

# PDL in port wine stain



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# References

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- Synergistic Photodynamic & Photothermal Treatment of Port-Wine Stain? Lasers in Surgery & Medicine 34:80–82 (2004)
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# Outlines

- Introduction, Mechanism
- Anesthesia
- Initial laser test
- Timing & treatment interval
- Assessment of the treatment result
- Rate & factor affect treatment response
- Combination therapy



# Introduction



# Introduction

- PDL: gold standard treatment of PWS
- Performed with proper parameters & repeated session  
excellent safety & potential to provide complete to near-complete clearance
- Sessions continue until a plateau in response is reached



# Mechanism



# Mechanism

- Selective photothermolysis
- Targets: hemoglobin in the affected cutaneous blood vessels
- Heat due to Hb absorption of laser energy results in photocoagulation & aggregation of RBC & then necrosis of endothelial cells
- Risk of damage to surrounding cutaneous structures is limited by selection of a proper pulse duration that confines thermal injury to the targeted PWS vasculature



# Anesthesia



# General vs topical anesthesia

- Site & size of the area
- Pt's age & developmental ability to understand & cope with procedure



# General vs topical anaesthetic

- Children  $< 5$  year: general anaesthesia (esp facial lesion)
- Children  $> 5$  year
  - Facial lesions: general anaesthesia (preferred)
  - Small body lesion: topical anaesthesia



# Type of Topical anesthesia

- Anesthesia which cause vasodilation are preferred esp for vascular lesions, especially port wine stains
- EMLA (lignocaine & prilocaine):
  - controversy regarding influence of EMLA on efficacy of PDL



# Topical anesthesia application

- Anesthetic response occurs within 45 to 60 mins
- Lasts for 1-2 hrs after removal
- Site of application: affect the duration of analgesia
- Areas with increased vasculature: ↑ drug clearance
- For maximum absorption: applied beneath occlusive dressings



# Risk of methemoglobinemia in EMLA

- EMLA use should be avoided in:
  - neonates with a gestational age of less than 37 wks
  - infants under 1 yr who are receiving concomitant therapy with agents such as phenytoin or acetaminophen



# Dosing for EMLA

- Age 0-3 mos or <5 kg: 1 g over 10 cm<sup>2</sup> skin for up to 1 hr
- Age 3-12 mos & >5 kg: 2 g over 20 cm<sup>2</sup> skin for up to 4 hrs
- Age 1-6 yrs & >10 kg: 10 g over 100 cm<sup>2</sup> skin for up to 4 hrs
- Age 7-12 yrs & >20 kg: 20 g over 200 cm<sup>2</sup> skin for up 4 hrs



**laser test**



## Initial skin laser test

- Select an area of normal skin either next to the birthmark or on the anterior aspect of the forearm
- Apply topical anaesthesia
- 2 or 3 low laser fluence shots fired at area of normal skin
- Any skin reaction noted, in particular any purpura



# Initial skin laser test

- Fluence producing earliest purpuric response multiplied by 2
- Small selected area on the vascular lesion is then treated
- Review test site after 2 mos



# Initial skin laser test

- Initial laser test is not required in:
  - very small lesions (up to 10 dots ) in older children
  - although it is good to test a small area of normal skin



# Typical PDL setting

- Spot size: 7-10 mm
- Pulse duration: 0.4-3 ms
- Fluence: 6-9 J/cm<sup>2</sup>



# Timing



# Timing

- Laser treatment for all vascular birthmarks: an early age so treatment is completed before school age:
  - usual: first birth day
  - some study: first few days (early intervention)



# Early intervention benefit

- Avoids risks of general anesthesia\*
- Enables the best cosmetic outcome with fewer sessions
- Reduces the likelihood of the psychosocial morbidity
- Reduce the risk of recurrences

\*FDA warning for repeated or lengthy of general anesthetic & sedation drugs in children < 3 years may affect brain development (negative effects on behavior or learning)



# Factors explain the better results for earlier PDL treatment of PWS

- Better penetration of the laser energy due to thinner lesion
- Greater proportion of erythrocytes in blood
- Less melanin in skin that can be a competing chromophore for absorbing laser energy
- Changes that occur in PWS with time (thickening, darkening, increase in size) make clearance more challenging



**Treatment interval**



# Treatment interval

- Usual: 4 to 6 wks
- In some study: every 2, 3 wks
- Comparison between 2 or 3 wks VS. 4 wks interval:
  - better response without increasing side effects
  - expediting time of resolution so prevent psychological consequences



# Assessment

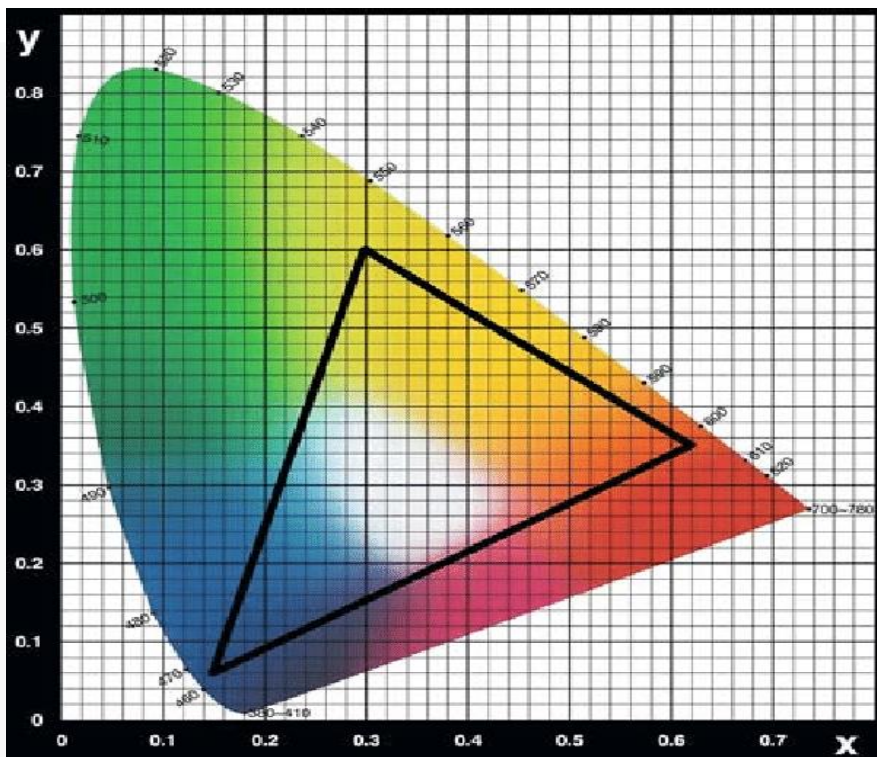


# Assessment of the treatment result

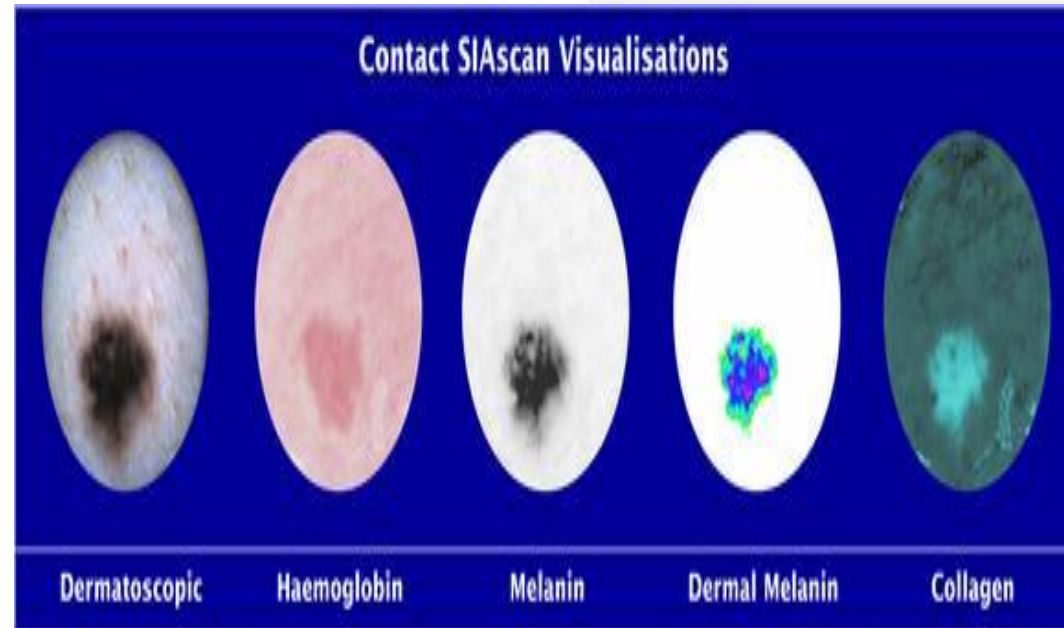
- Photography
- Dermoscopy
- Colour chart and dermospectrophotometry
- Siascopy



# Dermospectrophotometry



# Siascopy



**Factor affects treatment response**



# Response rate

- Age
- Color of PWS
- Site of PWS
- Type of lesion
- Size
- Number of treatment session



# Good treatment responder

- Age: younger age
- Color of PWS: pink/red
- Site of PWS: lateral facial region, forehead & neck
- Type of lesion: thin
- Size: small



# Poor treatment responder

- Age: older age
- Site: centropacial region (esp lip), lower limbs (high recurrence)
- Colour: dark purple
- Type of lesion: hypertrophic
- Size: large ( $> 80$  cm)



# Response to treatment

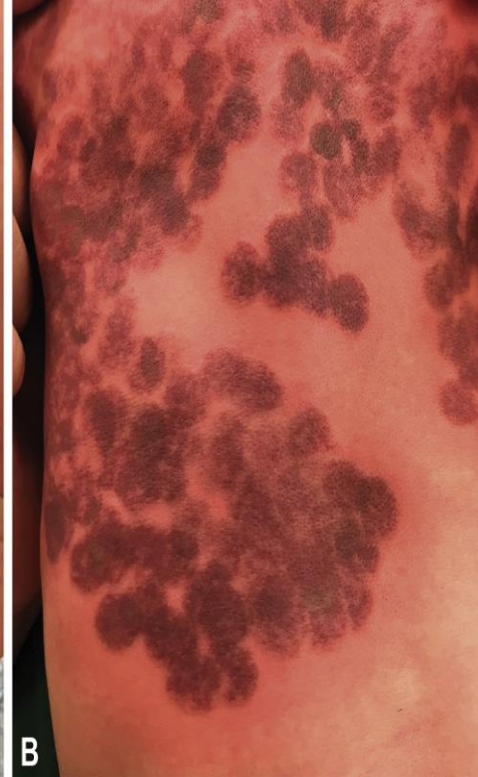


# Pattern of response to treatment

- Typical tissue reaction: mild to moderate purpura
- Overtreatment : charcoal gray color (risk of pigmentation)
- Goal in treatment: show an effect without overlap of pulses



# Mild to moderate purpura



charcoal gray color



# Pattern of response to treatment

- Clearing of the stain progresses from the periphery
- Soft tissue hypertrophy does not respond to laser & requires surgical correction, fiberoptic Nd-YAG laser (recently)



# Response rate

## our center

- 80%:
  - more than 50% lightening in color
  - Of which 33%: >90% improvement

## other center

- 70%:
  - more than 70% lightening in color
  - of which 43%: >90% improvement





# Adverse effects



# Adverse effects

- Minimal
- Swelling
- postinflammatory hyper/hypopigmentation
- Immediate post laser purpura (subsides within 5–10 days)
- Blistering & crusting
- Scarring: rare



# Recurrence



# Recurrence

- After completing laser session: 2–4-year break
- After break reassessed for any recurrence
- Rate of recurrence: 10%



# Combination therapy



# Combination of PDL with topical rapamycin

- Combined PDL with topical rapamycin 0.5% ointment 2/day
- Greater improvement & maintenance of therapeutic results with fewer overall laser treatments



# Combination of PDL and with photodynamic therapy

- Combined photodynamic and pulsed dye laser treatment of port wine stains (pdt/pdl) [ClinicalTrials.gov](https://clinicaltrials.gov)



# Combination of PDL and imiquimod

- PDL+Imiquimod: superior responses as compared to PDL alone



# Combination of PDL and fiberoptic Nd-YAG laser

- Treatment of deeper & superficial layers of hypertrophic PWS: good response





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