Morphological Changes in Erythrocytes under Laser Exposure in Children with Hemangioma of the Facial Region

[1]Karimkulov Nodirbek Abdujalilovich, [2]Sadykov Rasul Rustamovich

[1]Andijan state medical institute, Andijan, Uzbekistan

[2]Tashkent Medical Academy, Department of surgical diseases, Uzbekistan

Abstract

In pediatric pathology, hemangiomas occupy a leading place in terms of frequency of occurrence. They are characterized by rapid growth, damage to nearby tissues and structures. This article describes the hemangiomas of the facial region occurring against the background of anemia, the factors of their development, as well as the treatment tactics we expect. The frequency of occurrence reaches 40%. Hemangiomas against the background of anemia proceed with an active phase of proliferation, which limits traditional treatment. Unlike skin forms of infantile hemangiomas, the growth pattern in anemia has distinctive features: children come already in active proliferation phase. The duration of the course reaches 8 years.

Low-intensity laser radiation treatment for anemia has no major effect on the proliferative activity of hemangioma. Has an antioxidant and wound healing effect

INTRODUCTION

Hemangiomas are a common pathology of childhood, and are characterized by intensive growth and invasion into the surrounding tissues. The disease occurs in 1 in 15-22 newborns [4,8]. The most frequent localization of G. is the area of the face and mucous membranes, and in 20% of cases there is a combined lesion of the internal organs. The unpredictable course of the disease contributes to the development of a number of serious complications and deformities, which is a serious social problem [1,3,9].

Anemia as an endemic problem between mothers and children in the Republic of Uzbekistan. Hemangioma occurring against the background of anemia draws the attention of not only pediatricians, but also limits the possibilities of surgical treatment. The rapid growth of hemangioma and the possibility of subsequent necrosis and bleeding aggravate the treatment of patients with hemangiomas [10,12]. Two competing diseases in the complex treatment of which include drugs contraindicated in hemangiomas (vitamins, iron preparations, drugs that improve circulation) Differential diagnosis is rather difficult, requires long-term observation and special studies. It is important to note that an accurate diagnosis determines the further course and effectiveness of treatment [6].

Until today, despite the presence of a number of international scientific studies related to hemangiomas, the exact etiological factors in the development of hemangiomas have not been determined. Studies have shown that hemangiomas are most often located in the head and neck areas (up to 70%), causing changes in the appearance of the child, up to disfigurement. Hemangiomas located in the oral cavity mainly lead to complications in the form of bleeding, infection, dysfunction of vital organs, disfigurement of the appearance, and also leads to isolation of the patient from society, which is an important social problem. Based on the above, an urgent task is the early diagnosis of this pathology, the development of modern algorithms for minimally invasive and radical treatment [4,7].

MATERIALS AND METHODS

Scientific work was carried out on the basis of the Tashkent Medical Academy Department of Surgery (1st City Hospital) and the Andijan Medical Institute, Department of Oncology from 2018-2022. In the scientific work, high-energy lasers based on infrared radiation (CO2, NDYAG, Pulse dye laser) were used in combination with PDT for hemangiomas located in the oral cavity. The work was carried out in the course of the innovative grant SS-ITAB-2018-10 "Introduction of new computer technologies and locally produced equipment in the early diagnosis and treatment of hemangiomas in children."

Laser emitters CO2, NDYAG, Pulse dye laser is a product of medical equipment for medical institutions. According to the degree of electrical safety, it belongs to class II, group BF according to GOST R 50267.0-92. In terms of laser safety, the device complies with the "Sanitary norms and rules for the design and operation of lasers" N 5804-92 for class II in terms of the degree of danger of the

generated radiation (Appendix 1). Emitter wavelength 1460nm, power 12W. The irradiation area at the focus is 1 mm.

Clinical researches.

120 patients were examined, 80 patients were treated using new technologies. The comparison group consisted of 40 patients who were treated according to well-known methods in our country, as well as in other medical institutions. The distribution of patients by age and localization of hemangiomas is presented in Table 1. and 2.

The age contingent of patients ranged from the neonatal period to 60 years. The frequency of occurrence in girls was 78%, in boys 22%.

Table 1

Distribution of patients with hemangioma by age.

	Main Group		Comparison Group	
Age group	Number of patients	Frequency (%)	Number of patients	Frequency %
Newborn	40	50	2	5
Thoracic	18	22,5	5	12,5
Preschool	5	6,25	24	60
Preschool	5	6,25	3	7,5
Junior school	4	5	3	7,5
Senior school	4	5	1	2,5
Adolescence	2	2,5	1	2,5
Mature	2	2,5	1	2,5
Total	80		40	

* $P < 0.05$ in comparison with the control group

Most of the patients of the main group were up to infancy - 50% and infancy - 18%, in the comparison group, the main group consisted of children of pre-preschool age - 60% and preschool age - 7.5%.

Table 2

Localization of hemangiomas.

	quantity	%	quantity	%
Tongue	10	12,5	8	20
Upper, lower lip	12	15	13	32,5
Cheek	24	30	5	12,5
Hard palate	5	6,25	5	12,5
Soft palate	6	7,5	3	7,5
Gums	6	7,5	3	7,5
Tongue	5	6,25	2	5
Lower eyelid	12	15	1	2,5
Total	80		40	

Particular attention in the collection of anamneses was given to complaints, the anamnesis of the disease, the characteristics of the course of pregnancy and childbirth, and the development of the child (vaccinations received, past diseases) were collected in detail. All patients underwent standard treatment, whether there is a history of chronic anemia, HB below 100. If the operation was canceled due to anemia, then for how long. Before each procedure, a consent form for treatment was completed. An objective examination assessed the general condition of the child, functional data, clarified the localization

of the hemangioma with a detailed description of the structure, shape, color, size, involvement of neighboring organs in the process, the state of regional lymph nodes. Patients who applied to the clinic with various forms of hemangiomas underwent the following research methods:

1. General clinical studies, radiation and instrumental diagnostic methods.
2. Digital photography of hemangioma in the dynamics of treatment.
3. Planimetric studies.
4. Histology of skin biopsy specimens

Frequent localization of hemangiomas was: cheek 30% upper or lower lip (15%), gums (7.5%), tongue (6.25%). The results of treatment were assessed by visual criteria and ultrasound data of the GA study.

Clinical laboratory tests: general blood and urine tests, clotting time, coagulogram, biochemical blood tests.

Instrumental studies: Dopplerography was carried out with the SSI-5000 device, China. Sensors L 741 with linear array, 5-10 MHz. The imaging mode is normal and also the color Doppler scanning mode.An ultrasound examination assessed the depth of the hemangioma, its connection with the surrounding tissues, the presence of blood flow (blood flow rate, type of feeding vessel). Ultrasound data were converted into the DICOM (Digital Imaging and Communications in Medicine) system. The following formula was used to calculate the tumor volume:

$V=\sum Si*z$

Where V is the volume of SA, Si is the area of SA, z is the thickness of SA. Ultrasound examinations were performed every month to control the volume of SA.

RESULTS AND DISCUSSION

Low-intensity laser radiation (LILR) has long been used in clinical practice for the treatment of facial hemangioma. This issue has been thoroughly studied. However, LILR for bleeding has not been practically used so far. At the same time, there is convincing evidence that this factor is able to stimulate hematopoiesis and have a protective effect on ischemic tissues.

Low-intensity laser radiation (LILR) has been used in clinical practice for the treatment of anemia for a long time. However, LILR in concomitant hemangioma has not been practically used so far. At the same time, there is convincing evidence that this factor is able to stimulate hematopoiesis and have a protective effect on ischemic tissues.

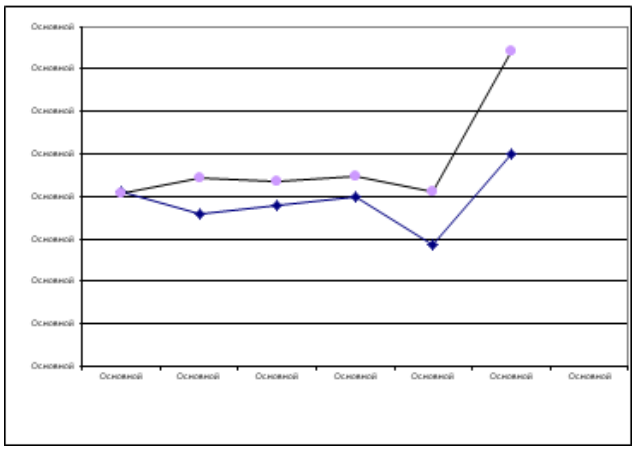
Anemia is a common comorbidity in children with hemangiomas.

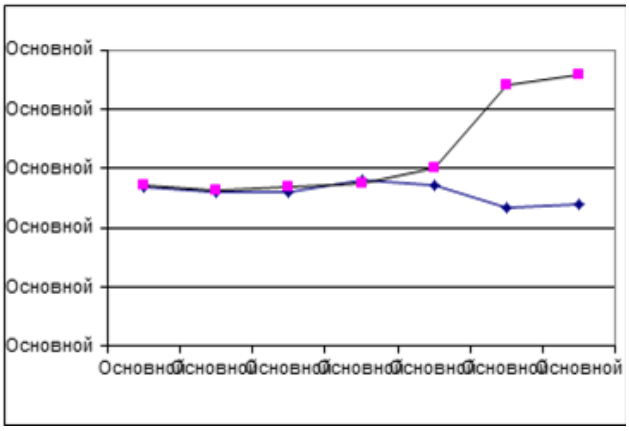
Modern methods of treatment of anemia are aimed at stimulating hematopoiesis by prescribing iron and vitamins, affecting appetite, and bioactive supplements.

The use of vitamins and other bioactive supplements is categorically contraindicated in children with hemangiomas.It is known that normally the blood is dominated by the so-called discocytes - erythrocytes in the form of biconcave discs. Changes in the shape of erythrocytes and an increase in the content of pathological forms are observed in various diseases and pathological conditions.

From modern positions, it can be assumed that the shape of erythrocytes changes due to oxidative damage, in particular, under the influence of reactive oxygen species.

The use of transdermal exposure to low-intensity infrared laser radiation has been studied. Patients were exposed to the following points: cubital vein, middle third of the sternum, projection of the liver, projection of the spleen, epigastric region. The treatment was carried out with the apparatus ALT "VOSTOK". The radiation power was 5-8 W, the exposure dose was 150-300 mJ/cm2. The course consisted of 4-8 daily sessions, from the first day of treatment. The control group received conventional basic therapy. General clinical data, laboratory parameters of erythrocytes, leukocytes, coagulogram were evaluated.





Studies have shown that the use of LILR contributes to a significant increase in the number of erythrocytes and hemoglobin (see graph). Improved coagulogram parameters. An improvement in the general condition of patients is noted. No complications from the therapy were observed.

Morphological study was subjected to peripheral blood of 34 patients who were in the department. There were 10 boys and 10 girls. - 24, patients under 1 year of age.

The patients were divided into two groups of 5 boys and 12 girls each. In both groups, a set of measures taken in the department was carried out. The patients were given iron preparations, dietary supplements, vitamins. In the second group propranolol in the standard dosage. The blood of practically healthy 6 volunteers served as a control.

Patients' blood was taken from a finger before the start of treatment and one day after the start of treatment.

For scanning electron microscopy, peripheral blood erythrocytes obtained from a finger were fixed in 2.5% glutaraldehyde in phosphate buffer (pH-7.4). After dehydration in solutions of alcohol - acetone of increasing concentration, they were dried by passing through the critical point of nitrous oxide in the HCP-2 apparatus (Hitachi).

The samples were mounted on aluminum substrates with electrically conductive glue. After ion sputtering with gold in an IB-3 apparatus (Eiko, Japan), the cells were viewed and photographed in a Hitachi S-40SA SEM).

The calculation of various forms of erythrocytes was carried out on electron diffraction patterns at a magnification of 400. At least 1000 erythrocytes were used for each period. Statistical processing of the material and plotting was carried out using Windows-95 application programs on a Compaq-Pentium computer.

Normally, according to our data, the main part of erythrocytes is discocytes - 843.1 + 16.1 per 1000 erythrocytes. Discocytes with one outgrowth - 36.2 + 4.3, discocytes with a ridge 58.1 + 6.1, discocytes with multiple outgrowths 36.9 + 6.7. Erythrocytes in the form of mulberries 3.4+ 1.6. Dome-shaped erythrocytes - 13.2 + 1.8, spherical erythrocytes 0.9 + 0.2, erythrocytes in the form of a deflated ball 5.9 + 1.3 (p.

In patients, the number of discocytes decreases and is 781.1 + 27.5. Significantly, almost 10 times, the number of degenerative forms of erythrocytes increases. With complicated hemangiomas, the number of normal discocytes decreases to an even greater extent. It is 708.8 + 34.1, while the number of degenerative-changed forms increases 15 times (Fig. 1). There is a further decrease in discocytes, up to 652.1 + 28.2. The content of degeneratively modified forms increases almost 20 times and amounts to 42.5 + 6.2.

The use of propranolol in the treatment complex leads to a statistically significant ($P<0.001$) increase in discocytes and a decrease in the number of pathological forms of erythrocytes. The number of discocytes was 790.2 + 24.2. Including with one outgrowth 64.4 + 3.2 with a ridge with a ridge 22.2 + 2.4, with multiple outgrowths - 50.1 + 3.8. Among the pathological forms of erythrocytes, domed erythrocytes dominated - their number was 14 3 + 1.8, erythrocytes in the form of mulberries were 5.2 + 1.1, spherical erythrocytes - 0.8 + 0.4, in the form of a deflated ball 8.2 + 1.2 and degenerative - changed - 6.2 + 0.8. (Fig. 2 , 3,4).

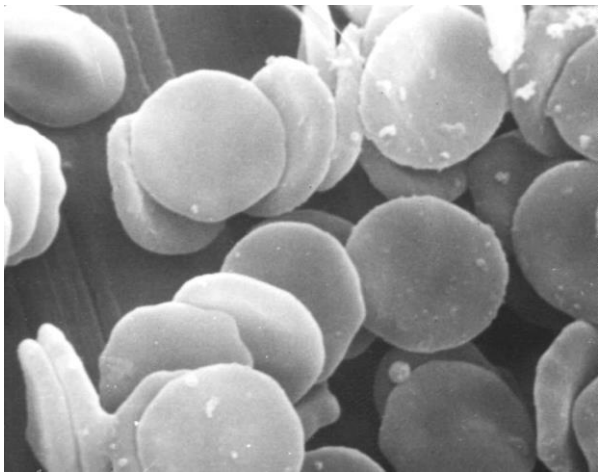


Fig. 2. Erythrocytes of a healthy person. SEM x 5000.

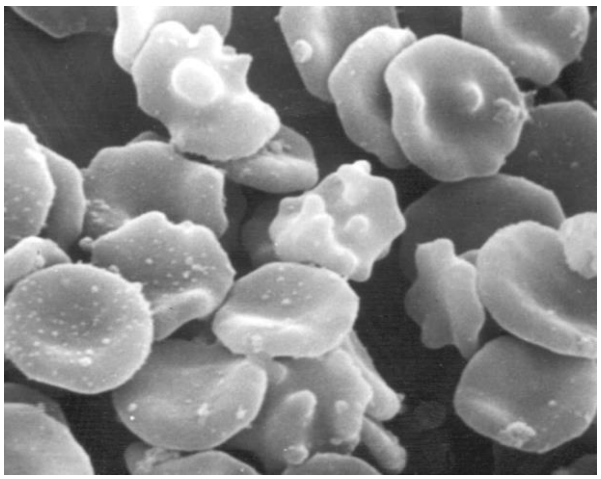


Fig. 3. Erythrocytes of a patient at the time of active growth. SEMx5000.

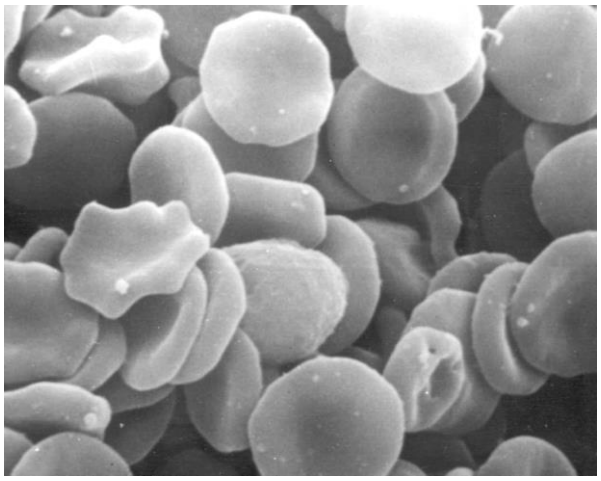


Fig. 4. Erythrocytes of a patient after growth arrest. SEMx5000.

CONCLUSIONS

The frequency of occurrence reaches 40%. Hemangiomas against the background of anemia proceed with an active phase of proliferation, limiting traditional treatment.

In contrast to the skin forms of infantile hemangiomas, the growth pattern in anemia has distinctive features: children are already in the phase of active proliferation with ulcers and bleeding. The duration of the course reaches 8 years.

LILI treatment for anemia has no major effect on the proliferative activity of hemangioma. It has an antioxidant and wound healing effect.

REFERENCES

1. Abdolrazaghi, H., Riyahi, A., & Zamenjany, M. R. (2020). Large venous hemangioma of brachial plexus. *Ann Card Anaesth, 23*(2), 218-220. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/32275040. doi:10.4103/aca.ACA_73_18
2. Adamski, A., Qian, J., & Adamo, M. A. (2020). Giant Intracranial Extraaxial Parietal-Occipital Cavernous Hemangioma in an Adolescent. *World Neurosurg, 141*, 3-7. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/32474102. doi:10.1016/j.wneu.2020.05.188
3. Al-Rwebah, H., Alkhodair, R., & Al-Khenaizan, S. (2020). Propranolol-induced hyperkalemia in the management of infantile hemangioma. *JAAD Case Rep, 6*(4), 359-361. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/32258322. doi:10.1016/j.jdcr.2020.01.028
4. Alghamdi, B., Al-Kadi, M., Alkhayal, N., Alhedaithy, R., & Al Mahdi, M. J. (2020). Intranasal lobular capillary hemangioma: A series of five cases. *Respir Med Case Rep, 30*, 101073. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/32455105. doi:10.1016/j.rmcr.2020.101073
5. Alsaid, R. Q., & Al-Musalhi, B. H. (2020). Progressing eczematous dermatitis in an infantile hemangioma with minimal or arrested growth treated with tacrolimus ointment. *JAAD Case Rep, 6*(6), 572-573. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/32509952. doi:10.1016/j.jdcr.2020.04.031
6. hy, J. B. (1978). The management of a large hemangioma of the oral cavity with cryotherapy. *J Oral Med, 33*(3), 104-106. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/282403.
7. Nagamine, K., Kanaya, K., Miyairi, Y., Ogiso, Y., & Shigeta, H. (2020). Aggressive growing of the infantile cavernous hemangioma of the calvaria: a case report and review of literature. *Childs Nerv Syst*. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/32435889. doi:10.1007/s00381-020-04678-4
8. Nayak, S. K., & Nayak, P. (2014). Intramuscular hemangioma of the oral cavity - a case report. *J Clin Diagn Res, 8*(8), ZD41-42. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/25302283. doi:10.7860/JCDR/2014/8305.4756
9. Negri, P. L. (1981). [Hemangioma of the oral cavity]. *Riv Ital Stomatol, 50*(11), 903-910. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/6960412.
10. Sullivan, M., Hartman, R., & Mahalingam, M. (2020). Poikilodermatous plaque-like hemangioma - a benign vasoformative entity with reproducible histopathologic and clinical features. *J Cutan Pathol*. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/32362008. doi:10.1111/cup.13734
11. Takamori, S., Seto, T., Jinnouchi, M., Matsubara, T., Haratake, N., Miura, N., . . . Takenoyama, M. (2020). Brain cavernous hemangioma mimicking radiation-induced necrosis in a patient with non-small cell lung cancer. *Thorac Cancer, 11*(7), 2056-2058. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/32469140. doi:10.1111/1759-7714.13494
12. Tani, S., Kunimoto, K., Inaba, Y., Mikita, N., Kaminaka, C., Kanazawa, N., . . . Jinnin, M. (2020). Change of serum cytokine profiles by propranolol treatment in patients with infantile hemangioma. *Drug Discov Ther, 14*(2), 89-92. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/32378651. doi:10.5582/ddt.2020.03014