The newest devices and techniques for vascular lesion treatment

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Infantile Hemangiomas

- Vascular tumors
- Rapid growth followed by stabilization and involution
- Treatment options
  - Observation
  - Steroids –Topical; Intraleisonal; Systemic 2-3 mg/kg
  - Propranolol/Timolol/Other Beta blockers
  - Ulceration Management: Barrier creams; Propranolol/Timolol; PDL
  - Laser
  - Surgery

Infantile Hemangiomas

“Propranolol was effective at a dose of up to 3 mg/kg/day for 6 months in treatment of infantile hemangioma”

- Multicenter, randomized, double-blind phase 2-3 trial funded by Pierre Fabre of a pediatric specific oral solution
- 460 infants randomly assigned to placebo or 1 or 3 mg/kg/d for 3 or 6 months with a pre planned interim analysis; final assessment week 24; 3 mg/kg for 6 months for final analysis


Infantile Hemangiomas

- 88% showed improvement by week 5 (5% of placebo)
- Complete or near complete resolution 60% (placebo 4%)
- 10% required systemic retreatment
- Hypoglycemia, hypotension, bradycardia and bronchospasm occurred infrequently with no significant placebo difference


When to use laser for infantile hemangiomas

- Patients who are not beta blocker candidates - rare
- Good adjunct when there is a superficial component
  - Can achieve more complete removal
  - Can decrease needed time for beta blocker
- Recurrence as beta blocker is tapered or stopped
- Residua left after active treatment
  - Vascular targeting lasers for any residual redness
  - Ablative fractional laser for any textural change
  - Goal of early treatment is to avoid any residua

In my opinion/experience

1) Infantile hemangiomas: PDL is best laser option; lower energies especially during the proliferative stage; may increase once stabilized or involuting
2) Combination of PDL and propranolol excellent option for lesions with a deep component, ulcerated or rapidly progressing
3) Combination of PDL and timolol is another option for thin lesions
4) Starting treatment early can avoid need for reconstructive treatments later
Port Wine Stain Birthmarks

- Vascular Malformation
- Slow progression (tissue thickening, nodules) over decades
- Treatment options
  - Lasers; Light Sources
  - Adjunctive Treatment

How can I improve treatment effect?

- Start Treatment Early
- Increase blood flow to the PWS area by:
  - Placing the patient in Trendelenberg

PDL Treatment Parameters

- 585 or 595 nm Wavelength
- 0.45 – 6 ms pulse duration
- Vary pulse duration and wavelength over time to achieve optimal results
- Larger spot size when possible
- 6-13 J/cm². Use 7mm spot size for higher energies (if needed)

PWS Treatment

- Consider multiple passes in single treatment session
- Consider varying wavelengths and devices
- Watch skin carefully during treatment
- Know desired endpoint

In my opinion/experience PWS

1) Port wine stain birthmarks: higher energies and more treatments required (partly because lesion does not involute by itself and in fact recurrence of blood vessels occurs)
2) Start as early as possible
3) Alternative treatments needed
   - Destructive methods in combination with anti-angiogenic agents
   - Studies needed to evaluate adjunctive options in children

• Treatments repeated at 4 week intervals for facial lesions in lighter skin types (shorter intervals may improve outcome)
• Longer intervals between treatments for extremity lesions and if there is significant hyperpigmentation
• **Multiple treatments are required (3-15 or more)**!
Rapamycin + PDL

- 23 patients with SWS and facial PWS
- Placebo; PDL + Placebo; 1% Rapamycin alone; PDL + Rapamycin
- Analysis at 6, 12, and 18 weeks after intervention
- PDL+Rapamycin yielded the lowest digital photographic image score (greatest improvement) and lowest percentage of blood vessels on histologic analysis
- Well tolerated; rapamycin was detected in the blood

Topical rapamycin combined with PDL in the treatment of capillary vascular malformations in SWS: Phase II, randomized double-blind, intranidal placebo-controlled clinical trial
JAAD 2015 72:152-158

Photographs taken before treatment (A), after 6 weeks (B) and after 12 weeks (C). The lateral part of port-wine stain was treated with laser and in the patient, according to the randomization, the rapamycin treatment was applied to the superior half. Note an important subjective improvement in OV1 (B) and in OV2 (C) in the part treated with PDL alone, and less improvement in the part treated with laser alone. This improvement was less in OV3 (D). The other 2 parts did not demonstrate improvement.

New Device in Development

- 3 technologies: Pulsed dye + Nd:YAG + RF
- More powerful PDL with extended dye life
- 2 Zoom handpieces & delivery system options: one for each cooling option.
- 2 Cooling options: DCD or EverCool, contact cooling.
- 5 Treatment modes depending on technologies & cooling options.

Angiofibromas

- Associated with Tuberous Sclerosis
- Slow progression; fairly rapid recurrence
- Treatment options
  - Lasers, Light Sources
  - Rapamycin: topical and/or oral

Pulsed-dye laser treatment 10 mm; 1.5 ms; 7.5 J/cm²; 30 ms cooling
Ablative fractional resurfacing 15 mm; 70 mJ; 40%
Pinpoint electrosurgery to papillary fibrotic lesions
0.2% topical rapamycin ointment bid

Tuberous Sclerosis

At end of RF pulse, benefit of PDL+RF is obvious. Vessels' temperatures persist leading to more thermal damage.

Angiofibromas

**How can I make treatment easier for pediatric patients?**

Child life specialists assist us with management of pediatric patients when general anesthesia used.

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**General Anesthesia**

- Mask inhalation anesthesia performed by experienced pediatric anesthesiologists
- Common intraoperative pain meds administered
  - 1) Intranasal fentanyl (also "smooths" wake up in addition to pain management)
  - 2) Rectal acetaminophen
- No NSAIDS when treating vasculature due to clotting inhibition
- These meds can be given without an i.v. after patient is asleep
- The families of pain meds work synergistically

**GAS Study: General Anesthesia compared to Spinal anesthesia**

- International, randomized controlled trial conducted at 28 hospitals - 7 countries - February 2007-January 2013
- 722 children less than 6 months old; hernia repair randomly assigned to general anesthesia or awake-regional anesthesia
- General anesthesia group - an average of 54 minutes
- Two-year outcome data available for 532 children
- Mean cognitive composite score was 98.6 for awake regional and 98.2 for general anesthesia – not statistically different
- Primary outcome of the GAS Study will be performance on a test of intelligence at age 5

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**FDA Drug Safety Communication:**

FDA review results in new warnings about using general anesthetics and sedation drugs in young children and pregnant women

**Association between a single general anesthesia exposure ...and neurocognitive outcomes...**

- 105 sibling pairs, exposed siblings and unexposed sibling had IQ testing at mean ages 10.6 and 10.9 years
- Exposed children received inhaled anesthetic agents from 20-240 minutes
- Mean IQ scores were not statistically significantly different:
  - Exposed sibling: full=111; performance = 108; verbal= 111
  - Non-exposed sibling: full=111; performance = 107; verbal= 111
- No differences in memory/learning, motor/processing speed, visuospatial function, attention, executive function, language or behavior
- Further study for repeated and prolonged exposure and vulnerable subgroups

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1. Laser all ready to go before child enters room
2. All adults with goggles before child enters room
3. Child brought into the room and immediately swaddled
4. Laser aid eye pads with overlying gauze
5. One staff member responsible only for eye protection
6. One staff member for holding child
7. 1 parent may be in the room but not participating in the procedure
Association between a single general anesthesia exposure ...and neurocognitive outcomes...

- 33 patients
- Average age at time of first treatment 1.9 years; Average number of treatments before the age of 4 years was 6.7
- Average age at time of survey 7.8 years
- Anesthetics included nitrous oxide, isoflurane and IV propofol
- ADHD 3%; Anxiety 6.1%; behavioral disorder 3.0%; language disorder 3.0%; speech disorder 3.0%; motor disorder 6.1%
- Rates are similar to those in the US population
- Study is small but no increased risks when comparing with prevalence rates reported in the literature

Summary for Pediatric Laser Treatments

- Lasers can be used safely in children
- For some conditions - results are improved when treatment performed in children
- Standard laser safety procedures such as eye protection must be followed
- Some special consideration should be taken when treating children
  - Considering potential fear
  - Discussing and considering options for anesthesia

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