



Pulse dye laser in hemangioma

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The most common tumors of childhood

Incidence rate: 5-10%

Risk factors :

- Older maternal age

- Twin births

- Pre-term birth

- Caucasian ethnicity

The most common site: head and neck

Complications: local tissue damage, ulceration, infection, bleeding, functional impact, and disfigurement



- Involution phases :

Rapidly proliferating phase up to the age of 1 year

Involuting phase between 1 and 5 years of age

involved phase up to the age of 10 years

- Complete regression rate: 50% until the age of 5 years
- Partial regression: up to 40%
- Residual skin changes: telangiectasia, scarring, or epidermal atrophy



Management

- Should be individualized
- Most HIs: regress spontaneously, required only active non-intervention
- Active intervention :~10% due to complications



Table 119.3 Haemangiomas likely to require treatment and their potential complications

Type of haemangioma	Potential complication
Subglottic (airway) with or without skin involvement	Airway occlusion
Ocular or periocular	Amblyopia
Large or multiple hepatic lesions	High-output cardiac failure
Diffuse hepatic	Abdominal compartment syndrome, hypothyroidism, cardiac failure
Large facial, perioral, perineal	Ulceration with subsequent scarring
Nasal, ear, lip, central face	Distortion of normal anatomy with disfigurement



- The major goals of management :
 - Preventing or reversing life- or function-threatening complications
 - Preventing permanent disfigurement
 - Minimizing psychosocial stress for the patient and family
 - Avoiding aggressive and potentially scarring procedures
 - Preventing or adequately treating ulceration to minimize scarring, infection and pain



- Superior efficacy (might be the first-line treatment) : combined oral/topical propranolol with laser compared to monotherapy
- The best laser modality: long-pulsed dye laser
- A higher dose and a longer treatment duration of propranolol orally achieved a higher success rate and increased side effects
- Adding PDL to propranolol : leads to the lowest adverse reactions (ulcer, color sink and color reduction)



Treatments for infantile Hemangioma: A systematic review and network meta-analysis

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- The applications of lasers in haemangiomas :
 - Treatment of the proliferative phase
 - Treatment of ulcerations
 - Treatment of residual telangiectasias after involution



- laser modalities in hemangioma:
 - Pulse dye laser:
 - First choice of vascular laser therapy
 - Mostly reported and applied in IHs laser therapy
 - Nd:YAG laser :
 - Infrared laser (wavelength of 1064 nm)
 - Good therapeutic effects on thick tumors
 - Worse efficiency and more adverse reactions
 - Combined Nd: YAG with PDL :
 - Not superior than PDL alone



PDL(Pulse Dye Laser)

- This laser acts on the chromophore with oxygen-containing hemoglobin
- The chromophore absorbs light to heat the lesion and causes coagulation, thereby exerting therapeutic effects
- Accepted treatment for:
 - Haemangioma ulceration :
 - Children treated with PDL experienced a relief in their pain within 24-48 h and that almost all (91%) ulceration healed within 4 weeks(1-3 sessions)
 - May also be beneficial for hemangiomas in areas prone to ulceration(anogenital area)
 - Residual erythema or telangiectasias :
 - Extremely successful with over half of patients



PDL(Pulse Dye Laser)

- Role in treating proliferating haemangiomas: controversial
 - Subset of thin, superficial lesions may respond to laser treatments
 - Thicker tumours are not effectively treated
 - Depth of penetration of the PDL is only 1.2 mm
 - Risk of scarring greater than port-wine stains
 - Persistent atrophic scarring , significant ulceration (uncommon)



PDL(Pulse Dye Laser)

- longer pulse PDL with epidermal cooling (most commonly)
- Higher success rate with longer pulse PDL compared with observation
- “Traditional PDL” group compared to “longer-pulse” PDL group:
 - Excellent clearance of the lesion did not differ between groups
 - Time to maximal proliferation was significantly shorter in the longer pulse PDL group
- Cryogen spray cooling as an adjunct to PDL versus no cooling:
 - Fewer treatments and had greater improvements in volume and texture
- Studies comparing laser with b-blockers or in combination with b-blockers
 - Greater improvements in lesion size in combination arms versus b-blockers alone
 - Greater effects of lasers on mixed superficial and deep IH



Laser Treatment of Infantile Hemangioma: A Systematic Review

PDL(Pulse Dye Laser)

- Multiple variations in treatment protocols did not allow for demonstration of superiority of a single method
- Risk of ulceration in proliferating lesions : low fluences should be used
- Treatment settings :
 - Pulse duration 0.45 to 1.5 ms
 - 10 or 7 mm spot
 - Fluence 5-7 J/cm²
 - Appropriate cooling
- Lower fluences and longer pulse durations are advisable in darker skin types
- Multiple treatments are generally required
 - 2-week intervals for rapidly proliferating lesions
 - 4 to 6-week intervals for involuting lesions



**Laser Treatment of Infantile Hemangioma:
A Systematic Review**

- 13 articles with 1529 hemangiomas were included in the meta-analysis
- 909 girls (73%) , 338 boys (27%)
- Location:
 - Head and neck (50%)
 - Trunk (27%)
 - Extremity(19%)
 - Genital area(3%)
 - Perineal(1%)
- Type:
 - Superficial (44%)
 - Mixed (24%)
 - Cutaneous nodular (28%)
- Most commonly used laser parameters:
 - WL:585 and 595 nm
 - Spot size: 5 and 7mm
 - Pulse duration: 0.45 ms were the
- Mean laser treatment sessions : 2.77 (every 2–8 weeks)



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Pulsed dye laser therapy for infantile hemangiomas: a systemic review and meta-analysis

L. SHEN^{1,2*}, G. ZHOU^{1,2*}, J. ZHAO¹, P. LI³, Q. XU¹, Y. DONG¹ and Z. ZHANG^{1,4}

- Overall resolution rate : 89.1%
- Remarkable lesion improvement:
 - 54% : all patients
 - 23% : 60–90% of patients
 - 23% : 25–50% of patients



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- Incidence of adverse effect: 6.28%
- **Complications :**
 - Atrophic scarring (30, 31.25%)
 - Ulceration (9, 9.38%)
 - Bleeding (2, 2.08%)
 - Infection(2, 2.08%)
 - Mild textural changes (3, 3.13%)
 - Hyperpigmentation(18, 18.75%)
 - **Hypopigmentation(31, 32.29%)**
- Hyperpigmentation, hypopigmentation, and negative textural changes greater in traditional PDL



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Harm/adverse event	N studies reporting harm (# participants with harm/total participants)	Reported rates across studies (%)
PDL		
Purpura [23]	1 (25/25)	100
Swelling [23]	1 (25/25)	100
Skin atrophy [16,28,38]	3 (67/760)	7–28
Ulceration [15,16,28,38,43]	5 (12/876)	0.76–7
Painful ulceration [16]	1 (3/60)	5
Bleeding [16]	1 (2/60)	3
Infection [16]	1 (2/60)	3
Atrophic scarring or scarring [21,23,28,38]	4 (9/742)	0.9–6
Hyperpigmentation [15,20,23,27,31,41,43]	7 (29/423)	1–20
Texture change [15,20]	2 (8/41)	13–23
Hypopigmentation [15,16,20,23,27,31,38,41,43]	9 (233/1140)	10–45
Blistering or crusting [14,20,23,31]	4 (26/113)	4.8–76
Cutaneous atrophy and pigmentation changes [38]	1 (54/657)	8
Granuloma telangiectaticum [39]	1 (4/548)	0.7
Pigment change (increase or decrease) [28,38]	2 (67/700)	7–9.7
Longer pulse PDL		
Hypopigmentation [15,20]	2 (4/34)	12–12.5
Hyperpigmentation [15,20]	2 (3/34)	8–12.5
Texture change [15,20]	2 (2/34)	4–12.5





Pulse dye laser in acne vulgaris



Acne & laser

- One of the commonest problems of adolescence with almost half of the patients experiencing persistence into adulthood
- Application of laser :
 - Inflammatory acne
 - Acne scar(hypertrophic & atrophic)
 - Post acne erythema



Acne & Pulse Dye Laser

- 585 and 595 nm and recently 1319 nm
- Mechanism:
 - Decreases P. acnes and inflammatory acne (porphyrins target & lethal oxidative damage)
 - Reduce scarring associated with acne (induces procollagen secondary to heating of perivascular dermis)
 - Decreases post-inflammatory acne (oxyhemoglobin target)
 - Reduce inflammatory and acne scar(TGF- β 1 ↑)



Acne & Pulse Dye Laser

- 595-nm PDL :
 - Higher fluences compared to 585-nm PDL
 - Non-purpuric results compared to conventional 585-nm PDL
 - Epidermal cooling : lower side effects
 - No topical anesthetic
 - 595-nm PDL has been used as a monotherapy or combination with other modalities



Acne & Pulse Dye Laser



Table 1. Review of 595 nm PDL studies.

Authors	Year of publication	Study type	Outcome
Lekwuttikarn et al.	2017	Split face randomized, controlled trial in treatment of acne vulgaris and acne erythema; n = 30	No significant difference in erythema and acne grading, papule count reduction significant.
Voravutinon N et al.	2016	Prospective, single-blinded split-face clinical trial using purpuric versus subpurpuric fluence; n = 55	Significant reduction in acne, with no significant difference between the two arms
Lekakh et al.	2015	Prospective, split-face clinical trial of Salicylic acid peel and PDL versus salicylic acid peel alone; n = 19	Significant
Park et al.	2014	Split-face, evaluator-blinded, randomized pilot study of fractional, non-ablative, 1550-nm laser versus 595-nm PDL acne erythema; n = 12	Both significantly improve erythema, 1550 nm fractional laser better.
Cho et al.	2009	Case report; n = 1	Significant improvement
Yoon et al.	2008	Single-blinded prospective trial to assess acne associated erythema; n = 20	Significant
Haedersdal et al	2008	Split face study of PDL assisted photodynamic therapy versus PDL; n = 15	Better results in PDL assisted photodynamic therapy arm

PDL & Post acne erythema

- Six articles evaluating efficacy of PDL on PAE.
- Painting motion technique on entire face from hair line to jaw line, excepting eyelids
- Reduce risk of PIH and pain: Cooling device
- No topical anesthesia
- Fluence and pulse duration varied from 3 to 11 j/cm², 350μs to 10 ms respectively
- Treatment sessions ranged from 1 to 6 sessions with treatment interval of 2-8 weeks

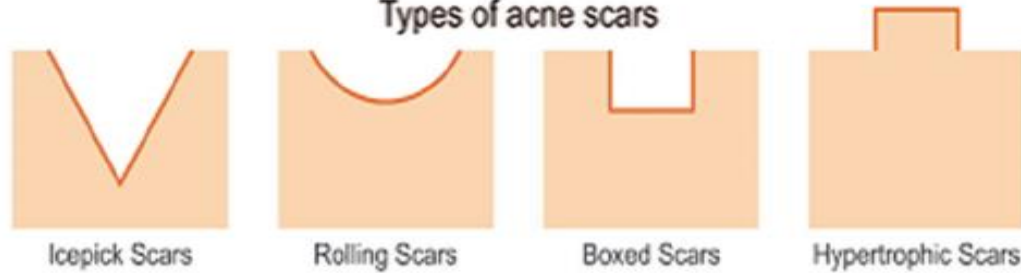


PDL & Post acne erythema



Author name	Number of sessions & interval(w)	Finding
Alster et al	1-2 6-8	585 nm /67.5% and 72.5% improvement in PAE and skin texture
Ibrahim et al	5 2	Significant reduction in PAE and acne severity by adding PDL to low-dose of isotretinoin (0.25 mg/kg/day) compared with isotretinoin alone (0.5 mg/kg/day) lower rate of side effects(acne flare, skin dryness and pruritus)
Lekwuttikarn et al	2 2	595nm / No significant difference between PDL-treated side compared to untreated side(PAE)
Leheta et al	6 2	585 nm/No significant difference between PDL-treated side compared to untreated side(PAE) Improvement in active acne lesions were reported in combination therapy
Park et al	3 4	595 nm / No significant difference between PDL with either Fractional non-ablative laser (1550 nm)
Chalerm suwattana kan et al	3 2	595 nm/No significant difference between PDL with Long-pulse Nd: YAG (1064 nm) Nd: YAG group revealed lower rate of adverse effects with more patients' satisfaction

Types of acne scars



Before

Parameters: 2.5-3.5 mm, 20 W, 110 msec

Courtesy of Dr. Anil Ganjoo, Skininnovation Clinics,

Different kind of lasers that can be potentially used

- Vascular lasers:
 - PDL
 - KTP
 - Nd-YAG
 - IPL
- Ablative fractional:
 - CO2
 - Er-YAG
- Non ablative fractional:
 - 1550 nm
 - 1540 nm
 - 1440 nm
 - 1565 nm
- Q-switched:
 - 694 nm
 - 1064 nm
 - 532 nm
- Hair removal devices:
 - all



PDL & Acne scar

- PDL or fractional laser therapy :
 - Second line therapy for linear hypertrophic scars (gold et al)
- Ice pick scars:
 - Challenging scar types, ice-pick scars tended to respond better to PDL
- Combination of pdl and ultra pulse fractional co2 laser :
 - May be better than pdl alone on fresh red hypertrophic scars (ouyang et al)



THANK YOU FOR YOUR ATTENTION



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