

Analysis of the Curative Effect from the Injection of Sclerosing Agent in 1,000 Patients with Vascular Abnormalities

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Abstract

Objective: To explore the effect of sclerosing agent local injection therapy in infantile hemangioma, Pyogenic granuloma, lymphatic malformation and venous malformation.

Methods: 1000 patients with vascular abnormalities were treated with sclerosing agent injection, followed up for observation, and evaluated to determine the efficacy.

Results: The follow-up time was 2 months to 5 years. The total effective rate of all kinds of vascular abnormalities was 96.5%. The cure rate of lymphatic malformation was 100%, the cure rate of Pyogenic granuloma was 100%, the cure rate of infantile hemangioma was 98%, and the venous malformations cure rate stood at 90%.

Conclusion: Sclerotherapy can be used as the first choice treatment option for infantile hemangioma, Pyogenic granuloma, lymphatic malformation and venous malformation.

Keywords: Vascular anomalies; Hemangioma; Vascular malformations; Sclerosing agent; Injection therapy

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Citation: Gao X, Lin JC (2017) Analysis of the Curative Effect from the Injection of Sclerosing Agent in 1,000 Patients with Vascular Abnormalities. J Vasc Endovasc Surg. Vol. 2 No. 3:25

Received: August 17, 2017; **Accepted:** August 29, 2017; **Published:** September 05, 2017

Introduction

The International Association for the study of vascular abnormalities utilizes the Mulliken classification, which is based on pathological changes in cytology and clinical behavior and is divided into two major categories of hemangioma and vascular malformations. Of the various types of hemangiomas, infantile hemangioma tends to appear most commonly. Infantile hemangioma is divided into superficial, deep, and mixed types. Occasionally, hemangioma may also form Pyogenic granuloma, Capocci vascular endothelial tumor, or congenital hemangioma. Vascular malformations are divided into capillary malformations, venous malformations, arteriovenous malformations, lymphatic malformations and mixed malformations. Since 2011, my hospital has used 1% Lauromacrogol, Pingyangmycin, and dexamethasone treatment for infantile hemangioma, Pyogenic granuloma, lymphatic malformation, and venous malformations of these vascular abnormalities. The treatment methods and results are analyzed below.

Materials and Methods

General Information

1,000 cases were treated with my treatment of vascular abnormalities from January 2011 to December 2015. Of the 1,000 cases, 370 were males and 630 were females. There were 756 cases of infantile hemangioma, 23 cases of Pyogenic granuloma, 67 cases of lymphatic malformation, and 154 cases of venous malformation. Patient ages ranged from 3 days to 60 years (27 cases with patients <1 month old, 305 cases with patients between 1 and 3 months old, 248 cases with patients between 3 and 6 months old, 188 cases with patients between 6 months and 1 year old, 151 cases with patients between 1 and 6 years old, 65 cases with patients between 6 and 18 years old, and 16 cases with patients over 18 years old). The average age was 4.2 months. Additionally, there were 466 head and face cases which consisted of 88 head cases, 90 facial cases, 53 forehead cases, 28 parotid gland cases, 43 eyelid cases, 9 eyebrow cases,

43 ear cases, 28 nose cases, 30 lip cases, 25 mouth cases, and 27 chin cases. Moreover, there were 42 neck cases, 201 trunk cases (19 nipple cases), 180 limb cases (32 hand cases, 33 feet cases), 41 perineum cases, and 70 additional cases that affected multiple areas of the body; the affected area's size ranged from 0.3 cm × 0.3 cm to 30 cm × 25 cm. All cases were diagnosed through clinical manifestation or imaging examinations including B-ultrasound scans, CT scans, and MRI scans. All cases were treated with sclerotherapy (**Figure 1**).

Methods

Drug injection and preparation: The injection contains 1% Lauromacrogol or Pingyangmycin+dexamethasone. The Lauromacrogol injection is usually administered as one liquid injection derived from the stock solution. If the tumor is large and the patient is young, the stock solution can be diluted with saline solution. Another version, the Lauromacrogol produced foam injection, is made by adding air at a ratio of 1:4 or 1:3. The Pingyangmycin+dexamethasone injection contains ≤ 0.5 mg/kg Pingyangmycin, not to exceed 8 mg, and ≤ 0.25 mg/kg Dexamethasone, not to exceed 5 mg. Use the appropriate amount of saline, according to tumor size and patient age, to dilute the Pingyangmycin+dexamethasone reserve. The above injections should only be prepared just prior to use.

Treatment: Before drug injection, the patient must fast for 30 min and be in good physical condition, which means the absence of fevers, respiratory tract infections, heart and lung dysfunctions, as well as other diseases. Most of the injection treatments are performed within the clinic. However, if the tumor is large or the patient requires large doses, intravenous access must be established before injection. In the scenario where allergic reactions are induced, the injection should be rapidly administered intravenously. If the tumor is large in size and located on the neck, infant patients can be hospitalized under general anesthesia and sent to the operating room in

order to prevent respiratory complications that may appear after injection. 10 min before injection of Lauromacrogol, sterilize the affected area with topical lidocaine gel. Utilize the appropriate needle to distribute the Lauromacrogol injection evenly into the tumor. Superficial infantile hemangioma injections to the tumor should be stopped when the tumor tissue has turned white. During injection, the needle should be inserted as parallel as possible with the tumor so that the drug can diffuse outwards. The injection should be continuously repeated at different areas of the tumor until the alcohol is spread within the tumor. When it comes to the deep or mixed types of infantile hemangioma, intravenous malformation injections of Lauromacrogol to the tumor ought to be continued until the tumor has tension. Unlike superficial infantile hemangioma injections, injections for deep or mixed types of infantile hemangioma do not necessarily need to be injected from multiple points. Try to inject the tumor at the area where it drains blood vessels. If the previous injection is not effective, use the Lauromacrogol stock solution or foam injection directly on blood vessels. To treat the mixed type of hemangioma, inject Lauromacrogol stock solution into the superficial part of the tumor after the deep hemangioma has dissipated. The initial dose of the Lauromacrogol stock solution injection should not exceed 1 mL for infants less than 1 month of age, 2 mL for infants less than 3 months of age, and 3 mL for infants less than 1 year of age. Pyogenic granuloma requires two Lauromacrogol stock solution injections of no more than 0.5 mL of stock solution. The first must be used along the surface of the tumor until the surface turns pale and followed up with the second as a vertical injection towards the base. This procedure usually achieves good results and cures after a single injection. Lymphatic malformations with medium to large cysts must first have its intra capsular lymph fluid extracted before receiving an injection of Pingyangmycin and dexamethasone diluted with saline solution; the microvascular type of lymphatic malformations require direct multi-point injections into the tumor for optimal results. Each dose must not surpass 8 mg of Pingyangmycin and 5 mg of dexamethasone,



Figure 1 Typical cases.

usually only 3 doses are needed to cure afflicted individuals. The combination of Pingyangmycin and dexamethasone can reduce fevers and allergic reactions.

After injection, apply pressure for 30 min to increase the local drug action for improved efficacy. Keep patients carefully observed within the hospital during these thirty minutes to treat possible allergic reactions. Bandage the patient's limbs, chest, or abdomen depending on the location of the injection site. If the injection site is one of the patient's arms, then that arm should be bandaged after injection. Also, the injection site must be kept dry for 24 hours after injection. Following injection of Lauromacrogol, patients need to return every 3 weeks to be reviewed. If they are not cured, then another injection of no more than 100 mg must be delivered. After the tumor shrinks, the interval between follow-ups can be extended to avoid over-treatment. On the other hand, if the tumor does not shrink, then patients should be required to return for a follow-up every 1 to 2 weeks. 3 weeks after injection of Pingyangmycin, the tumor size should be significantly reduced. Patients will need to follow-up after 1 month. If there is not a sizable shrinkage in the tumor's size, patients must be injected again. The injection should not be given more than 3 times so as to avoid irreversible pulmonary fibrosis. Evaluation of tumor shrinkage and improvement in symptoms (as measured through photographs) were performed before each drug injection, and deep lesions were assessed by color Doppler ultrasonography.

Complications: If anaphylactic shock emerges, treat immediately with oxygen and a bolus injection of dexamethasone. The next time anaphylactic shock appears, one should first establish intravenous access to avoid delivering drugs into the blood vessels. If the injection site begins severely swelling, use 5 mL/kg mannitol twice a day or another type of anti-infection treatment. A small number of children may develop a fever (~38°C) after injection and should be given anti-inflammatory treatment. If the tumor experiences ulceration after injection, the family is allowed to use their own Jujube acid salt for cleaning. In the case of nerve damage, patient should be orally administered methylcobalamin.

Follow-up: Patients were followed up 3 times within a month after treatment. Follow-ups were gradually extended to once every 3 months for 3 visits. Then patients were required to return twice with half a year between each visit. After 1 year, patients were assessed through color Doppler ultrasound in order to determine tumor recurrence, examine the scar left behind, and analyze the remaining pigment for changes in color.

Results

98% (735/750) of infantile hemangioma cases were cured by injecting cinnamic alcohol. Among them, 158 cases were of the superficial type and required 1 to 10 injections, with an average of 3.8 injections. As for the deep type, 283 cases were treated with 2-12 injections at an average rate of 4.5 injections per case. The 294 mixed cases received between 2 to 11 injections and an average of 4.8 injections. There were 8 cases of allergy-induced fainting, 20 cases where ulceration lead to scarring, and 5 cases of infection. Fifteen patients underwent surgical excision

after the injection. The 154 cases of venous malformations were treated with 1 to 8 injections of Lauromacrogol or injections of Pingyangmycin at an average rate of 4.3 injections per case. The treatment cured 90% of patients, improved 5%, proved ineffective in 5%, and presented no significant complications. For the 67 cases of lymphatic malformations, patients were treated with Pingyangmycin injection+dexamethasone 2 to 3 times the treatment, an average of 2.8 times. This worked at a 100% cure rate, brought about satisfactory results, and did not result in any complications. As for the 23 cases of Pyogenic granuloma, patients were given an injection of Lauromacrogol, which cured at a 100% effective rate and did not result in complications. During the follow-up that was scheduled for 2 months to 5 years after treatment, there were no instances of recurrence, the appearance of the deformity was corrected, the tumor disappeared, there was an absence of pain, and there were improvements in pigmentation, scarring, and skin depression.

Discussion

Vascular abnormalities may appear in any part of the body. They tend to appear more commonly along the visible skin of the head and face, but they can also appear subcutaneously, deep within muscles, bones, or visceral organs. Vascular abnormalities, according to cytological characteristics and clinical behavior, are divided into tumors and deformities. According to domestic statistics, the ratio of hemangioma between females and males is 1.69:1.00, where infants born within 3 months account for 91.4% of the data. There are no gender differences in vascular malformations [1]. When it comes to infantile hemangioma, Pyogenic granulomatous are considered vascular tumors while venous malformations as well as lymphatic malformations are deemed vascular malformations [1]. Hemangioma is characterized by vascular endothelial cell proliferation and increased cell density, which is divided into the prodromal period, the initial period, the proliferative phase, the maturation period, and the regression phase. Superficial infantile hemangioma often occurs in the neonatal period, usually two weeks after birth; however, deep infant hemangioma generally manifests 2 to 3 months after birth and creates significant drainage of the veins and subsequent degeneration. Infantile hemangioma experiences rapid growth (proliferation) within 6 to 8 months, peaks after 1 year, and then degrades until the patient is 5 to 10 years old. Vascular malformation is a congenital disease with developmental abnormalities such as abnormal channels and resting vascular endothelial cells. Vascular malformations are divided into capillary types, intravenous types, lymphatic types, arteriovenous types and mixed types [2]. Their growth remains proportional to the growth that the infant experiences.

Hemangioma can be dissipated, but large hemangioma, after receding, will leave vasodilation, loose skin, scarring, or pigmentation and other sequelae at a rate of 10% to 30% [3]. Therefore, the treatment of hemangioma should be initiated during the proliferative phase to achieve the best results [4]. Vascular malformation will not disappear on its own. During infancy, hemangioma, venous malformations, and lymphatic malformations can be easily confused. Deep hemangioma and

venous malformations can sometimes exist at the same time, too. Early treatment is much simpler and less time-consuming. Babies will need early treatment to avoid facial disfigurement and active treatment in perineal areas to avoid ulceration. Therefore, it is very important that children with abnormal blood vessels receive treatment as soon as possible. In fact, it is best to start from the first day of discovery rather than naively wait for natural regression.

Hemangioma and vascular malformations both have a variety of treatment methods that include sclerotherapy, laser treatment, Propranolol, and surgical treatment: Propranolol works effectively against hemangioma but not vascular malformations; hormone treatments present adverse side effects; Laser treatment is used to combat superficial hemangioma and vascular malformations. Radiation and isotope treatment also give rise to countless complications. Surgical resection leaves permanent scarring, presents the possibility of relapse if tumor is not fully removed, and even stimulates the tumor's growth rate. Sclerosing agent injection therapy has proven to be very effective. Tumor injection stimulates aseptic inflammation, tissue necrosis, fibrosis, and vascular endothelial cell damage, forcing the tumor to shrink and eventually disappear. Furthermore, sclerosing agent infection therapy is minimally invasive, low-risk, easily performed, low-cost, and can be widely implemented in clinical practice. The current application of injection drugs like Lauromacrogol and Pingyangmycin allows most of the treatment process to be completed in the clinic.

Sclerotherapy can be thought of as a tug of war with the tumor. The tumor's growth period requires the most effort, like the beginning of a tug of war contest. If cancer begins gaining ground, this signals that the patient needs a different medicine or a higher dosage. However, if the medical team holds the lead, then they must remain cautious so that they do not fall over from using too much strength. The drug dose cannot be too large and the concentration cannot be too high in order to

prevent ulceration, scarring, or subcutaneous depression. Use the appropriate dosage since it is important to not overdose. External use of lidocaine prior to puncture can only relieve pain caused by injection and not pain induced by subsequent swelling. If the injection is not delivered to the blood vessels, it is best to minimize injection time. While applying pressure after injection, do not press the chest or abdomen because the patient may cry from increased pressure and succumb to head or face microvascular rupture.

Anaphylactic shock is more likely to occur when the patient is young, has a large tumor, subject to a large injection dose. I had a total of 8 patients with anaphylactic shock. One of the eight was a 5-month-old baby girl who had a right knee superficial infantile hemangioma with a tumor diameter of only 1 cm. She also had cyanosis, difficulty breathing, and blood pressure drops. In addition, edema immediately appeared after injection and gradually faded after two to three days. I believe the after-injection fever she experienced may have been caused by drug reactions or respiratory infections that resulted from decreased immunity after injection. Injection site rupturing is often due to tumor shallowness or excessive dosage and will leave a scar. However, rupturing can be reduced or avoided through careful control over drug dosage and concentration to reduce or avoid. Pigmentation, skin loosening, skin sagging and other complications will improve with time.

Conclusion

In summary, this report reported the treatment of vascular abnormalities in 1,000 patients over 5 years. The results prove that sclerotherapy is clinically effective, improves appearance, removes tumors, relieves symptoms, and satisfies patients as well as their families. I believe that sclerotherapy injection can be used as the primary treatment against vascular malformations in infantile hemangioma, Pyogenic granuloma, venous malformations, lymphatic malformations.

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