

# Kristen M. Kelly, M.D.

## BIOGRAPHY



### *Memberships*

American Academy of Dermatology

American Society for Laser Medicine and Surgery

American Society for Photodynamic Therapy

### *Professional Background*

2003 - Present	Associate Clinical Professor	University of California, Irvine
1997 - 2003	Assistant Clinical Professor	University of California, Irvine
1997-1998	David Packard Fellow	Beckman Laser Institute,
	Dermatologic Laser Applications	University of California, Irvine
1994-1997	Resident in Dermatology	University of California, Irvine
1993-1994	Resident in Internal Medicine	St. Mary's Medical Center, Long Beach
1993	M.D.	University of California, Los Angeles
1989	B.S. Psychobiology	University of California, Los Angeles

## RESEARCH INTERESTS

- Treatment of cutaneous vascular lesions especially port wine stains and hemangiomas
- Photodynamic therapy of skin lesions
- Cutaneous laser surgery translational technology development
- Non-invasive optical imaging of cutaneous lesions

### Port Wine Stain Birthmarks (PWS)

PWS are congenital, progressive vascular malformations of human skin which are characterized by a normal skin surface overlying an abnormal plexus of dilated blood vessels. PWS occur in approximately 0.7% of neonates. PWS are initially flat red macules but with time, lesions tend to darken to purple and become thickened as vascular nodules develop. Two-thirds of these malformations occur on the face and thus present a particularly significant problem often adversely affecting social interactions.



### Pulsed Dye Laser (PDL) Treatment of PWS

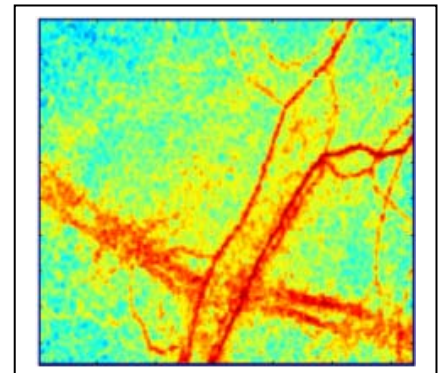
Historically, treatments for PWS included ionizing radiation, dermabrasion, cryosurgery, and electrotherapy; however, these modalities resulted in cosmetically unacceptable scarring. The introduction of the PDL for PWS treatment was a significant advancement, as this modality achieves reasonably good results in some PWS patients due to its ability to selectively destroy cutaneous blood vessels. With PDL therapy, few patients (< 10%) achieve complete blanching of their PWS.

### Research Objectives

**1) What are the limitations of current laser therapy?** Reasons for the limitations of PWS laser therapy are not understood but we believe there are several likely issues. First, PDL are able to remove intermediate-sized vessels, but in many patients, small superficial vessels are left. Second, absorption of laser energy by epidermal melanin reduces the light dosage reaching the blood vessels, decreasing the amount of heat produced in the targeted PWS and leading to sub-optimal lesion blanching. Third, injury induced by laser treatment may create a wound healing response resulting in significant angiogenesis. This drive for new vessel formation may limit treatment effect.

**2) How can current light –based therapies be improved or adapted to achieve improved results?** We have evaluated the use of photodynamic therapy (PDT) for treatment of PWS and demonstrated that this treatment modality has significant therapeutic potential; however, successful implementation of PDT for clinical applications requires careful design of the process to confine the injury to the vasculature and limit the extent and depth of epidermal injury and blood vessel destruction. To this end, we have developed a combined PDT + PDL approach using a vascular-specific photosensitizer and careful selection of light parameters, considerably enhancing the margin of safety by using sub-therapeutic PDT to initiate vascular injury, which is then augmented by PDL irradiation.

**3) How can available technology be safely and effectively implemented into a clinical setting?** At the University of California, Irvine Surgery Laser Clinic in the Beckman Laser Institute, we have state of the art equipment, consultation and treatment areas, including an operating room, where we provide treatment to hundreds of children and adults with vascular birthmarks and other cutaneous entities amenable to light-based treatment. We also have an Advanced Technology Suite where interested patients can participate in implementation of new and developing diagnostic and treatment approaches.



## SELECTED PUBLICATIONS

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2. Zhong , R., Ramirez-San-Juan, J.C. Choi, B., Jia, W., Aguilar, G., Kelly, K.M., Nelson, J.S. Thermal response of ex vivo human skin during multiple cryogen spurts and 1,450 nm laser pulses. *Lasers Surg Med* 2006 Feb;38(2):137-41.
3. Datrice, N., Ramirez-San-Juan, J., Zhang, R., Mehskinpour, A., Aguilar G., Nelson , J.S., Kelly, K.M. Cutaneous Effects of Cryogen Spray Cooling on In Vivo Human Skin. *Dermatologic Surgery* 2006 ; 32:009-1014.
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5. Jung, B., Kim, C.-S., Choi, B., Kelly, K.M., Nelson, J.S. Use of erythema index imaging for systematic analysis of port wine stain skin response to laser therapy. *Lasers Surg Med* 2005; 37:186-191.
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