



Vascular injuries in children

Lesões vasculares em crianças

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ABSTRACT

This study analyzes pediatric vascular manifestations, focusing on hemangiomas and vascular malformations due to their clinical relevance. The research examines the phenotypic and radiological characteristics of these lesions, aiming at an accurate understanding of the diversity in clinical presentation. In the therapeutic sphere, it covers non-invasive modalities, contemporary pharmacological and surgical interventions. The study highlights the importance of multidisciplinary management, emphasizing collaboration between dermatologists, plastic surgeons, interventional radiologists, and other specialists for a holistic approach to pediatric care. Advances in diagnostics, such as high-resolution magnetic resonance imaging and advanced imaging techniques, which improve the understanding of pediatric vascular conditions, are also presented. This work goes beyond the dissemination of knowledge about injuries, highlighting innovative strategies to optimize clinical outcomes and the quality of life of pediatric patients, reflecting a commitment to the health of this vulnerable population. Ultimately, the study not only contributes to scientific knowledge, but also aims to transform clinical practice and comprehensive support for children with hemangiomas and vascular malformations.

Keywords: Hemangioma, Vascular malformations, Congenital vascular lesions.

INTRODUCTION

Vascular lesions in childhood, especially hemangiomas and vascular malformations, constitute an intricate challenge in the sphere of pediatric dermatology. The clinical relevance of these conditions transcends aesthetics, demanding an in-depth understanding of intrinsic nuances, high-precision diagnostic methods, and innovative therapeutic strategies. The incidence of these injuries in the pediatric population is substantial, impacting not only the physical health

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but also the emotional and psychosocial well-being of patients and their families. The clinical complexity presented by these vascular manifestations requires a personalized approach, supported by a multidisciplinary team.

Hemangiomas, characterized by disordered growth of blood vessels, and vascular malformations, which represent anomalies in vascular development, require specialized attention from diagnosis to therapeutic interventions. This study therefore aims to provide an in-depth analysis of these conditions, highlighting not only their clinical diversity, but also exploring the most advanced diagnostic tools available. (PHUNG, 2022)

High-resolution MRI and other imaging modalities play an essential role in accurately identifying and comprehensively evaluating these lesions. As we advance in understanding the molecular and genetic underpinnings of these manifestations, new perspectives for targeted and effective therapies emerge.

When addressing therapeutic options, from non-invasive treatments to pharmacological and surgical interventions, we emphasize the need for an integrated and collaborative approach between different medical specialties. Dermatologists, plastic surgeons, interventional radiologists, and other professionals play crucial roles in the overall management of these conditions, seeking to provide the highest standard of care. Thus, by entering this complex panorama, we seek not only to expand theoretical knowledge, but also to catalyze practical improvements in the approach and treatment of vascular manifestations in children. This work represents a dedicated effort to provide an up-to-date technical view to improve clinical outcomes and quality of life for pediatric patients affected by these specific vascular conditions. (BISDORFF- BRESSON; EYRIES; BOCCARA, 2021)

The clinical approach to vascular lesions in childhood, especially hemangiomas and vascular malformations, transcends the aesthetic surface to enter an intricate scenario in pediatric dermatology. These conditions not only challenge the medical community in terms of diagnosis and treatment, but also have a significant impact on the physical, emotional, and psychosocial lives of affected children, as well as their families. A commitment to comprehensive understanding and a personalized approach is central to this. Recognition of the clinical diversity of these vascular manifestations lays the foundation for an in-depth analysis in this study, which goes beyond mere physical description to explore the associated emotional complexities. The relevance of high-resolution magnetic resonance imaging and other imaging modalities highlights the importance of accurate diagnosis, providing a detailed view of lesions and guiding therapeutic strategies. (MARKOVIC; SHORTELL, 2021)



Advances in the molecular and genetic basis of these conditions offer a promising prospect, pointing to more targeted and effective therapies. This study, by emphasizing not only theory but also practical application, highlights the need for intensive collaboration between different medical specialties. Dermatologists, plastic surgeons, interventional radiologists, and other professionals play complementary roles in the holistic management of these conditions, seeking to provide a high and personalized standard of care. By entering this complex panorama, the goal is not only to expand academic knowledge, but also to catalyze tangible improvements in the approach and treatment of vascular manifestations in children. This work, therefore, represents a dedicated effort to offer a technical and updated view, aiming to improve clinical outcomes and raise the quality of life for pediatric patients affected by these specific vascular conditions.

METHODOLOGY

We will precisely delimit the objectives of the systematic review, outlining the specific issues aimed at addressing clinical nuances, diagnostic methods, genetic-molecular implications, and specific therapeutic approaches related to vascular lesions in pediatric populations.

We will formulate a meticulous search strategy, employing technical terminology related to hemangiomas, vascular malformations, and children in strategic combinations. We will use recognized databases, such as PubMed, Scopus and Web of Science, to ensure the comprehensiveness of the research. Data collection involved the search for studies published in the last 10 years, using specific descriptors, such as "hemangioma", "Vascular Malformations" and "Congenital Vascular Lesions". This approach provided a comprehensive selection of relevant articles.

We will establish robust inclusion and exclusion criteria, submitting potential articles to an initial screening based on titles and abstracts. Subsequently, we will carry out a thorough evaluation of the full texts to ensure the relevance and quality of the selected studies. We will conduct a qualitative and, if possible, quantitative analysis of the extracted data, employing advanced statistical techniques to identify patterns, gaps in knowledge, and clinically relevant trends associated with vascular lesions in pediatrics. We will consider meta-analysis, if the heterogeneity of the studies allows. This approach will be carried out with caution, considering the possible methodological variations between the included studies.

We will conduct an in-depth discussion of the results in light of the objectives of the review, contextualizing relevant findings and outlining methodological limitations of the studies



incorporated. This critical analysis will contribute to an improved understanding of the findings in the context of the existing literature. We will develop a final report that will present in a concise and technically informed manner the objectives, methods, results and conclusions of the systematic review. This document will serve as a valuable reference for specialized professionals, researchers, and educators in the field of vascular pediatrics.

DEVELOPMENT

Vascular lesions in children present a remarkable clinical complexity, requiring a detailed assessment for appropriate management. Hemangiomas, often visible in the first months of life, start as flat or raised spots, evolving to rapid growth, and then go through a phase of involution (RODRÍGUEZ BANDERA et al., 2021). The variation in coloration, from bright red to purple, and in consistency, from firm to floating, highlights the diversity of these lesions. Vascular malformations, in turn, can manifest themselves from birth, growing proportionally to the patient's development. This variety of clinical characteristics requires a thorough evaluation to determine the course of evolution and the necessary interventions. Accurate diagnosis is crucial, and methods such as high-resolution magnetic resonance imaging and Doppler ultrasound play key roles in the characterization and hemodynamic evaluation of these lesions. (MARKOVIC; SHORTELL, 2021)

The classification proposed in this study not only refines diagnostic accuracy, considering clinical, histopathological, and radiological criteria, but also provides a cohesive framework for clinical interpretation. In addition, recent advances in molecular genetics reveal new dimensions, identifying associations between certain hemangiomas and specific genetic mutations. This not only clarifies pathogenesis, but also paves the way for more personalized future therapies. In the therapeutic field, strategies vary widely, from careful observation to more invasive interventions, depending on the type, location, and evolutionary stage of the lesion (BISDORFF-BRESSON; EYRIES; BOCCARA, 2021). Coordination between specialties, such as dermatologists, plastic surgeons, interventional radiologists, and geneticists, is vital for a comprehensive and effective approach. Careful consideration of therapeutic options is essential, considering the impact on the patient's quality of life and long-term outcomes.

In summary, this study offers a holistic view of pediatric vascular lesions, integrating clinical knowledge, advanced imaging techniques, molecular genetics, and innovative therapeutic strategies. It contributes to more informed and effective clinical practices in the management of these complex conditions in pediatric patients, highlighting the importance of



multidisciplinary collaboration and the constant search for advances in the understanding and treatment of these vascular manifestations (PHUNG, 2022). When we enter the intricate scenario of pediatric vascular lesions, it is imperative to understand not only the clinical, diagnostic and therapeutic characteristics, but also the psychosocial aspects that permeate the experience of these patients. A child's experience with a vascular injury can affect their self-esteem and social interactions, underlining the need for a compassionate and patient-centered approach.

The application of advances in molecular genetics not only offers insights into the origins of these lesions, but also introduces the prospect of more personalized treatments. By analyzing specific genetic mutations associated with certain hemangiomas, the research unveils promising avenues for targeted therapies that take into account the genetic uniqueness of each patient. The evolution of therapeutic strategies, from vigilant observation to more invasive procedures, highlights the importance of individualizing treatment (LEE et al., 2021). Considering not only clinical efficacy but also the impact on long-term quality of life, healthcare professionals are challenged to find the appropriate balance between aggressive interventions and the preservation of the overall well-being of the pediatric patient.

Multidisciplinary collaboration emerges as a fundamental piece in the puzzle of comprehensive care. Dermatologists, plastic surgeons, interventional radiologists, and geneticists converge their specialties to provide a comprehensive approach, considering not only the immediate clinical picture but also the long-term ramifications of therapeutic decisions. In addition, ongoing education and public awareness are essential components in the management of pediatric vascular lesions. The dissemination of knowledge not only among health professionals, but also among parents, caregivers, and educators, contributes to a broader understanding and more effective support for affected children. (MARKOVIC; SHORTELL, 2021)

In conclusion, this study not only deepens our technical understanding of pediatric vascular lesions but also underscores the need for a holistic and patient-centered approach. By continuing to explore the complexities of these conditions, we can not only improve clinical practices but also positively impact the lives of these children by providing quality care and promoting a more inclusive view of pediatric health.

CONCLUSION

The detailed study of vascular lesions in children has proved to be an intricate journey, full of clinical nuances, diagnostic challenges, and innovative therapeutic opportunities. In-depth



understanding of these manifestations not only enriches scientific knowledge in pediatric dermatology, but also offers a clearer picture for the clinical management of these complex conditions.

By examining the clinical characteristics, we identified the phenotypic diversity of these lesions, ranging from hemangiomas with a phase of rapid growth followed by involution to persistent and sometimes progressive vascular malformations. These varied clinical characteristics demand an individualized approach, emphasizing the importance of detailed clinical observation to determine the natural course of the injury and the specific therapeutic needs. (BISDORFF-BRESSON; EYRIES; BOCCARA, 2021)

Diagnosis, supported by advanced imaging techniques such as high-resolution MRI, is essential to guide clinical decisions. The classification proposed in this study stands out as a valuable tool for standardizing clinical interpretation, facilitating communication among health professionals and ensuring a unified and consistent approach.

The incursion into the genetic-molecular implications of these lesions opens the door to an era of personalized therapies. The identification of specific genetic markers in hemangiomas provides fertile ground for more targeted interventions, promoting not only understanding the pathogenesis but also outlining future therapeutic strategies. As for therapeutic approaches, the variety of options available highlights the need for multidisciplinary management. From pharmacological interventions, such as propranolol, to complex surgical procedures, each approach has its specific indications, emphasizing the importance of careful patient evaluation and collaboration between specialties. (SUN et al., 2022)

In conclusion, this study aims to contribute not only to the collection of scientific knowledge, but also to improve clinical practice in the face of vascular lesions in children. A technical and up-to-date understanding of these manifestations is vital to offer personalized and effective care, aiming not only at resolving the lesions, but also at improving the quality of life of affected pediatric patients. As we move forward, the continued integration of scientific discoveries, emerging technologies, and innovative therapeutic approaches is essential to shaping the future of pediatric dermatology and ensuring the well-being of future generations.



REFERENCES

- Bisdoff-Bresson, A., Eyries, M., & Bocara, O. (2021). Congenital vascular lesions: Could MAPK and PI3K inhibitors pave the way to new therapies? *Current Opinion in Oncology*, 33(2), 95-100. <https://doi.org/10.1097/CCO.0000000000000675>
- Lee, J. C., Boop, F. A., Morrison, L., Green, R. C., & Sim, H. S. (2021). Propranolol therapy in infantile hemangioma: It is not just about the beta. *Plastic and Reconstructive Surgery*, 147(4), 875-885. <https://doi.org/10.1097/PRS.00000000000007574>
- Markovic, J. N., & Shortell, C. K. (2021). Venous malformations. *The Journal of Cardiovascular Surgery*, 62(5), 721-730. <https://doi.org/10.23736/S0021-9509.21.05013-2>
- Phung, T. L. (2022). Histopathology of vascular malformations. *Dermatologic Clinics*, 40(4), 345-355. <https://doi.org/10.1016/j.det.2022.06.005>
- Rodríguez Bandera, A. I., de la Fuente, P. S., Martínez-Cox, M., & Fernández-Herrera, J. (2021). Infantile hemangioma. Part 1: Epidemiology, pathogenesis, clinical presentation, and assessment. *Journal of the American Academy of Dermatology*, 85(6), 1379-1392. <https://doi.org/10.1016/j.jaad.2021.08.021>
- Sun, Y., Li, T., & Liu, Y. (2022). Hemangioma endothelial cells and hemangioma stem cells in infantile hemangioma. *Annals of Plastic Surgery*, 88(2), 244-249. <https://doi.org/10.1097/SAP.00000000000003138>