

Efficacy of Tunable Dye Laser for the Treatment of Infantile Hemangiomas

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Background

Infantile Hemangiomas (IH) are the most common vascular tumor in infants. It is estimated that 4-5% of infants and up to 10% of non-Caucasian infants can present with IHs.¹⁻⁴ Hemangiomas can range from superficial, deep, or mixed with components of both deep and superficial layers.

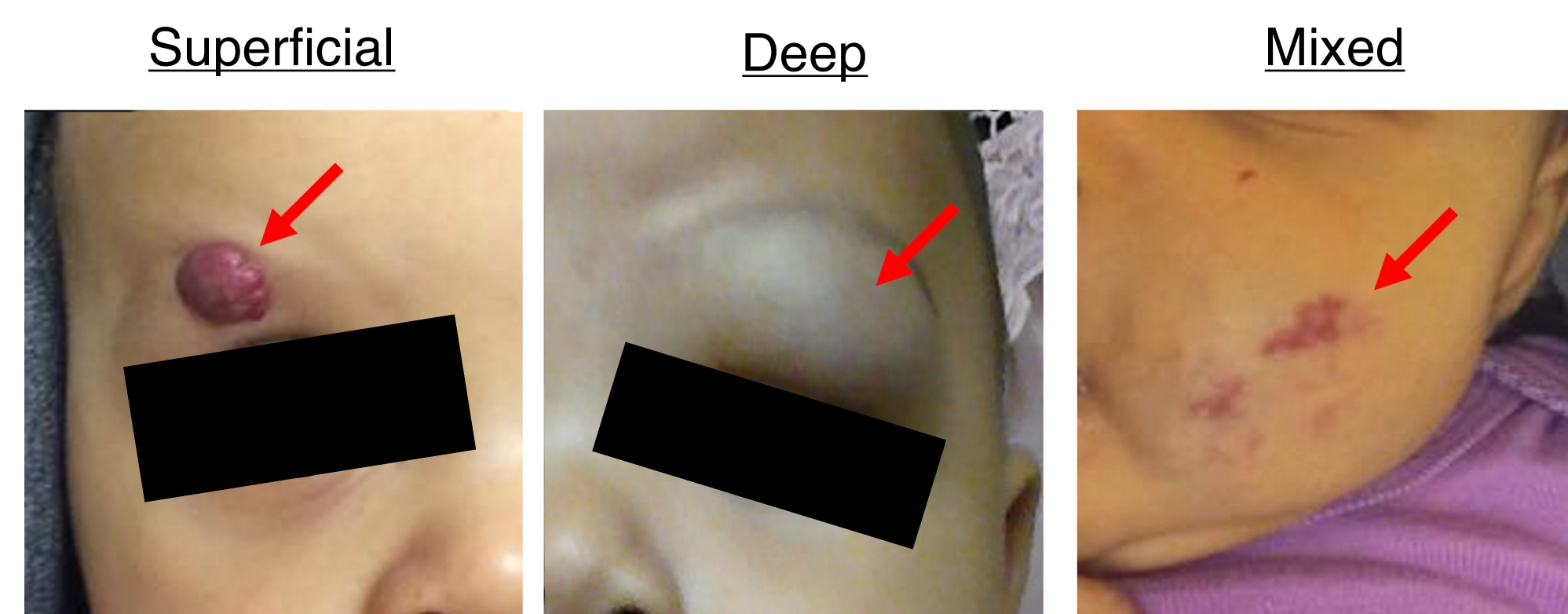


Figure 1. Hemangioma Types

Current treatment guidelines include systemic propranolol, topical timolol, surgical excision, Tunable Dye Laser (TDL), intralesional steroid injections, or combination therapy.⁵

Although beta-blocker therapy is the current mainstay treatment of IHs, side effects such as fatigue, allergic reactions, bradycardia, hypoglycemia, dyspnea, and altered mood and sleep pattern have precluded parental consent to undergo systemic treatment.⁶

Laser therapy may offer an efficacious approach for the treatment of IHs without the risk of systemic effects and associated complications; however, no long-term data is available.⁷ The purpose of this study is to investigate the clinical efficacy of TDL in the treatment of IHs.

Methods

A retrospective cohort analysis of 100 patients with 138 IHs from 2016-2021 was performed. Patients were identified and divided into two groups: oral propranolol with TDL therapy (dual therapy) or TDL therapy only.

Patient characteristics included: patients' age of onset and diagnoses, sex, associated syndromes, and history of prematurity. Clinical characteristics and treatment efficacy included size and number of hemangiomas, type of hemangioma, location, duration and number of treatments, and associated complications.

Results

- 100 patients met the inclusion criteria: 74 underwent TDL therapy and 26 underwent dual therapy of TDL therapy with oral propranolol.
- There was no significant difference between the patient cohorts for the age of onset and diagnosis of the hemangiomas, number of hemangiomas per patient, hemangioma type and location, patient sex, associated syndromes, and history of prematurity (Table 1).
- There was no statistical significance in involution rates between the dual therapy group (92.8 percent) and the TDL laser only group (92.7 percent) ($p = 1.00$).
- When comparing treatment duration required to achieve resolution of the hemangioma, the dual therapy group required more laser therapies as compared to the monotherapy group (3.2 ± 1.7 versus 2.3 ± 1.4 , $p = .007$) (Figure 2). Similarly, the average follow-up duration in the dual therapy group was greater (16.5 ± 12.9 months versus 11.5 ± 12.3 months, $p = .04$).

Table 1. Patient Demographics and Clinical Characteristics by Treatment Group*

Characteristic	Laser (%)	Laser + Propranolol (%)	p
No. of patients	74 (74.0)	26 (26.0)	N/A
Age of onset			
Mean no. $\pm$ SD, days	8.7 $\pm$ 22.6	3.0 $\pm$ 13.3	0.07
Age of diagnosis			
Mean no. $\pm$ SD, months	6.3 $\pm$ 7.7	6.7 $\pm$ 7.3	0.79
No. of hemangiomas	97 (70.3)	41 (29.7)	N/A
No. of hemangiomas per patient			
Mean no. $\pm$ SD	1.4 $\pm$ 0.7	1.7 $\pm$ 1.2	0.29
Hemangioma size			
Mean size $\pm$ SD, cm	30.8 $\pm$ 24.5	42.4 $\pm$ 35.3	0.06
Hemangioma type			
Superficial	11 (11.4)	0 (0)	0.05
Deep	14 (14.4)	5 (12.2)	
Mixed	72 (74.2)	36 (87.8)	
Location			
Face	29 (28.9)	17 (41.5)	0.12
Head and neck	32 (33.0)	9 (22.0)	
Trunk	16 (16.5)	2 (5.0)	
Upper extremity	10 (10.3)	5 (12.2)	
Lower extremity	10 (10.3)	8 (19.5)	
Involved hemangiomas	90 (92.8)	38 (92.7)	1.00
No. of laser treatments			
Mean no. treatments $\pm$ SD	2.2 $\pm$ 1.4	3.4 $\pm$ 2.4	0.004
No. of laser treatments for resolution of hemangioma			
Mean no. treatments $\pm$ SD	2.3 $\pm$ 1.4	3.2 $\pm$ 1.7	0.007
Average followup duration			
Mean followup duration $\pm$ SD, months	11.5 $\pm$ 12.3	16.5 $\pm$ 12.9	0.04
Duration of oral propranolol treatment			
Mean time $\pm$ SD, days	N/A	172.0 $\pm$ 117.7	N/A
Sex			
Male	27 (36.5)	8 (30.8)	0.64
Female	47 (63.5)	18 (69.2)	
Associated Syndromes	0 (0)	0 (0)	N/A
Prematurity	15 (30.0)	3 (15.8)	0.36

N/A, not applicable

*All cell values are expressed as no. (%), except for age of onset, no. hemangiomas per patient, hemangioma size, no. of laser treatments, no. of laser treatments for resolution of IH, average followup duration, and duration of oral propranolol treatment which are expressed as mean $\pm$ SD

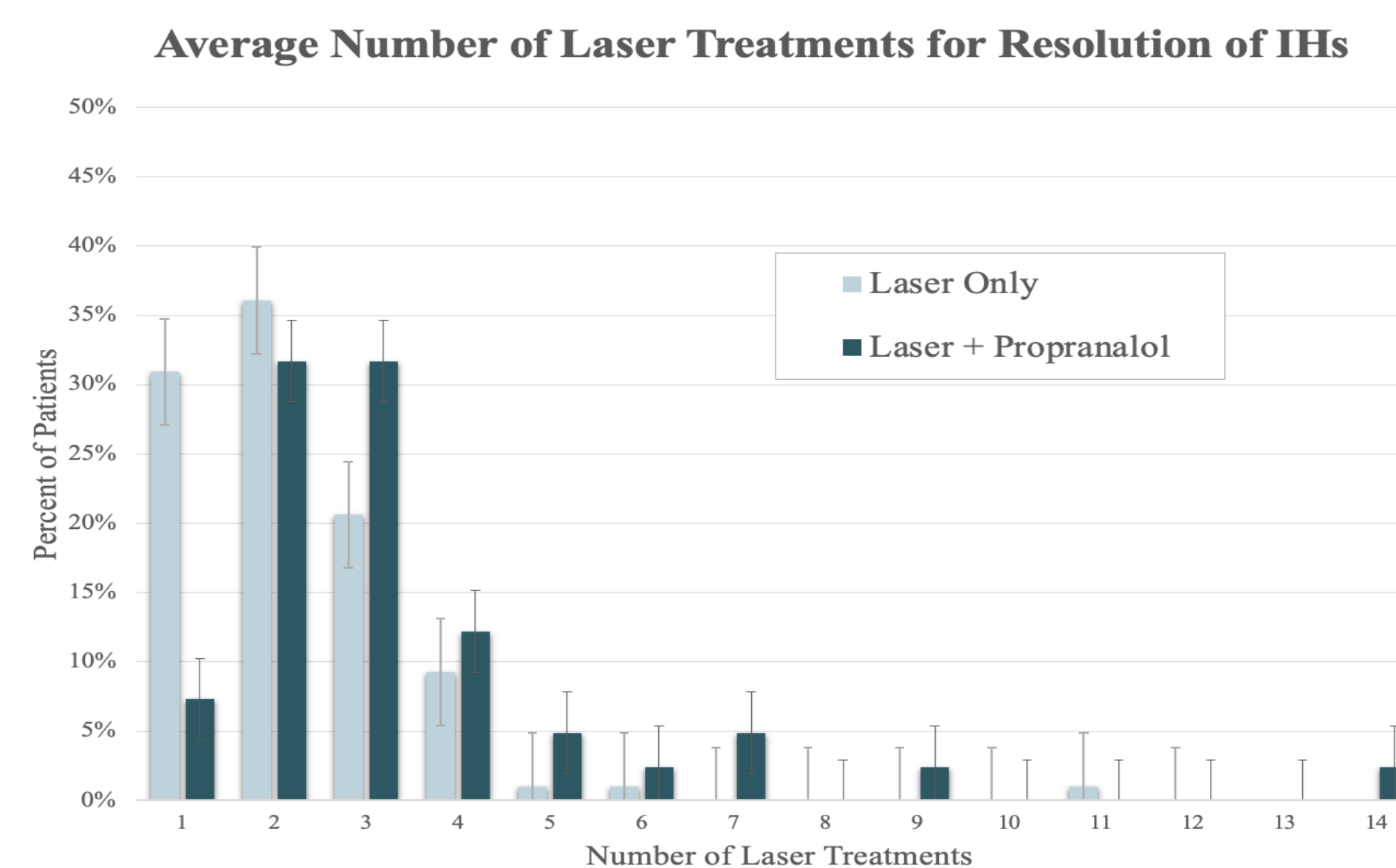


Figure 2. Average Number of Laser Treatments for Resolution of IH:



Figure 3. Infantile hemangioma on right wrist before (left) and after (right) two treatments with TDL + steroid injections.



Figure 4. Infantile hemangioma on right arm before (left) and after (right) four treatments with TDL + steroid injections.



Figure 5. Infantile Hemangioma on right eyelid before (left) and after (right) treatments with oral propranolol followed by two treatments of TDL + steroid injection.

Results (Cont.)

- A total of 4 patients in the laser with propranolol cohort experienced side effects and associated complications [$n = 4$ (15.4 percent) versus $n = 0$ (0 percent), $p = .004$] (Table 2).
- The laser with propranolol cohort experienced a total of six different side effects and associated complications.
- The side effects ranged from dyspnea, fatigue, pallor, altered sleep pattern, decreased appetite and unspecified.
- Rebound growth after discontinuing propranolol was observed in 26.9% of patients in the Laser + Propranolol group

Table 2. Complications in Patients Undergoing Laser Only Versus Laser with Propranolol Therapy

Characteristic	Laser (%)	Laser + Propranolol (%)	p
No. of patients with complications	0 (0)	4 (15.4)	0.004
No. of complications	0	6	
Dyspnea	0 (0)	1 (3.8)	0.26
Fatigue	0 (0)	1 (3.8)	0.26
Pallor	0 (0)	1 (3.8)	0.26
Altered sleep pattern	0 (0)	1 (3.8)	0.26
Decrease Appetite	0 (0)	1 (3.8)	0.26
Unspecified / Other	0 (0)	1 (3.8)	0.26
No. of patients with rebound growth	N/A	7 (26.9)	N/A

N/A, not applicable

Discussion

- Both laser only or laser with oral propranolol are efficacious approaches to treating IHs.
- Similarly, a systemic review and meta-analysis which included 13 articles and 1529 hemangiomas found an overall resolution rate of 89.1% with PDL (pulsed dye laser).⁸
- Despite similar outcomes, dual therapy with propranolol yields a higher risk for systemic complications.
- Similar to our study, a systemic review in 2013 reported a 31.3% incidence of adverse events with the use of propranolol.⁹
- Laser monotherapy provides a safer alternative for the treatments of IHs without the added risk of side effects and associated complications.

Sources

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