

Vascular Anomalies: Understanding the Condition and New Treatment Perspectives with Surgical Data Science Tools

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ABSTRACT

The aim of the study was to investigate the effect of using Laser Genesis while conducting surgeries in patients diagnosed with Capillary Malformations (CM), Venous Malformations (VM), and Capillary-Venous Malformations compared to standard treatment protocols.

Abbreviations: CM: Capillary Malformations; VM: Capillary Malformations; LM: Lymphatic Malformations; AVM: Arteriovenous Malformations; IQR: Interquartile Ranges; SD: Standard Deviations

Introduction

Vascular anomalies are a group of abnormalities that occur in blood vessels, lymphatic vessels, or both. They can be present at birth or develop later in life. These anomalies can cause cosmetic deformities or functional problems such as bleeding, pain, and swelling. In this blog post, we will discuss the different types of vascular anomalies and their treatment options. There are two main types of vascular anomalies: vascular tumors and vascular malformations. Vascular tumors are benign growths that occur in blood vessels, while vascular malformations are abnormalities in the development of blood vessels or lymphatic vessels. Vascular malformations can be further classified into four subtypes: Capillary Malformations (CM), Venous Malformations (VM), Lymphatic Malformations (LM), Arteriovenous

Malformations (AVM). Capillary Malformations are commonly known as "port-wine stains" and often appear as red or purple marks on the skin. Venous Malformations are usually blue or green and can cause pain and swelling. Lymphatic Malformations are collections of abnormal lymphatic vessels that can lead to fluid accumulation and swelling. Arteriovenous Malformations are abnormal connections between arteries and veins that can cause bleeding and other complications. Treatment options for vascular anomalies depend on the type, size, location, and symptoms of the anomaly. In some cases, observation may be recommended if the anomaly is small and not causing any symptoms. For larger or symptomatic anomalies, two main treatment options may include:

Laser Therapy

Laser treatment can be effective in treating Capillary Malformations and can help reduce the appearance of port-wine stains and combined syndromes.

Sclerotherapy

This involves injecting a sclerosing agent into the abnormal vessels to damage and close them off. This is often used to treat Venous Malformations and Lymphatic Malformations.

Embolization

This involves injecting a substance into the abnormal vessels to block blood flow and shrink the anomaly. This is often used to treat Arteriovenous Malformations [1]. While there are effective treatment options for vascular anomalies, there is still much to be learned about the condition. Future research should focus on developing new and innovative treatment options, as well as improving our understanding of the underlying causes of vascular anomalies. Additionally, more research is needed to evaluate the long-term outcomes of different treatment approaches and to identify potential risk factors for complications. Vascular anomalies can be a challenging condition to manage, but with the right diagnosis and treatment, many people with these abnormalities can achieve good outcomes. After reviewing video archives of surgeries we realised that using Laser Genesis might have an effect on the overall efficiency of laser treatment. So that we've conducted a retrospective data analysis.

Methods

The study was conducted in accordance with the Helsinki Declaration. Before any procedure patient or their legal representative signed an informed consent form and were given the opportunity to review the study protocol and patient information, which were approved by the Independent Ethics Committee. Participants were then identified by patient number [2]. This is a two-way cohort study in groups of children (aged 7-18 years) with clinically diagnosed vascular pathology who were admitted to the CSP from January 1, 2018 to August 27, 2021. This study is registered on ClinicalTrials.gov, NCT 04999618. Group 1 included 142 patients with CM, group 2 contained 74 patients with CVM and group 3 contained 57 patients with VM; all these patients were diagnosed between 2019 and 2021. The control group consisted of patients who underwent treatment at the Vascular Anomalies Center from 2018 to 2020. Using the database, control subjects were recruited who did not have CM, CVM, or VM, respectively, and who were matched with patients in the study groups by gender, age, and index diagnosis date. Each control cohort was 2.5-3 times larger than the corresponding study cohort. We will continue observation of this control and allied study cohorts until the end of 2023. Surgeries were performed under general anaesthesia or local anaesthesia, depending on age, stage of treatment, volume of vascular malformation, and its localization [3].

Data on anaesthesia was recorded and determined the division of groups into subgroups. In case of damage to the peri-orbital area, metal shields were used, while in other cases, latex-free hypoallergenic eye patches were applied. Since all procedures were performed in the conditions of a day hospital, patients were discharged 3-4 hours after the surgery. Then, patients were observed at 7 and 30 days after laser treatment. Demographic and clinical characteristics of the study population were assessed using means with standard deviations (SD) for normally distributed continuous variables, medians with interquartile ranges (IQR) for non-normally distributed continuous variables, or frequencies with percentages for categorical variables.

Result

Significant differences were obtained in the early postoperative period between the two groups. The mean recovery time was higher in group B, which received Laser Genesis, at 7 days [IQR 0-9], compared to group A, which received regenerative solution, at 3 days [IQR 0-8]; $p < 0.0001$; mean difference 4 days [95% CI 1-3]. Regarding the impact of skin diseases on the quality of life in childhood scale, a statistically significant difference was observed between groups A and B after 1 week (mean difference 1.73; 95% CI 1-3; $p = 0.001$), but there was no difference between them after 3 weeks (mean difference 0.6; 95% CI -0.20 to 1.50; $p = 0.134$) [4].

Conclusion

The new approach in laser surgery for vascular anomalies significantly reduces the duration of the early postoperative period. These data suggest that the use of Laser Genesis can lead to faster recovery by reducing the number of required procedures [5]. Further studies with a larger case series are needed to reveal the positive effects of this treatment on children and their families wellbeing.

Discussion

While there are effective treatment options for vascular anomalies, there is still much to be learned about the condition. Future research should focus on developing new and innovative treatment options, as well as improving our understanding of the underlying causes of vascular anomalies. Additionally, more research is needed to evaluate the long-term outcomes of different treatment approaches and to identify potential risk factors for complications. We will continue our research and report the results of integrating those tools to ensure potential risk reduction. Moreover we assume that future studies should focus on evaluating the association of preoperative assessment in children who may also be at higher risk of neurologic complications.

MeSH Terms

Children, Laser Therapy*, Lasers*, Vascular Malformations / surgery.

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