeen patients with infantile hemangioma and slow-flow vascular malformations treated with polidocanol 1% foam sclerotherapy. Foam was prepared by Tessari's method. Injection performed under general or local anesthesia, injections were repeated (if necessary) on monthly basis, assessment of lesion size and response to treatment was performed by ultrasonography. Effectiveness of polidocanol foam sclerotherapy was evaluated according to reduction in lesion size.

Results: A total of 17 patients were enrolled, 15 of them (88.23%) were females and 2 (11.76%) were males, with age range from 10 months to 57 years old (mean age 21.69). Eleven patents (64.7%) had venous malformations while 6 patients (35.29%) had infantile hemangioma. Mean number of treatment sessions was 2.76. Nine patients had excellent outcome, 3 with good outcome, 3 with fair outcome and 2 had poor outcome in relation to lesion size. Complications were transient.

Conclusions: Polidocanol foam sclerotherapy is an easy to perform procedure, safe, and repeatable, provide excellent outcome for venous malformations and good outcome for infantile hemangioma.

Keywords: Sclerotherapy, Polidocanol, infantile hemangioma, vascular malformations. (J Bagh Coll Dentistry 2016; 28(3):116-120).

INTRODUCTION

Vascular anomalies are congenital errors of vascular development causing identifiable birthmarks of the skin and mucosa and a variable degree of underlying soft tissue abnormalities [(1,2)]. Vascular lesions most often first present in pediatric patients and are among the most common congenital and neonatal abnormalities with a reported incidence of 10—12% in Caucasian infants and approximately 60% of them occurring in the head and neck region [(3)].

Vascular anomalies are now divided into two main categories: vascular tumors and vascular malformations. Infantile hemangiomas comprise the majority of vascular anomalies and are considered the predominant vascular tumor type composed of rapidly proliferating endothelial cells [(1)]. Unlike hemangiomas, vascular malformations are uncommon, rarely regress, and continue to expand, and have high rates of recurrence following [(4-6)].

Infantile Hemangiomas proliferate during the first 9–12 months of life and subsequently involute at a variable course over many years [(7,8)]. Vascular malformations are composed of ectatic venous channels that will continue to grow throughout the patient's lifetime. The overall incidence of venous malformation is about 1 in 10 000 [(9)].

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Mulliken and Glowacki suggested that the term vascular malformation be used to describe anomalies of vasculature that are present at birth, grow proportionally with the child, have normal endothelial turnover, and do not spontaneously regress [(10)].

Sclerotherapy

Sclerotherapy was described as a treatment of varicosities as early as the 1830s.Andrew and Kelly were the first to describe its role in infantile hemangioma. The aim of sclerotherapy is the fibrous occlusion of the vessel lumen rather than merely thrombosing a vessel that may be amenable to recanalization, sclerosing a vessel transforms it into a fibrous cord, which cannot be recanalized [(11)].

Contra-indications for sclerotherapy

There are relative and absolute contra indications for sclerotherapy (Margaret W. Mann, 2011), relative contra-indications include:

- Marked allergic diathesis/severe bronchial asthma
- Poor general health/severe concomitant disease (malignancy and cardiovascular and respiratory tract diseases)
- Immobility
- Known thrombophilia or hypercoagulable state
- Needle phobia

- Known asymptomatic Patent Foramen Ovale (PFO) (especially with foam sclerotherapy)
- Arteriovenous malformation (more difficult to treat and higher risk of necrosis).

While absolute contra-indication are

- Known allergy to the sclerosant
- History of extensive deep venous thrombosis DVT
- Acute superficial or deep vein thrombosis
- Local infection in the area of sclerotherapy, cellulitis, or severe systemic infection
- Pregnancy (Polidocanol crosses the placental barrier)
- Advanced peripheral arterial occlusive disease
- Advanced collagen vascular disease.

Foam sclerotherapy

Foam sclerotherapy is more efficacious in seclerosing larger-diameter vessels because the bubbles mechanically displace blood, thereby

1- Maximizing the contact time
2- Maximizing surface area between the sclerosant and the vein endothelium.
3- Lower concentration and volume are needed to effectively sclerose veins using foam In comparison to liquid sclerotherapy [(12)].

Polidocanol

Polidocanol (Aethoxysclerol, Kreussler, Wiesbaden, Germany) is a widely used nonionic detergent sclerosant that was first developed as an anesthetic and acts through endothelial over hydration, vascular injury, and closure [(13)].

Polidocanol is a more moderate form of ethanol. It is an effective sclerosing agent that consists of 95% hydroxypolyethoxydodecane and 5% ethyl alcohol and is known to have a low risk of complications. The maximum recommended dose varies in the literature (the range varies from 10 to 20 mL of 3% solution) but to the European guidelines it is of 2 mg/kg (10 mL 1% solution for a 50-kg individual). At near maximum dosage, patients have reported perioral paresthesia or strange taste sensation, which may be related to the anesthetic property of Polidocanol. Toxic levels can produce cardiotoxicity, much like lidocaine toxicity, resulting in bradycardia and hypotension [(12)].

MATERIALS AND METHODS

This study involved 17 consecutive patients (15 females, 2 males), who are sustained with vascular lesions in the head and neck region, those patients have attended the consultation clinic of maxillofacial surgery department in Ghazi Al Hariri specialized surgical center, Baghdad, from march 2013 to December 2014, and was included and followed for 6 months.

Patients included in this study were

1- Patients with infantile or congenital hemangioma
2- Patients with slow flow vascular malformation (capillary, venous, or lymphatic)
3- Patients with vascular lesions who had poor treatment results by other types of sclerosing agents

While patient excluded are those with:

1- Known sensitivity to Polidocanol
2- Patients with poor general health or medically compromised, like diabetes mellitus, hypertension, history of DVT, malignancy, ischemic heart diseases, pregnancy, etc.
3- Arteriovenous vascular malformations
4- Cellulitis with local infection in area intended for sclerosant injection

Doppler ultrasonography was used for the purpose of assessment of size, site, extension, and flow pattern, the device used in this study was Phillips HD11xe, manufactured by Philips Electronics 2008, Netherlands. Polidocanol (Aethoxysclerol) was used as a seclerosing agent, it is supplied as 2 ml ampules, a package of 5 ampules, the required amount was from 0.5 ml to 5 ml

Sclerotherapy tray

A sclerotherapy tray is set up and it included: cotton swabs, iodine povidine solution, Dental syringe with Xylocain local anesthesia, 2 syringes 5ml each, 1 syringe 1ml, 3 way stop cock, 1% Polidocanol ampules, gauze, and adhesive tapes. Sclerotherapy is shown in (Fig 1).

The procedure is generally performed in the out-patient clinic setting unless there is a need for general anesthesia, the patient is comfortably seated. Intended site for injection is scrapped with cotton swabs and Povidone-iodine solution in circular movement starting from accused site outward. In case requiring general anesthesia, the scrapping is done after the patient is anesthetized, but when with local anesthesia scrapping is done first.

Administration of local anesthesia by infiltration technique around the lesion, the amount injected was one ampule (i.e. 2.2 ml), waiting till patients is well anaesthetized, and then preparation of foam is carried out.

In this study, liquid sclerosant is turned into foam by Tessari's method or so called "double syringe technique" in which room air is mixed with the liquid via a 3-way stop cock and agitated

back and forth for about 10 times. The foam produced is stable to about a minute then it turns into a liquid again. Foam production is shown in fig 1

The mixing ratio is 3:1 room air to sclerosant, amount of foam injected equals to the volume of the lesion, and this means that the patient will receive ¼ liquidconcentrations by volume.

Fig 1: Syringes containing foam connected via 3-way stop cock, the first syringe contains 1 ml of liquid Polidocanol and the other contains 3 ml or room air.

The needle introduced into the lesion from adjacent normal tissue directed toward the most vascular part (if visible) until blood can be aspirated, the injection is performed slowly with light pressure from the more vascular area then distributed to the periphery, during this time foam is seen to displace blood from the lesion and a form of temporary blanching prevails, injection is continued until the measured amount was administered, then drawn out. Gauze dressing applied for about 10 minutes.

Evaluation of treatment effectiveness included 4 scales:

Scale 1: Poor (0 to 25 percent)
Scale 2: Fair (26 to 50 percent)
Scale 3: Good (51 to 75 percent)
Scale 4: Excellent (76 to 100 percent)

RESULTS

Patients enrolled in the study were 17 patients, 15 of them were females (88.23%) and 2 males (11.76 %) as shown in table 1.

Table 1: Gender distribution statistics

Genders	No. of Patients	Percentage
Males	2	11.76
Females	15	88.23
Total	17	100

Patients diagnosed as having infantile hemangioma were six patients (35.2%), 5 of which were females and 1 male, while patients who had venous malformations were 11 (64.7%), 10 of them were females and 1 male. Relations are shown in table 2.

Table 2: Relation the lesion type and gender

	Female	Male	Total	Percentage
Venous Malformation	10	1	11	64.7%
Infantile Hemangioma	5	1	6	35.29%

Twelve patients underwent sclerotherapy sessions under local anesthesia with vasoconstrictor and five under general anesthesia. Nine patients (75%) of the patients treated under local anesthesia had excellent results and the rest had good and fair results, while patients treated under general anesthesia had response range of poor to fair.

Treatment sessions

Two patients received single injection session, 6 patients received 2 injections, 5 patients received 3 injections, and 3 patients received 4 injections while 1patient had received 6 injection sessions ,injections were performed on monthly basis resulting in a mean value of 2.76.

Twelve patients underwent sclerotherapy sessions under local anesthesia with vasoconstrictor and five under general anesthesia. Nine patients (75%) of the patients treated under local anesthesia had excellent result and the rest had good and fair results, while patients treated with general anesthesia had response range from poor to fair.

Treatment outcome

Nine patients has excellent outcome (decrease of size of lesion range from 76-100%), 3 patients had good outcome (reduction in size range from 51-75%), 3 patients had fair outcome (decrease in lesion size range from (26-50%), while 2 patients had poor outcome (reduction in size was less than 25%), results are shown in fig. 2**.**

The response varied between infantile hemangioma and venous malformation as shown in table 3.

Table 3: Relation between lesion type and response

Lesion type	Response			
	76-100% Excellent	51-75% Good	26-50% Fair	0-25% Poor
Infantile Hemangioma	0	2	3	1
Venous Malformations	9	1	0	1

Relation of patient's age to the amount of reduction in lesion size is shown in fig. 3.

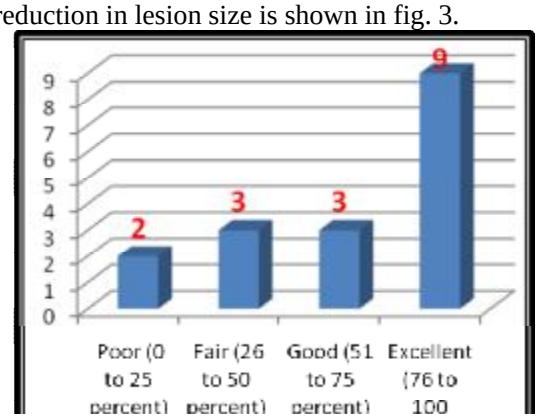

Fig. 2: The number of patients in relation to the amount of decrease in lesion size.

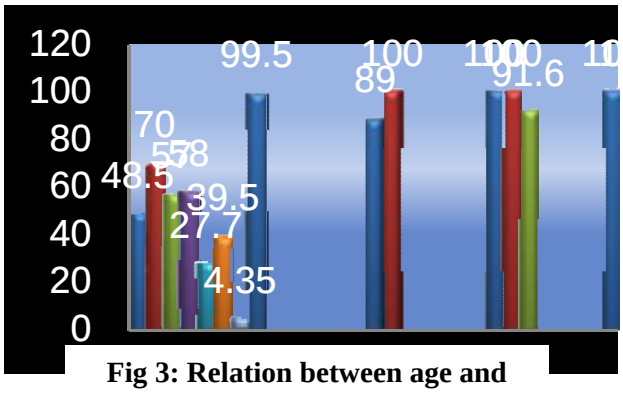

Fig 3: Relation between age and response

Swelling and necrosis were the only complications observed throughout this study, they were transients and as shown in table 4.

Table 4: Relation between No. of patients, No. of sessions, and complications

Type of complication	No. of patients	Percentage	No. of sessions	Percentage
Swelling	14	82%	33	70%
Necrosis	1	5.8%	1	2.1%

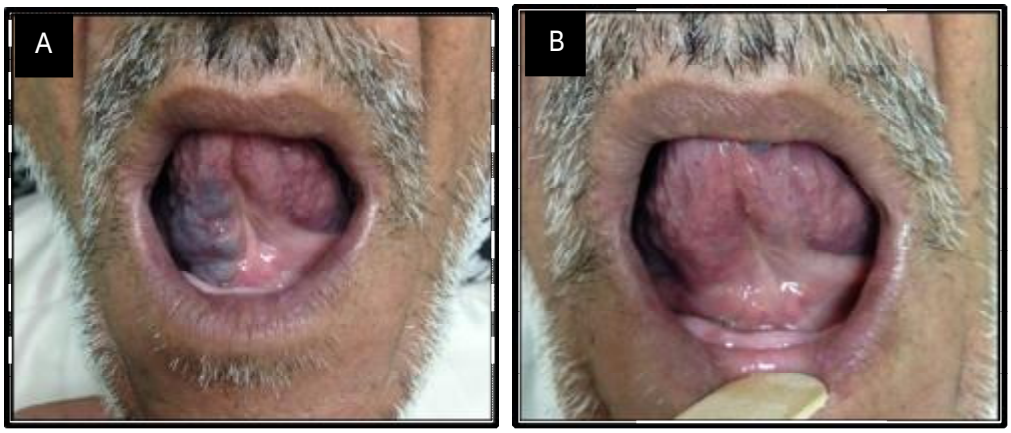

Fig. 4: Patient with venous malformation treated by polidocanol foam sclerotherapy, A before treatment, B after 3 injection sessions.

DISCUSSION

In this study, the female: male ratio was 9:1 which coincide with Haggstrom et al who studied a group of 1058 patients, 750 of them (71%) were females while the other 308 patients (29%) were males [(2)], but this ratio is far from Kryger & Sisco 2010 results that stated that female: male ratio was 3:1 [(14)]. This difference in ratio may be related to the fact that this study only included infantile hemangiomas and venous malformations, also related to the small number of patients enrolled.

The study also showed that venous malformations occurred 2 times more than infantile hemangioma in females (10 females with IH, and5 with VM) while it is the same in male patients (1 male with IH and 1 male with VM), this might be related to the effect of estrogen in the pathogenesis of vascular lesions which is supported by Mulliken and Glowacki [(10)].

Haggstrom et al found that infantile hemangiomas affect 10% of population with a greater incidence in Caucasian, female gender, and premature low-weight birth children [(2)].

Patients treated under local anesthesia had poor to excellent response (12.85-100%) in comparison to those treated under general anesthesia that had poor to good results (4.35 - 57%), this might be due to the effect of vasoconstrictor present in the anesthetic agent, which increases the contact time between the sclerosing agent and endothelium thus increasing its effect in relation to dose. This is supported by Dietzek interpretation that epinephrine helps with vessel vasoconstriction producing a longer dwell times and helps with sclerosing agent effect [(15)].

Infantile hemangioma showed poor to good response (4.35- 70.22%) to sclerotherapy while venous malformations had poor to excellent response (12.85 -100%). This might be related to the pathogenesis of each lesion, infantile hemangioma as a benign tumor involve vessels that have hyperplastic endothelial cells, the ones that vessels of venous malformations don't have and instead they have normal but hypertrophied endothelium which leads to reduced effect of sclerosing agent.

The response to polidocanol sclerotherapy in children (1st decade of life) ranged from 4.35% to 70% which was relatively less than that of adolescents and adults (12.8 to 100%), and this might be related to healing and regeneration ability which is relatively higher in children, as well asthe ongoing growth phase that counter acts the effect of endothelial fibrosis and damage induced by the sclerosant, thus leading to less response.

Swelling is evident due to the inflammatory response induced by polidocanol, this agree with E. Gorriz- Gommez et al [(16)] study on 15 patients and stated that direct puncture polidocanol sclerotherapy was effective treatment for vascular malformation, in which pain and post-operative inflammation were successfully controlled with analgesics and anti-inflammatory drugs; he had only one case of superficial necrosis (1 of 15 patients, 6.6%) that healed by secondary intention.

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