## 206

### HOLMIUM LASER ABLATION OF COMPLETELY EMBEDDED URETERAL STONE

**Prabhakar Pandey**

*Cumberland, MD*

**Background and Objectives:** Holmium laser has been successfully utilized to fragment the intraluminal ureteral stone. Totally embedded ureteral stones present a challenging problem in stone management. Evaluation of efficacy of retrograde ureteroscopic holmium laser ablation in management of completely embedded ureteral stone is presented.
**Material and Methods:** 34-year old female presented with 2 years' history of recurrent flank pain following ureteral perforation and stone migration during an attempted stone extraction by percutaneous antegrade approach. Endoluminal ultrasound and subsequent ureteroscopy confirmed a completely embedded proximal ureteral stone. Ureteroscopy using "double guide-wire technique" in combination with fluoroscopy was utilized to locate the ureteral stone site. Overlying urothelium was ablated by means of holmium laser energy. Exposed stone was subsequently fragmented and teased off the wall by laser fiber tip. Ureter was subsequently left stented for 4 weeks.
**Results:** Uneventful complete stone extraction was accomplished. Patient is now symptom free.
**Conclusions:** Ureteroscopic holmium laser ablative technique offers an attractive and effective minimally invasive alternative for management of completely embedded ureteral stone.

## 207

### HOLMIUM LASER ABLATION OF NEAR-OCCLUDING URETERAL TUMOR: AN "ANTEGRADE" URETEROSCOPIC APPROACH UTILIZING URETERAL ACCESS SHEATH

**Prabhakar Pandey**

*Cumberland, MD*

**Background and Objectives:** Holmium laser has been successfully utilized to ablate ureteral tumors. However, near-occluding tumors, though rare, presents a challenging endourological problem. Evaluation of efficacy of combined application of ureteral access sheath and ureteroscopic laser ablation of an invading recurrent ovarian adenocarcinoma causing a nearly-occluded ureteral lumen is presented.
**Material and Methods:** 71 year old female presented with right-sided hydronephrosis from recurrent ovarian adenocarcinoma invading ureteral wall. Retrograde pyelogram and endoscopic evaluation revealed a nearly occluding right ureteral tumor involving 3.5 cm segment at the junction of middle and distal third ureter. Lack of luminal definition and normal ureteral landmarks precluded retrograde ureteroscopic laser ablation of the tumor. Controlled withdrawal of flexible ureteroscope positioned through ureteral access sheath enabled laser ablation of the occluding tumor.
**Results:** Restoration of ureteral lumen by ureteroscopic laser ablation of the near-occluding tumor was successfully accomplished.
**Conclusions:** Ureteral access sheath presents as a useful adjunct in ureteroscopic management near-occluding ureteral tumors.

# POSTERS

## 210

### IMPRESSIVE LASER HAIR REMOVAL WITH 810 nm AND 940 nm POWERPULSED DIODE LASERS: A COMPARATIVE STUDY

**Albert J. Nemeth and Marianne B. Lehman**

*Advanced Specialized Laser Center, Clearwater, FL*

**Background/Objectives:** This study prospectively compared laser hair removal comfort and efficacy utilizing 810 nm and 940 nm power pulsed diode lasers (Asclepion, Jena, Germany).
**Patients/Methods:** In this *single-blinded* study, 25 patients (22 female, 3 male) with Skin Types II–VI had half of the treatment region treated with one laser, the other half with the other laser with all treatment parameters identical utilizing a 12 mm sapphire chilled tip spot and fluences of 11–32 J/cm$^2$.
**Results:** Treatment with the 940 nm wavelength was perceived by the majority of patients as being more comfortable through all sites treated as well as sessions in which single and multiple sites were treated. The comfort advantage for 940 nm was particularly evident for patients of color. The % of Hair Removed (% Clearing) per Treatment Session and Wavelength is summarized in the following table:

| | | 940 nm Side | 810 nm Side |
|---|---|---|---|
| After 1 Treatment | 54 Treatment Sites | 31.11% | 32.13% |
| After 2 Treatments | 47 Treatment Sites | 46.91% | 45.53% |
| After 3 Treatments | 43 Treatment Sites | 60.35% | 58.11% |

Two (8%) patients had transient sequelae on the 810 nm side whereas none were seen on the 940 nm side.
**Conclusion:** Our data suggest that there are no differences in treatment efficacy between wavelengths. The 940 nm hair removal laser represents an exciting addition to our laser hair removal armamentarium.

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## 211

### IMPRESSIVE CLEARING OF SPIDER ANGIOMAS WITH LONG PULSE 940 nm DIODE LASER TREATMENT

**Albert J. Nemeth**

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**Background/Objectives:** This study prospectively evaluated the efficacy of a long pulse 940 nm diode laser (Dornier MedTech, Wessling, Germany) to effectively treat spider angiomas, vascular lesions with an arteriolar feeder vessel routinely confirmed by diascopy.
**Patients/Methods:** One Hundred patients (16 male; 84 female) with Fitzpatrick Skin Types I–III underwent 940 nm laser treatment to remove 184 cosmetically objectionable spider angiomas. One Hundred Thirteen (61.4%) lesions were on the nose and cheeks. Lesions treated included both de novo and tenacious lesions resistant to multiple high power tunable pulse dye laser treatments with fluences to 14.5 J/cm$^2$. The primary 940 nm diode laser parameters used were as follows: Spot size of 0.5 mm, fluences of 713–917 J/cm$^2$ , and a pulse duration of 20 ms. Zimmer rapid air-cooling was used to provide patient comfort during treatment as well as to provide epidermal protection. Anesthetic cream provided additional patient comfort. Treatments were performed at 2-month intervals. The mean patient follow-up period was 30 months. Results were assessed clinically and documented photographically.
**Results:** The 940 nm diode laser achieved impressive *non-purpuric* clearing of 181 (98.4%) spider angiomas with 1–2 treatments. There were no instances of infection or scarring.
**Conclusion:** The 940 nm diode laser with Zimmer rapid air-cooling was very efficacious in safely treating spider angiomas regardless of location with cosmetically excellent results.

## 212

### HAIR REMOVAL IN HIRSUTE PATIENTS WITH POLYCYSTIC OVARIAN SYNDROME

**Lucile E. White, Susan E. Lai, Simon Yoo, and Murad Alam**

*Northwestern University, Chicago, IL*

**Background and Objective:** The objective of this study was to determine whether laser treatment is effective in patients with polycystic ovarian syndrome (PCOS) as observed by the physician provider. Efficacy in this patient population has only been assessed by the patients on a subjective scale. Due to the emotional distress and anxiety caused by hirsutism, patient assessments may not be the most accurate method of assessing efficacy.
**Study Design/Materials and Methods:** This was an open label, single-center, prospective clinical study. Participants were patients who carried a diagnosis of PCOS. One half of the patient's face was randomly selected to receive low fluence treatment (the control) and the other half of the face received high fluence therapeutic treatment. The treatments were performed at the baseline visit/week 0, 8, and 16. At weeks 0, 8, 16, and 24, photographs were taken to assess the hirsutism. At the week 24 follow-up visit, the patients completed a survey.
**Results:** In 38 of 39 patients, treatment with the diode laser resulted in statistically significant mean hair reductions at week 8, 16, and 24 when comparing the treated and untreated sides of the face. Physician and patient assessments confirmed these findings. Patients preferred the treated side to the untreated side. Further, patients found that the laser hair removal was more effective than previous methods that had been tried for epilation.
**Conclusion:** The diode laser is an effective method of hair removal in patients with polycystic ovarian syndrome as assessed by an objective physician assessment.

## 213

### THE EFFECT OF LIGHT EMITTING DIODE TREATMENT ON SCAR APPEARANCE

**Lucile E White, Rania Agha-Majzoub, Simon Yoo, and Murad Alam**

*Northwestern University, Chicago, IL*

**Background and Objective:** To determine whether the use of light emitting diodes (LEDs) will improve the appearance of scars.
**Study Design/Materials and Methods:** 30 patients scheduled for two elliptical skin excisions on the same day. On post-operative day four, when the proliferative phase of wound healing was beginning, patients applied an LED to one of the scars for 15 minutes a day over 8 weeks. The untreated scar was covered during the LED exposure and served as the control. Patients returned to clinic at weeks 12 and 24 and completed a previously-normed Patient and Observer Scar Assessment Scale (PlastReconstrSurg 2004). Physicians assessed vascularity, pigmentation, thickness, length, width, and surface area.
**Results:** Of the 30 patients, 21 stated that the treated scar was less pruritic and erythematous than the untreated scar. Patients also appreciated the convenience of the at-home treatments and found the treatments easy to perform. The treated scars were less vascular and pigmented. There was no significant difference in the thickness, length, or width of the scars.
**Conclusion:** LED treatment can improve the appearance of scars. The LED treatment improved the vascularity and hyperpigmentation of the treated scar compared to the untreated scar. The thickness, length, and width of the scar were not affected by LED treatment. Changing other treatment parameters, such as duration of LED exposure, may affect the thickness, length, and width of treated scars and warrants further investigation.

## 214

### THE NEW-GENERATION, HIGH-ENERGY, 595 NM, LONG PULSE-DURATION PULSED-DYE LASER EFFECTIVELY REMOVES SPIDER VEINS OF THE LOWER EXTREMITY

**Eric F. Bernstein**

*Bryn Mawr, PA*

**Background and Objectives:** Lower extremity spider veins are a cosmetic problem that poses a formidable clinical problem for laser removal. They are significantly harder to remove than facial telangiectasias. A new-generation pulsed-dye laser capable of administering pulses that clinically behave like true 40 ms pulses has been developed, by doubling the number of sub-pulses comprising each laser pulse.

**Study Design/Materials and Methods:** Fifteen subjects with Fitzpatrick skin types I–III were enrolled in the study. Thirty-five sites were treated 3 times at 6 week intervals using an average fluence of 20.4 J/cm$^2$, a 3 × 10 mm spot, and a dynamic cooling device to protect the epidermis. Digital photographs were taken before initiating treatment and 8 weeks following the final treatment.

**Results:** Vessel clearance averaged 66% 8 weeks following the final treatment. Side-effects were limited to hyper-pigmentation rated as mild in 14%, and moderate in 18% of subjects. There was no textural change on any treatment site.

**Conclusions:** The new-generation, high-energy, 595 nm, long pulse-duration, pulsed-dye laser effectively removes lower extremity spider veins in subjects with skin types I–III.

## 215

### PAIRED COMPARISON OF PULSED DYE LASER FOR NAIL PSORIASIS

**Stacy McClure, Susan Lai, Lucile E. White, and Murad Alam**

*Chicago, IL*

**Background and Objectives:** To determine whether treatment using 595 pulsed dye laser to the nail matrix once monthly over a 3 month period will improve nail psoriasis.

**Study Design/Material and Methods:** Pilot, open label, single-center trial of 20 patients with psoriatic nail dystrophy treated with pulsed dye laser (595 nm, Vbeam, Candela Corp, Wayland, MA). Inclusion criteria were psoriatic nail changes in at least two nails, excluding the thumb, present for at least 1 year. For the first affected nail, 1–2 pulses of 9 J/6 ms/10 mm were delivered to assess the purpura threshold, with increase by 1 joule increments until purpura. At least one affected nail was left untreated (control). Additional involved nails were treated at 1 J above the purpura threshold and/or at 1 J below.

**Results:** The NAPSI, a nail psoriasis severity index, showed a 3-month post-treatment decrease of up to 1 point (on a 4-point scale) in treated nails versus controls. Subject and physician assessments (Global Impression of Change scores) at 6 months showed improvements across subjects, but these changes, like changes in blinded ratings of digital photographs, were not statistically significant.

**Conclusions:** Nail psoriasis may improve after the nail unit is treated with purpura-inducing pulsed-dye laser, presumably by affecting the microvasculature. The treatments appear to be safe and do not induce nail dystrophy. More treatments per nail may elicit more consistent improvements.

## 216

### TREATMENT OF FACIAL LENTIGINES WITH THE LONG- PULSED DYE LASER BY COPMRESSION METHOD

**Taro Kono, Henry H Chan, Dieter Manstein, Hiroyuki Sakurai, and Motohiro Nozaki**

*Tokyo Women's Medical University, Tokyo*

**Background and Objective:** Q-switched lasers have been used for the treatment of lentigines but post-inflammatory hyperpigmentation can be an issue especially in Asians. The 595 nm long-pulsed dye laser(LPDL) has been used for the treatment of vascular lesions and although it is well absorbed by oxyhemoglobin, it is also absorbed by melanin. To use this device for the treatment of facial lentigines, we attached a glass lens to the tip of the laser's handpiece, allowing compression of the skin during treatment. In doing so, eliminated the absorption by oxyhemoglobin. This prospective study aims to evaluate the efficacy and complications of such an approach to the use of LPDL in the treatment of facial lentigines in Asians.

**Study Design/Materials and Methods:** 40 Asian patients (1 male, 39 female) with facial lentigines Fitzpatrick skin types III–IV were enrolled in this study. Lentigine was treated with LPDL by compression method with fluence between 10 to 13 J/cm$^2$ and pulse duration of 1.5 milliseconds. Cryogen spray cooling was not used. Lightening of the lesions was assessed by photograph and reflectance spectrometer. Erythema, hypo-or hyperpigmentation and scarring were also assessed by clinical examinators.

**Results:** 28 patients showed excellent result, 10 patients showed good result and 2 patients showed fair result. The degree of clearing measured by reflectance spectrometer was 82%. There was no scarring or dyspigmentation.

**Conclusion:** LPDL delivered with a compression method is effective with less adverse effect for facial lentigines. The addition of compression technique may allow "vascular" pulsed dye laser to be used for treating a variety of pigmented lesions.

## 217

### USE OF A NOVEL SMALL TIP IPL HANDPIECE FOR TREATMENT OF DISCRETE PIGMENTED AND VASCULAR LESIONS

**Min-Wei Christine Lee,[1] E. Victor Ross,[2] and Scott Davenport[3]**

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[2]*Naval Medical Center San Diego, CA*
[3]*Cutera Corporation, Brisbane, CA*

**Design and purpose:** To evaluate a "small tip" intense pulsed light handpiece in the treatment of discrete pigmented and vascular lesions. The small tip was configured for optimizing treatment of non-flat regions of the face. Also, the size allowed for confinement of light to specific lesions, thus optimizing outcomes in darker and tanned patients where background pigment might otherwise limit fluences sufficient for lesion clearance.
**Methods and materials:** Thirty-two patients ranging in age from 27 to 58 and Fitzpatrick skin types I through IV were included in this evaluation. Treated areas included the face, hands, and arms. The 6.3 mm cooled sapphire tip was applied to discrete pigmented and vascular lesions with fluences ranging from 6 to 20 J/cm$^2$. Clinical endpoints were immediate darkening of pigmented lesions or persistent bluing and/or contraction of telangiectasias or cherry angiomas.
**Results:** Two approaches were used with this device. The first used a lower range of fluences such that erythema and edema were minimal. Using this low energy approach, facial telangiectases showed 5–10% improvement after one treatment (one pass), and 30–40% improvement after 6 treatments. Patients with pigmented lesions had 10–15% improvement after one treatment (one pass), and 40–50% improvement after 6 treatments. The second approach used a higher range of fluences such that erythema, edema, and mild desquamation were allowed. Using this more aggressive formula, one pass performed in a single treatment session achieved 60 to 70% improvement in darker pigmented lesions and 50% clearance of vessels.
**Conclusions:** A novel small tip intense pulsed light handpiece allows for precise placement of green-yellow light for clearance of discrete pigmented and vascular lesions. This precise placement allows for treatment in some darker skin types and/or mildly tanned skin.

## 218

### HISTOLOGIC AND CLINICAL EVALUATIOIN OF THE USE OF FORCED COOL AIR WITH FRACTIONAL LASER RESURFACING

**Zakia Rahman, Heather Tanner, Kin F Chan, and Kerrie Jiang**

*Palo Alto, CA*

**Background:** The clinical and histologic effects of forced air cooling with a Zimmer Cryo 5 (Zimmer Medizin Sytems, Germany) on the microscopic thermal lesions with the 1550 nm Erbium-glass laser were investigated.
**Methods:** All patients were evaluated in two IRB protocols. Skin biopsies were performed at varying settings. Treatments were performed with no cooling, and with Zimmer settings $z = 1$, $z = 2$, and $z = 6$. Pain scores were recorded. Tissues were excised immediately after or 3-day post treatment. Images of multiple micro-lesions were acquired and their dimensions evaluated.
**Results:** Forced cool air decreased pain perception. Histology results revealed reduction in lesion widths of the microscopic thermal injury zones as compared to the control (no cooling) by 17–28% at $z = 1$, 14–27% at $z = 2$ and 20–30% at $z = 3$. The MEND size also decreased by approximately 21% and 35%, respectively, at $z = 1$ and $z = 2$, both at 12 mJ. A slight decrease in lesion depth as a result of forced air cooling was observed for all Zimmer settings; however the decrease in depth was not statistically significant.
**Discussion:** The use of the forced cool air device mitigates pain associated with laser treatment by the gate control theory of pain. Histologic analysis revealed that combining forced air cooling with fractional resurfacing did not significantly alter depth of thermal damage zones. Based on the lesion dimensions observed following use of different cooling settings, it appears that concurrent selection of cooling settings and treatment energies may result in targeted thermal delivery, maximal efficacy for different treatment indication and pain mitigation.

## 219

### COMPARISON OF HIGH ENERGY VERSUS LOW ENERGY TREATMENT FOR RESURFACING WITH THE 1550 NM ERBIUM-GLASS FRACTIONAL LASER

**Zakia Rahman, Heather Tanner, Scott Herron, and Kerrie Jiang**

*Stanford University, Reliant Technologies, Palo Alto Medical Foundation, Paulo Alto, CA*

**Background:** Fractional photothermolysis using the 1550 nm Erbium-glass fiber laser resurfaces the skin while sparing tissue between zones of microthermal injury. The perioral region has been resistant to treatment by most non-ablative modalities due to dynamic muscle activity. We postulated that use of higher treatment energies would increase depth of penetration and efficacy. We present the results of the first study investigating fractional resurfacing of the perioral region.
**Methods:** 30 subjects aged 40–65, with Fitzpatrick skin type I–IV and moderate to severe perioral rhytides, were enrolled in an Institutional Review Board approved investigation. Up to 5 treatments were administered using the 1550 nm Erbium-glass fiber laser at intervals ranging from 7–14 days using either lower energy, higher density settings (6–12 mJ/MTZ, 3000–4000 MTZ/cm$^2$) or higher energy, lower density settings (12–20 mJ/MTZ, 1000–2000 MTZ/cm$^2$). Subjects were evaluated 1 and 3 months post-treatment for changes in the appearance of wrinkles, texture and pigmentation using a standardized improvement scale (0–4).
**Results:** All treatments were safe and well-tolerated. Transient erythema was observed in all subjects and lasted, on average, 4–7 days among subjects in the lower energy group as compared to 7–10 days for the higher energy treatment group. Three months post-treatment, the appearance of wrinkles improved an average of $3.0 \pm 1.6$ and $2.57 \pm 1.4$ among higher energy and lower energy subjects, respectively.
**Discussion:** Fractional laser treatment using the 1550 nm Erbium-glass fiber laser is a safe and effective modality for resurfacing, although higher energy treatments may be associated with transient effects, such as increased erythema and petechiae.

## 220

### COMPARISON STUDY OF THE DOWN TIME AND COMPLICATIONS OF FRAXEL LASER SKIN REJUVENATION

**Taro Kono, Henry H Chan, Dieter Manstein, Iskra P Sesova, and Motohiro Nozaki**

*Tokyo Women's Medical University, Tokyo*

**Background and Objective:** Fractional resurfacing is a new concept of cutaneous re-modeling whereby laser induced zones of microthermal injury surrounded by normal viable tissue. Down time and complication are minimal, but they are still observed. The aim of this study is to compare the down time and complications using Fraxel laser of the different density and energy.
**Method:** 16 female Asian patients were enrolled in the study. Group 1 (n = 8); Half of the face was treated with 8 pass of fraxel laser at 125 MTZ/cm$^2$ at energy of 8 mJ. The other half of the face was treated with the same device with 8 pass at 250 MTZ/cm$^2$ at energy of 8 mJ. Group 2 (n = 8); Half of the face was treated with 8 pass of fraxel laser at 125 MTZ/cm$^2$ at energy of 8 mJ. The other half of the face was treated with the same device with 8 pass at 125 MTZ/cm$^2$ at energy of 16 mJ. Ice pack cooling was used during and post laser treatment. The patients were evaluated for patient's satisfaction and side effects (pain, erythema, edema, hypopigmentation, hyperpigmentation and scar).
**Result:** Pain, erythema and swelling were observed significantly higher or longer in patients treated with high energy ($p<0.01$) and density ($p<0.01$). Patient's satisfaction is significantly higher in patients with high energy ($p<0.05$), but not high density. Hyperpigmentation was observed in one patient treated with high density. Hypopigmentation and scarring were not observed.
**Conclusion:** Lower energy and density reduce pain and down time. High density is not significantly effective and has a risk of hyperpigmentation. High energy is significantly effective with minimum complications.

## 221

### TOLERANCE OF THE PULSED DYE LASERS ON CHILDREN TREATED FOR PORT WINE STAINS (191 CASES)

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**Background and Objectives:** Although the PDL therapy is the gold standard for the treatment of PWS on children, there are not many publications on his tolerance. We present the results, in term of tolerance, of 191 children treated between 2000 and 2005.
**Material and method:** 191 children, younger than 5 years, were treated for PWS with a pulsed dye laser. Parameters: Vbeam Candela, 595 nm, 1.5, 3 or 6 milliseconds pulse-duration: the maximal fluences were respectively 12, 13, and 14 joules/cm$^2$ with the 7 mm handpiece, DCD = 30/20 millisec.. We decrease the fluence from 1 to 2.5 J/cm$^2$ on the eyelid, at the beginning of the treatment, and outside the face. A total of 1260 treatments were performed.
**Results (tolerance):** We observed: transient hyperpigmentations in 5% of cases, seen always after the age of 1 year; twelve cases of transient hypopigmentation: (9 cases on the members); purpura in any case, and 2–6 days oedema in 20%(every time on the eyelid); six cases of eczematiform eruption; crusts: in 20%, mainly with fluences greater than 12 J/cm$^2$, with 2 cases of remaining discreet atrophy (0.9%), but no case of visible scar or severe side effect was noticed.
**Conclusions:** This study demonstrates the very good safety of this laser, even on newborns, and especially on the face, and the possibility to begin very early the treatment of PWS.

## 222

### MONOPOLAR RADIOFREQUENCY FOR SKIN TIGHTENING – CHANGING PARAMETERS AND CLINICAL SAFETY

**Weiss RA, Munavalli G, Beasley KL, and Weiss MA**

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**Background and Objectives:** Monopolar radiofrequency for skin tightening has been utilized on thousands of patients since 2002. A retrospective chart review was performed to determine the incidence of side effects.
**Study Design/Materials and Methods:** Charts and clinical images of 429 consecutive patient treatments between 2002 and 2005 using a monopolar radiofrequency device for skin tightening were reviewed. As treatment algorithms evolved over 3 years, the algorithm of multiple passes at lower fluence associated with better clinical outcomes and greater patient acceptance was adopted.
**Results:** The most common immediate and expected clinical effects were erythema and edema lasting less than 24 hours, although 6 patients reported edema lasting for up to one week. A total of 1.7 % of treatments resulted in temporary side effects, the most significant of which was a slight depression on the cheek (N = 1) which completely resolved within 3.5 months. Other side effects included localized areas of acneiform subcutaneous erythematous papules (N = 3) and a linear superficial crust (N = 1) with the original tip, all resolving within one week One patient reported small erythematous subcutaneous nodules resolving in 17 days.
**Conclusions:** Our data in an office setting without injectable anesthetic or IV sedation utilizing monopolar RF for skin tightening indicates that it is a safe procedure. Treatment algorithm and tips have evolved over several years. Side effects are low incidence, self-limited and minor, comparable to other non-ablative devices.

## 223

### EXTENDED MICROLASERPEEL™

**Jason N. Pozner**

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**Background and Objective:** We have Experience with more than 500 superficial erbium resurfacings (Microlaserpeel™) (MLP) and hve noted that there are patients who have more periocular or perioral photodamage than is correctible than MLP alone. We sought to describe our experience with deep erbium resurfacing in the perioral or periocular areas combined with MLP on the rest of the face – called Extended Microlaserpeel (XMLP).
**Study Design/Materials and Methods:** Since November 2000, 55 patients were treated with XMLP using a Sciton Profile Erbium:YAG system. Topical anesthetics were applied. For additional perioral deep resurfacing infraorbital and mental nerve blocks were done. For deep periocular resufacing, subcutaneous periocular infiltration of 1% Lidocaine was done. The laser was set at 40–70 microns of ablation and one facial pass performed. For perioral resurfacing the laser was set at 100 microns ablation and multiple passes were done until there was significant rhytid reduction. For periocular resurfacing the laser was set at 80 microns ablation and 50 microns coagulation and 2 passes performed of the lower lids and occasionally one pass of the upper lids. Open wound care was instituted and all patients received preoperative antibiotics and antivirals.
**Results:** All patients tolerated their treatment. There were no infections or pigmentary issues noted. Results were consistent with the degree of tissue ablated.
**Conclusion:** XMLP is a useful addition to ablative resurfacing.

## 224

### A CLINICAL AND HISTOLOGIC EVALUATION OF STRETCH MARKS WITH THE MULTICLEAR (TARGETED NARROW BAND UVB/UVA 1)

**Neil S. Sadick**

*Joan and Sanford I. Weill Medical College, Cornell University, New York, NY*

**Background:** Striae distensae, better known as stretch marks, are a common disfiguring skin disorder of significant cosmetic concern. The MultiClear (CureLight Ltd.) is a medical device emitting high intensity incoherent light with peaks at 313 and 360 nm and 420 nm.
**Materials and Methods:** We report the use of this technology to treat 14 male and female subjects with Fitzpatrick skin types II–VI. Subjects were treated twice weekly for a period of five weeks. Treatment included a single pass over the area at increasing doses based upon the subject's response. Follow-up visits were scheduled for four weeks, eight weeks, and twelve weeks after the last treatment. Photographs were taken at each visit. Biopsies were taken at baseline, after the last treatment and at the twelve week follow-up visit.
**Results:** Nine of the 14 subjects enrolled completed all treatment and follow-up visits. Eighty-nine percent of subjects achieved greater than 75% improvement after the final treatment. At the 4-week follow-up visit, 78% percent has greater than 50% improvement and at the 8- and 12-week follow-up visits, 56% of subjects had greater than 50% improvement. Transient hyperpigmentation was noted in almost all cases and resolved without treatment except one that required hydroquinone. While all subjects responded to treatment, it was noted that stretch marks in darker skin types pigmented more quickly. Cellular markers and routine histologic results will be presented.
**Conclusion:** Targeted narrow band UVB/UVA 1 is a safe and effective method to treat stretch marks. Maintenance treatments may be helpful in maintaining pigmentation of stretch marks.

## 225

### A RANDOMIZED PROSPECTIVE CONTROLLED CLINICAL STUDY TO DETERMINE THE SAFETY AND EFFICACY OF THE VELASMOOTH SYSTEM FOR CELLULITE TREATMENT

**Neil S. Sadick**

*Sanford I. Weill Medical College, New York, NY*

**Background:** The VelaSmooth (Syneron Medical, Ltd. Yokneam, Israel) is a device that combines controlled infrared light and conducted bipolar radiofrequency energies with mechanical manipulation of the skin to improve the appearance of cellulite.
**Materials and Methods:** We report the use of radiofrequency and infrared light to treat twenty female subjects. Subjects were randomized into two groups, right leg or left leg, and were treated twice weekly for a period of six weeks. Treatment included multiple passes over the treated leg until the optimal endpoint of mild erythema and radiant heating were achieved by the operator. Follow-up visits were scheduled for four weeks and eight weeks after the last treatment. Weight and thigh circumference measurements were taken weekly and at the follow-up visits and pictures were taken at the first and last treatment visits along with the follow-up visits. Biopsies to determine the effect of radiofrequency on adipocytes were taken from three volunteers at baseline, after the final treatment and at the eight week follow-up. Blood draws were performed on five volunteers at baseline, immediately after the final treatment for routine chemistry and liver function.
**Results:** Preliminary results show that a more slender body type responds better to treatment. Subjects did experience contouring in the treated area after the 12 treatments.
**Conclusion:** Infrared light and conducted bipolar radiofrequency energies are a safe and affective way to minimize the appearance of cellulite and improve contouring in the thigh and buttocks region. More treatments are recommended for subjects for maximum efficacy.

## 226

### USE OF THE POLARIS AND LYRA DEVICES FOR THE TREATMENT OF LEG TELANGIECTASES. HISTOLOGIC AND IMMUNOHISTOCHEMICAL ANALYSIS

**Neil S. Sadick,[1] and Victor G. Prieto[2]**

*[1]Joan and Sanford I. Weill Medical College, Cornell University, New York, NY*
*[2]Anderson Cancer Center, Houston, TX*

**Background:** Several devices have been proposed for the treatment of leg telangiectases. Histologic changes induced in the vessels have been well characterized.
**Materials and Methods:** Three volunteers with Grade III leg telangiectases were treated with 1064 Nd:YAG laser used settings for blue vessels at PW 35 ms, 300 J/cm$^2$, 3.0 mm spot and 2 pps pulse to the left legs and 900 nm diode laser used settings at 80 J of energy and 100 J/cm$^3$ radiofrequency (RF) to the right legs. Three-mm punches were taken from either site 7 days post treatment. The specimens were stained for elastic tissue (von Gieson) and collagen tissue (trichrome). Expression of procollagen 1 and hsp 70 was analyzed by immunohistochemistry.
**Results:** Specimens treated with both technologies showed intermediate-sized vessels with complete thrombosis and extensive hemorrhage in both dermis and subcutis. Overlying epidermis evidenced damage characterized as focal full-thickness necrosis. Special stains confirmed the damage to the vessels. Hsp70 expression was intense in both the epidermis and the muscle cells of dermal vessels. Procollagen 1 was predominantly expressed at the dermal-epidermal junction.
**Conclusions:** Both devices result in severe damage to intermediate-size vessels thus explaining the reported clinical improvement of leg telangiectases. The expression of hsp70 in the dermal vessels and overlying epidermis is consistent with a direct thermal effect.

## 227

### A SINGLE CENTER, RANDOMIZED, COMPARATIVE, PROSPECTIVE CLINICAL STUDY TO DETERMINE THE EFFICACY OF THE VELASMOOTH SYSTEM VS. THE TRIACTIVE SYSTEM FOR THE TREATMENT OF CELLULITE

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**Background:** Cellulite is the dimpling pattern on skin caused by lobules of underlying adipose tissue. Cellulite occurs mostly on the thighs, buttocks and hips. Cellulite is not related to being overweight; average and underweight people also get cellulite. While harmless, the dimpled appearance is a cause of concern for some people.
**Materials/Methods:** Cellulite grading is determined utilizing the 4 stage Nurnberger – Muller scale. Treatment is done utilizing Syneron's Velasmooth (IR)/(RF) device software v. 2.0 and Cynosure's Triactive class-1 laser device. Photography is done utilizing the standardized Canfield FujiPix S2 Pro digital photography device, and Stereotactic floor stand. Visual inspection and grading is quantified and statistically examined by SPSS Statistical analysis software. Patients were treated once a week for 12 weeks with the randomization of Triactive on one side and Velasmooth on the other side. Measurements were taken before treament, after the final treatment, and again four weeks after the final treatment.
**Results:** Will be presented at the ASLMS meeting as the study is ongoing at this time.
**Summary:** Cosmetic appearance of cellulite can be resolved utilizing several forms of treatments. This study will determine if there is a difference between these two treatment modalities.

## 228

### THE USE OF RHYTHMIC SUCTION MASSAGE, LOW LEVEL LASER IRRADIATION, AND SUPERFICIAL COOLING TO EFFECT CHANGES IN ADIPOSE TISSUE/CELLULITE

**Michael H. Gold**

*Nashville, TN*

**Background and Objective:** The treatment of cellulite has become one of the most talked about areas of study in laser medicine over the past several years. Many companies are coming to the market place with a variety of lotions and potions with minimal, if any, clinical science, behind them. Recently a new medical device, with rhythmic suction massage, low level laser irradiation, and superficial cooling, has been added to the cellulite therapy armamentarium. The purpose of this clinical trial was to study its effectiveness in an IRB controlled clinical trial.
**Study Design:** A total of 10 female subjects were entered into this clinical trial. Subjects had their cellulite evaluated and the severity evaluated utilizing the Visual Cellulite Grading Scale. Subjects received 15, biweekly treatments, utilizing protocols determined by the device manufacturer.
**Results:** Nine of the ten subjects completed the entire study and one month follow-up period. At the end of the study, no significant changes in the weight of the subjects were noted but the average cellulite score improved from a score of 2.44 at baseline, to 1.44 following treatment, an approximate 50% improvement which was found in 80% of the subjects.
**Conclusion:** This new cellulite treatment device offers the potential to be an important addition to our armamentarium for those interested in treating their cellulite.

## 229

### A RANDOMIZED, CONTROLLED, DOUBLE-BLIND STUDY OF THE LOCALIZED LOW LEVEL HEAT TREATMENT OF ACNE BLEMISHES USING THE ZENO DEVICE

**Michael H. Gold**

*Nashville, TN*

**Background and Objective:** The Zeno device is a portable hand-held device that is able to produce accurately controlled low level heat that may be applied to the skin via a small metal tip to prevent acne. The temperature is controlled to be in a range of 46.5–49 degrees C. The purpose of this clinical trial is to determine the safety and efficacy of this device.
**Study Design:** This study was carried out at three clinical sites with each site enrolling between 10–15 patients. The study is randomized and controlled within a subject. Subjects will receive treatment with both an active and a placebo device. The subjects had to have two similar acne lesions to be eligible for this treatment. One was treated with the active device; the other with the placebo. The treatments were performed twice on the first day and one treatment again the following day. A follow-up assessment occurred on day 5 and then again at day 10.
**Results:** This study is ongoing at the time of this submission. The primary endpoint studied in all of the subjects is the time to resolution of the acne lesion. Secondary endpoints including investigator and subject assessment of "blemish change assessment scale" and the investigator assessment using the "blemish assessment scale" are being evaluated. Any and all untoward events are also reported.
**Conclusions:** This low level heat source may prove to be a new and safe take home device for patients to use alone or as adjunctive therapy with previously prescribed medications.

## 230

### TREATMENT OF EPIDERMAL PIGMENTED LESIONS WITH THE 595 nm PULSED DYE LASER

**Jerome M. Garden, and Yacov Domankevitz**

*Northwestern University, Chicago, IL, Candela Corporation, Wayland, MA*

**Background and Objectives:** The 595 nm pulsed dye laser has been the standard of care for many vascular lesions. Although the 595 nm wavelength is absorbed by melanin, the pulsed dye has not been used for the treatment of epidermal pigmented lesions. The objective of this study was to evaluate the effectiveness and safety of the 595 nm pulsed dye laser in the treatment of these lesions by examining various laser parameters and delivery techniques without skin cooling.
**Design/Material and Methods:** 21 patients (skin type I–III) with epidermal pigmented lesions were treated with a 595 nm pulsed dye laser (Vbeam, Candela Corp.). Pulse durations and laser radiant exposures ranged from 1.5–10 msec and 7–12 J/cm$^2$ respectively at a spot size of 7 mm. Each patient received 1 to 4 treatments 4 to 6 weeks apart. Follow-up evaluations were conducted 2 and 4 months post-last treatment. Improvement was determined by evaluation of pre/post-treatment photographs.
**Results:** The procedure was well tolerated by all patients. Pigmentation lightening was observed in all patients. Seventy-three% of all lesions had at least 50% lightening and 47% had better than 75% improvement. Side effects were mild including immediate erythema and edema, rare cases of hypopigmentation and transient purpura and atrophy.
**Conclusions:** The study demonstrated that the 595 nm pulsed dye laser is effective and safe in the treatment of epidermal pigmented lesions.

## 231

### LPDL TREATMENT OF RESISTANT PORT WINE STAINS FOR ASIANS

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**Background and Objectives:** Port wine stains (PWSs) often become hypertrophy with aging. The 585 nm PDL is standard treatment in childhood, but hypertrophic and nodular PWSs do not respond as well. In Japan, there are many middle-aged patients with hypertrophic PWS who had no chance of PDL treatment in their childhood.
**Study Design/Materials and Methods:** We treated 49 Asian patients age 0–70 with PWSs, resistant to further treatment by conventional 585 nm PDL (Candela; SPTL-1b; 0.45 msec, 6–7 J/cm$^2$, 7 mm spot), using 595 nm LPDL (Candela; V beam; 1.5–40 msec, 12–15 J/cm$^2$, 7 mm spot; DCD 30/30). Response evaluated from photographs by 2 plastic surgeons as either; poor (0–25% lightening), fair (26–50%), good (51–75%), or excellent (76–100%).
**Results:** The majority of patients had significantly improvement. Of 49 patients, 15 patients (30.6%) achieved excellent result, and 14 patients (28.6%) good, after an average of 4 treatments. There was no cases of scarring or hyper-pigmentation.
**Conclusions:** As previously shown in Caucasians, most Asians with PWSs resistant to further treatment by conventional PDL, respond well to 595 nm LPDL. The risk of scarring or hyper-pigmentation is very low. The relative benefit of longer wavelength, higher fluence, longer pulse duration, and epidermal protection by DCD, remains unknown. In this study, both children and adults with PDL-resistant PWS responded well to LPDL. Early treatment with LPDL is recommended for Asians with PWS.

## 232

### INTENSE PULSED LIGHT AND UV EXPOSURE: CARCINOGENESIS AND SIDE EFFECTS. AN EXPERIMENTAL ANIMAL STUDY

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**Background and Objectives:** We examined whether IPL treatment has a carcinogenic potential in itself or in combination with ultraviolet (UV) radiation. Secondarily, side effects such as oedema, erythema, wounds, pigmentary- and texture changes were evaluated.
**Study Design/Materials and Methods:** Hairless mice (n = 144) received 3 IPL treatments at 2-week intervals. Simulated solar irradiation was administered only preoperatively or pre- and postoperatively. Weekly clinical assessments of skin tumors were performed during the 10-months observation period. Side effects were evaluated by clinical assessments and by a categorical Kodak Gray scale.
**Results:** No tumors appeared in untreated control mice or in mice only treated with IPL. Skin tumors developed in 24% of mice only treated with preoperative UV-radiation and in 26% of mice treated with preoperative UV-radiation in combination with IPL. Skin tumors developed in all mice treated with UV-radiation pre- and postoperatively and the time first, second and third tumors was independent of whether the mice were treated with IPL or not ($p = 0.11$). IPL treatment of non-UV-radiated skin induced transient oedema. IPL rejuvenation of preoperative UV-radiated skin induced prolonged oedema, mild erythema, and immediate darkening of UV-induced hyperpigmented skin, followed by desquamation and lightening of hyperpigmented skin. UV-radiation on IPL treated skin induced hyperpigmentation of the same intensity as corresponding UV-radiated mice.
**Conclusions:** IPL rejuvenation has no carcinogenic potential itself and does not influence UV-induced carcinogenesis. UV-radiation increases the of occurrence side effects from IPL rejuvenation.

## 233

### AMBIENT TEMPERATURE SIGNIFICANTLY ALTERS THE EFFICACY OF FORCED AIR COOLING OF SKIN SURFACE: A PROSPECTIVE STUDY

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**Background and Objectives:** Forced air cooling is a well established technique that protects the epidermis during laser heating of deeper structures, thereby allowing for increased laser fluences. The goal of this prospective study was to identify whether an elevation in ambient room temperature influences the efficacy of forced air cooling. This study was undertaken to explain the development of superficial ulcerations observed after laser hair removal in several patients who were previously treated at identical laser parameters without incident.
**Study Design/Materials and Methods:** 24 sites (12 subjects) were evaluated for surface skin temperature at 72 and 82 degrees Fahrenheit. A Zimmer cooling system was applied in a similar manner to that which would be used during laser hair removal. Skin surface temperatures were measured during cold air exposure in examination rooms with ambient temperatures of 72 degrees and 82 degrees, respectively.
**Results:** Prior to cooling, mean skin surface temperature was 9 degrees higher in the warmer room ($p<0.01$). Immediately after exposure to forced air cooling (within 1 second), the skin surface temperature was considerably higher (9 degrees, $p<0.01$) in the warmer room.
**Conclusions:** Forced air cooling in a room with an ambient temperature of 82 degrees is not as effective as in a room that is 72 degrees. This could explain occasional ulcerations in patients who have had previous treatments at identical laser parameters.

## 234

### SIDE EFFECTS AND COMPLICATIONS USING INTENSE PULSED LIGHT SOURCES (IPL)

**Sabine Stangl and Wolfgang Kimmig**

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**Background and objective:** Lasers are well known advices for about 25 years. In contrast flash lamps – intense pulsed light sources (IPL). These devices are available for about 10 years on the market and there are many differences between lasers and IPL.
**Material and methods:** A laser emits monochromatic light whereas IPL emit a whole range of wavelengths between about 250 nm and 1200 nm. Cut off filter reduce this range and enable the treatment of different skin problems. Water is used as cooling of the flashlamp and as the cut off filter in longer wavelengths. Most of the light belongs to the infrared and is not in the range of visible light, which is the absorption range of most chromophores of skin. When using therapeutic energy densities the surrounding tissue is heated unspecific. Therefore side effects are more likely.
**Results:** Flash lamps are used for many indications: epilation, treatment of vascular and pigmented lesions and photo-rejuvenation. All these treatment modalities can be performed with one device. But there is only a small range of therapeutic benefit. Therefore side effects and adverse reactions, as burns with crusts, blisters, vesicles and erosions as well as hypo- and hyperpigmentations are more likely.
**Conclusion:** All preparations regarding security that are made in laser treatment are necessary in flash lamp performance as well. The diagnosis has to be clear before; the indication has to be ensured. If treatment is performed by non medical staff the treatment has to be supervised by a physician.

## 235

### THE VEINVIEWER—A NEW REAL-TIME VEIN IMAGING DEVICE—IMPROVES OUTCOME OF TELANGIECTASIA'S FEEDER VEIN TREATMENT USING 1064-NM LASER AND SCLEROTHERAPY

**Roberto Kasuo Miyake,[1] Rodrigo Kikuchi,[1] Flavio Duarte,[1] and Eduardo Ramacciotti[2]**

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**Background and Objectives:** Feeder veins are often not visible and can interfere on telangiectasias treatment outcome. Subcutaneous veins can be made easily discernible by the use of a new invention, the VeinViewer (V–V). The V–V operates by illuminating the skin with near infrared light (NIRL). This NIRL is absorbed or scattered by blood while it is scattered in all directions in skin and subcutaneous fat. The NIRL image is filmed, continuously processed by a computer, and then projected back onto the skin using green light. In May 2005, as a preliminary study of a prospective controlled trial, 15 subjects with feeder veins were treated guided by the V–V. The idea is to avoid feeder vein phlebectomy.
**Study Design/Materials and Methods:** 15 female patients with telangiectasias non-responsive to laser or sclerotherapy were submitted to a single session of Quantum 1064-nm laser (16 msec, 125 J/cm$^2$) plus 75% dextrose sclerotherapy, all with V–V, and skin cooled by Cryo5. Outcome was determined by blinded evaluation of photographs taken before and after final treatment. This study is still ongoing and a total of 60 subjects, divided into three groups (laser, laser + V–V, laser + sclerotherapy + V–V), are being now evaluated.
**Results:** 60% (9) of patients presented a total or partial improvement of the lesion. 26% (4) had no improvement, and 14% (2), had worsening.
**Conclusion:** This preliminary study made us believe that the V–V allows physicians to achieve better results by locating the feeder veins that are too deep for naked eye visualization and too shallow for ultrasound detection.

## 236

### ENCHANCING THE PERSPECTIVE OF ENDOVENOUS LASER TREATMENT (EVLT) AS TO EFFICACY AND SAFETY

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**Background and Objective:** EVLT for great saphenous vein reflux is applied effectively with > 80% success rate after 1 year and minimal complications. In order to expand the indication for treatment and improve the efficacy and safety, the mechanism of action was studied in vitro.
**Materials and Methods:** EVLT was simulated in a tube or a human vein filled with heparinized blood embedded in a transparent polyacrylamide gel. An optical technique was used to visualize thermal effects supported by thermocouple measurements during exposure with either an 810 nm Diode laser, 2.1 mm pulse Holmium and 2 mm cw Thulium laser.
**Results:** During and after laser exposure, the temperature within the vein resides over 70°C for tens of seconds while the vein-wall and adjacent tissue are heated by thermal conduction. The main difference between the lasers was seen in coagulum formation, thermal diffusion and localized high peak temperatures over 300°C with the potential risk of pulmonary embolism, skin burns and bruising.
**Conclusion:** The mechanism of EVLT is related to the total energy deposited over the length of the vein. The settings of the lasers can be optimized for a well-controlled effect with minimal adverse effects.

## 237

### USE OF A VARIABLE LONG PULSE ALEXANDRITE LASER IN THE TREATMENT OF FACIAL TELANGIECTASIAS

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**Background and Objectives:** Determine the optimal pulse duration using a long pulse 755 nm alexandrite laser in the treatment of facial telangiectasias.
**Study Design/Materials and Methods:** 15 patients with Fitzpatrick skin types I–III and facial telangiectasias ranging from 0.2 mm to 1.0 mm were enrolled. Spot sizes were 3 mm and 6 mm. Pulse durations ranged from 3 ms to 80 ms. For each pulse duration, test sites were performed to determine threshold fluences using persistent bluing and/or immediate stenosis as the clinical endpoint. Test sites were re-evaluated 21 days later. Optimal settings, those that resulted in the greatest clearance with minimal side effects (pain, purpura, epidermal damage, pigment changes), were used to treat a larger area of like-sized vessels using the optimal settings. Follow-up evaluations were conducted 6 and 12 weeks after a single treatment. Polarized digital photographs were obtained at each visit. Improvement was determined by blinded evaluation of pre/post-treatment photographs.
**Results:** The average threshold fluence for persistent bluing and/or immediate stenosis was 88 J/cm$^2$. Persistent bluing and/or immediate stenosis were the best predictors for long term clearance. Purpura occurred at 3 ms and 20 ms (n = 11). The optimal pulse duration was 40 ms. Clearance rates approached 30% twelve weeks after a single treatment. Larger blue vessels cleared better than smaller red vessels.
**Conclusions:** Purpura occurred most often with shorter pulses. By lengthening the pulsewidth beyond 3 ms, a long pulse alexandrite laser achieves satisfactory clearance in larger blue telangiectasias with an improved side effect profile.

## 238

### INTENSE PULSED LIGHT FOR THE TREATMENT OF FACIAL FLUSHING IN ASIAN SKIN

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**Background and Objectives:** In Korea, it is estimated that we have over one million of patients have rosacea, and 2.5 out of 100 Korean people are perceived to have the facial flushing symptom.
**Study Design/Materials and Methods:** There were 204 cases of facial flushing were enrolled during the period of Aug 2002 through Oct 2005, and the average number of treatment was 4.2 per case.
**Results:** Effect result from the assessment using photography and a clinical scoring system came out as 61% in flushing, 64% in erythema, 75% in telangiectasia, and 57% in facial tone. With this treatment of IPL, the subjects showed the adverse effects such as crust (18 cases) and postinflammatory hyperpigmentation (2 cases).
**Conclusion:** We had effectual result especially on the patients who have telangiectasia. Additional general effect was that the skin tone got to be clearer in overall.

## 239

### OPTIMAL PARAMETERS FOR THE TREATMENT OF LEG VEINS USING ND:YAG LASERS AT 1064 NM

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**Background and Objective:** The treatment of large vessels such as leg veins is successfully performed in clinical practice using pulsed Nd:YAG lasers. To elucidate the governing parameters in selective photothermolysis of large vessels, a recently developed mathematical model for photothermolysis was adapted for leg veins.
**Materials and Methods:** A mathematical model calculated the temperature values during and after laser heating of vessels using a Nd:YAG at 1064 nm. The thermal damage in the vessel and the laser efficiency was calculated. The laser efficiency is defined as the ratio of the thermal damage in the targeted vessel and the applied laser fluence ($J/cm^2$).
**Results:** The calculated temperature distribution within blood vessels and dermis was in good agreement with clinical findings. The laser induced thermal damage improves with increasing vessel diameter, in agreement with clinical findings. For laser fluence of 100–400 $J/cm^2$, the pulse duration and the beam diameter have minor contribution. Excess dermis heating and pain can be reduced by using moderate fluence of 100–200 $J/cm^2$.
**Conclusion:** A lookup table for optimal treatment of leg veins is presented using Nd:YAG lasers at 1064 nm. The maximal efficiency is predicted for fluences of 100–200 $J/cm^2$ in a wide range of pulse duration (10–60 ms).

## 240

### UVA LIGHT AND ENDOGENOUS PHOTOSENSITIZERS GENERATE SINGLET OXYGEN THAT IS QUANTIFIED BY MEASURING ITS LUMINESCENCE

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**Background and Objective:** The UVA light produces deleterious biological effects in which singlet oxygen plays a major role. In tissue UVA light is weakly absorbed by a limited number of molecules, which may act then as photosensitizer. To elucidate the role of UVA and singlet oxygen in tissue, it must be shown that these endogenous photosensitizers generate singlet oxygen with a sufficient quantum yield ($\Phi_\Delta$).
**Materials and Methods:** Flavins, NADH/NADPH, urocanic acid and different fatty acids were excited at 355 nm using a Nd:YAG laser. Singlet oxygen was detected directly by its time resolved luminescence at 1270 nm. The respective decay rates of singlet oxygen were determined, in particular at different oxygen concentrations.
**Results:** In fully aerated solution of $H_2O$ e.g. riboflavin yielded $\Phi_\Delta = 0.54 \pm 0.07$, which is comparable to exogenous photosensitizers. The results show a decrease of $\Phi_\Delta$ with decreasing oxygen concentration. Thus, the quantum yield depends critically on the oxygen partial pressure ($pO_2$) in the respective experimental setup. That is important when comparing experiments of *in vitro* ($pO_2 \sim 150$ mmHg) and conditions *in vivo* (skin: $pO_2 < 20$ mmHg).
**Conclusion:** Our investigations provide clear evidence that UVA light at 355 nm generates singlet oxygen in endogenous sensitizers such as flavins, urocanic acid or fatty acids.

## 241

### TREATMENT OF THE "BLUE FACE" WITH A PULSED ND:YAG LASER

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**Background and Objectives:** Patients with severe rosacea-associated vascular changes, manifested by a blue-purple skin discoloration, are often resistant to conventional laser therapy. This study was undertaken to evaluate the efficacy of a pulsed Nd:YAG laser for the treatment of the severe vascular manifestations of rosacea.
**Study Design/Material and Methods:** 10 subjects with severe vascular changes of rosacea and blue-purple facial discoloration were enrolled in the study. Subjects underwent 1 to 3 laser treatments at monthly intervals, and a 4 week and 3 month follow-up evaluation. Outcomes were assessed by blinded comparison of standardized 35 mm photographs and subject evaluations. A 1064 nm laser was used with a 3–4 mm spot, 50 ms, 120–150 J/cm$^2$ and contact cooling.
**Results:** 50–90% improvement was observed in all subjects after 1–3 treatment sessions. All subjects were satisfied with their treatment and their clinical improvement. There was no occurrence of purpura, and side effects were minimal.
**Conclusions:** Patients with severe rosacea associated vascular changes, manifested by a blue-purple facial discoloration, respond well to pulsed Nd:YAG laser treatment.

## 242

### COMPARISON TREATMENTS FOR VASCULAR LESIONS WITH THE VBEAM AND THE STARLUX IPL

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**Background:** Facial erythema is a common condition that afflicts millions of people. Pulsed dye lasers are commonly used for the treatment of vascular lesions and yield good results. The Starlux Pulsed Light System is a new generation of pulsed light systems for vascular lesions with minimal recovery and no purpura.
**Materials and Methods:** Ten subjects with bilateral facial telangiectases and erythema were treated with the Vbeam PDL and the Starlux Pulsed Light System. One side of the face was treated with the Vbeam and the contralateral side of the face was treated with the Starlux Pulsed Light System using the G hand piece. Three treatments were performed at four week intervals. Patients were followed at 4, 8, and 12 weeks after the last treatment. Digital photography, investigator and subject assessments were recorded at each visit. Objective assessment with a spectrophotometer was also performed at each visit.
**Results:** There was comparable reduction in erythema and telangiectasia on the Vbeam and Starlux treatment sites. Spectrophotometer readings correlated with clinical findings.
**Conclusion:** The Starlux Pulsed Light System is a safe and effective treatment method for facial telangiectasia and erythema, with results indistinguishable from that of Vbeam PDL. Subjective and objective assessments yielded similar reduction on the Vbeam and Starlux treatment sites.

## 243

### MECHANISM OF IMMEDIATE WHITENING DURING TATTOO REMOVAL

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**Background and Objective:** Transient skin whitening occurs immediately after tattoo treatment with nanosecond domain laser pulses, and is a clinically useful endpoint. The underlying mechanism is poorly understood, and was examined.
**Study Design/Materials and Methods:** India ink gelatin samples and human black tattoos *in vivo* were imaged non-invasively by confocal microscopy, optical coherence tomography and ultrasound after Q-switched laser exposures. Carbon tattoos in pigs were also created, treated *in vivo* with a range of fluences and conditions, biopsied, and evaluated microscopically.
**Results:** Well demarcated circular, highly reflective structures consistent with 1~30 μm bubbles were observed, which gradually shrank over about 20 minutes as whitening disappeared. The threshold for both bubble formation and skin whitening with 755 nm, 50 ns pulses was 1 J/cm$^2$. Darker tattoos were associated with greater bubble formation. When a second or further exposures were made after whitening had faded, fewer and smaller bubbles were noted.
**Conclusion:** Immediate whitening results from formation of small, stable bubbles in the tissue that strongly scatter both light and ultrasound. Gradual dissolution of the bubbles accounts for gradual fading of the whitened skin. Gas contents of the bubbles is unknown, and may consist of water vapor, nitrogen, $CO_2$, combustion or other products of laser-tattoo particle interaction. Clinically, a correlation between whitening and tattoo removal is well accepted, which implies some role for bubbles in the mechanism of tattoo removal.

## 244

### A NOVEL PHOTOPNEUMATIC DEVICE FOR THE TREATMENT OF FACIAL ACNE

**David F. Horne, Jeffrey S. Dover, Kenneth A. Arndt, and Brigitte Stewart**

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**Background and Objective:** A variety of laser and light sources have been studied for the treatment of acne. A novel device using negative pressure to elevate and partially empty the sebaceous unit with concomitant broadband light exposure was evaluated for the treatment of inflammatory acne.

**Study Design/Materials and Methods:** Full-face treatments were delivered weekly for four weeks to 20 female and male patients with mild to moderate inflammatory acne. Different means of assessment including acne lesion counts, high quality structured photographic analysis and patient satisfaction were used to document the response.

**Results and Conclusions:** The change in the number of acne lesions from baseline to one, two, and three months following the final treatment, photographs assessed by a panel of blinded assessors and patient assessments are underway and results will be presented. Rigorous evaluation of these data will be necessary to determine if there is an effect in this series of patients.

## 245

### TARGETED THIRTY MINUTE MINI-THERMAGE IS EFFECTIVE FOR LOWER FACE AND NECK LAXITY

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**Background:** Radiofrequency treatment is effective for tightening of skin of the lower face and neck. Early work with this technology utilized a single pass at relatively high energies. Some authors have obtained similar cosmetic effects with multiple passes at lower energies. However, as the number of pulses has increased per treatment, so has the time it takes to complete the procedure.

**Study Design/Materials and Methods:** Ten patients with lower face and neck laxity were treated with the ThermaCool device. Treatment was limited to 300 pulses or 30 minutes (whichever came first) at settings of 60.5 to 63.0 (60–90 Joules) in multiple passes. Treatment was confined to the lower cheeks and jaw line.

**Results:** At six month's follow-up, blinded evaluation of pre and post-treatment photographs revealed improvement consistent with previous reports. Several patients reported mild to moderate discomfort during the procedure and transient erythema. No long-term complications were noted. Patients reported satisfaction with the cosmetic results of the limited procedure.

**Conclusions:** The findings support the efficacy of radiofrequency for skin tightening using multiple passes at relatively low energies. This technique may offer a more favorable side effect profile than single pass, high-energy protocols. Limiting treatment time and area allows the physician to target the area most in need of improvement, and offers time and cost savings to the patient and physician without sacrificing efficacy.

## 246

### EFFECT OF ADDITIONAL TREATMENT WITH THE 1540 nm ERBIUM:GLASS LASER FOR INFLAMMATORY FACIAL ACNE

**Melissa A. Bogle[1,2], Jeffrey S. Dover,[2] Kenneth A. Arndt,[2] and Serge Mordon[3]**

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*[3]INSERM Lille, France*

**Background and Objective:** Treatment of facial acne with the 1540 nm Erbium:Glass laser is effective and relatively painless. At six months follow-up, inflammatory lesions are reduced 79%. This study was performed to gather extended follow-up data and determine whether an additional treatment performed at 6 months can prolong the lesion-free period.

**Study Design/Materials and Methods:** A double arm study was performed on 6 patients who underwent treatment 6 months prior with an Erbium:Glass laser (Aramis, Quantel Medical, France). The treatments performed six months prior included 4 treatments at 2 week intervals (60 J/cm$^2$ over active lesions followed by 40 J/cm$^2$ over the full face). Three subjects received a fifth treatment at the same protocol as their original four treatments at the 6 month follow up visit, and three received no additional treatment. Final evaluation was 3 months later (9 months after completion of the initial 4 treatment sessions).

**Results:** A single treatment 6 months after the initial course of four held the reduction in lesion counts at 80% at 9 month follow-up, while patients without retreatment had a 72% reduction in lesion counts at 9 months. The procedure was well tolerated without side effects.

**Conclusion:** Additional treatment sessions with the 1540 nm Erbium:Glass laser prolong the lesion-free period and maintenance therapy should be included as a part of the treatment course.

## 247

### THERMAGE FOR THE TREATMENT OF FACIAL LAXITY: ASIAN EXPERIENCE WITH 412 CASES

**Dong-Hye Suh,[1] Ka-Yeun Chang,[1] Ho-Chan Son,[1] Ji-Ho Ryou,[1] Sang-Jun Lee,[1] and Kye-Yong Song[2]**

[1]*Seoul, Korea*

[2]*Anacli Clinic, College of Medicine, Chung-Ang University*

**Background and Objectives:** A radiofrequency device, ThermaCool TC system (Thermage) has stood in highlight for nonablative facial skin tightening. In this study, we present the clinical and histological results of Asian patients treated with the Thermage.

**Study Design/Materials and Methods:** 412 Asian patients with laxity of the middle and lower face were treated with the Thermage. All patients have received only thermage treatment. Patient ages ranged from 25 to 78 years(average of 51.7 years). Patients were evaluated for skin tightening at baseline and were followed for 12 months. 2 mm-sized skin biopsies and photographs were taken on 10 patients before and at 2 months.

**Results:** Clinically all patients showed an overall improvement in their appearances. In this study the patients experienced an average of 87% satisfaction. Histologically, after the treatment, newly formed dense collagen bundles were observed in upper dermis.

**Conclusions:** Thermage is an effective treatment to Asian patients. 2 months follow-up, histologic finding was well correlated with clinical change.

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### FRAXEL® LASER EFFECTIVE IN TREATMENT 0F ACNE SCARS

**Alexis Parker, Diana Rotenberg, Amanda Mitchell, Tina Dolan, and Denise Gonzalez**

*Lasair Aesthetic Health, PC, Denver, Colorado*

**Background and Objective:** Improving the appearance of acne scars remains a challenge. Traditional methods, $CO_2$ resurfacing and dermabrasion, often produce unsatisfactory improvement. Swelling, potential infection and prolonged erythema after laser resurfacing cause significant downtime and discomfort. The Fraxel® laser for non-ablative resurfacing produces minimal recovery time and significant rejuvenation of photodamaged and aging skin. We noted that this system might be beneficial for patients with acne scars.

**Study Design/Materials and Methods:** Fraxel® laser treatment was performed on 25 patients with acne scars. Patients treated in 2 to 3 week intervals. Average treatment density ranged from 1350 to 2300 microthermal zones. Patients treated an average of four times.

**Results:** Ratings for medical care averaged 8.0, on a scale of 1 to 10. Improvement was determined by independent evaluation of photographs.

**Results:** Patient satisfaction and independent observation of improvement all rated well above 50%. Photos show marked improvement of ice pick scars, filling of large saucer type scars, decreased inflammation, and overall improvement of texture and tone.

**Conclusions:** Fractional Photothermolysis offers improvement of all types of acne scarring and inflammation secondary to acne with a very low rate of side effects. With an aggressive postoperative protocol, downtime is limited. The majority of patients return to work and social activities in two to five days. This minimal "downtime" compared to traditional ablative resurfacing is highly desirable.

## 249

### FRACTIONAL RESURFACING OF ACNE SCARRING IN DARKER SKINNED PATIENTS

**Cynthia Weinstein, Robert Chu, and Rhett Bosnich**

*Doctor Skin Clinics, Melbourne, Australia*

**Background and Objectives:** Fractional laser resurfacing is a relatively new and effective modality for the treatment of acne scarring, and can be used effectively on darker skin types. This study was undertaken to determine effects of our treatment protocol for fractional resurfacing on patients with darker skin types and facial acne scarring.

**Study Design/Materials and Methods:** 29 patients with Fitzpatrick skin Types IV–V and facial acne scarring were included in the study. Fractional resurfacing was performed using a 1550 nm Fraxel SR laser system (Reliant Technologies) after the application of topical anaesthetic. A Zimmer air cooler was used during treatment. Scarred areas were initially treated with 8 passes (50% overlap) at 12 mJ/MTZ and 125 MTZ/cmsq, followed by a further 4–6 passes (50% overlap) at 16–20 mJ/MTZ and 125 MTZ/cmsq. A final total density of 2500–2750 MTZ/cmsq was achieved each treatment. All patients were commenced on Retinol 2 (Environ) immediately after treatment for a period of four weeks. Two to four treatments were performed at two to four week intervals. Improvement was determined by blinded evaluation of photographs taken before treatment and after the final treatment.

**Results:** Over 90% of patients achieved greater than 50% improvement in acne scars after 2–4 treatments. Treatment was well tolerated, and no significant complications or pigmentary changes were observed. Healing time was 2–4 days.

**Conclusion:** Fractional laser resurfacing of acneform scars in darker skin appears very safe and effective.

## 250

### FRACTIONAL RESURFACING OF ACNE SCARRING

**Cynthia Weinstein, Robert Chu, and Rhett Bosnich**

*Doctor Skin Clinics, Melbourne, Australia*

**Background and Objectives:** Fractional laser resurfacing is a relatively new and effective modality for the treatment of acne scarring, and can be used in all skin types. Usually five treatments are required to produce satisfactory results. This study was undertaken to determine the effects of our treatment protocol for fractional laser resurfacing on patients with facial acne scarring.
**Study Design/Materials and Methods:** 16 patients with Fitzpatrick skin Types I–III and facial acne scarring were included in the study. Fractional resurfacing was performed using a 1550 nm Fraxel SR laser system (Reliant Technologies) after application of topical anaesthetic. A Zimmer air cooler was used during treatment. Scarred areas were initially treated with 8 passes (50% overlap) at 12 mJ/MTZ and 125 MTZ/cmsq. Then a further 4–6 passes (50% overlap) were performed at 16–20 mJ/MTZ and 125 MTZ/cmsq. A final total density of 2500–2750 MTZ/cmsq was achieved each treatment. All patients were commenced on Retinol 2 (Environ) immediately after treatment for a period of four weeks. Two to four treatments were performed at two to four week intervals. Improvement was determined by blinded evaluation of photographs taken before treatment and after the final treatment.
**Results:** Over 90% of patients achieved greater than 50% improvement in acne scars after 2–4 treatments. Treatment was well tolerated, and no significant complications were observed. Healing time was 2–4 days.
**Conclusion:** Fractional resurfacing of acneform scars appears very safe and effective, with minimal downtime.

## 251

### FRACTIONAL PHOTOTHERMOLYSIS FOR TREATMENT OF POIKILODERMA OF CIVATTE

**Daniel S. Behroozan,[1] Adrienne S. Glaich,[2] Leonard H. Goldberg,[2] Tianhong Dai,[3] and Paul M. Friedman[2,4]**

[1]*David Geffen School of Medicine at UCLA, Los Angeles, CA*
[2]*DermSurgery Laser Center, Houston, TX*
[3]*Rice University, Houston, TX*
[4]*University of Texas Medical School, Houston, TX*

**Background and Objectives:** Poikiloderma of Civatte refers to skin changes resulting in hyper- and hypopigmentation, and telangiectasias. Several treatment modalities based on the theory of photothermolysis have been used to treat this condition, but complete clearing is difficult to achieve. To evaluate the safety and efficacy of fractional photothermolysis (1550-nm Fraxel SR™ laser) for the treatment of poikiloderma on the neck.
**Study Design/Materials and Methods:** Five patients with poikiloderma of Civatte on the neck received 2–4 successive treatments at 2–4 week intervals with the 1550-nm Fraxel SR™ laser. Treatments were done with an energy setting of 8–10 mJ/MTZ and a final density of 2000 MTZs/cm$^2$. Digital photographs were taken prior to each treatment and at 2 weeks and 2 months after the final treatment. Independent physician clinical assessments were performed.
**Results:** Independent physician clinical assessment 2 weeks after the final treatment with the Fraxel SR™ laser revealed significant clinical improvements in erythema, dyschromia and overall texture of treated skin in all patients. Each patient's degree of satisfaction paralleled the physician's assessment of improvement. Two-month follow-up revealed persistence of improvement.
**Conclusions:** Fractional photothermolysis is an effective and safe modality in the treatment of poikiloderma of Civatte. Side effects were limited to mild pain during treatment and mild post-treatment erythema and edema resolving within 24–48 hours.

## 252

### EVALUATION OF THE COMBINATION OF DIODE LASER (900 nm) WITH RADIOFREQUENCY (RF) ENERGIES IN TREATMENT OF PERIORAL WRINKLES

**Gerald Boey**

*Vancouver, Canada*

**Background and Objectives:** The combination of diode laser and RF energies is used for the treatment of mild to moderate facial rhytides and skin laxity. The objective of this study is to evaluate the Polaris WR™ (Syneron Inc, Yokneam, Israel) in the treatment of perioral wrinkles.
**Materials and Methods:** Twenty women (mean age 52.5 years, range 48–66; skin phototypes III–IV) with mild to moderate perioral rhytides corresponding to Fitzpatrick scale of 3 to 5 received 3 to 4 Polaris treatments using the fluencies of 35–45 J/cm$^2$ and 75–89 J/cm$^3$. Clinical results were evaluated three months after the last treatment. Digital photographs were used to assess the outcomes. Patients were asked to rate their improvement.
**Results:** All 20 patients completed treatments and showed some degree of clinical improvement at the end of the study. The mean investigator- and patient-evaluated improvements were 27.75% (10.2–45.3, 95% CI) and 37.35% (20.8%–53.9%, 95% CI), respectively. The average clinical improvement was rated at 21% by the investigator and 29% by patients. Adverse effects were mostly limited to transient erythema and pain during treatment ($n = 3$). One patient had a blister that healed within a few weeks. No patients experienced any downtime associated with their treatments.
**Conclusions:** The combination of diode laser (900 nm) and radiofrequency energies is safe and effective in treatment of perioral wrinkles. Further clinical work is needed to determine the optimal settings.

## 253

### PILI BIGEMINI AND TERMINAL HAIR GROWTH INDUCED BY LOW FLUENCE ALEXANDRITE LASER HAIR REMOVAL

**Iqbal A. Bukhari**

*Alkhobar, Saudi Arabia*

**Introduction:** at present, Ruby, Alexandrite, Nd: YAG and Diode lasers are used in hair removal and considered as an alternative option to waxing and electrolysis with few temporary complications such as erythema, oedema, epidermal crusting, blistering, hyperpigmentation and hypopigmentation. In this report we document an unusual increase in terminal hair growth after alexandrite laser hair removal in three female patients. The cases: Three arabian female patients with different Fitzpatrick skin types (ranging from II–V) presented to our dermatology clinic with an increase in hair density and thickness on the face and neck after undergoing alexandrite (755-nm, Candela Laser Corporation, Wayland, MA) laser hair removal therapy. Two patients were showing the sign of pili bigemini. Cases will be discussed in the session.

## 254

### EVALUATION OF SEBUM OUTPUT AFTER 1,450 nm DIODE LASER (SMOOTHBEAM™) TREATMENT

**Hans J Laubach,[1] Susanne Astner,[1] Dilip Y. Paithankar,[2] Joan Clifford Lipton,[2] and Dieter Manstein[1]**

[1]*Wellman Center for Photomedicine, Massachusetts General Hospital, Harvard Medical School, Boston, MA*
[2]*Candela Corporation, Wayland, MA*

**Background and Objective:** We investigated the effect of a 1,450 nm diode laser (Smoothbeam™) on facial sebum production.
**Materials and Methods:** Nine healthy volunteers without acne received a total of 3 treatments on two well-demarcated test areas on the left or right forehead and nose. The other side of the face was used as control. Nine subjects completed the treatment regimen and were available for follow up. Sebum output measurements with two different devices were done prior to the first treatment, 1 week, and 1 month after the last treatment. Additionally, clinical photographs were taken and patients were asked to complete a questionnaire at the 1 week and 1 month follow up visit.
**Results:** There was no statistically significant change in sebum output when treatment sites and control sites were compared with each other. 6 out of 9 subjects reported no improvement in the overall appearance of the treatment sites and 8 out of 9 subject reported no change in pore size. Only one subject reported a decrease in oiliness of the skin. We observed a significant increase of sebum production at the follow-ups compared to baseline for both the treatment and control sides. This is most likely due to external factors like seasonal changes.
**Conclusions:** A treatment series with a 1,450 nm diode laser does not affect the facial sebum production significantly. The reported clinical improvement of acne after the treatment is most likely due to other mechanisms such as possible effects on inflammatory pathways, keratinocyte proliferation or reduction of *P. acnes*.

## 255

### NON-ABLATIVE FRACTIONAL PHOTOTHERMOLYSIS WITH NEAR INFRARED LAMP

**Hans J. Laubach,[1] James Childs,[2] Gregory Altshuler,[2] Andrei Erofeev,[2] Ilya Yaroslavsky,[2] and Dieter Manstein[1]**

[1]*Wellman Center for Photomedicine, Harvard Medical School, Boston, MA*
[2]*Palomar Medical Inc, Burlington, MA*

**Background and Objective:** Using a newly developed near infrared lamp device (LuxIR prototype, Palomar Medical, Burlington, MA) that provides a spatially non-uniform light distribution, we investigated the possibility of simultaneously generating multiple, spatially-confined thermal lesions without epidermal damage.
**Materials and Methods:** Post mortem procured human skin samples were exposed to the LuxIR prototype. This device employs a near infrared halogen lamp (adjusted emission spectrum 850–2300 μm) with skin surface cooling and a patterned optical window. The window includes a dielectric mirror mask with an array of 21 apertures, allowing for a patterned irradiation profile. Various exposure parameters were tested in combination with different cooling periods. Thermal damage was assessed by NBTC staining.
**Results:** We demonstrated individual, separated thermal lesions with complete loss of NBTC staining with epidermal sparing. The lesions were elliptically shaped with a the maximum diameter axis parallel to the skin surface measuring approximately 2 mm and a center depth of 1.5 mm. The preferred range of fluences to create such lesions was approximately between 60 and 100 J/cm$^2$, 2–4 seconds exposure time in combination with pre-, parallel and post cooling. Longer exposure times resulted in confluent thermal damage.
**Conclusions:** A broadband near infrared lamp, in combination with a patterned irradiation profile and surface cooling is capable of providing non-ablative fractional photothermolysis.

## 256

### TREATMENT OF NON-FACIAL PHOTOREJUVENATION WITH PHOTOPNEUMATIC THERAPY

**Camilia Miranda and Vic A. Narurkar**

*Bay Area Laser Institute, UC Davis Medical School, San Francisco, CA*

**Background/Objectives:** Traditional treatment of non facial skin with lasers and light sources has been limited by speed, spot size, fluence and complications such as honeycombing, patchiness and scarring. We report the use of photopneumatic therapy to successfully treat large areas of photodamaged skin of the neck, chest and extremities.
**Study Design:** Thirty patients of skin types I–IV with photodamage of the neck, chest and extremities were treated with an Aesthera PPx device using high pneumatic energy and variable power settings based on skin type and extent of photodamage. Treatments were performed at 4 week intervals and patients were followed for one year.
**Results:** Significant clearance of nonfacial photodamage was accomplisdhed after four treatments with a mean clearance of 52%. Average treatment times for neck and chest was seven minutes, extremities was twelve minutes. No topical anesthesia was required. There were no adverse effects and skip areas of treatments. In addition, textural improvement was noted both on subjective and objective scales as measured by photography and Visia analysis.
**Conclusions:** Photopneumatic therapy provides a rapid method for treating non facial photodamaged skin with speed, lack of anesthesia and lack of striping, honeycombing, skip areas and adverse events. Additional studies are being conducted to study long term clearance rates.

## 257

### COMPARISON OF DIFFERENT LIGHT SOURCES FOR ACTIVATION OF 5 AMINOLEVULANIC ACID

**Camilia Miranda and Vic A. Narurkar**

*Bay Area Laser Institute, San Francisco, CA*

**Background and Objectives:** A variety of light sources have been reported to activate 5 amino levulanic acid but a systematic study of the effectiveness of activation and its clinical impact has never been undertaken. We performed a retrospective study of activation of 5 aminolevulanic acid by blue light, pulsed dye laser, pulsed KTP laser, intense pulsed light and 590 nm LED.
**Study Design:** Ten patients were randomly analyzed from each group of devices (420 nm Blue light, PDL,KTP,IPL and 590 nm LED) for a total of 50 patients. Incubation times varied from 30 minutes for 420 nm blue light to 60 minutes for other sources. Indications for activation included acne and photorejuvenation. Analysis was based on effect of activation, clinical results and long term follow ups for one year.
**Results:** The best activating light source for 5 amino levulanic acid was blue light, followed respectively by IPL, PDL,590 nm LED and KTP. Acne clearance was greatest with 5 aminolevulanic acid and blue light, modest with IPL and minimal with PDL, KTP and 590 nm LED. Photorejuvenation was greatest with combined IPL/420 nm blue, highly effective with IPL and minimal with 420 nm blue, PDL,KTP and 590 nm LED. Average c.
**Conclusions:** The best activating agent for levulanic acid is 420 nm light. Clinically, the best results for acne were achieved with 420 nm light and for photorejuvenation with combined 420 nm light and IPL. Other light sources are minimally effective clinically.

## 258

### A REVIEW OF THE LASER TREATMENT OF CONGENITAL PIGMENTED NEVI

**H. Shinohara, M. Miyasaka, H. Taira, K. Ichikawa, and R. Tanino**

*Tokai University School of Medicine, Kanagawa, Japan*

**Background and Objectives:** We treated patients with Congenital Pigmented Nevi using laser therapy (Normal pulse ruby laser(Toshiba Co.), Q-switch ruby laser(Spectrum Co.)and Ultrapulse CO2 laser(Coherent Co)). The purpose of this study is to review these cases.
**Study Design/Materials and Methods:** We performed a retrospective study of 82 patients who were followed in our clinic for at least one year during the years of 1980 to 2004. We evaluate the laser therapeutic effect.
**Results:** Normal pulse ruby laser 58 patients(1980∼1989) Excellent:7, Good:11, Fair:21, Poor:17, Q-switch ruby laser 14 patients (1994∼2004) Excellent:4, Good:6, Fair:1, Poor:3, Ultrapulse CO2 laser + Q-switch ruby laser 5 patients (1998∼2004)Excellent:2, Good: 2, Fair:1, Normal pulse ruby laser + Q-switch ruby laser 5 patients (1998∼2004) Excellent: 1, Good:3,Fair:2.
**Conclusions:** Sometimes surgical resection may cause functional disorder or scaring, therefore we should consider laser therapy for Congenital Pigmented Nevus. Laser therapy exerts its therapeutic effects in patients with superficial type Congenital Pigmented Nevus, and combined therapy with a normal pulsed ruby laser and Q-switched ruby laser was more effective. Laser therapy was not seemed to be the indication for patients with hypertrophic-type giant pigmented nevus with satellite lesions.

## 259

### CLINICAL EVALUATION OF THE PULSED Nd:YAG LASER FOR LIPOLYSIS

**Seungho Chang, Mikyung Cho, and Bangsoon Kim**

*S&U Dermatological Clinic, Seoul, Korea*

**Background and Objective:** Laser lipolysis with 1064 nm Nd:YAG laser, widely used in Latin America and Europe, has recently been introduced in Korea. We report a clinical study of the effects of the laser on local obesity.
**Study Design/Materials and Methods:** Fifty patients with unwanted fat were included in this study. The 1064 nm laser at 40 Hz and 150 mJ and 1100 microsecond pulse was shot through an optic fiber inserted in the 1 mm diameter cannula. All patients had been photographed and measured by plicometry at baseline, 1month, and 3 month follow up visits.
**Results:** Patients treated with laser lipolysis were showed variable improvement according to treatment area and/or total energy. This was documented through photographs and plicometry measurements. Any side effects was not showed in all patients.
**Conclusion:** Laser lipolysis is a safe and effective treatment for small quantities of local obesity. But laser lipolysis can't replace surgical liposuction for fat excess of larger area.

## 260

### DEFINING GENITAL HYPERVASCULARITY AND DYSESTHESIA (GHD) AND SUCCESSFUL TREATMENT WITH PULSED-DYE LASER

**Jennifer Krejci-Manwaring, Mark McCune, and Daniel Hurwitz**

*University of Kansas School of Medicine, Kansas City, KS*

**Background and Objective:** Subsets of vulvodynia such as Vulvar Vestibulitis Syndrome and Dysesthetic Vulvodynia are difficult to define and have of elusive etiology. They cause considerable physical and psychological impairment due to disabling symptoms and lack of successful treatments. We report 15 years of clinical experience identifying and treating this disorder with the Pulsed-Dye Laser.
**Materials and Methods:** A retrospective cohort analysis of 14 women who were referred to a private dermatology clinic for treatment of Vestibulitis or Dysesthetic Vulvodynia between 1990 and 2005.
**Results:** Patients were pre- and post-menopausal. All patients received multiple unsuccessful treatments prior to referral including oral antimicrobials, antidepressants, and various topical therapies including antimicrobials, anesthetics, and corticosteroids, and surgical intervention. All patients had improvement in symptoms, i.e. pain, redness, and daily function.
**Conclusion:** We suggest Genital Hypervascularity and Dysesthesia (GHD) as a new nomenclature because it marries the potential pathology with symptomatology. This disorder is not limited to the vulva but often extends to the perineum and perianal area and we consider it analogous to scrotodynia, which we have also successfully treated with the Pulsed-Dye Laser. Though erythema is not uniformly present, improvement with a blood vessel targeting laser lends support that hypervascularity may play a role in the underlying pathology. Furthermore, it suggests that neither are primarily a psychologic entity.

## 261

### INSTRINSIC FLUORESCENCE CHANGES ASSOCIATED WITH CISPLATIN-INDUCED APOPTOSIS OF HUMAN EPITHELIAL KERATINOCYTES

**Jonathan Levitt,[1] Joanna Xylas,[1] Amy Baldwin,[2] Karl Münger,[2] and Irene Gerogakoudi[1]**

*[1]Department of Biomedical Engineering, Tufts University*
*[2]Department of Pathology, Harvard Medical School*

**Background and Objective:** The goal of this study was to determine whether detectable changes take place in the endogenous fluorescence of human epithelial keratinocytes associated with apoptosis. As apoptotic abnormalities are often present during the early stages of cancer development, non-invasive optical detection modalities may prove useful in early cancer formations. We are particularly interested in the detection of pre-cancerous changes in the uterine cervix and performed our studies using human epithelial keratinocyte monolayer cultures.
**Study Design/Materials and Methods:** Cells were treated with a standard apoptosis-inducing agent or the vehicle and their autofluorescence was imaged using a microscope at different time-points following the onset of treatment. Specifically, we observed the autoflourescence patterns of NAD(P)H (360 nm excitation/450 nm emission) and FAD (460 nm excitation/520 nm emission), two enzymes involved in oxidative phosphorilation primarily localized in the mitochondria. Cells were stained with Hoechst to assess nuclear fragmentation then fixed and labeled using fluorescently tagged Apoptosis Inducing Factor (AIF), a protein that translocates from mitochondria to the nucleus to initiate fragmentation during apoptosis.
**Results:** We found reproducible perinuclear NAD(P)H and FAD fluorescence patterns correlating with the progression of apoptosis. We also detect a strong perinuclear AIF translocation at 9-hours after onset of treatment. However at later time-points the AIF perinuclear localization is not as prominent possibly because it is predominantly in the nucleus.
**Conclusion:** Our studies demonstrate that distinct changes in the cellular autofluorescence patterns can be correlated to early apoptotic stages of cell death.

## 262

### FRACTIONAL PHOTOTHERMOLYSIS IN THE TREATMENT OF MELASMA AND ACNE SCARS

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**Background:** The ablative devices $CO^2$ laser and Erbium YAG laser have been the gold standard in the treatment of acne scars. However long time recovery, persistent erythema and colateral effects are restrictive to most patients. The non ablative laser proceduces are practical and safe, but have been modest in the treatment of acne scars. Melasma can be difficult to treat and many laser devices are restrictive, because of potential adverse effects, including epidermal necrosis, postinflammatory hyperpigmentation and hypertrophic scars. The new laser tecnology as Fractional Photothermolysis ( FP), is a novel 1550 nm fiber based laser system, that creates localized microscopic areas of thermolysis ( MT2). Studies indicate that FP can safely and quickly helps to improve acne scars and melasma.
**Material and Methods:** We report the use of FP to treat 50 patients with acne scars and melasma. The procedure was performed in face. For acne scars patients received 5 ( five ) treatments administered at 2 to 3 weeks interval, using energy setting of 8 MJ and density of 250 MT2/$cm^2$ per pass ( 8 passes ). For melasma patients received 4( four ) treatments administered at 1 to 3 weeks interval, using energy setting of to 3 weeks interval using energy setting of 6 MJ and density of 125 MT2/$cm^2$ per pass ( 6 passes ). Response was assessed with patient questionaire and digital photography.
**Results:** The digital photography analyse and patient questionnaire demonstrated 65% of patients with excelent results, 20% of good results and 15% with regular results.
**Conclusion:** Nowadays patients wants results but no downtime recovery and less risks. The FP causes a minimal thermical damage at epidermis and dermis, time recovery is quick and easy and results are significant.

## 263

### RISKS AND COMPLICATIONS OF PLASMA SKIN RESURFACING: A LONGITUDINAL CASE SERIES

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**Background and Objective:** Plasma skin resurfacing (PSR) comprises a novel approach to skin rejuvenation. The device converts a stream of nitrogen into a plasma of ionised gas and heat, allowing controlled ablation of tissue.
**Study Design/Materials and Methods:** Ten patients were treated with PSR from August 2004 to August 2005. Patients were seen in follow up at 3 days, 1 and 4 weeks, and every two to three months thereafter. Patients were evaluated for the degree of pain, drainage, crusting, erythema, scarring, and pigmentary abnormalities.
**Results:** Most patients underwent treatment to the periocular and perioral areas. Three patients underwent full face PSR. Fluences ranged from 3.5 J to 4 J, with 1 or 2 passes depending on the area treated. The majority of patients treated were pleased with the outcome of the procedure, although most also expressed a desire for additional improvement. Of 4 patients who had had prior $CO_2$ resurfacing, 1 found PSR much less effective, 2 found it somewhat less effective, and 1 found it comparable. Duration of residual post-procedure erythema ranged from 3 weeks to 3 months. Focal mild scarring was noted on follow-up in 4 patients (40%), in one case resulting in a slight ectropion. These were successfully managed with intralesional steroid injections. Pigmentary changes were noted in 1 patient (10%), comprising discrete areas of hyperpigmentation.
**Conclusion:** PSR may, at high fluences, achieve outcomes approaching $CO_2$ resurfacing in some cases. Practitioners, however, should be aware that the incidence of prolongued erythema, scarring, and pigmentary changes may be comparable to $CO_2$ laser results.

## 264

### OBJECTIVE EVALUATION OF THE EFFECT OF NON-ABLATIVE SKIN TIGHTENING WITH A BROAD BAND INFRARED LIGHT DEVICE

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*Tokyo Women's Medical University Aoyama Women's Medicine, Tokyo, Japan*

**Background and Objectives:** The efficacy and safety of the broad-band infrared light device was evaluated its safety, efficacy in skin tightening and analyzed with 3D.
**Study design/Materials and Methods:** 21 female with Fitzpatrick skin types III-IV enrolled in the study. Patients received three treatments at three-week intervals with the Titan® (Cutera,USA) in cheek or full-face with fluences of 32–38 J/$cm^2$. Clinical evaluations were done before and three months after three treatments subjectively by patients, objectively by physician, and by 3D analysis with Primos® (PRIMOS, Germany) analyzing Ra, Rz and parameters.
**Results:** Improvement of skin tightening was evaluated 20 of 21 cases by patients and 19 of 21 by physicians. 18 cases showed improvement in skin roughness objectively verified with 3D analysis in all parameters with statistical significance. Patients' evaluation was slightly higher than physicians' evaluation in skin tightening. In contrast, patients and physician evaluations were almost the same for skin roughness. Mild erythema and edema occurred in seven points and deep dermal burn was seen in one out of 1064 shots.
**Conclusions:** Non-ablative skin tightening and textural improvement by Titan was evaluated as safe and effective. Interestingly, patient satisfaction was a little higher than physicians' evaluation in skin tightening.

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### HISTOLOGICAL AND QUANTITATIVE EVALUATION OF THE EFFECT OF NON-ABLATIVE SKIN TIGHTENING WITH A RADIOFREQUENCY DEVICE

**Kei Negishi,[1] Toshihiko Hibino,[2] Chika Katagiri,[2] Ritsuko Ehama,[2] and Shingo Wakamatsu[1]**

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*[2]Shiseido Research Center, Yokohama, Japan*

**Background and Objectives:** In order to evaluate the effect of skin rejuvenation, changes of elastin fibers and collagen synthesis were investigated.
**Study design/Materials and Methods:** Six females with skin types III-IV were received full-face single pass treatment with the ThemaCool (Thermage) at the levels of 12.5–14.5. Clinical evaluation was performed after one, three, and six months post-treatment. Skin biopsy samples were obtained at each visit, and processed for immunostaining of elastin, in situ hybridization of human collagen I, and Sirius red staining method for semi-quantitative analysis of collagen.
**Results:** The intensity of elastin staining increased in all cases, and peaked at one or three months after the treatment. Semi-quantitative analysis of collagen showed that the amount of collagen increased after one month and maintained its level in four cases with statistical significance. In situ hybridization analysis demonstrated that the number of cells expressing collagen type I was significantly higher at one to three months in the former four cases but slightly less at six months in the latter two cases. These changes were correlated well with clinical appearance.
**Conclusions:** This study showed that the radiofrequency treatment induces de novo syntheses of collagen and elastin within one month, and it remains at least for six months of post-treatment.

## 266

### NON-INVASIVE OBSERVATION OF EPIDERMAL PIGMENT REMOVAL WITH INTENSE PULSED LIGHT

**Kei Negishi,[1] Toyonobu Yamashita,[2] Takeshi Hariya,[2] Kaori Ikuta,[2] and Shingo Wakamatsu[1]**

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*†Shiseido Research Center, Yokohama, Japan*

**Background and Objectives:** The efficacy of intense pulsed light (IPL) in pigment removal is well known. However, its mechanism is not completely understood.
**Study design/Materials and Methods:** Three subjects, skin types III to IV, with epidermal pigment maculae on their cheek were enrolled in this study. All lesions were treated with 560–1200 nm filter of IPL (QuntumSR, Lumenis). Epidermal change was observed using reflectance mode confocal microscopy (RCM) and optical coherence tomography (OCT) for 20 days. Superficially extruding microcrust was examined by transmission electron microscopy (TEM).
**Results:** All lesions showed clinical improvement. The images of RCM and OCT showed that melanosomes in basal layer migrated on day two, moved to surface and extruded on day five. TEM images of peeled crust include a relatively normal shaped numerous melanosomes which were not ruptured as previously reported by Q switched laser. RCM images on day nine showed activated melanocytes on basal layer.
**Conclusions:** This study clearly demonstrated the effectiveness of melanin removal by IPL treatment. This study also indicates and confirms the definitive topical usage of melanin production preventatives, e.g. application of hydroquinone immediately after the crust might leads better clinical outcome.

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### ULTRASTRUCTURAL CHANGES WERE ALSO ASSESSED WITH TRANSMISSION ELECTRON MICROSCOPY (TEM)

**Tokuya Omi, Shigeru Sato, Raleigh W. Hankins, Seiji Kawana, and Kayoko Numano**

*Queen's Square Medical Center, Yokohama, Japan, Central Institute for Electron Microscopic Research, Nippon Medical School, Tokyo, Japan, Third Diagnosis Division, Health Sciences Research Institute, Kanagawa, Japan*

**Background and aims:** Red light phototherapy with laser sources has been successfully used for a number of indications. A new generation of quasi-monochromatic 633 nm light-emitting diode (LED) systems is now getting good results in the same indications, but few studies have examined changes in visible red light irradiated *in vivo* skin. This *in vivo* study was thus designed to examine changes in ultrastructural level and immunological level induced in normal human skin by visible red LED energy.
**Subjects and methods:** 10 adult male volunteers (35–48 years old) who satisfied all study criteria had the skin over the medial fibula irradiated once per week for 8 weeks with a visible red ($633 \pm 3$ nm) LED-based system, irradiance 105 mW/cm$^2$, 15 min/session, radiant flux of 94 J/cm$^2$. Skin punch biopsies taken from each subject after the second and eighth treatment sessions were routinely prepared for transmission electron microscopy (TEM) and were examined under an electron microscope. Skin biopsies were also taken after the eighth treatment session and cultures were prepared to assay the type and quantity of skin homing T-cells using qualitative and quantitative PCR techniques.
**Results:** TEM revealed the increase of vimentin filaments in fibroblasts and mild inflammatory change in interstitial dermais. Qualitative PCR showed the presence of both Th-1 and Th-2 T-cells, and quantitative PCR showed an increase in the numbers of both types of skin-homing T-cell, much more so for Th-2 than for Th-1.
**Conclusions:** Visible red LED irradiation appeared to activate the skin in immunological and morphologically level.

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### HAIR DISTRIBUTION PATTERN WITH RELEVANCE FOR OPTICAL HAIR REMOVAL

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**Background and Objective:** The modeling of light tissue interaction during photo-epilation typically considers individual hair follicles. The temperature field for hair follicles located closely relative to each other (hair pairs) is distorted and results in enhanced interfollicular thermal damage. Therefore it is important to know the distribution of the distance of hairs relative to each other. Standard hair counts reveal only the average hair density and do not serve this purpose.
**Materials and Methods:** 8 adult subjects (6 male and 2 female) of skin type II, III and IV provided high-resolution (1200 dpi) color images of test sites ($3 \times 3$ cm$^2$) from both thighs two weeks after hair clipping. The images were magnified 5 X and manually evaluated to determine for each hair the minimal distance to an adjacent hair.
**Results:** The minimal distance between adjacent hairs was not randomly distributed. It could be approximated for each volunteer by two distinct Gaussian distributions representing hair pairs and individual hairs. The mean hair distance was for hair pairs approximately 400 μm and for individual hairs 2600 μm. The percentage of hairs arranged as pairs was in average close to 50%, with marked variation between different subjects but minimal variation for the corresponding sites of same subjects.
**Conclusion:** We determined the distribution of the distance of hairs relative to each other in a representative study sample. A relative high percentage of hairs was arranged closely to each other. This has to be considered for selection of exposure parameters and modeling of optical hair removal procedures.

## 269

### CLINICAL EXPERIENCE OF THE USE OF A NEW RADIOFREQUENCY DEVICE FOR THE TREATMENT OF LOCAL FAT, CELLULITE AND SKIN TIGHTENING

**Fernanda H. Sakamoto, Juliana M. Macéa, Milka Y. Kawashita, Luis A. Torezan, and Nuno E. S. Osorio**

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**Background and Objectives:** New technology devices have been developed for different indications including local fat reduction, skin tightening and cellulite. Radiofrequency (RF) based treatments have been suggested to show efficacy by different companies. We describe our 6-month experience with the new RF Accent®—Orion Lasers, using the treatment protocol and energy suggested by the company.
**Study Design/Materials and Methods:** 10 female subjects presenting for treatment of local fat (8), cellulite (1) or skin laxity (1) received 4 to 8 treatments given every 7 to 15 days. All patients maintained their normal lifestyle and diet. Circumference of the areas treated were measured. Patients and physicians also graded the level of improvement based on pre and post-treatment photographs and personal opinion (grade 0 to 4).
**Results:** All patients with fat and cellulite rated slight improvement; 6 of these 9 patients also showed some level of weight loss. One patient gained weight. For skin tightening there was no response. 60% of the patients showed a slight reduction (0.5–3 cm) of circumference after treatment.
**Conclusions:** RF treatment produced little or no improvement in this small group of patients. New protocols should be encouraged to provide better results.

## 270

### BRAZILIAN EXPERIENCE IN THE USE OF THE FRAXEL® LASER FOR THE TREATMENT OF FACIAL MELASMA

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**Background and Objectives:** Melasma is a multifactorial condition resulting in facial hyperpigmentation. Laser and non-laser devices such as IPLs show controversial results for melasma treatment. The objective was to study the safety and efficacy of the use of the Fraxel Laser®—Reliant Technologies Inc. for melasma treatment.
**Study Design/Materials and Methods:** 30 Fitzpatrick skin type III–IV subjects with melasma refractory to bleaching agents were treated with the 15 mm tip, set to 250 microthermal zones (MTZ), energy 7–8 mJ, (total energy from 3.2 to 5.7 kJ). Different areas were successively treated with one pass, then retreated to reach an end point of~3000 MTZ. Patients received 3 to 4 treatments every 3 to 4 weeks. Patients and physicians not involved with the study graded the level of improvement based on pre and post-treatment photographs and personal examination.
**Results:** Two patients (7%) discontinued the treatment due to pain. Twenty-eight (93%) patients showed considerable improvement since the first treatment. Patients obtained 40 to 80% clearance of the melasma. No hyperpigmentation was found after the treatment. Patients showed high level of satisfaction.
**Conclusions:** Use of the Fraxel® laser is a safe and effective noninvasive treatment for recalcitrant melasma. Treatment is moderately to strongly painful. Long-term follow-up is required to determine persistence of these good results.

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### TREATMENT OF VARIOUS TYPES OF SCAR USING MULTIHOLE METHOD (COMBINATION OF FRAXEL LASER AND MICRONEEDLE THERAPY)

**Ho-Chan Son, Ka-yeun Chang, Dong-hye Suh, and Ji-Ho Rhue Kye-Yong Song**

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There are lots of types of scar including burn scar, varicella scar, acne scar and so on. Its treatment, however, doesn't seem to be easy and usually takes a long time. We evaluated the efficacy and safety after combination treatment of Fractional resurfacing laser (Fraxel laser, Reliant Tech, CA) and Microneedle therapy system (Dermaroller, Horst Liebl, Germany) both methods for the treatment of various scars. Fourty eight subjects were enrolled. The patients were treated as a series of 4 sessions spaced at 3–4 week intervals. After classifying according to type of scar, the effectiveness was evaluated on four grades by clinical photograph at baseline each treatment session and 2 month after last treatment and questionnaire for subjective satisfaction degrees was performed. And we took a biopsy with some patients. Patients satisfaction rate was found to be moderate to high. 37 subjects (78%) answered as 'satisfied', and 18 of 28 burn scar subjecs answered as 'very satisfied'. The Combination treatment with Fraxel laser and DermaRoller is thought to be a safe and effective treatment modality for various types of scar and we think further study is needed in future. scar.

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### TREATMENT OF ACNE SCARS WITH FRAXEL LASER

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Fractional resurfacing laser(Fraxel laser, Reliant Tech, CA) and Microneedle therapy system (Dermaroller, Horst Liebl, Germany) are the novel concept in skin rejuvenation which has been shown to stimulate dermal collagen remodeling, thereby improving acne scar. We evaluated the efficacy and safety after combination treatment of both methods for the treatment of atrophic acne scar. Twenty four subjects with moderate to severe acne scars were enrolled. The patients were treated as a series of 4 sessions spaced at 3–4 week intervals. The effectiveness was evaluated on four grades by clinical photograph at baseline each treatment session and 2 month after last treatment and questionnaire for subjective satisfaction degrees was performed. In photographic assessment, 20 subjects (83%) and 18 subjects (75%) were improved more than 50% and 75% respectively. Patients satisfaction rate was found to be moderate to high and 22 subjects (91%) answered high. Biopsy specimens showed remodeling and deposition of new organized collagen. Side effects were transient erythema, edema, and hyperpigmentation. The Combination treatment with Fraxel laser and DermaRoller is thought to be a safe and effective treatment modality for acne scars

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### MULTI-SPECTRAL IMAGING SYSTEM FOR EVALUATION OF LASER TREATMENTS IN DERMATOLOGY

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**Background and Objectives:** To assess the efficacy of treatments of skin disorders by e.g. lasers, an imaging system has been developed capable of making reproducible multi-spectral images over time.
**Study Design:** The multi-spectral imaging system consists of a 12 bit camera with close up optics, a high speed tunable spectral filter and a high power LED illumination source. An image of the area of interest can be reproduced over long time spans between treatments. After manual alignment, dedicated software corrects for motion and deformation of the skin using an elastic spline image registration algorithm.
**Results:** Feasibility tests were performed in the outpatient clinic of dermatology showing that images can be reproduced with sufficient detail to track changes in vasculature, pigmentation, skin pores and scars as a function of skin treatments or progression of skin diseases in time. However, the interpretation of the additional spectral and spatial information from various tissue depths provided by the images needs additional expertise from the clinicians. The multi-spectral information could reveal skin diseases at early stage or differentiate abnormal from normal skin.
**Conclusions:** The multi-spectral imaging system in combination with dedicated imaging software shows to be a useful tool in the field of dermatology to diagnose skin disease and for follow-up and evaluation of various treatment modalities.

## 274

### MODELING THERMAL RESPONSE OF SKIN TO 2000 nm LASER IRRADIATION

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**Background and Objective:** We seek to make a mathematical model to precisely predict temperature and damage in skin for 2000 nm laser irradiation. The model supported by experimental validation permitted evaluation of a wider range of exposure parameters and study of key factors associated with thermal injury.

**Study Design/Materials and Methods:** Basic to the model was the use of finite element technique for computing transient temperatures. The model simulated the laser induced temperature distribution and predicted the occurrence of damage with a rate process model. The extent of damage of the surface was evaluated by visual inspection and the over all volume of damage was determined histologically.

**Results:** The model predictions of temperature on skin surface generated by laser irradiation of various powers and exposure durations were compared to experimental measurements. The validated model was used to predict the temperature distribution as well as thermal induced lesion in the skin. Qualitative and quantitative histopathologic study of skin damage was performed to determine the mechanisms of laser induced damage in the skin and map the extent and severity of the lesions for comparisons with the laser irradiation and the temperature predicted by thermal model.

**Conclusions:** The model was quite accurate for predicting skin temperature and damage for 2000 nm laser irradiation. Validation of the model provided a system for predicting thermal response of skin to laser irradiation and evaluating laser safety standard at 2000 nm wavelength.

## 275

### ENDOGENOUS FLUOROPHORES RESPONSIBLE FOR AUTOFLUORESCENCE PROPERTIES OF STEATOTIC LIVER

**AnnaCleta Croce,[1] Isabel Freitas,[1] Mariapia Vairetti,[2] Umberto Cillo,[3] and Giovanni Bottiroli[1]**

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**Background/Objective:** A real-time diagnosis of fat accumulation in liver has at present great importance to direct the choice of acceptable marginal livers in relation with the rising demand of organs for transplantation. Previous preliminary studies showed the dependence of autofluorescence parameters (signal amplitude and spectral shape response to irradiation) on liver steatosis degree. Aim of this work is to define the endogenous fluorophores responsible of this behaviour.

**Study design:** Unfixed liver biopsy samples, preserved at −80°C and thawed immediately before use, were analysed both as bulk tissue specimens, via fiber-optic probe, and as tissue sections. Serial cryostatic sections were submitted to: microspectrofluorometry and image analysis (exc.366 nm), histochemical characterization, H&E staining for diagnosis. The contribution of the single fluorophores to the whole spectral emission was estimated by means of fitting analysis procedures.

**Results:** The main fluorophores participating to the whole spectral emission (NAD(P)H (bound/free), flavins, fatty acid, lipopigments, vitamin A) exhibited variability in their contribution in the different cases considered. Vitamin A showed an increase in its contribution both in lipid droplets and in the apparently normal parenchima of steatotic livers, and underwent the faster and greater decrease upon irradiation.

**Conclusions:** Because of its photophysical and chemico-physical properties, vitamin A is the endogenous fluorophore mainly responsible for the fluorescence behaviour of steatotic liver.

## 276

### EVALUATION OF THE BIOLOGICAL EFFECTS OF COMBINED LIGHT/RADIO FREQUENCY ON INTACT HUMAN SKIN EX-VIVO

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**Background and Objectives:** Combined light/radio frequency (RF) is used for multiple cosmetic applications with great success. We here use human skin grafted to the chorioallantoic membrane (CAM) of chick embryos to investigate effects of this combined treatment on human skin.

**Study Design/Materials and Methods** Skin from mastectomies (obtained within 2 hours of surgery) was exposed to combined RF/light or only RF or light and cut into multiple samples. Controls were untreated skin, and ungrafted skin that was immediately prepared for histology. Chick eggs of 9–11 days incubation were opened and pieces of skin were placed on the CAM and the eggs were then sealed and returned to the incubator for four days. The skin was then removed from the eggs and prepared for histology. Sections were stained with conventional pathological stains and antibodies for examining normal histology and the presence of collagen fibers, elastin fibers, myofibroblasts, blood vessels and proliferating cells.

**Results:** Histological evaluation shows that none of the treatments produced marked damage to the skin. We are now performing computerized morphometric analysis of sections for specific cellular and molecular characteristics.

**Conclusion:** Grafting of human skin on the chick CAM is a potentially an inexpensive and simple method to study the effect of combined electromagnetic radiation on multiple biological characteristics of human skin.

## 277

### ULTRASTRUCTURAL EVALUATION OF SKIN AFTER TREATMENT WITH THE POLARIS WR (SYNERON MEDICAL LTD., YOKNEAM, ISRAEL)

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**Background and Objective:** Non-ablative rejuvination devices are systems that deliver energy to the dermis in order to promote dermal collagen production and tissue contraction. The gold standard treatment device employs a mono-polar radiofrequency electrode to induce a deep thermal injury to the skin. This study will examine the ultrastructural changes in collagen using a combination bipolar RF electrode in conjunction with an infrared diode laser.
**Study Design/Materials and Methods:** One subject was consented and treated in the abdominal region with the Polaris WR device (Syneron Medical Ltd., Yokneam, Israel) using 1, 3 or 5 pulses at setting 32/90. Biopsies from each treatment region and a control biopsy were taken immediately post treatment for electron microscopic examination of the 0–1 mm and 1–2 mm levels. Sections of tissue 0.5 mm × 0.5 mm × 80 nm were examined with an RCA EMU-4 Tranmission Electron Microscope. Samples from each 1 mm depth were examined by two blinded observers and the morphology and degree of collagen change as compared to the control tissue was documented.
**Results:** Ultrastructural examination of tissue showed increased amount of collagen fibril changes with increasing passes. The changes seen after single passes showed an accumulation of partially denatured collagen. Five passes caused areas of collagen to become completely denatured.
**Conclusion:** This ultrastructural study of the Polaris WR (Syneron Medical Ltd., Yokneam, Israel) treated human skin shows changes in collagen fibril morphology with an increased effect demonstrated in the dermis with multiple passes. The thermal injury that result in the ultrastructural changes seen in the dermal layer appears to alter the architecture of the treated skin.

## 278

### THE ROLE OF BIPOLAR RADIO FREQUENCY, PULSATILE SUCTION AND INFRARED ENERGY IN THE TREATMENT OF ATROPHIC STRIATUM

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**Background and Objectives:** Atrophic Striatum remains a challenging clinical problem in aesthetic medicine. The Vela Smooth device (Syneron, Israel) is used to improve the appearance of cellulite. This retrospective study evaluates the safety and efficacy of a bipolar radiofrequency, pulsatile suction and infrared energy for treatment of stretch marks.
**Study Design/Materials and Methods:** 16 subjects with the presence of atrophic striatum on their postpartum abdomens and thighs were treated twice weekly for up to 8 weeks until the end point of erythema and radiant heat had been achieved. In addition to the investigator evaluation, subjects were asked to grade the degree of stretch mark improvement on a linear analog scale from 0% improvement to 100% improvement.
**Results:** All subjects completed at least 12 treatments. Almost 57% of subjects presented at least some improvement in their stretch marks in addition to the reported circumferential reduction and cellulite improvements. The average degree of improvement was 45%, with a range of 25%–60%. 43% of subjects with abdominal striatum and with anterior thigh striatum reported 0% improvement in their stretch marks. There were no complications reported during the course of treatment.
**Conclusions:** The combination of radiofrequency, pulsatile suction and infrared energies may offer therapeutic improvement in the aesthetic appearance atrophic striatum.

## 279

### $CO_2$ LASER INDUCED ABLATIVE MICROPATTERNS IN SKIN

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**Background and Objective:** $CO_2$ lasers in dermatology have been traditionally employed to either cut or ablate layers of skin. In cardiology a focused $CO_2$ laser has been successfully used to create multiple transmyocardial channels allowing for enhanced perfusion. In dermatology the application of multiple small diameter channels has so far not been exploited, although the application of microscopic patterns of thermal injury recently became quite popular (fractional resurfacing).
**Study Design:** Post mortem human skin was exposed to single $CO_2$ laser (Ultrapulse, Lumenis) pulses using nominal a 0.2 mm diameter focusing handpiece with an energy of 100–500 mJ per pulse and a pulse duration of 1 ms. Patterns of multiple exposures with well defined distances were made using a x-y micrometer stage. Ablation and thermal damage profile were assessed histologically using NBTC stain on frozen sections.
**Results:** Single pulses of 500 mJ resulted in cylindrically shaped channels with a depth of up to approximately 3000 μm and a cross sectional opening of approximately 400 μm. Surrounding thermal damage zone was 50 μm. Cross section and thermal damage zones were fairly uniform throughout the entire length. Sparing of confluent damage between individual lesions could be maintained for a minimal distance of 1000 μm between centers of individual lesions. This setting resulted in immediate skin shrinkage of approximately 15%.
**Conclusion:** A focused $CO_2$ laser can create small diameter channels with a high depth to diameter ratio in skin with minimal collateral thermal damage. It is feasible that patterns consisting of multiple such lesions maybe a novel approach for various dermatological applications including resurfacing or enhanced drainage of tattoo ink after q-switch assisted tattoo removal.

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### HIGH FREQUENCY ULTRASOUND FOR CELLULITE IMAGING

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**Background:** Cellulite describes the characteristic orange peel-type dimpling of the skin most commonly seen on the thighs and buttocks of women. Regardless of weight, up to 98% of post-pubertal females display some degree of cellulite. It is rarely seen in males, except those with androgen deficiencies. Although not conclusive, the clinical appearance most likely arises from characteristic features of female subcutaneous fat architecture including the protrusion of subcutaneous fat into the dermis creating an undulating dermal-subcutaneous fat junction. Presently, there are no effective therapies that significantly improve the appearance of cellulite.
**Materials and Methods:** Using high resolution ultrasound, with and without compression, the distance between fat protrusions and the surface of the skin were measured in both affected and unaffected males and females. Additionally, the distance between the skin surface and the subcutaneous fat were measured in areas without fat protrusions.
**Results:** Clinical severity correlated with the amount of fat protrusion into the dermis. Areas with less fat protrusion displayed less clinical severity.
**Conclusion:** High resolution ultrasound confirms a correlation between cellulite and fat protrusions into dermis. Furthermore, it provides a scientific modality for assessing improvement with new treatments for cellulite. Non-invasive means of cellulite treatment emerge; high resolution ultrasound provides scientific criteria by which to judge their efficacy. This device may provide non-invasive ultrasound guided treatment.

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### REAL TIME DETECTION OF CIRCULATING CANCER CELLS IN A MOUSE MODEL BY A PORTABLE *IN VIVO* FLOW CYTOMETER

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**Background and Objectives:** Circulating tumor cells can be found in the early stages of development of metastatic tumors, and the number of such cells has been shown to predict survival in breast cancer patients. For this study, a portable two color *in vivo* flow cytometer was developed to determine if circulating tumor cells either expressing GFP or labeled with exogenous dyes could be detected non-invasively.
**Study Design/Materials and Methods:** The first portable two color *in vivo* flow cytometer was developed to focus a 473 nm and/or a 633 nm excitation slit across the lumen of a blood vessel. Fluorescence from passing cells is detected confocally to improve the signal to noise ratio (SNR). Data taken on DiD- and calcein-labeled red blood cells flowing in microfluidic channels tested the ability of the system to detect both labels simultaneously. For the animal model test, transfected human breast cancer cells expressing GFP were injected intravenously into mice, and data was recorded from an ear artery.
**Results:** For both the microfluidic and *in vivo* study, definite counts of the number of labeled cells were obtained with a high SNR.
**Conclusion:** The portable, two color *in vivo* flow cytometer is able to detect cells labeled with fluorescent dyes at two different wavelengths both *in vitro* and in a mouse model.

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### UPPER AIRWAY VESICANT DAMAGE DETECTION USING OPTICAL COHERENCE TOMOGRAPHY

**Marie J. Hammer-Wilson, Daniel Jun, Woong-Gyu Jung, Yehchan Ahn, Zhongping Chen, and Petra Wilder-Smith**

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**Background and Objectives:** Chemical warfare aerosols are deposited in the upper airway (UA) before reaching the lungs. The goal of this study was to investigate the use of non-invasive Optical Coherence Tomography (OCT) imaging techniques to detect UA changes after half-mustard gas (HMG) exposure.
**Study design/Materials and Methods:** Right cheek pouches from 18 hamsters were topically treated for either 1 or 5 minutes using 5, 2 or 0.4 mg/ml HMG. Controls were untreated areas from the same pouches. Twenty four hours post HMG exposure the tissue was excised and fixed. The tissue was inspected for gross damage, OCT imaging was performed on both HMG exposed and control areas and the tissue was processed for histology.
**Results:** Stereomicroscopic tissue examination showed blistering, membrane opacity, and broken vessels, for both exposure times with 5 mg/ml HMG. Two mg/ml HMG caused slight blistering and increased membrane cloudiness. No visible response was seen with 0.4 mg/ml HMG. Co-localized OCT images showed severe disruption of the mucosal structure with 5 mg/ml HMG, intermediate effects with 2 mg/ml HMG and no effect with 0.4 mg/ml HMG.
**Conclusions:** OCT can be used to non-invasively visualize vesicant induced damage in oral mucosa.
Supported by: AFOSR (FA9550–04-1–0101), CA TRDRP 445174–18079, CRFA 30003, CCRP 00–01391V-20235, NIH (LAMMP) RR01192, DOE DE903–91ER 61227, NIH EB-00293 CA91717, NSF BES-86924.

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### NEW WAY OF COMPARING NEAR-INFRARED SPECTROSCOPY (NIRS) AND FUNCTIONAL MAGNETIC RESONANCE IMAGING (fMRI) DURING BRAIN ACTIVATION

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**Background and objective:** Currently fMRI and NIRS are used to study functional brain imaging. The relationship between the fMRI BOLD (Blood Oxygen Level Dependent) signal and changes of oxy-, deoxy-hemoglobin, which are measured by NIRS is not clear. In this study, we compared the fMRI BOLD signal with NIRS data by using a standard method of calculating the BOLD signal and at the same time we show preliminary results of a new method for the calculation of BOLD signal that is more meaningful for comparison with NIRS data.
**Study Design/Materials and Methods:** We present concurrent NIRS-fMRI measurements on human subjects during a finger tapping test. A special optical helmet (fMRI-compatible) with a retractable and resilient set of optical fibers was devised to improve the coupling between the fibers and the scalp. The fMRI data were collected with a 3 Tesla Siemens Trio magnetic resonance scanner and a quadrature birdcage radiofrequency coil.
**Results:** The spatial and temporal comparison of the fMRI and NIRS signals associated with brain activation showed a very good agreement by using the standard method. The new way of calculating the BOLD signal has yielded interesting comparison with NIRS data.
**Conclusions:** The new way of calculating BOLD signal will help us to understand the relationship between BOLD signal and hemoglobin changes, especially if BOLD correlates better with Oxy or deoxy-hemoglobin.

## 284

### WHAT EXACTLY CAUSES INCREASE IN SKIN TRANSPARENCY: WATER REPLACEMENT OR DEHYDRATION?

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**Background and Objective:** Strong light scattering in skin reduces the effectiveness and precision of light delivery. Optical clearing (OC) techniques reduce skin scattering and hence solve the problem. Two major mechanisms of skin OC are involved: water replacement by an optical clearing agent (OCA) and skin dehydration. The goal of the work is experimental investigation of the contributions of these mechanisms into skin OC.
**Materials and Methods:** Samples of pig, rat and human skin *in vitro* and *in vivo* were studied. Diffusion fluxes of OCAs into skin and water out of skin were estimated using measurements of the refractive index (RI). The permeability of the stratum corneum (SC) was enhanced using a flash-lamp (EsteLux, Palomar Medical Inc.) having a mask which provided patterned light delivery. Several OCAs were used. Direct skin dehydration in the oven at temperature of $\sim 50^{\circ}$ was used in OC mechanisms investigations.
**Results:** For SC with enhanced permeability the OC effect and RI change were more significant in comparison with normal skin. Based on RI temporal dependencies of OCA and physiological solution, the diffusion constant ($\tau_D$) was estimated. For instance, for normal rat skin $\tau_D \cong 7500$ sec for glucose and 5500 sec for glycerol solution.
**Conclusion:** Both effects—water replacement by OCA and skin dehydration – contribute to skin optical clearing *via* refractive index matching phenomenon.

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### EVALUATION OF THE KTP LASER IN TREATING POIKILODERMA OF CIVATTE

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**Background and Objectives:** Poikiloderma of Civatte is a dermatologic condition of the neck primarily affecting women that is a combination of atrophy, telangiectasia and pigmentary changes. The Potassium Titanyl Phosphate (KTP) laser has a wavelength of 532 nm, which targets both hemoglobin and melanin, thus targeting both components of Poikiloderma of Civatte.
**Study Design/Materials and Methods:** This study investigated the effectiveness of Potassium Titanyl Phosphate (KTP) laser in a before and after evaluation using each subject as their own control. The Laserscope Gemini is a combination of Nd:YAG and KTP lasers, the latter being the type utilized for this investigation. This device utilizes parallel contact cooling. Three subjects received two bilateral treatments of the neck at a 3 week interval. KTP laser treatments used a double pass technique, a spot size of 10 mm, a fluence between 7 to 8 J/cm$^2$, and a pulse width of 30 ms. Images were evaluated 2 months post treatment for improvement in redness and pigmentation.
**Results:** Each of the three patients reported 90% clearance of their Poikiloderma at the 8 week follow-up visit after their second treatment. A blinded evaluator rated two subjects to have 60% total clearance and one subject at 70% total clearanc.
**Conclusion:** The results indicate that the KTP is promising in reducing the vascular and pigment components of Poikiloderma of Civatte.

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### NATIVE FLUORESCENCE STUDY: THREE DIFFERENT SITES OF ORAL NORMAL MUCOSA RELATION TO HABITS, AGE, GENDER AND RACE

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Native fluorescence occurs in many animal and plant tissues following excitation by UV light. The fluorescence spectrum characteristic of a given tissue may vary with changes in tissue composition and organization. Hence, this optical phenomenon provides a reliable and minimally invasive diagnostic tool for examining tissues in normal and pathological conditions.
**Study Design:** Clinical.
**Objective:** To analyze three different sites of oral mucosa, according their native fluorescence, relation to habits (tobacco and/or alcohol), age, gender and race.
**Material and Method:** 100 adults, healthy, who were selected at laser unit. The fluorescence spectra were obtained using a "plug-in" spectrometer (PC2000 and Software OOIBase 32$^{TM}$ and optical fiber. The native fluorescence was observed in lower lip, buccal mucosa and tongue, using a prototype of luminous source, composed of three low power LEDS.
**Results and Discussion:** 300 spectra were collected and the graphs demonstrated similar characteristics at two fluorescent peaks region (500 nm and 600 nm). The fluorescence intensity had different degree, according the sites and mucosal type.
**Conclusion:** The tobacco and/or alcohol not shows influence in this sample; In the group III and IV, with 41 and 82 years old, we observed less relative intensity of native fluorescence than group I and II; Between the genders male and female, we didn't detected spectra differences.

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### FLUORESCENCE RESPONSE QUANTIFICATION OF PHOTOFRIN® CONCENTRATION IN OPTICAL PHANTOMS

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**Objectives:** We have investigated the use of optical phantoms with known levels of porfimer sodium (Photofrin®, PF) to determine the feasibility of using the fluorescence response as a dosimetric tool for clinical photodynamic therapy.
**Methods:** Phantoms were created using a mixture of NaCl, water, and agar. Ink and blood were added for absorbance, silica powder and Intralipid for scattering, bovine serum as protein, and Photofrin® at concentrations from 0.1–5 μg/ml. Excitation light at 532.2 and 405 nm was coupled to the phantom via a 200 μm optical fiber, and the fluorescent signal was captured by 6 radially-oriented 200 μm fibers and spectrally analyzed. Data from un-doped samples were used as control, normalized, and subtracted from the doped samples. The fluorescent signal at 630 nm was used for analysis.
**Results:** Fluorescence increased as a linear function of increasing PF concentration with both excitation sources. Correlation was excellent ($p<0.0001$).
**Conclusions:** There is a linear correlation between Photofrin concentration and fluorescent response at both examined wavelengths. Studies are in progress to investigate this method in tissue from patient biopsy samples.

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### ERYTHROPLASIA OF QUEYRAT TREATED BY BLUE LIGHT-ACTIVATED TOPICAL AMINOLEVULINIC ACID PHOTODYNAMIC THERAPY

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**Background and Objectives:** Conventional therapy of erythroplasia of Queyrat (EQ) with surgery and $CO_2$ laser ablation is difficult, costly and associated with significant morbidity. Treatment of EQ with red light-activated topical aminolaevulinic acid (ALA) photodynamic therapy (PDT) has been reported. We present a patient with EQ who has been successfully treated with blue light-activated topical ALA PDT.
**Study Design/Materials and Methods:** An uncircumcised man with biopsy-confirmed EQ complicated by urethral meatal involvement and foreskin adhesions underwent three monthly sessions of ALA-PDT with 1 hour incubation and activation by 10 J/cm$^2$ of blue light. A circumcision was performed to treat the adhesions. Lidocaine 4% cream was applied for 15 minutes prior to application of ALA.
**Results:** There was significant improvement in the size of the glans plaque, erythema, hyperkeratosis and discomfort. After three treatments, there was no clinical involvement of the urethral meatus. Biopsies of the residual erythematous plaque showed inflammation only. The patient experienced minimal pain during or after treatment sessions.
**Conclusions:** Therapy of EQ with blue light-activated topical ALA PDT may offer the advantages of low morbidity and quick recovery, possibility of ambulatory treatment, lower costs as compared to conventional therapy, tumor specificity, preservation of function and favorable cosmesis. Further investigation of this modality is warranted.

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### TRYPTOPHAN AUTOFLUORESCENCE IMAGING OF EPITHELIAL CELLS

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**Background and Objectives:** Autofluorescence spectroscopy and imaging is being explored as a means for developing non-invasive diagnostics and for understanding biochemical changes that occur during cancer development. While several spectroscopic studies have demonstrated the use of tryptophan fluorescence as a diagnostic marker for cancer and aging, there is a limited number of tryptophan imaging studies. The objective of this project is to characterize the pattern and intensity of tryptophan fluorescence in several human primary cell cultures.
**Study Design/Materials and Methods:** We included in our studies normal and human-papilloma virus transfected epithelial keratinocytes, MEL/STR/LIV16 melanoma, and SUM1315 breast cancer cells. To characterize the tryptophan fluorescence, we used an upright Leitz UV microscope with a 100X, UV objective. Cells were grown on quartz coverslips to minimize background.
**Results:** We find that all cell lines exhibit diffuse tryptophan fluorescence throughout the cell, with cytoplasmic fluorescence significantly brighter than fluorescence emanating from most of the nucleus. The nucleolus is the main structure within the nucleus that fluoresces. Furthermore, in the case of the melanoma cells we also detect bright punctuate cytoplasmic fluorescence, which may originate from melanosomes.
**Conclusion:** We have been able to detect and characterize tryptophan autofluorescence patterns in normal, pre-cancerous and cancerous epithelial cells. This information, along with information from other natural chromophores, such as NAD(P)H and FAD may be useful clinical diagnostic markers.

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### TOPICAL PHOTODYNAMIC THERAPY FOR TREATMENT OF ACNE VULGARIS: COMPARISON OF TWO IPL APPLICATORS AND DIFFERENT APPLICATION TIMES OF ALA

**Eun Ju Hwang and Kyle Seo**

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**Background and Objectives:** Photodynamic therapy is increasingly used for a treatment of acne. In a prospective study, the efficacies of two light spectras of IPL were compared to find out if longer wavelength is more effective. For Asians, we adjusted the ideal application time of Levulan.
**Study design:** Twenty nine volunteers with moderate acne vulgaris had treated with the ALA (Levulan) and IPL (Ellipse, DDD, Denmark). Levulan had applied on one half face for 1 hour and the other for 4 hours. The one group randomly had been treated with the VL (555∼950 nm) and the other with the HR (600∼950 nm) applicator. At 1st, 4th, 14th, and 24th week, we evaluated facial appearances by counting the comedones and the inflammatory acnes. We compared the objective photography to assess a hyperpigmentation.
**Results:** There was no difference of treatment effects in comparison of 1 hr and 4 hrs of the application time of Levulan. The HR applicator was more efficient than VR in reduction of inflammatory acne. We assessed risk factors of hyperpigmentation.
**Conclusions:** Just single ALA-PDT led to visible improvement of acne that lasted at least 5 months. The clinical efficacy and the safety are more in HR than VR applicator. In order to avoid a hyperpigmentation, Levulan should be applied for a short time.

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### HISTOLOGIC STUDY OF ENDOVENOUS 1480 nm DIODE LASER IN A RABBIT MODEL

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**Background and Objectives:** Recently endovenous laser occlusion has been shown to be effective for elimination of varicose veins. Effective use of wavelengths between 808 and 1320 has been described either with pulsed or continuous administration of energy. This study was undertaken to conduct a pilot study to evaluate endovenous 1480 nm laser histologically.
**Study Design/Materials and Methods:** Histologic specimens were evaluated immediately after endovenous treatment in rabbit ear veins. A bilateral comparison was performed using 1480 nm diode laser vs. 980 nm diode laser, tumescent vs. non-tumescent, and continuous vs. pulsed energy delivery. Chronic change was also histologically studied 21-day postoperatively using pulsed 1480 nm diode laser with tumescent anesthesia.
**Results:** Histologic findings showed both 1480 nm laser and 980 nm laser occluded the veins in a rabbit model. However, occlusion rate in the same energy setting was higher in specimens treated using the 1480 nm laser. Thermal damage of the tissue around the veins was far less in specimens with tumescent solution.
**Conclusion:** Endovenous 1480 nm diode laser was shown to be effective for venous occlusion in a rabbit model. The target for this laser is water, resulting in more specific absorption of energy to vein walls than other lasers. The 1480 nm endovenous laser has potential clinical applications with efficacy and safety in venous treatment. Further study is warranted.

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### ENDONASAL LOW INTENSITY LASER IRRADIATION THERAPY*

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**Background and Objective:** Endonasal low intensity laser therapy (ELILT) began in China in 1998. Now in China it is widely applied to treat hyperlipidemia and brain diseases such as Alzheimer's disease, Parkinson's disease, insomnia, poststroke depression, intractable headache, ache in head or face, cerebral thrombosis, acute ischemic cerebrovascular disease, migraine, brain lesion and mild cognitive impairment. Its research was reviewed in this paper.
**Study Design/Materials and Methods:** EILILT was an endonasal photobiomodulation (PBM), and was reviewed from viewpoints of three pathways mediating EILILT, Yangming channel, autonomic nervous system (ANS) and blood cells in terms of the cellular rehabilitation of PBM and time theory of PBM.
**Results:** Two unhealth acupoints of Yangming channal inside nose might mediate EILILT as is low intensity laser acupuncture. Unbalance ANS might be modulated. Blood cells might mediate t EILILT as is intravascular low intensity laser therapy. These three pathways are integrated in ELILT so that serum amyloid β protein, malformation rate of erythrocyte, CCK-8, or serum lipid might decrease, and melanin production, SOD activity or β endorphin might increase after ELILT treatment.
**Conclusions:** ELILT might work in view of the previous research, but it should be verified by randomized placebo-controlled trial
*It is supported by National Science Foundation of China.

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### OPTICAL MAMMOGRAPHY FOR TUMOR DETECTION AND OXIMETRY

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**Background and Objective:** Breast cancer is the second leading cause of cancer death among women in the United States. Optical techniques have been proposed for many years as an alternative breast imaging modality that provides a safe and noninvasive study of the human breast. Our research objectives is focused on developing a robust approach to optical mammography to enhance the diagnostic information by optimizing the spatial information content and the functional information associated with the oxygen saturation of hemoglobin.
**Study Design/Materials and Methods:** Our approach to breast imaging is based on 2-D projection by near-infrared illumination at wavelength between 650–900 nm. We present a novel 2-D phased-array scheme for enhanced spatial resolution and depth discrimination of previously reported second-derivative images. We also apply a novel spectral method of oximetry.
**Results:** We present data to demonstrate the depth discrimination and oximetry capabilities of this new approach to tissue-like phantoms.
**Conclusion:** We have shown the basis for designing a new system for optical mammography that is aimed at depth discrimination and quantitative tumor oximetry. (Supported by NIH grants CA95885 and NSF award BES-93840).

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### DEVELOPMENT OF PULSED-DIRECT CURRENT IONTOPHORETIC SYSTEM

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**Background and Objectives:** The skin is a primary area of body contact with the environment and is the route by which many chemicals enter the body. The delivery of drugs into and through the skin has been an important area of research for many years. And percutaneous absorption is also one of the most important phenomena in derma-cosmetics research. Iontophoresis can be defined as the process of increasing the rate of penetration of ions into or through a tissue by the application of an external electric field across the tissue.
**Study Design/Materials and Methods:** Impedance spectroscopy was used to investigate the electrical response of skin to different ions, applied currents and fields. The dielectric measurements were performed using automatic swept-frequency network and impedance analyzers. The frequency range 5 Hz to 10 MHz was covered by an HP-4192A impedance analyzer.
**Results:** The stratum corneum shows two important electrical features. First, it tends to become polarized as an electrical field is applied continuously. Second, its impedance changes with the frequency of the applied electrical field. To avoid the counterproductive polarization, the current should be applied in a periodic manner, which is called pulsed direct current. The pulsed direct current generating iontophoretic delivery system was developed. In the state of on, charged molecules are delivered by the iontophoretic diffusion process into the skin.
**Conclusions:** A non-parenteral method for the delivery of macromolecules was developed by using a pulse direct current mode iontophoretic technique.

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### LOW LEVEL LIGHT STIMULATES WOUND HEALING IN MICE

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**Background and Objectives:** It has been known for many years that low levels of laser or non-coherent light (LLLT) can accelerate wound healing, however its use remains controversial. Here we directly compare light of different coherence, wavelength and energy in a standardized animal model.

**Study Design/Materials and Methods:** Dorsal full thickness excisional wounds in mice were used. Illumination was performed 30 minutes after wounding using HeNe laser, and filtered LumaCare and XenonArc lamps. Fluences varied between 1 and 50 J/cm$^2$ and fluence rates between 2 and 50 mW/cm$^2$

**Results:** Maximum healing effect was achieved at 2 J/cm$^2$ of 635-nm non-coherent light. The effect is diminished at doses below 1 J/cm$^2$ and above 25 J/cm$^2$. The two most effective wavelengths of light were found to be 635 and 820-nm. We found no difference between filtered 635 + 15-nm light from a lamp and 633-nm light from a HeNe laser. The strain and age of the mouse affected the magnitude of the effect. In Balb/c and SKH hairless mice, wounds treated with light started to contract after illumination, while control wounds initially expanded for 24 hours. In C57/BL6 mice light did not have an effect on healing rates and control wounds did not expand.

**Conclusions:** LLLT accelerates healing of acute excisional wounds in mice. Effectiveness depends on the dose of light, wavelength and strain of mice used.

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### COMPARATIVE EXPERIENCE IN PDT: BLU AND RED LIGHT*, ALA CREAM** AND LEVULAN™

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**Background and objectives:** PDT therapy is coming a very common way to treat different problems. This study was designed to compare and to determinate what is the best combination of light source and ALA in PDT.

**Materials and methods:** 120 patients (age from 14 to 68 yrs old, 58% women–42% men) divided in 4 groups was selected to treat different problems such as actinic keratosis, acne, photodamge, warts and bcc: 1st group used blu light (407–420 nm—iClear XL, Curelight Inc, USA) and ALA cream**; 2nd group: blu light and Levulan™ (Dusa Pharm.Inc); 3rd group: red light (630 nm—Alpha Strumenti*, Milano, Italy) and ALA cream**; 4th group: red light and Levulan™. Exposure time to ALA was 1 hour (occlusive dressing) and time exposure to the light source was 7 minutes (blu) and 18 minutes (red). Distance from skin was 9.84 inch (blu) and 4,72 inch (red).

**Results:** good results was obtained in all the 4 groups; erythema, edema and pain was registered especially with red light and Levulan™.

**Conclusion:** blu light is more effective and goes quickly in combination with Levulan™. The ALA cream** allows us to use different concentration to control skin reaction to have less or no down time for patients.

—*not FDA approved

—**not FDA approved and available in different concentrations (5%, 10% and 20%)

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### TUFTED ANGIOMA SUCCESSFULLY TREATED BY ALA-PDT

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[2]*Nippon Medical School, Tokyo, Japan*

**Background and Objectives:** Tufted angioma is an acquired benign vascular tumor of endothelial origin. The precise mechanism of vascular proliferation remains unclear. Complete excision is the first choice as other non-surgical treatments often fail and result in local recurrence. We assessed the efficacy of ALA-PDT for this vascular proliferative disorder.

**A Case Report:** A 68-year-old female patient with a recurrent erythematous indurated plaque measuring 65 × 28 mm on the neck after the whole resection 6 years ago visited our institute. Histological examination revealed numerous lobules ('tufts') with cleft-like vascular lumina within upper and mid dermis and the lesion was diagnosed as tufted angioma (angioblastoma). Laser treatment with the conventional 350 microseconds, 585 nm pulsed-dye was first tried consecutive 10 times, which had failed to improve and the lesion gradually enlarged. ALA-PDT was performed as the next. The lesion was applied with 20%ALA and irradiated at 100 J/cm$^2$ with a 600–700 nm filtered light source (Tokyo Iken, Co., Ltd.). The treatment was repeated 7 times with an interval of 4 weeks. Clinically, the color of the tumor turned to be almost normal and no induration was observed after the 6th treatment. A biopsy taken after the 7th ALA-PDT demonstrated no neoplastic endothelioid cells. No recurrence has been found at the 6th month follow-up.

**Conclusions:** This is the first case report of tufted angioma successfully treated by ALA-PDT.

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### ANESTHETIC MANAGEMENT FOR LASER TONSILLECTOMY

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**Background and Objective:** Obstruction of the upper airway is a major challenge for anesthetists during the induction of general anesthesia in spontaneously breathing children with adenotonsillar hypertrophy. To improve the airway patency and ventilation we applied common airway manoeuvers such as chin lift and jaw thrust associated with lateral positioning. The latter dramatically enhanced the effects of airway maneuvers and avoided the need to insert an oral airway device which may lead to a laryngospasm.
**Methods:** We studied 100 children aged 3.8 years ($\pm 0.92$) with obstructive sleep apnea syndrome scheduled for elective partial tonsillectomy with laser. Once in the operating theatre patients underwent standard monitoring. Anesthesia was induced with sevoflurane (8%) via a face mask with 100% oxygen. Intubation of the trachea was facilitated with atracurium (0.5 mg/kg). The fraction of the inspired oxygen ($FiO_2$) supplied was set at 0.4 in order to avoid ignition of the airway. Once the surgical procedure was over and the patients had recovered protective airway reflexes the trachea was extubated.
**Results:** During the induction the common airway maneuvers were applied in all patients. In 55% patients lateral positioning was also required. In 35% the intubation of the trachea was impaired due to the tonsillar hypertrophy. Neither laryngospasm nor ignitions of the airway were recorded.
**Conclusions:** We believe that this anesthetic management provides smooth induction and improves airway patency as well as ventilation for patients with tonsillar hypertrophy.

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### THE EFFECTIVENESS OF VARIOUS NON-INVASIVE APPROACHES TO THE DETECTION OF ORAL MALIGNANCY

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**Background and Objectives:** Early detection of cancer and its curable precursors remains the best way to ensure patient survival and quality of life. A wide range non-invasive approaches is under investigation for the non-invasive diagnosis of oral premalignancy and malignancy. Goal of these studies was to assess the effectiveness, strengths and weaknesses of endogenous fluorescence, photosensitizer-induced fluorescence, optical coherence tomography, polar decomposition techniques, as well as multi photon imaging approaches, and combinations of the above.
**Study Design/Materials and Methods:** Non-invasive imaging was performed in the standard hamster cheek pouch model for oral carcinogenesis in 500 animals, and in 70 patients with oral lesions. Semiquantitative diagnoses (scale of 0–6) obtained from the imaging approaches were compared with diagnoses (scale of 0–6) obtained using the histopathological gold standard.
**Results:** Photosensitizer-induced fluorescence provided excellent visualization of lesion location and margins. Diagnostic sensitivity and specificity were best using a multi-modality approach.
**Conclusions:** Non-invasive diagnostics provide information on a wide range of criteria that can be used to detect pathology and lesion extent in oral premalignancy and malignancy. Supported by: Air Force Office of Scientific Research (FA9550–04-1–0101), CA TRDRP 445174–18079, CRFA 30003, CCRP 00–01391V-20235, NIH (LAMMP) RR01192, DOE DE903–91ER 61227, NIH EB-00293 CA91717, NSF BES-86924.

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### USE OF POLARIZED LIGHT FOR THE DETECTION OF ORAL PRE-MALIGNANCY AND MALIGNANCY

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**Background and Objectives:** The goal of this study was to investigate the use of polarized light for the detection of oral pre-malignancy and malignancy and for delineating the borders of these lesions.
**Study Design/Materials and Methods:** Using a high speed polarimetry system that generates 16 full Mueller matrices, in vivo imaging was performed in healthy, dysplastic and malignant oral tissues using the standard hamster cheek pouch model for oral carcinogenesis. Depolarization and retardance were measured in vivo in the lesion and in matching, healthy contralateral tissues, which then underwent routine processing for histopathology.
**Results:** Pathological lesions depolarized light less than healthy tissue. Also, retardance values changed within the lesions whereas no change in retardance was visible for the non-cancerous lesion. Definition of lesion borders using this technique exceeded clinical capabilities, and corresponded well with the histopathological extent of the pathology.
**Conclusions:** Depolarization and retardance images are potentially useful, not only for differentiating between samples, but also for boundary identification of pre-malignant and malignant tissues. Supported by: CA TRDRP 445174–18079, CRFA 30003, CCRP 00–01391V-20235, NIH (LAMMP) RR01192, DOE DE903–91ER 61227, NIH EB-00293 CA91717, NSF BES-86924. National Institutes of Health (EB-00293, NCI-91717, RR-01192, EB0002SS, EB002494 and AR47551), Air Force Office of Scientific Research (F49620–00-1–0371, FA9550–04-1–0101.

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### DETECTING DEMINERALIZATION OF TEETH DUE TO GASTRIC ACID EXPOSURE

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**Background and Objective:** Effects of gastric acid on the tooth surface include demineralization, loss of tooth substance, functional impairment, pain and tooth fracture. This study explored the use of Optical Coherence Tomography (OCT) and Polarization-Sensitive OCT (PS-OCT) to image and quantify demineralization and loss of enamel substance due to acid exposure using a simulated Gastroesophageal Reflux (GERD) model.

**Study Design/Materials and Methods:** In 18 extracted acrylic-embedded teeth, drill holes designated the OCT scan line, permitting accurate re-imaging throughout the protocol. Three teeth per pH were treated with gastric acid at pH of 1.0, 3.0, or 5.5. to mimic normal oral conditions and GERD. OCT and PS-OCT imaging of the samples was performed prior to and after each treatment. Parallel microradiographic images determined mineral content.

**Results:** Optical properties of the tissues changed throughout the GERD treatments. Changes were greatest at pH1. Acid-induced changes in reflectivity and polarization paralleled changes in mineralization. Accurate determination of tooth loss was possible.

**Conclusion:** OCT and PS-OCT can be used to detect enamel demineralization and loss resulting from gastric acidic exposure.

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### MULTIPHOTON MICROSCOPY OF TOBACCO-INDUCED MORPHOLOGICAL CHANGES IN ORGANOTYPIC SKIN MODELS

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**Background and Objectives:** Tobacco smoke components may directly lead to premature skin aging. To study this effect, organotypic skin constructs (RAFTs) were exposed to cigarette smoke condensate (CSC). The purpose of this study was to determine the impact of CSC on RAFT behavior by monitoring morphologic changes and using multiphoton microscopy (MPM) to examine structural changes in the matrix. RAFTs were constructed using neonatal and adult cell lines.

**Study Design/Materials and Methods:** RAFTs consisted of keratinocytes layered on fibroblasts in a collagen suspension. CSC was collected onto filters by combustion of cigarettes attached to a puffing vacuum.16 RAFTs were created per group, and different CSC concentrations (0,10, 25, and 50 μg/mL) were added to the growth media. Each RAFT was imaged using MPM after 0,7, and 14 days at 10 μm intervals in depth. RAFT dimensions were measured to calculate contraction at the same time intervals.

**Results:** In both cell lines, RAFTs exposed to higher CSC concentration demonstrated less contraction over time. In general, signal intensity decreased with greater depth, though the DDD constant demonstrated variation and no clear trends. The visual changes in density also varied.

**Conclusions:** CSC clearly alters the contraction rates of RAFTs, exhibiting dose dependent effects. No consistent trends were observed with respect to collagen. Further work will examine collagen fiber in CSC-treated RAFTs.

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### DETECTING NONMELANOMA SKIN CANCERS USING MULTI-MODAL CONFOCAL MICROSCOPY

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**Background and Significance:** Early detection of neoplasm is imperative for successful cancer treatments. The goal of this study was to establish the feasibility of using dye-enhanced multi-modal confocal microscopy as a tool for detecting different types of nonmelanoma skin cancers.

**Materials and Methods:** Freshly excised thick skin samples were used for the experiments. The specimens were rapidly stained in aqueous solutions of either toluidine blue or methylene blue and imaged using multi-spectral confocal reflectance and fluorescence microscope. Reflectance images were acquired at the wavelengths of 633nm, 656 nm, and 830nm. Fluorescence was excited at 633 nm and 656 nm. Fluorescence emission was registered in the range between 670 nm and 690 nm. The resulting images were compared to the corresponding *en face* frozen H&E sections.

**Results and Conclusion:** The results of the study indicate that dye-enhanced multi-spectral reflectance and fluorescence confocal images provide complimentary information on tissue morphology and dye uptake. Confocal images of stained skin closely resemble corresponding H&E sections, enabling interpretation of confocal images and cancer detection in a same manner as histopathology.