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Clinical Evaluation of Color Doppler Ultrasound in Selecting the Optimal Treatment Modality for Infantile Hemangioma△

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Key words: color Doppler ultrasound; infantile hemangioma; Nd:YAG laser; intense pulsed light; lauromacrogol

Objective We investigated the efficacy and safety of 1064 nm Nd: YAG laser, intense pulsed light (IPL), and lauromacrogol injection in the treatment of hemangioma, in order to evaluate the value of color Doppler ultrasound guidance in choosing the optimal treatment modality.

Methods Infantile patients who were clinical diagnosed as hemangiomas were randomly divided into group A, who had color Doppler ultrasound examinations before the treatment, and group B who had the treatment without ultrasound evaluation. Patients in the group A were assigned into subgroups according to the depth of lesion by sonography: group A-1 for those who had a lesion depth <1.2 mm, and took intense pulsed light therapy; group A-2 for those who had a lesion depth ⩾1.2mm and < 3 mm, and took long pulse 1064 nm Nd:YAG laser therapy; group A-3 for those who had a lesion depth ⩾3mm and <5 mm, and were treated by IPL combined with long pulse 1064 nm Nd:YAG laser treatment; Group A-4 for those who had a lesion depth ⩾5 mm, and took lauromacrogol injection therapy. Patients in the group B took long pulse 1064 nm Nd:YAG laser treatment without preoperative ultrasound evaluation. The efficacy and adverse reactions of the treatments between the groups were evaluated and compared statistically.

Results Totally 113 patients with 128 skin lesions were enrolled in this study, 85 in the group A (mean age 6.8±7.9 months) and 28 in the group B (mean age 6.9±9.9 months). The mean depth of hemangioma was 3.3±1.1 mm in the group A, ranging from 0.5-7.8 mm, with 0.8±0.4 mm, 2.2±0.4 mm,

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4.2±0.6 mm and 6.2±0.7 mm in group A1, A2, A3 and A4, respectively. The cure rates and effective rates in the group A were significantly higher than those in the group B (cure rates: 64.5% *vs* 56.3%, U=3.378, P=0.045; effective rates: 89.5% *vs* 78.1%, U=4.163, P=0.041). The adverse effect rates of the group A (vesicle 20.0%, pigmentation 46.9%, scarring 17.7%) were lower than those of the group B (vesicle 21.9%, pigmentation 60.4%, scarring 25.0%). Incidences of pigmentation and scarring were statistically significantly different (U=3.884, P=0.034, and U=4.016, P=0.032 respectively) between the two groups.

Conclusion With the guidance of color Doppler ultrasound, the efficacy and safety of long pulse 1064 nmNd:YAG laser, intense pulsed light, and lauromacrogol injection in the treatment of infantile hemangioma have better outcomes compared to laser treatment alone without preoperative ultrasound examination.

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HEMANGIOMA is one of the most common vascular tumors in children. Infantile hemangiomas are benign proliferations of endothelial cells. They can be clinically classified as superficial, deep, and mixed according to the location of the vascular proliferation, whether in the dermis, hypodermis, or both. The incidence of hemangioma in the early neonatal is about 5%-10%, and 30% in preterm infants.[1,2] Although it is possible for infantile hemangioma to regress completely, about 40% to 50% of patients persist residual lesions, such as telangiectasias, scar, skin atrophy, fibrofatty tissue residues, and other beauty defects.[3,4] Clinically, there are still 20% to 30% of hemangiomas that cannot regress completely. Some severe hemangiomas with rapid proliferation may lead to serious dysfunction, and even be life-threatening.[2] Therefore, in recent years, more experts prefer treatments rather than observation.

Application of laser in the treatment of hemangioma has been more commonly used than ever due to the development of laser technology. Although the effect of long pulse 1064nm Nd: YAG laser treatment is deep and fast, it is very easy to leave an obvious scar. In order to reduce complications, the present study applied color doppler ultrasound prior to treatments to assess the physical volume, composition, depth, and velocity of blood flow in the hemangioma, and compared their outcomes with that of the laser treatment without ultrasound guidance, in order to establish the rationale of using ultrasound to optimize the treatment for patients with hemangioma.

PATIENTS AND METHODS

Case selection

This study was carried out in the Department of Dermatology, the First Affiliated Hospital of Nanjing Medical University from July 2014 to July 2015. Patients were recruited from outpatient clinics. The inclusion criteria: 1. Children patients with clinical diagnosis of hemangioma; 2. Without contraindications of laser treatment, such as local bleeding, ulcers, and infection; 3. Untreated in the past three months. The exclusion criteria: 1. Lauromacrogol allergy for children who accept the injection treatment; 2. Voluntary withdraw because of serious side effects after the treatment, such as severe erythema, itching. The study was approved by the institutional ethics committee. After being informed details on adverse reactions and prognosis for the treatment, the guardians signed the consents. The enrolled patients were assigned into group A or group B by simple randomization. Patient whose programmed number was divisible by 5 was assigned into group B, and all the other enrolled patients were assigned into group A.

Pretreatment ultrasound evaluation

All patients in Group A had ultrasound examinations before treatment by the same sonographer in the Department of Ultrasound. Ultrasound device (Philips, IU22, Netherlands) with a linear array probe (L12-5MHz) was used. We observed the size, boundary, internal echoic texture, blood flow distribution and flow velocity for hemangiomas, and measured the maximum dimension perpendicular to the skin as the depth of the lesion.

Treatments plans

Patients in group A were subsequently grouped according to the depths of hemangioma measured by ultrasound. group A-1: depth <1.2 mm, intense pulsed light(IPL) therapy; group A-2: depth ⩾1.2 mm and <3 mm, long pulse 1064 nm Nd:YAG laser treatment; group A-3: depth⩾3 and <5 mm, or blood flow velocity ranging from 15 cm/s to 30 cm/s, combination of IPL and long pulse 1064 nm Nd:YAG laser treatment. The above three treatments were performed for 3-5 times continuously, with an interval of 3-4 weeks. group A-4: depth ⩾5 mm, or blood