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Role of Sclerotherapy in the Management of Various Types of Vascular Anomalies in a Tertiary Health Care Center

Research Article

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Abstract

Introduction: In the population the vascular malformations are around 4.5%. These malformations can be classified into arterial malformations, venous malformations, arterio-venous malformations, lymphatic malformations, and capillary malformations and combined vascular defects.

Aims and objectives: To study the Role of sclerotherapy in the management of various types of vascular anomalies at a tertiary health care center.

Methodology: This was a cross-sectional study carried out in the department of Interventional Radiology of a tertiary health care centre during the six month period i.e. august 2018 to January 2019. In the six month period there were 50 patients enrolled for study. Patients had undergone Sclerotherapy with sodium tetradecyl sulfate alone (Group A) (n=25) versus sodium tetradecyl sulfate and lipiodol (Group B) (n=25) randomly. The statistical analysis was done by SPSS 19 version software.

Result: The majority of the patients in the age group of <10 years were 46%, followed by 10-20 years were 30%, 20-30 years were 14%, 30-40 years were 10%. The majority of the patients were Females i.e. 64% and males 36%. The various sites of vascular malformations found were Upper limb extremity in 38%, followed by Head and Neck in 28%, Lower limb extremity in 16%, Buttocks in 10%, Genital area in 8%.The majority of the patients with successful Sclerotherapy in first attempt were in Group B i.e. 38% as compared 24% in Group A while 26% in Group A versus only 10% in Group B patients required Re-embolization. This observed difference was statistically significant (X^2=5.11, df=1, p<0.02).No major complications were found in our study but the mild complications were comparable in both the groups (X^2=0.46, df=6, p>0.05)

Conclusion: It can be concluded from our study that both the groups of sclerosants were effective in the treatment of various malformations but success in first attempt was more to combined sodium tetradecyl sulfate and lipiodol versus sodium tetradecyl sulfate alone and both the groups were having comparable complications.

Keywords: Sclerotherapy; Vascular Anomaly; Sodium tetradecyl sulfate; Lipiodol

Introduction

Vascular anomalies are congenital anomalies categorized into vascular tumor and vascular dysmorphogenesis (Vascular anomalies).

The Vascular Malformations (VMs) are found in 4.5% of the population [1]. These malformations can be classified into Arterial Malformations (AMs), Venous Malformations (VMs), Arterio-Venous Malformations (AVMs), Lymphatic Malformations (LMs), and Capillary Malformations (CMs) and combined vascular defects. These malformations are known to manifest in all parts of the human body. In addition, these malformations are present at birth; that is, they are congenital, but they usually induce clinical symptoms and findings after childhood, in early adulthood, or in later stage of life by the influence of various factors such as trauma, infection, or

hormones [2-4]. Diagnosis of a vascular malformation is primarily clinical, but ultrasound and especially Magnetic Resonance Imaging (MRI) has an important role [1]. Treatment options can include minimal therapies such as elevation, compression garments, and aspirin whereas medical management of LMs can require antibiotics and steroids [5].

Sclerotherapy has become an important tool in the treatment of vascular malformations. However, there has not been any evidence to suggest that any single sclerosing agent is more effective than others in clinical trials; thus the radiologist's personal preference does play a role in the selection of the sclerosing agent [6].

Sclerotherapy refers to the introduction of a sclerosing agent into the lumen of a vessel producing endothelial damage, which leads to thrombosis and subsequent fibrosis. It has been extensively used in the management of superficial varicose veins and other venous abnormalities [6,7].

Sclerotherapy is the injection of a chemical solution (sclerosant) into a vein, damaging the endothelial lining and causing vessel occlusion and the development of fibrous tissue [8].

Sclerosing solutions are classified into three groups, based on the mechanism of action - detergent agents, osmotic agents and chemical irritants. The various sclerosants include STS (Sodium Tetrodecly Sulfate), polidocanol, hypertonic saline, sodium morrhuate, etc. It causes destruction of endothelium by altering the surface tension around the endothelial cells by a process known as protein theft mechanism [9].

So we have studied the role of Sclerotherapy in the management of various types of vascular malformation at tertiary health care center.

Methodology

This was a cross-sectional study carried out in the department of Interventional Radiology at Jawaharlal Nehru Medical College & Acharaya Vinoba Bhave Rural Hospital, Sawangi (Meghe), Wardha during the six month period i.e. august 2018 to January 2019. Patients of all ages and both sexes were included in the study. Patients with vascular anomalies diagnosed on Ultrasonography, MRI or CT were included. Poor surgical candidate were excluded from our study. In the six month period 50 patients with various types of vascular malformations all over the body were diagnosed and enrolled in the study with written and informed consent. Each patient underwent all routine investigations including CBC, PT-INR, KFT, HbsAg, HCV and HIV. Each patient was subjected to Angiography of the affected limb under standard protocol. The arterial and venous tributaries were documented along with the geography of the lesion. Sclerotherapy was then done with sodium tetradecyl sulfate alone (Group A) (n=25) versus sodium tetradecyl sulfate and lipiodol (ethiodized oil) (Group B) (n=25) randomly. Patients were followed up frequently (5 days, 15 days, 1 month and later if needed) and re-embolization (re-sclerotherapy) was done in patients when needed. The various complications if any were noted. Procedure was performed on Philips Aurora FD 20/10 machine. In patient where only STS was used as an embolizing agent, doses between 0.5 ml to 2 ml were used, where in a 2 ml syringe STS was mixed with contrast medium slowly (No foam preparation). In patient where sclerotherapy was performed using STS and lipiodol, 0.5 ml lipiodol and 2 ml Setrol was mixed slowly in 2-3 ml syringes and used for sclerotherapy. The procedure was done under fluoroscopy. The peripheral vascular anomalies were punctured per-cutaneously using scalp vein 23/24 in number. After puncturing the vascular lesion, contrast shoot was taken to characterize the lesion and its boundaries. Contrast was then aspirated back using the same syringe. Sclerotherapy was then started by connecting the syringe containing sclerosant to scalp vein. Agent was injected in the form of pulses under fluoroscopy. Sclerotherapy was stopped before the agent entered deep vessels. The statistical analysis was done by SPSS 19 version software (Cases 1-3).

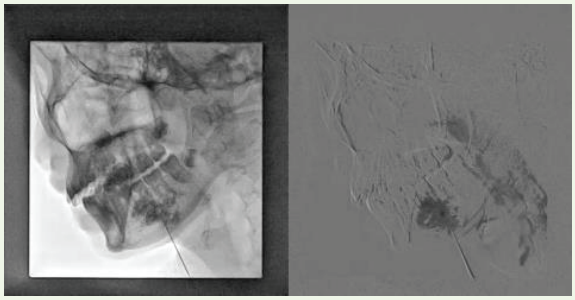
Result

(Table 1) The majority of the patients were in the age group of <10 years (46%), followed by 10-20 years (30%), 20-30 years 14% and 30-40 years 10%.

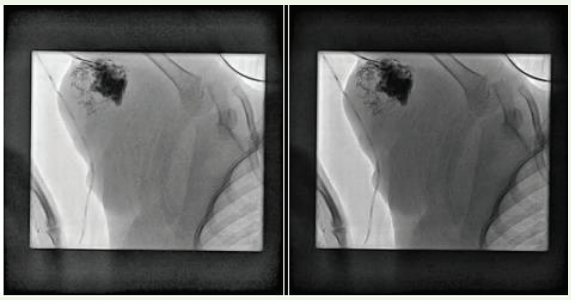
(Table 2) The majority of the patients were Females i.e. 64% and males 36%.

(Table 3) The various sites of vascular malformations found were Upper limb extremity in 38%, followed by Head and Neck in 28%, lower limb extremity in 16%, Buttocks in 10%, Genital area in 8% (Table 4).

(Graph 1) In majority of the patients, successful sclerotherapy in the first attempt were in Group B i.e. 38% as compared to 24%



Case 1: In a 32 year old male, Angiography (1st image) reveals a hemangioma in left submandibular region. Angiography (2nd image) during sclerotherapy using STS and Liopiodol.



Case 2: In a 9 year old female, Angiography (1st and 2nd images) reveals the vascular anomaly in the right axilla. Angiography while performing sclerotherapy of the same using STS and Lipiodol can be depicted in the next 3 images.

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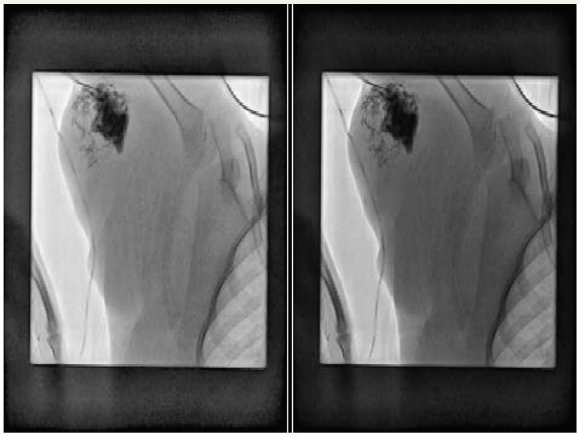
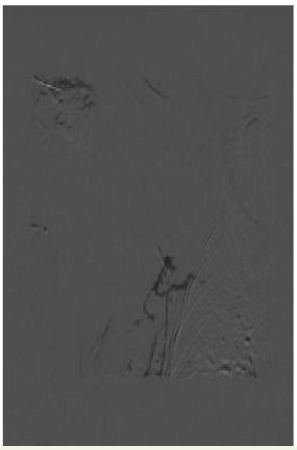




Case 3: In a 18 years old girl, Angiography (A, B) reveals vascular anomaly at the medial aspect of arm. The arteries and veins supplying the anomaly can be seen. Angiography (C) during sclerotherapy using Sodium Tetradecyl Sulphate and Lipiodol can be seen.

Table 1: Distribution of the patients as per the age.

Age (Yrs)	No.	Percentage (%)
<10	23	46
10-20	15	14
20-30	7	30
30-40	5	46
Total	50	100

The majority of the patients were in the age group of <10 years (46%), followed by 10-20 years (30%), 20-30 years 14% and 30-40 years 10%.

Table 2: Distribution of the patients as per the sex.

Sex	No.	Percentage (%)
Male	18	36
Female	32	64
Total	50	100

The majority of the patients were Females i.e. 64% and males 36%.

Table 3: Various sites of vascular malformations.

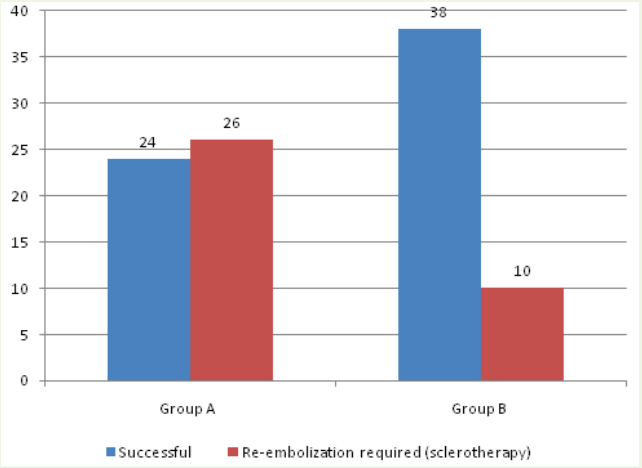
Site	No.	Percentage (%)
Upper limb extremity	19	38
Head and Neck	14	28
Lower limb extremity	8	16
Buttocks	5	10
Genital area	4	8
Total	50	100

The various sites of vascular malformations found were Upper limb extremity in 38%, followed by Head and Neck in 28%, lower limb extremity in 16%, Buttocks in 10%, Genital area in 8%.

Table 4: Distribution of the patients as per the successful sclerotherapy in first attempt.

Sclerotherapy in first attempt	Group A	Group B
Successful	12(24)	19(38)
Re-embolization required (sclerotherapy)	13(26)	5(10)
Total	**25(50)**	**25 (50)**

(X^2=5.11, df=1, p<0.02)



Graph 1: Distribution of the patients as per the successful sclerotherapy in first attempt.

In majority of the patients, successful sclerotherapy in the first attempt were in Group B i.e. 38% as compared to 24% in Group A whereas 26% in Group A versus only 10% in Group B patients required Re-embolization. This observed difference was statistically significant (X2=5.11, df=1, p<0.02)

in Group A whereas 26% in Group A versus only 10% in Group B patients required Re-embolization. This observed difference was statistically significant (X^2=5.11, df=1, p<0.02)

(Table 5) No major complications were found in our study. Only the minor complications like pain and swelling at embolization site and limitation of movements were seen in both groups, in whom Pain was found in 26% and 14%; Swelling in 18% and 10% and Movement limitations in 28% and 22% in Group A and Group B respectively,

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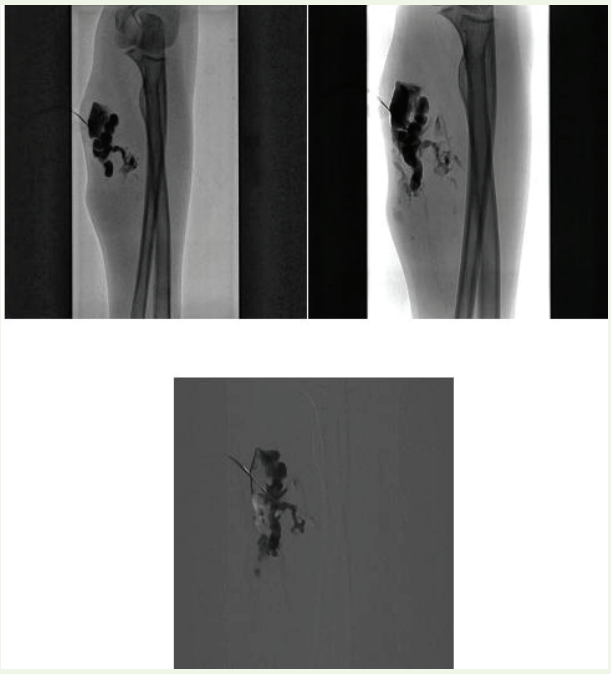
Table 5: Distribution of the patients as per the prevalence of various Complications in both the groups.

Complications	Group A	Group B
Pain	13(26)	7(14)
Swelling	9(18)	5(10)
Movement limitations	14(28)	11(22)
(X^2=0.46, df=6, p>0.05)		

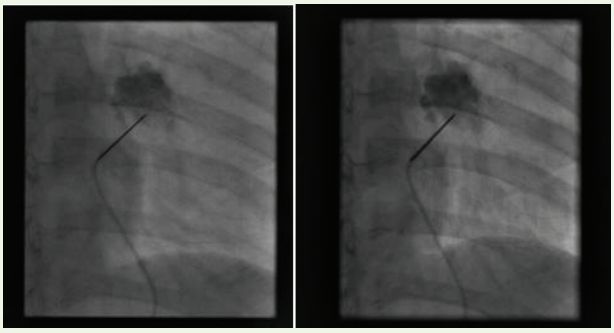
but the complications were comparable in both the groups (X^2=0.46, df=6, p>0.05) (Cases 4-6).

Discussion

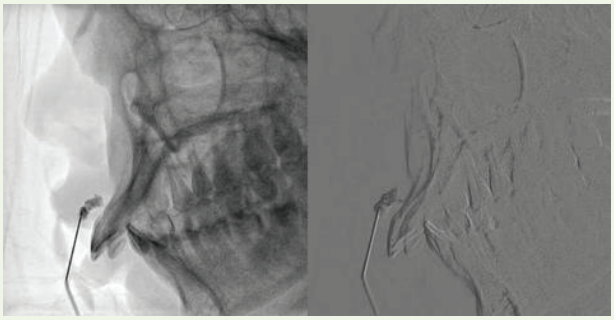
Vascular malformations being true in-born errors of development in the vascular tree are all present since birth, though all may not be clinically apparent [10]. The commonest of all the vascular anomalies are the venous malformations with a higher propensity for the head and neck region [10]. They can cause pain, bleeding, restriction of movement, pressure on adjacent structures, consumptive coagulopathy and aesthetic concern. They can either be discrete or extensive. The overall incidence of venous malformations is reported to be 1-4% of the population with no sex predilection. They are usually singular, isolated presentations but may occur in multiple areas. They may clinically manifest in infancy, childhood, adulthood or they may remain asymptomatic throughout life. Unlike hemangiomas they do not regress and grow correspondingly as the child develops. Venous malformations may occur in solitary form or they may be combined with capillary or lymphatic malformations. The microscopic examination reveals dilated vascular channels in proliferation lined by normal flattened endothelial with normal mast cells count. These endothelial cells characteristically have normal turn-over rate. MRI is the best investigation for venous malformations and gives off decreased signal intensity on the T1-weighted image hyperintense signal intensity on the T2-weighted image [11].



Case 4: In a 15 year old boy, Angiography reveals the vascular anomaly (1st image) along chest on left side with images attained while performing scleorthery using STS can be seen in the next image.



Case 5: In a 37 year old male, Angiography (1st image) reveals vascular anomaly in the upper lip. Angiography images while performing Sclerotherapy using STS can be seen (2nd image).



Case 6: In a 11 year old girl, Angiography (1st image) reveals a vascular nidus around the knee. Angiography images while performing Sclerotherapy using STS can be seen (2nd image).

MRI can distinguish low-flow venous malformations from high-flow arterio-venous malformations and fistulas. It can also provide information about delineation of the neurovascular structures and their involvement with the malformations (Case 7).

Management of venous malformations is quite challenging because treatment carries a significant risk of morbidity and the recurrence. Surgical resection, though definitive treatment, is often not feasible except for smaller lesions because of deeper involvement of neurovascular structures particularly in the head and neck and extremity malformations. Recurrence of Incompletely excised lesions is very frequent.

Laser treatment of venous malformations has also been attempted with varying success rate. Laser photocoagulation with argon, Nd-Yag or combination lasers have been found to be somehow effective for tiny superficial venous or capillary-venous lesions but not for significantly sized lesions. Recurrence is common and often repeated treatments are necessary. Hence they may be useful in select group of patients [11,12].

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Case 7: In a 36 year old male, Angiography (1st image) reveals a vascular nidus at the region of tibia. Angiography images while performing Sclerotherapy using STS can be seen (2nd image).

Sclerotherapy alone or in combination with surgical excision is now the accepted modality of treatment in symptomatic venous malformations. Localized areas can be treated without an incision and diffuse, extensive lesions may be symptomatically palliated. Conservative management with numerous sclerosing agents (boiling water, alcohol, sodium morrhuate, quinine, urethan, silver nitrate, iron, zinc chloride, liquid vegetable protein) have been used since the 18th century for the treatment of a wide variety of vascular anomalies [8,10-14].

In 1946, Sodium Tetradecyl Sulfate (STS) was introduced in, and it is still widely used today. Over 13,000 patients treated by STS were reported by George Fegan in the 1960s, significantly advancing the technique by concentrating on fibrosis of the vein rather than thrombosis, focusing on controlling significant points of reflux, and emphasizing the importance of compression of the treated limb [15]. The procedure became medically accepted in mainland Europe during that time. However it was poorly understood or accepted in England or the United States, a situation that continues to this day amongst some sections of the medical community [16].

Lipiodol (labeled Ethiodol in the USA), also known as ethiodized oil, is a poppy seed oil used to outline structures in radiological investigations by injection as a radio-opaque contrast agent [17,18]. It is used in chemo-embolization and as a contrast agent in follow-up imaging [19,20]. Lipiodol is also used in lymphangiography [21,22]. It has an additional use in gastric variceal obliteration as a dilutant that does not affect polymerization of cyanoacrylate.

Comopsition of ethiodized oil is ethyl esters of fatty acids of poppy seed oil, primarily as ethyl mono and di-iodostearate combined with iodine. The precise structure is unknown. Lipiodol was first synthesized in the Paris School of Pharmacy in 1901 by Marcel Guerbet. Historically, Lipiodol was the first iodinated contrast agent (used for myelography by two French physicians, Jacques Forestier and Jean Sicard in 1921) (Case 8).

In our study the majority of the patients were in the age group of <10 years (46%), followed by 10-20 years (30%), 20-30 years were 14% and 30-40 years were 10%. The majority of the patients were females in my study i.e. 64% and males were 36%. The various sites of vascular malformations found were Upper limb extremity in 38%, Lower limb extremity in16%, Head and Neck in 28%, Buttocks in 10%, Genital area in 8%.

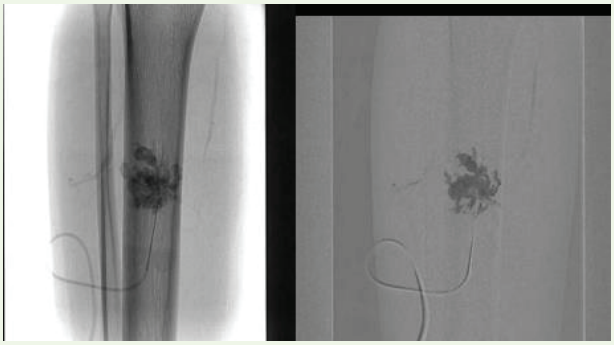
The majority of the patients with successful Sclerotherapy in first attempt were in Group B i.e. 38% as compared to 24% in Group A whereas 26% in Group A versus only 10% in Group B patients required Re-embolization. This observed difference was statistically significant (X^2=5.11, df=1, p<0.02).

No major complications were found in our study, only the minor complications in both groups were Pain in 26% and 14%; Swelling in 18% and 10%; Movement limitations in 28% and 22% in Group A and Group B respectively, but the complications were comparable in both the groups (X^2=0.46, df=6, p>0.05) (Case 9).

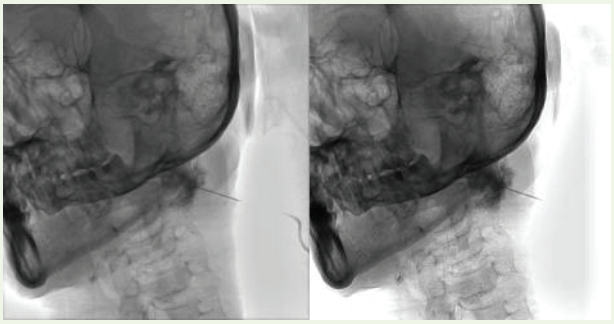
These findings are similar to EskoVeräjänkorva15 who found that Out of the 63 patients investigated, 83% (53) had Venous Malformations (VMs) and 9% (5) were defined as having Arterio-Venous Malformations (AVMs). Patients with a VM were operated on, in 14% (8) out of all VM cases. Hence 86% (45) of patients with a VM received adequate help to their symptoms solely from sclerotherapy. The duration of treatment for the 14% of the VM patients that needed a surgical procedure was prolonged by 7-9 months, that is, by 41%.

Conclusion

It can be concluded from our study that both the groups of sclerosants were effective in the treatment for various malformations but success in first attempt was more to combined sodium tetradecyl



Case 8: In a 31 year old Female, Angiography (1st image) shows a vascular anomaly along the angle of mandible. Angiography images while performing Sclerotherapy using STS and Lipiodol can be seen (2nd image).



Case 9: Angiography of right wrist (1st image) in a young female reveals a vascular nidus. Angiography while performing Sclerotherapy using STS can be seen (2nd image).

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sulfate and lipiodol versus sodium tetradecyl sulfate alone and both the groups were having comparable complications.

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