



BMLA 2022 Annual Conference

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Foreword:

The 39th British Medical Laser Association 2022 Annual Conference & Educational Courses was our first face-to-face event since 2019. Delegates expressed their pleasure in seeing fellow enthusiasts driven by a passion to learn, share knowledge and disseminate the latest advances within lasers and light-based treatments.

As usual, the Educational Courses were delivered by leading experts and experienced trainers. The latest topic of ‘Treating Skin of Colour’ was the most popular course. Interest in dental lasers continues to grow, as does our ‘nursing and therapist’ contributions which this year featured two dedicated sessions in addition to other talks delivered throughout the scientific programme.

Among the conferences invited speakers was Lauren Sutherland QC, who discussed approaches to consent from her experience as part of the legal team in the landmark *Montgomery v Lanarkshire Health Board* case. Delivering the Vasant Oswal Oration was Prof Harry Moseley, who spoke about his experiences of phototherapy with his talk ‘The Darker Side of Light’. The Great Debate featured an expert panel led by audience questions and discussion around topics including the future regulation for Lasers/IPL in the non-surgical aesthetics sector following the recent Government announcement. The conference ended with the traditional ‘Problem Page’ session led by BMLA President, Dr Vishal Madan, where challenging cases were submitted and discussed by leading clinical experts. Next year’s conference will take place 10th - 12th May 2023, at the Voco St David’s Hotel in Cardiff.

Dr Tom Lister
Conference Scientific Lead

INV.01 Laser created acoustic waves for the treatment of cellulite

Dr Martin Kassir¹

¹*Kassir Dermatology, Dallas, United States*

Session 1 - Skin Lasers

Biography:

Dr Martin Kassir is a Board-Certified Dermatologist specialising in aesthetic dermatology and laser procedures and has practiced dermatology since 2000.

An internationally recognized speaker and educator on aesthetic dermatology procedures, he has lectured and conducted dermatology seminars on six continents and served as Course Instructor on Lasers and IPL, DermaFrac, Botox, Dysport, Xeomin, Fillers, Microneedling and Radiofrequency Devices. Dr. Kassir is Director of the Worldwide Laser Institute, a center for education and training.

Cellulite is a common dermatological condition with a female preponderance, affecting up to 90% post-pubertal females. It is characterized with dimpling and denting of the skin surface. Once considered to be a benign physiological isolated skin condition of only an aesthetic concern, cellulite is now considered a pathological entity with systemic associations and a negative psychological impact on patients.

Several treatment options from lifestyle modifications and topical cosmetic therapies to energy-based devices have been studied for its treatment. However, treatment remains a challenge despite many new modalities in the armamentarium. Laser and light therapies along with radiofrequency are useful treatment options with a good safety profile. Acoustic wave therapy and subcision are also beneficial in cellulite reduction.

Dr. Kassir will review the physiology of cellulite, some of the current treatment options, and introduce Carbon Wave as the newest treatment option for cellulite utilizing lasers and acoustic wave therapy.

O.01 A review of combination pulsed dye and fractional CO₂ laser for hypertrophic burn scar management

Ms Sindhoo Rangarajan¹, Ms Ruth Bennett¹, Mr Chris Lewis¹

¹*Royal Victoria Infirmary, United Kingdom*

Session 1: Skin Lasers

Biography:

Plastic Themed Core Surgical Trainee in the North East Deanery. BMBS from the University of Nottingham for the Intercollegiate Speciality examination in Cardiothoracic Surgery.

Background and Objectives

Hypertrophic scars (HT) following burn injuries cause significant morbidities to burn survivors and impact activities of daily living. The 595nm pulsed dye laser (PDL) and the 10,600nm ablative fractional carbon dioxide laser (AFCO₂L) have both been used individually to improve HT scars with each laser addressing a specific subset of scar traits. Advances in HT scar treatment includes the use of combined PDL and AFCO₂L. This review aims to appraise the current evidence and review this novel treatment approach.

Methods

An English language literature search was performed using PubMed with the resulting papers chosen based on level of evidence and relevance to our study objective. Five papers of twenty were deemed acceptable and data was extracted by hand.

Results

Combined PDL and AFCO₂L show improved scar appearance. However, the research papers selected include both adult and paediatric populations as well as HT scars resulting from both burns and non-burns pathology. Moreover, they were prospective studies and often failed to include appropriate randomisation or controls to be able to robustly compare the scars after individual and combined laser treatment. Finally, there was a plethora of scoring systems used to objectively rate and no provision made for patient reported outcome measures (PROMS).

Conclusion

Combined PDL and AFCO₂L shows a promising avenue for post-burn HT scar research with a great need for well-designed prospective trials in both children and adults using standardised validated scoring systems supplemented with PROMS.

O.02 Randomised controlled trial for treatment of hypertrophic burns scars with pulsed dye laser: ELABS update

Dr. Mark Brewin¹

¹Salisbury NHS Foundation Trust, Salisbury, United Kingdom

Session 1: Skin Lasers

Biography:

Mark is a clinical scientist at the Salisbury Laser Clinic and works as R&D lead in Burns & Plastics. His main research interest lies in using lasers to treat hypertrophic burns scars. He works closely with research groups and charities to promote work to improve the outcome from burns scars.

Background & Objectives

Hypertrophic scars are abnormal scars that occur following burn injury. This study will assess the effectiveness and cost-effectiveness of treating hypertrophic burns scars with pulsed dye laser (PDL) at an early stage of scar formation. The objective is to improve the Quality of Life for the patient by both improving the appearance of, and reducing the impact from, burn scarring. The study will also report the patient-reported experience of the treatment.

Study design and Method

This is a 3-year NIHR(RfPB)-funded parallel-arm randomised, controlled trial to compare PDL and standard care against standard care alone. The difference in primary outcome is the patient-rated part of the POSAS scale and will be measured between baseline and 6-month follow-up. The recruits will be within 3 months of healing from a burn injury greater than 1% of body surface area showing a potential for hypertrophic scarring. 150 patients will be recruited in a multi-centre study across the UK to achieve a sample size of 120. Psychological and psycho-social impact will be evaluated using validated scales. A qualitative telephone survey will identify themes in the patient experience of the treatment and its effectiveness. The research output may contribute towards NICE guidelines and a robust PDL treatment protocol on the treatment of burn scars.

Discussion

This presentation will outline the study design and the progress on recruitment to-date.

O.03 UK Regional Prospective Audit of use of Fractional Carbon Dioxide Laser for Hypertrophic Burns Scars

Dr Elizabeth Wasson^{1,2}, Dr Charankumal Singh Thandi², Ms Emma Hitchens², Dr Kay Thomas², Dr Ariella Levene², Dr Andie Lun², Dr Daniel Keith²

¹Royal Liverpool and Broadgreen University Hospitals Trust, Liverpool, United Kingdom, ²Department of Dermatology, North Bristol NHS Trust & Bristol Laser Centre Southmead Hospital, Bristol, United Kingdom

Session 1: Skin Lasers

Biography:

Elizabeth Wasson is a Foundation Year 1 Doctor who recently graduated from the University of Bristol and currently working in Liverpool. During her elective placement she worked with the Bristol Dermatology Department and hopes to pursue a career in Dermatology. Charankumal Thandi is an Academic Dermatology Registrar working in Bristol.

Background

There is increasing evidence supporting the use of Carbon Dioxide lasers to treat hypertrophic burn scars. Previous studies have suggested scar recurrence within 2 weeks to 3 years. This study aims to look at the effectiveness of the use of these lasers in practice, in a Regional Laser Centre.

Methods

Data was collected prospectively between November 2020 and March 2022 at a UK regional medical laser centre. All patients included had hypertrophic scarring due to burn injuries and were referred for fractional ablative laser treatment. They received fractional CO₂ laser treatment (10600nm, SmartXide Touch, DEKA, USA). Scars were assessed at every visit and graded according to the scoring system POSAS v2.0. The same two clinicians independently carried out the observer score each time, and an average was taken of the two scores. Statistical analysis was carried out in R v4.1.2 (©2021 The R Foundation for Statistical Computing, Vienna, Austria).

Results

A total of 47 treatments were carried out on 23 patients. Mean follow up was 226 days (range 84-580). Patients included received 2-5 treatments (mean 2.47). There were significant reductions in mean observer recorded scar thickness (P<0.001), relief (P<0.0005), pliability (P<0.005), surface area (P<0.005) and overall impression (P<0.00001). There were significant reductions in patient perceived itch (P<0.005), stiffness (P<0.005) and thickness (P<0.01) of the scars. One complication was reported, mild post-procedure infection which was treated with oral antibiotics.

Conclusion

Fractional CO₂ Laser treatment can offer good cosmetic and symptomatic relief with minimal complications for patients with hypertrophic burn scars.

O.04 The Use of Dual Mode 1064 nm Picosecond Domain Nd:YAG Laser for Hypertrophic Scar

Dr. Dave Gerald Oenarta^{1,2}, Dr. Luciana Tjipta Joewana¹,

¹Dr. Lucille Skin and Dental, Surabaya, Indonesia, ²Widya Mandala Surabaya Catholic University School of Medicine, Surabaya, Indonesia

Session 1: Skin Lasers

Biography:

I'm a board-certified dermatologist and an appointed lecturer at a medical school in Indonesia. I did my medical school and postgraduate study in Indonesia and Wales. I'm a certified key opinion leader and

trainer for laser and filler injection. My interests are laser dermatology and minimal invasive facial aesthetics.

Introduction:

Hypertrophic scar is a type of pathological scar caused by excessive tissue response during wound healing. Laser is a relatively new modality for scars but has shown its efficacy. Pulsed dye laser is the most studied laser for hypertrophic scars however other lasers have shown efficacy. One of it is 1064 Nd:YAG, both in nanosecond or picosecond domain.

Case:

A 20-year-old female came to our clinic with a square scar on her left knee. She first noticed it 2 months before. Physical examination showed solitary purplish to hyperpigmented scar and thus was diagnosed with hypertrophic scar. She was treated with 1064 nm ps Nd:YAG with 300 ps pulse duration, 9x9 (fractional) and 4 cm (non-fractional) spot sizes, 1 mJ/px (fractional) and 1 J/cm² (non-fractional) of fluences, 1 Hz (fractional) and 3 Hz (non-fractional) of frequencies. Patient was then instructed to apply desoximethasone and silicone gel twice daily. Treatment was done for 5 sessions 1 month apart.

Discussion

Laser treatment on HS is based on the concept of HS as vascular endothelial cells dysfunction caused by reticular dermis damage and persistent inflammation. Beside vascular, melanocyte is known to interact with and influence fibroblast multiplication through TGF- β during the wound healing process. This becomes the rationale of targeting melanocytes with 1064 nm Nd:YAG lasers. Using fractional mode ensures microchannels creation to support subsequent laser delivery and topical agents penetration.

Conclusion:

Picosecond Nd:YAG laser is a promising modality to treat hypertrophic scar.

Keywords: hypertrophic scar, picosecond Nd:YAG laser, fractional, topical agents

O.05 The coming of age of the diode laser for hair removal

Mr John Culbert¹

¹*Cosmex Clinic, Cambridge, United Kingdom*

Session 2: Skin Lasers

Biography:

Qualified as an engineer and worked in R&D, product support and design assurance at Cambridge Instruments and Philips S&I.

Currently Director within Cosmex Clinic and lead on energy-based treatments. Previously Director of Cambridge Stratum a distributor of aesthetic medical energy-based devices.

Diode lasers for hair removal have been great for longevity, stability and affordability but have generally lacked power, which has made treatments painful and or slow. They have also been poor for treating finer and lighter hair.

The latest generation of laser diodes produce far higher power density. It will be explained what this is and why it enables a much wider range of hair colours to be treated and greatly reduces the discomfort associated with the treatment.

The new ability to effectively treat most hair colours with a single pulse has made SHR (Super Hair Removal) a slow and only partially effective technique, largely redundant, as is pulse stacking. Single pass glide mode is enabled and elevates the skill set of the laser therapist.

Diode lasers are now available in a range of wavelengths, most commonly 755, 808 and 1064nm and are increasingly being used in combination. However, some of the justifications for these are questionable

marketing ploys and will be examined and quantified as part of the presentation.

O.06 Folliculitis decalvans managed with long pulsed Nd:YAG; our experience and a review of the literature

Miss Soo Oh¹, Ms Sara Badrol¹, Ms Sevina Tzortzis¹, Dr Noha El Shimy², Dr Stephen Murdoch²

¹*Princess Royal Hospital, Shrewsbury and Telford Hospital NHS Trust, Telford, United Kingdom,* ²*St. Michael's Clinic, Shrewsbury, United Kingdom*

Session 2: Skin Lasers

Biography:

Miss Soo Oh is an ENT trainee in the West Midlands with an interest in skin cancer and medical skin care.

Background

Folliculitis decalvans (FD) is a rare inflammatory disorder predominantly of the scalp that can progress to cicatricial alopecia. Mainstay treatment is antibiotics; however, resolution is difficult, and relapse is common. Only three cases of FD treated with neodymium:yttrium aluminum garnet (Nd:YAG) laser exist in the literature. We present two cases of recalcitrant FD managed with long pulsed Nd:YAG laser and a literature review.

Study Design

Retrospective case series of two patients with FD treated with long pulsed Nd:YAG laser.

Results

The first case was a 49-year-old male with Fitzpatrick skin type II. Previous unsuccessful treatment included oral doxycycline and isotretinoin. A course of eight sessions of Nd:YAG laser (CynergyTM, Cynosure) was performed with settings of 50J/cm², 20msec pulse duration, and 10mm spot size. Complete resolution of FD was achieved and remained stable without adjuvant treatment at 6 months post laser.

The second case was a 46-year-old male with Fitzpatrick skin type IV with 9-years history of FD. Previously, oral antibiotics (clindamycin, rifampicin, erythromycin, ciprofloxacin) as well as dapsone, intralesional triamcinolone and acitretin treatment was trialled without success. A total of four successful treatments with Nd:YAG laser was completed with settings of 30J/cm², 40msec pulse duration, and 15mm spot size. Treatment is ongoing.

Conclusion

Our experience of Nd:YAG laser treatment of FD have been positive. All cases from literature report full resolution of FD maintained without adjuvant treatment between 6 months to 1.5 years after final treatment. Treatment with Nd:YAG laser is an option for patients suffering from recalcitrant FD.

O.07 Laser Hair Removal – What are the ‘best’ intervals between repeat sessions?

Mr Mike Murphy¹

¹*Dermalase Research Unit, Glasgow, United Kingdom*

Session 2: Skin Lasers

Biography:

- *General Secretary of the Association of Laser Safety Professionals, since 2017.*

- *General Secretary & Treasurer of the UK Council for Surgical Plume.*
- *Certificated Laser Protection Adviser (LPA) since 2014. Registered with Healthcare Improvement Scotland (HIS).*
- *More than 30 years in the medical laser industry working in various countries across the world.*
- *Trainer in medical laser applications and safety across many countries since 1991.*
- *Published more than 25 articles, reports and papers in peer-reviewed medical laser journals and trade magazines.*

Laser/IPL hair removal has been around since the 1990s, with various degrees of success. Clinical studies have investigated the use of a range of wavelengths, fluences and pulse widths. But there has been very little clinical research into the most suitable intervals between treatment sessions.

Using data on the duration of the anagen and telogen phases of the hair growth cycles in a number of sites on the body, a simple numerical model was devised to investigate timings. Assuming a range of “effective kill rates”, the most appropriate intervals between sessions were calculated, based on maximum efficiency outcomes. These data should provide a useful guide for all operators in this field.

O.08 Very Interesting laser cases from my clinic - WITHDRAWN

Md Ahmed Al Issa¹

¹*Derma Clinic, Saudi Arabia*

Session 2: Skin Lasers

O.09 Treating Pigmented lesions with Energy based devices - A cautionary tale

Dr Vishal Madan¹

¹*Everything Skin Clinic, Cheadle, United Kingdom*

Session 2: Skin Lasers

Biography:

Dr Vishal Madan, MBBS (Hons), MD, MRCP is a Consultant Dermatologist, Laser and Dermatological Surgeon at the Salford Royal NHS Foundation Trust and Central Manchester Foundation Trust and President of the British Medical Laser Association (BMLA). He qualified in Dermatology in India and moved to the UK in 2002 and, after completing the prestigious Addenbrooke’s Cambridge medical rotation, he undertook his specialist training in Dermatology in Manchester. As he has a special interest in procedural dermatology he has completed two fellowships; one in Laser Dermatology at the Salford Royal NHS Foundation trust and another fellowship in Mohs micrographic (Skin cancer) and reconstructive skin surgery at the Welsh Institute of Dermatology, University Hospital of Wales, Cardiff. Dr Madan has published in excess of 95 articles, authored 4 book chapters and edited a book on specialty examination in Dermatology and another on skin cancer. He has been an invited reviewer for 11 international journals and has 50 scientific presentations. Dr Madan runs a successful laser course at the Salford Royal NHS Trust.

Practitioners are taught to be cautious in treating undiagnosed pigmented lesions. It is certainly the case that pigmented lesions such as lentigo maligna, dysplastic naevi and similar lesions should never be lasered as laser treatment may mask the visible signs of progression to melanoma. The author shares his clinical experience of managing such pigmented lesions in his practice.

INV.02 The Darker Side of Light

Prof Harry Moseley

¹*University of Dundee, United Kingdom*

Session 3 (Plenary) - The Vasant Oswal Oration

Biography:

Now semi-retired, Professor Moseley still has an active interest in bio-physical aspects of lasers and ultra-violet radiation. He continues to provide laser treatment at a private clinic and acts as independent expert in medico-legal cases involving laser treatments. He is a Board Member of the European Laser Association.

The benefits of light, particularly from lasers, in the field of medicine is widely recognised. However, light sources may also have a sinister side. In this presentation, we will look at some of the work carried out at the Photobiology Unit in Dundee as we consider the Darker Side of Light.

SS.01 Why Er:YAG and CO₂ Lasers used simultaneously for treating facial acne scarring give better results than using any of these lasers alone – a new approach.

Ms Roxana Chiru¹, Miss Kerry Muggeson¹, Professor Sandip Hindocha¹, Dr Ekaterina Burova¹

¹*Bedford Hospital NHS Trust, Bedford, United Kingdom*

Session 4: Nursing and Therapist session

Biography:

Mrs. Roxana Chiru, MD, PhD, BTEC (LASER), FRCSRO (PLAST) Mrs. Roxana Chiru is a plastic, reconstructive, aesthetic and laser surgeon, fully accredited and on the Specialist Register with the GMC. She works at the Plastic Surgery and Laser Treatment Centre Bedford Hospital NHS Trust as a Consultant Plastic Surgeon.

Mrs. Roxana Chiru has trained in Romania (Bucharest), Switzerland (Zurich), Austria (Vienna) and UK (London, Liverpool). She has a PhD in oncological breast surgery and the BTEC Professional Certificate in Medical Laser & Light Therapies, levels 4 and 5.

Acne scarring is a common complication of acne and has a strong psychological impact. Although various treatments exist, most of them have partial response. Laser skin resurfacing is among those giving one of the best cosmetic outcomes.

Fractional Er:YAG and fractional CO₂ laser are both ablative lasers targeting the water in the tissues. The important difference is that the CO₂ laser has a more coagulative effect creating a horizontal tissue damage while the Er:YAG is less aggressive inducing a vertical effect confined to the superficial layers of the skin. Most acne patient have more than one type of acne scarring and usually of different depths, thus requiring a bi-dimensional tissue remodelling. The two lasers (Er:YAG and CO₂) complement each other safely and effectively for a better result.

SS.02 Infection control measures to Sterilise Laser Handpieces in an NHS Setting

Laura Newman¹

¹*NHS Lothian, Edinburgh, United Kingdom*

Session 4: Nursing and Therapist session

Biography:

Laura has 7.5 years' experience of working in Plastic Surgery and 6 years as a laser nurse. She is adept in wound management and care of patients with birthmarks and various vascular malformations. She works proficiently within a multi-disciplinary team, providing laser and plastic surgery care in both outpatient settings. Previously Laura worked in the plastic surgery inpatient ward for 2 years prior to working in the outpatient setting.

Purchasing of any Laser is a substantial cost to both NHS and Private Clinics. Due to the fragility of some of the handpieces they are not suitable for Steam Sterilisation or submersion in sterilising solution. Discussion about purchasing an additional Laser handpiece and how we implemented the Trio Wipe 3 Step Cleaning Process to effectively sterilise and meet Standard Operating Procedures and NHS Infection control measures. Prior to purchasing Laser consumables consideration should be given to the sterilisation processes.

SS.03 Laser hair reduction for ileostomy sites**Miss Katie Bradley¹**

¹Bedfordshire Hospitals NHS Foundation Trust, United Kingdom

Session 4: Nursing and Therapist session

Biography:

Sister Katie Bradley graduated as a nurse in 2007 at the University of Bedfordshire, DipHE in General Nursing. Katie has worked in the trust for 25 years, working in many different departments at Bedford Hospital. For 4 years now Katie has worked in the Plastics and Laser department, experienced nurse in Plastic surgery, furthering her knowledge to become a laser specialist nurse and to carry out nurse-led clinics in the NHS and Privately.

Laser hair reduction is a popular treatment both in the aesthetic and medical world. In the NHS, we treat a number of conditions that require this treatment. One of them being laser hair reduction for ileostomy sites. In this presentation, I will discuss how this type of laser treatment works, skin typing and laser selection. I will discuss the benefits of such a treatment compared to traditional shaving.

SS.04 Training processes and pitfalls for laser specialist nurses at Salisbury NHS Foundation Trust**Dr. Mark Brewin**

¹Salisbury NHS Foundation Trust, United Kingdom

Session 4: Nursing and Therapist session

Biography:

Mark is a registered clinical scientist with a keen interest in lasers and burns scars. He works closely with several research groups and charities to promote work to improve the outcome from burns scars. Recently he has acquired funding from National Institute of Healthcare Research under the Research for Patient Benefit Programme. This is for a national multicentre randomised controlled trial to look at both the clinical and cost effectiveness of early laser treatment in hypertrophic burns scars.

Laser specialist nurses at Salisbury NHS Foundation Trust carry out a wide range of cutaneous laser treatments at Salisbury Laser Clinic. Extended Practice Protocols or EPPs have been implemented for the nursing staff to cover the three main treatment designations which include epilatory, vascular and tattoo removal. The competencies are

devised from the Health Education England (HEE) Cosmetic Procedures Part 1 (Nov 2015) and align with the BMLA treatment guidelines (March 2019). This talk will describe the intricacies and principles of these EPPs and the amount of resource that is required for this specialist training. At present, Salisbury NHS Foundation Trust is trying to increase the scope of EPPs for nurses to carry out other treatments and for other members of staff, such as Healthcare Assistants and Clinical Scientists, to be signed off for these EPPs. Validity of the complexity of this work is underappreciated due to its specialist nature and appropriate banding of staff is often overlooked. Staff retention of these highly specialist trained staff has now become the premium aim. This presentation will outline all the processes and sign-offs in place for specialist nurse training and planning for the future with a robust and multi-talented workforce.

INV.03 Specialist Educational Programmes in the Vocational Sector: Laser & Light-Based Therapies**Dr Godfrey Town¹**

¹Senior Research Fellow, Aalborg University Hospital, Dermatology Dept., Aalborg, Denmark, ²RPA2000 Certificated Laser Protection Adviser, Haywards Heath, United Kingdom

Session 5: Running a Laser Clinic

Biography:

Dr Godfrey Town Ph.D. is a registered clinical technologist and RPA2000 certificated Laser Protection adviser. He has published 26 scientific and clinical papers in peer-reviewed journals, holds an Expert Witness Certificate from Cardiff Law School and is a long-time active member of EADV, ASLMS and the UK BMLA.

This talk reviews the history and development of standards and training for users of “prescribed techniques and technologies”, namely lasers and intense light sources (ILS), and explains why only recognising courses on the regulated framework unfairly restricts recognition of training by highly qualified, specialist training providers in this sector. Regulatory agencies and local authorities are under immense pressure in managing workloads and dealing with statutory duties and they find difficulty finding the resources to assess or approve courses and training providers, and to manage the ongoing review of course documentation against national standards.

Course qualifications appearing on a regulated framework should evidence scrutiny and external verification against National Standards (where they exist). They should also mean that courses and exams are externally validated by the Awarding Organisations that offer them to training providers. However, a qualifications regulator (e.g., Ofqual) looks to the Awarding Organisation to be the competent party in the development, delivery and assessment of a given qualification. In other words, the regulator is not the subject expert but relies upon the Awarding Organisations to appoint subject experts where required. Failure to approve specialist, customised courses that do not appear on the regulated framework, denies competent laser and ILS practitioners undertaking credible and robust academic and practical training and education from specialist and expert training providers, long established in this niche sector. Furthermore, this impacts upon their employment and registration in areas that insist upon regulated qualifications that may not in fact best meet their training and education needs.

O.10 Forthcoming change in regulation for premises and practitioners using Laser/IPL for Aesthetics**Dr Jon Exley¹**

¹Lynton Laser, United Kingdom

Session 5: Running a Laser Clinic

Biography:

Jon's interest in lasers began whilst studying physics both at the University of Leeds (UK) and the Université Joseph Fourier in Grenoble (France). Following graduation with a first-class honours' degree, he joined one of the UK's leading medical laser research centres at the University of Manchester, to undertake a Ph.D. research project sponsored by Lynton. Whilst working in laser research, Jon was able to spend time at the world-famous Beckman Laser Institute (Irvine, California) and helped develop new technologies for medical and cosmetic treatments using Intense Pulsed Light. Jon was responsible for establishing Lynton's first clinic and training centre enabling the company to offer industry leading training courses delivered in conjunction with the University of Manchester (Dept. of Physics). Following completion of his MBA from Manchester Business School, Jon was appointed Managing Director of Lynton and he is proud to have developed Lynton into the UK's leading supplier of Laser and IPL equipment offering innovative technology to a wide range of sectors including Aesthetics, Dermatology, Plastic Surgery, Urology, Cardio Thoracic surgery and much more. Jon is also actively involved with wider industry matters being recently appointed to the External Advisory Board for the University of Manchester (Dept. of Physics) and he holds the position of Honorary Secretary of the British Medical Laser Association (BMLA). In addition, Jon was invited to join the Expert Reference Group established by Health Education England (NHS), which developed a new educational qualification framework for the use of Lasers, Intense Pulsed Light and LED in non-surgical cosmetic interventions.

Following a recommendation by the All-Party Parliamentary Group on Beauty, Aesthetics and Wellbeing, the government announced its intention to introduce a licensing regime for non-surgical cosmetic procedures including treatments with Lasers and Light sources. Whilst the Aesthetics sector now awaits further announcements, this talk will outline the current situation and consider how a licensing scheme may operate.

O.11 The Regulation of Independent Healthcare Services in Scotland**Tracy Birch¹**

¹Healthcare Improvement Scotland, United Kingdom

Session 5: Running a Laser Clinic

Biography:

Tracy Birch is a Senior Inspector at Healthcare Improvement Scotland. Tracy is currently one of three Senior Inspectors who lead the regulation of independent healthcare team. Tracy has worked at Healthcare Improvement Scotland for approximately 18 years and has a wide range of experience in scrutiny and assurance of NHS and independent healthcare services in Scotland.

The talk will give delegates information on the role of Healthcare Improvement Scotland in relation to regulating independent healthcare services in Scotland, including services using laser equipment. Additionally, the talk will cover an insight on the types of issues and complaints relating to lasers that the team encounter in their work. One of the inspectors, Anna Martin, will also be available to take any questions in relation to her role on the ground regulating services for laser users.

O.12 Profit Hacking. Do This - Not That!**Ms Geraldine Kekati¹**

¹Solta Medical, United Kingdom

Session 5: Running a Laser Clinic

Biography:

Geraldine has significant medical aesthetics experience, having worked alongside leading dermatologists and plastic surgeons in both the US and UK. With a Foundation Degree in the Application of Aesthetic Lasers and Tissue Reaction, Geraldine's experience in the medical aesthetics industry covers many roles, including Clinic Manager, Advanced Laser Practitioner, Capital Equipment Sales and Staff Training. Geraldine has been an integral part of the team for multiple tech-sector Medi-Spa launches in the US and U.K. and believes it's much harder to make a failing business profitable than it is to launch a successful start-up.

There are many formulas touted as "successful ways to launch" a clinic. If the source of advice is a marketing company, web developer or consultant, it's hard to believe clinics were successful prior to influencers. Some of the applications I hear:

At best:

- Cost a lot of money
- Offer no guarantees

At worst:

- Are outdated
- Cause staff discontent
- Destroy long-term financial viability

I have been an integral part of the team for multiple Medi-Spa launches in the US & U.K. and have been responsible for integrating the client experience and profit projections to ensure a viable business model is put in place. I have built clientele in many different cities, and through failure, rejection and small successes, I have developed a process of strategies, goals, and pitfalls to avoid that keep my vision current and my expenses lean, whilst I navigate the process from clinic launch to longevity. Outline of topics:

- Identify trends that affect your customer base.
- Pivot to benefit from your insights.
- Tailor your engagement.
- Train your team to drive revenue.
- Help your team succeed.
- Hold your nerve.

INV.04 Montgomery and the legal duty of candour - a journey from Hippocrates to paternalism to patient autonomy?**QC Lauren Sutherland¹**

¹Ampersand Advocates, Scotland, United Kingdom

Session 6 (Plenary)

Biography:

Lauren is a Barrister practicing in Scotland at Ampersand Advocates and in England & Wales at Byrom Street, Manchester. She has taught

consent to doctors and dentists for many years and was part of the legal team in the landmark Supreme Court case of *Montgomery v Lanarkshire Health Board*.

What does patient “consent” really mean? In 2015 the landmark decision of the Supreme Court in *Montgomery v Lanarkshire Health Board* finally recognised the rights of patients to have accurate information about their treatment options and the risks and benefits of those options. The decision was welcomed by many but there were others who felt this approach was a step too far and harmful to the doctor/patient relationship.

For many years prior to Montgomery decisions about treatment options had been made by clinicians paternalistically with patients seen as passive uninformed recipients in the process. There was an attitude, reinforced by the courts, that involving patients in their care would in some way lead to bad decisions medically and would harm the doctor/patient relationship. There was judicial deference to the medical profession. The courts endorsed the view that the profession could decide what information was disclosed to patients.

This lecture will chart the development of the law in the area of information disclosure to date and will question whether the decision in Montgomery has now led to a change in attitude by the medical profession and the courts. Is there now a recognition that the patient who wishes information has a right to receive it and equally has a right to make the informed decisions about their medical care? Does the delivery of good ethical medical care demand recognition of the right of patients to be informed to enable them to give real or true consent?

INV.05 The management of paediatric scars with lasers

Mr Declan Collins¹

¹Chelsea And Westminster Hospital, London, United Kingdom

Session 7: Paediatric session

Biography:

Declan Collins is a Consultant in Plastic Surgery with a specialist interest in burns, scars, and laser. He is the Lead for Research at the Burns Unit at Chelsea and Westminster Hospital, London, and has set up the laser service as part of the scar management unit. He also works at The London Scar Clinic.

The cause of scars in children is similar to that of the adult population and can be broadly grouped into three categories, trauma, burns and medical conditions.

Trauma and injuries are a frequent cause of scarring in the paediatric population with burns injuries making up a significant proportion of these. In the UK on average 110 children are seen per day in emergency departments with burn injuries.

Whilst many wounds heal without significant sequelae many children suffer from functional restrictions, dyspigmentation, pain and itch. Scars may also have serious psychosocial consequences for paediatric patients affecting self-confidence, causing anxiety and reducing social interaction. Successful scar management is multimodal but laser and light-based treatments are now an essential part of the treatment strategy.

We look at some of the challenges of delivering laser scar management in the out-patient and hospital setting. With an emphasis on burns scars, we consider the main laser treatment modalities for irregularities of scar thickness, pigment and vascularity; the frequency and timing of treatments and the role of ancillary procedures and therapies such as topical and intral-lesional drug delivery in combination with conventional scar therapies.

O.13 Management strategies for self-inflicted scars in paediatric patients

Dr Claire Patton¹, Mr Andrew McKean², Mr Declan Collins³

¹Chelsea And Westminster Hospital, London, United Kingdom, ²Chelsea And Westminster Hospital, London, United Kingdom, ³Chelsea And Westminster Hospital, London, United Kingdom

Session 7: Paediatric session

Biography:

Claire Patton is a Junior Clinical Fellow in the Chelsea and Westminster Hospital Plastic and Burns Surgery department. She has recently achieved a training number in Oral and Maxillofacial surgery but looks forward to bringing techniques learned from Plastic surgery and laser colleagues into this field.

Background and Objectives

Deliberate self-harm (DSH) is defined by NICE as ‘any act of self-poisoning or self-injury, irrespective of the underlying intent’. DSH may be inflicted for a variety of reasons in different population groups, however, is more common in females. Scars resulting from DSH can lead to patient experiencing stigma, shame, guilt and anger. Improving scars can have a positive impact on patients’ well being however there are different treatment modalities available and therefore we wanted to explore these.

Materials and Methods

We present cases where laser therapy has been employed to improve the aesthetics of scars resulting from self-inflicted wounds (SIW), review typical cases of DSH that present to our service and review current trends in management.

Results

Literature review reveals that there are a number of ways in which scars can be managed ranging from conservative measures, non-surgical methods such as laser, dermabrasion or tattooing to surgical management e.g. excision with primary closure, skin grafts or local flaps. Non-ablative fractional 1565 nm laser and CO₂ laser were shown to improve scars by objective measurement. There is no evidence for the best treatments to use in paediatric patients, but it is important to consider what treatments will be tolerated in this age range and the challenges of providing treatment.

Conclusion

Scar management is complex especially in cases of DSH. There is a paucity of published research related to the management of SIW scars in paediatric patients and we support further evaluation of available treatments

O.14 Upper lip scarring as a complication of laser treatment for capillary malformation

Dr Miteshkumar Ramwani¹, Dr Giulia Rinaldi², Dr Samira Batul Syed¹

¹Great Ormond Street Hospital for Children NHS Foundation Trust, London, United Kingdom, ²University College London Hospitals NHS Foundation Trust, London, United Kingdom

Session 7: Paediatric session

Biography:

Dr Miteshkumar Ramwani has almost 8 years of experience working as a Paediatrician after finishing paediatric training in India. Currently he works as a clinical fellow with the department of Paediatric Dermatology at GOSH. He is aspirant to become paediatric dermatologist.

Background and Objectives: Port-wine stains (PWS) are capillary malformations. They usually present as pinkish purple or dark red markings on the skin with well-defined borders.

At our centre, Pulsed Dye Laser (PDL) therapy is the first line laser treatment for PWS, and as a second line, we offer triple wavelength therapy using 'Cynergy' multiplex laser which uses a combination of PDL 585nm and NDYAG 1064nm, superimposed by PDL at 595nm for recalcitrant facial PWS. Common side effects following laser therapy are pain, redness, and bruising at the site of laser. However, scarring is uncommon.

The objective of the study was to determine the incidence and possible risk factors associated with scarring on the upper lip.

Study Design: This was a hospital-based retrospective observational study, recruiting children aged 3-18 years with facial PWS who were treated with Triple therapy. Patients with haemangiomas or other facial vascular anomalies were excluded from the study.

Results: A total of 139 patients were treated on upper lip from January 2019 to January 2022. Incidence of lip scarring after laser treatment was 5.03% over 3 years (7 patients). We found the key factors for scarring to be inadequate post-operative nursing care, lack of parental education, abnormal wound healing, and equipment failure with improper delivery of cooling.

Conclusions: The complications from laser surgery can be minimised by early recognition, nursing advice and treatment of scarring. Scars from laser therapy can be treated with topical or intralesional steroids (Triamcinolone) and silicone gel among other therapies.

O.15 Pulse dye LASER - treatments can be safely delivered without formal test patching in children

Miss Shetha Naji^{1,2}, Mr Christopher Jones³, Miss Eleanor Breuning¹
¹Alder Hay Hospital, Liverpool, United Kingdom, ²Whiston Hospital, Prescot, United Kingdom, ³NHS, Leeds

Session 7: Paediatric session

Biography:

Senior clinical fellow

Introduction

Pulse dye LASER (PDL) traditionally requires test patching prior to full treatment, to assess for efficacy and side effects. In our unit, in children under age 6, this requires a general anaesthetic. The aim of this study was to ascertain whether results of test patching change settings chosen for subsequent treatment and therefore, whether test patches are necessary.

Method

Retrospective review of 29 newly treated patients with Fitzpatrick skin types I-III, using Candela Vbeam Perfecta, from a prospectively populated database was performed. LASER settings and any side effects, of test patching and 1-3 subsequent treatments were analysed.

Results

An average of 1.8 treatment settings were used for test patching. Each patient's test patch used the same pulse duration, spot size and cooling settings, with variance of fluence only. An average of 15.5 shots per test was performed. Only 2 patients had Treatment 1 fluences lower than the Test Patch, because of strong responses noted immediately. 45% of Treatment 1 fluences started with the same fluence as the test patch with the majority increased during Treatment 1. No side effects were noted in this cohort following any treatment.

Conclusion

For an experienced operator, full treatment without test patching can safely be performed in patients with Fitzpatrick skin type I-III, because immediate clinical assessment is sufficient. PDL treatment of entire lesions is now performed based upon immediate result of test shots

and a prospective audit is ongoing. Benefits include reduced number of general anaesthetics, reduced waiting lists and better cost efficiency.

INV.06 Results from a novel, multi-focal low frequency ultrasound device for painless lipolysis

Dr Mario Trelles¹

¹Spanish Society of Surgical Medical Lasers (SELMQ), Spain

Session 9: Skin/Aesthetics

Biography:

MD and PhD Maxima Cum Laude, General Surgeon, Plastic Aesthetic and Reconstructive Surgeon. American Board Diploma for Lasers in Aesthetic Surgery.

Consultant Plastic-Aesthetic Surgeon, Vilafortuny Laser Centre / Plastic Section, Jumeira, Dubai (UAE).

Professor and Chair of the Master Program "Lasers in Medicine & Surgery in Dermatology and Aesthetics for Post Graduated Medical Doctors", Official College of Physicians & University of Barcelona, and the Nebrija University, Madrid, Spain.

High intensity focused ultrasound (HIFU) produces adipose tissue lysis during the treatment of subcutaneous fat due to thermal effect. In this study, a system of low frequency and medium intensity ultrasound is used for non-invasive reduction in subcutaneous fat. The technology used differs from the traditional thermal effect concept of HIFU because it uses medium-intensity, low-frequency waves and multiple energy focal zones. It allows modification and reduction of subcutaneous fat accumulations during application, which is practically painless. This study presents the first specific technical analysis of this system and the results obtained in ten patients who have received the three abdominal treatments were examined three months after the third session, compared to the results with their status at the beginning of treatment. The various measurements have found a significant objective and subjective reduction in the abdominal volume, which was also verified by comparative photographs. The Histological analysis following the treatment showed an adipocyte membrane lysis and the tissue presented with better condition of dermis with less elastosis. Additionally, no significant adverse effects were observed. Moreover, the abdomen region fat reduction was statistically confirmed by keeping the outcome stable three months after last treatment.

O.16 1550nm scanning laser resurfacing plus Hi-Fu an effective alternative to medical needling +RF

Mr John Culbert¹, Mrs Louise Sommereux², Mrs Mandy Davies³
¹Cosmex Clinic, Cambridge, United Kingdom, ²Cosmex Clinic, Cambridge, United Kingdom, ³Vale Lasers, Cardiff, Wales

Session 9: Skin/Aesthetics

Biography:

John Culbert has been responsible for energy-based treatments at Cosmex Clinic since 2014. The clinic's range of aesthetic medical treatments is extensive. 2015 he founded Cambridge Stratium to better satisfy the requirements of the clinic. John started his career in R&D engineering at Cambridge Instruments, then Philips S&I.

We are seeing an increased use of combination treatments to achieve optimum results with minimum patient down time. Fractional 1550nm

laser is an FDA approved non-ablative treatment for skin resurfacing and scar revision, which is now enhanced by non-sequential scanning to greatly reduce the bulk heating effect. This enables more intense treatments to be delivered in a single pass with less discomfort to the patient. The higher power in each of the micro treatment pulses enables a greater therapeutic depth, with minimal risk of PIH. 1550nm treatments have been FDA approved for Melasma and the non-sequential scanning reduces the bulk heating, a suspected cause of recurrence. When combined with Hi-Fu the overall treatment can extend from the epidermis to a maximum of 5mm when treating skin, or 16mm when breaking down stubborn areas of fat. The results achieved in terms of skin resurfacing and scar revision are at least comparable with medical needling + RF. The advantages of the combination of 1550 and Hi Fu are:

- Non-invasive i.e. no breaking of the skin barrier,
- Very flexible scanning from 25- 3025ppa and any shape
- FDA approved for treating Melasma and age spots
- FDA approval for treating female pattern hair loss
- Hi-Fu is an effective treatment for breaking down deposits of fat to 16mm depth.
- Much lower consumable cost and no risk of blunt needles
- No needle phobia

O.17 Professional and At Home IPL impact on Diode Laser Hair Reduction. Overview of the studies

Ms Magdalena Atta-Motte¹, Izabela Zaleska²

¹Certifa Aesthetics Training Academy, London, United Kingdom, ²The Section of Professional Cosmetology, The Faculty of Motor Rehabilitation, the University of Physical Education in Krakow, Krakow, Poland

Session 9: Skin/Aesthetics

Biography:

An International Laser Expert and Author of over 20 papers including "Laser business" book published. Visiting lecturer and international trainer on lasers and EBD. Member of American Society for Laser Medicine and Surgery (ASLMS), BMLA (British Medical Laser Association), ELA (European Lasers Association).

Introduction

Devices that use light, including lasers, are very popular and are often used in aesthetics. According to Statistics MRC, the global aesthetic laser market will reach \$1.29 billion in 2022. The most popular treatment performed with light-based devices is hair reduction.

For hair reduction, diode lasers are considered the gold standard, safe and effective for every skin type, hair type and ethnicity, as confirmed by our clinical cohort studies on groups of different ethnicities.

Material and methods

90 healthy females, 21- 23 years old, skin type II-III took part in the study. 805 nm diode laser and the Professional IPL device, as was the Home IPL was used.

Results

Results were compromised when patients used IPL devices prior to diode laser treatments IPL.

We found that diode laser alone was more effective than when used after IPL treatments. The more IPL treatments, the less effective the diode laser was.

A percentage average of hair loss among patients treated with a diode laser as a control group is higher which indicates the laser's higher effectiveness.

Conclusions:

- IPL – professional and for home use has a negative impact on subsequent diode laser treatments.

- The more treatments with professional and home IPL, the worse the results of subsequent diode laser treatments.
- Treatments with the use of IPL reduce unwanted hair less than a diode laser.
- Treatments with professional and home IPL are more painful than treatments with a diode laser.

O.18 My 20 Years' Experience with Laser Tattoo Removal (Useful Tips) - WITHDRAWN

Md Ahmed Al Issa¹

¹Derma Clinic, Saudi Arabia

Session 9: Skin/Aesthetics

O.19 Pulse stacking with the Alexandrite laser for management of highly resistance verrucas in immunocompromised patients

Ms Kerry Davies¹, Mr Caroline Hutchinson¹, Mr Iain Mackay¹

¹Canniesburn Plastic Surgery Unit, Glasgow Royal Infirmary, United Kingdom

Session 9: Skin/Aesthetics

Biography:

Specialist Trainee Registrar and previous Clinical Research Fellow in Lasers at Canniesburn Plastic Surgery Unit.

Introduction

A case series of 10 consecutive patients referred to the laser suite for the management of verrucas and warts that had previously exhausted all other management options. All patients were immunocompromised.

Methodology

All patients had overlying callus paired down with a 15 blade and received local anaesthesia to facilitate effective pulse stacking. Lesions were treated initially by triple pulsing the entire surface with the Alexandrite laser; 755nm, 6mm spot, 3msec, 80 J/cm². If the wound broke down, subsequent treatments were double pulsed.

Results

6 patients had a complete resolution of their warts, 1 had a partial clearance and 2 had no effect. 1 patient spontaneously resolved whilst on waiting list and was excluded. 4 had significant wound breakdown. The patients who had failed treatment both had mosaic warts affecting both hands and feet. 2 patients who went back to pulsed dye laser treatment had a return of their lesions. These subsequently resolved with further alexandrite laser. The best responders had individual or clusters of lesions with mosaic warts being highly resistant to treatment.

Conclusion

Pulse stacking with the alexandrite laser is an effective therapy for the treatment of highly resistant warts and verrucas in immunocompromised patients with complete success in 67% increasing to 75% if mosaic warts are excluded.

INV.07 Laser and light-based diagnostic adjuncts in clinical practice

Mr Colin Hopper¹

¹UCL, London, United Kingdom

Session A: PDT

Biography:

Asst Clin Prof

UCL Eastman Dental Institute

From the earliest days of modern PDT, the use of drugs to enhance tumour mapping has been of interest. However, until recently, these techniques have found few clinical applications. The exception being the use of ALA in brain tumour mapping.

There have been a number of systems developed for diagnostic and mapping purposes that rely on the physical and biochemical characteristics of tumour tissue and several systems integrate diagnostic and therapeutic elements – so called theranostics. These techniques tend to use non laser light sources, but the particular attributes of laser light are utilised in optical coherence tomography. The talk will illustrate the available techniques and compare with competitor technologies.

O.20 Photodynamic Therapy – how do we do it? 12 years' experience from Kings College Hospital

Professor Kathy Fan¹

¹Kings College Hospital, London, United Kingdom

Session A: PDT

Biography:

Kathleen Fan PhD BDS MBBS FDS RCS FRCSEd FRCS(OMFS)
Consultant Oral & Maxillofacial Surgeon, Kings College Hospital, London

Professor in Oral & Maxillofacial Surgery, Kings College London

Introduction:

Photodynamic therapy (PDT) is a treatment involving the utilisation of a drug which acts as a photosensitiser with preferential accumulation in abnormal tissue. On activation by visible light, the target tissue is destroyed. This modality is of benefit in the management of cutaneous malignancy and premalignancy, in particular patients with field cancerization / field change due to widespread photodamage.

Our unique set up of PDT service is linked to a conventional skin cancer multi-disciplinary service. The service is run by the maxillofacial team and delivered by a nursing team (Clinical Nurse Specialist and maxillofacial nurses). The service evolved rapidly from conventional PDT for discrete lesions (basal cell carcinomas, Bowen's disease and actinic keratosis) to managing patient with extensive field change disease utilising a combination of conventional and daylight PDT. The local patient population includes large numbers on immunosuppressant therapy for chronic disorders and organ transplant recipients and a greater cohort with field change disease. The utilisation of PDT in these patient groups, in addition it's use as an adjunct to surgery and tools created to aid delivery of optimal treatment will be discussed.

Conclusion:

Photo dynamic therapy is a useful modality in the management of basal cell carcinoma and cutaneous pre-malignancies, in particular it's utilisation in managing cutaneous field change disease. However, there is still opportunities for optimisation.

O.21 An LED-based device for phototesting: from concept to pre-clinic

Dr Paul O'Mahoney¹, Prof Sally Ibbotson¹, Dr Ewan Eadie²

¹University Of Dundee, Dundee, United Kingdom, ²NHS Tayside, Dundee, United Kingdom

Session A: PDT

Biography:

Dr Paul O'Mahoney is a Post-Doctoral Research Assistant working within the Photobiology Unit at Ninewells hospital. He obtained his PhD in Physics in 2015 and his BEng (Hons) in Mechanical Engineering in 2011. His research is focused on the applications of physics in Photodynamic Therapy and Photodiagnosis.

In order to establish whether an individual is abnormally photosensitive and the nature and degree of photosensitivity, monochromator phototesting is undertaken as the "gold standard" investigation in photo-diagnostic centres. This process usually employs the use of a diffracted xenon arc source, where each narrow waveband and light dose are delivered in sequence, resulting in a time intensive process, particularly at longer UVA and visible wavelengths. An LED-based phototesting device was devised to address challenges present in phototesting.

The concept of the device is that multiple LEDs can be employed to deliver each waveband and dose of light simultaneously to separate areas of the skin. In this way, total irradiation time can be drastically reduced, on the condition that LED irradiances are high enough. An issue with the use of LEDs is heat generation, therefore the LEDs are coupled via optical fibre to the patient's skin, keeping excess heat and electrical components away from the patient. A fibre-skin interface is designed to facilitate irradiation of an 8 mm diameter area, consistent with xenon-arc monochromator, with a transparent plastic film for easy cleaning.

The final device contains 36 individually addressable LED's. The LED irradiances were comparable to the xenon-arc monochromator system, indicating good suitability for phototesting. Based on these irradiances, a phototesting schedule which might typically take upwards of 1.5-hours may be completed in as little as 20 minutes. In summary, this novel LED-based device replicates some of the key features of monochromator phototesting, with innovations which drastically reduce planned irradiation time.

O.22 Thermal Relaxation Time – the glaring flaw in Selective Photothermolysis

Mr Mike Murphy¹

¹Dermalase Research Unit, Glasgow, Scotland

Session A: PDT

Biography:

- General Secretary of the Association of Laser Safety Professionals, since 2017.
- General Secretary & Treasurer of the UK Council for Surgical Plume.
- Certificated Laser Protection Adviser (LPA) since 2014. Registered with Healthcare Improvement Scotland (HIS).
- More than 30 years in the medical laser industry working in various countries across the world.
- Trainer in medical laser applications and safety across many countries since 1991.
- Published more than 25 articles, reports and papers in peer-reviewed medical laser journals and trade magazines.

In 1982 Anderson and Parrish introduced the idea of Selective Photothermolysis in the treatment of blood vessels by laser. They suggested limit the laser pulse duration to within one thermal relaxation time of the target vessels, to ensure a suitable temperature rise in the target, and to minimise thermal damage to surrounding tissues. They wanted to induce "coagulation necrosis" in these vessels.

This idea was tested clinically, and results were very encouraging. However, the laser they tested output pulsewidths around 0.3 microseconds, whereas the target vessels had relaxation times in the range 50 microseconds to 4.8

ms. Their histological results showed explosive responses in the vessels leading to purpura – not coagulation necrosis, as they had hoped for. The reason for this was due to the very short pulsewidths they tested – it was too short. The relaxation time idea is incorrect since it does not consider the coagulation processes in the target tissues. To properly denature tissues we must consider the temperature-time history of the target cells and the consequent protein denaturation. Modern-day lasers (diode, long-pulsed Nd:YAG) and IPLs utilise pulsewidths far in excess of the targets' relaxation times (both hair follicles and vessels) and yet clinical results are good. This report shows why the choice of relaxation times as a temporal guide is clearly wrong.

O.23 Quantifying the benefits of picosecond lasers

Mr. John Culbert¹

¹Cosmex Clinic, Cambridge, United Kingdom

Session A: PDT

Biography:

John Culbert has been responsible for energy based treatments at Cosmex Clinic since 2014. The clinic's range of aesthetic medical treatments is extensive. 2015 he founded Cambridge Stratum to better satisfy the requirements of the clinic. John started his career in R&D engineering at Cambridge Instruments, then Philips S&I.

Picosecond lasers when launched were “justified” by claims of superior performance including, the ability to clear all colour tattoos and the ability to completely clear tattoos with little or no collateral damage to the skin.

This paper attempts to quantify these claims in comparison to the current industry standard 5ns Q switch laser.

Specifically:

The relative strength and range of the photothermal and photoacoustic effects and how this is affected by power density.

Depth of therapeutic treatment and how this is affected by wavelength and laser power density.

Injury to the surrounding tissue and how this is affected by the laser energy.

How the treatment of phagocytised particles is affected by the laser power density.

The limiting factors including laser power and phagocytised particles are briefly discussed.

Other potential advantages of picosecond lasers are mentioned but not quantified, including Light Induced Optical Breakdown (LIOBS) and the potential use of picosecond lasers for treating melasma.

INV.08 Photoantimicrobials - Improving on Methylene Blue

Professor Mark Wainwright¹

¹Liverpool John Moores University Hospital, Liverpool, United Kingdom

Session B: Lasers in Dentistry and Vascular Lesions

Biography:

Prof. Mark Wainwright has been in photosensitiser R&D since 1987, initially in the photodynamic therapy of cancer, but for almost 30 years

in infection control applications, especially concerning conventional drug resistance. He formed the spin-out drug-discovery company Pharamlucia in 2008. His book *Photosensitisers in Biomedicine* was published in 2009. Mark has been Professor of Antimicrobial Chemotherapy at LJMU since 2011.

The phenothiazinium derivative methylene blue (MB) was first reported to be an effective photobactericide in 1908. It has been used in conventional human therapy since 1891, and is the most common clinically used photoantimicrobial, principally in dentistry. However, its activity can be superseded by improved, compounds, based on a similar chemical scaffold.

Using a conventional drug development approach, phenothiazinium compounds having greater lipophilicity, lower aggregation potential and increased singlet oxygen yield have been produced. These compounds are unsurprisingly improved photoantimicrobials in vitro but have also shown improved activity using substitute in vivo models, such as *Galleria mellonella* and in small animal screens.

The two principal new compounds are a pentacyclic analogue of MB and a derivative of the related toluidine blue (TB) having a larger alkyl side chain. Both compounds represent optimal property combinations from within large candidate series and considerable collaborative screening against biological targets in vitro and in vivo. Massively increased activity relative to MB is explained by improved uptake due to designed characteristics, such as increased lipophilicity and lower aggregation.

In order to satisfy suitability for purpose requirements and to demonstrate utility against conventional drug resistance, the activity profile for the compounds includes important pathogens such as *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, vancomycin-resistant enterococci and *Candida auris*.

O.24 Laser-Assisted in ankyloglossia and upper midline frenectomy in paediatric patients

Dr. Reem Hanna^{1,2}

¹Department of Oral Surgery, King's College Hospital, London, United Kingdom, ²Department of Surgical Sciences and Integrated Diagnostics, University of Genoa, Italy

Session B: Lasers in Dentistry and Vascular Lesions

Biography:

• Professor ac in Department of Surgical Sciences and Integrated Diagnostics/University of Genoa (UniGe)

• An Associate Specialist in Department of Oral Surgery at King's College Hospital in London/UK.

• Registered Specialist in Oral surgeon in UK.

• Honorary Associate Professor at UCL-Eastman Dental Institute in London/UK, where she is the coordinator and lead of Fellowship Courses in Laser Dentistry for dentists, hygienists and therapists.

• Senior educator, clinician and experienced researcher. She lectures nationally and internationally on the use of photobiomodulation, antimicrobial photodynamic therapy and surgical laser in various oral applications and diseases. She has been invited to present her work at several international conferences, as an invited/keynote presenter. She achieved her PhD in Photomedicine from UniGe in 2020 with distinction and has received publications in over 35 peer reviewed papers on the use of phototherapy in dentistry.

• Executive Board Member of British Medical Laser Association (BMLA) and Chair of Scientific Committee.

Tongue-tie (ankyloglossia) is a condition present at birth that restricts the tongue's range of motion, leading to inability to breastfeed successfully and causing a variety of challenges for the infant and the mother. Whereas upper midline frenum of various mucogingival attachment, causing central diastema for which surgical intervention is required. Treatment of ankyloglossia and upper midline anomalies is controversial. Laser-assisted therapy can overcome the challenges of the current treatment modalities.

This talk addresses the clinical indications and advantages in utilising various surgical laser wavelengths, leading to optimal clinical outcomes and enhance patients' experience. It also includes clinical cases and clinical study that have shown that Laser treatment can offer a minimal surgical intervention with minimal post-operative complications, functional improvement and good patient's perception of the laser treatment.

O.25 Verrucous Vascular Malformations (VVMs): Is laser therapy effective for these lesions?

Dr Anita Cako¹, Dr Mitesh Ramwani¹, Dr Samira Syed¹
¹Great Ormond Street Hospital, London, United Kingdom

Session B: Lasers in Dentistry and Vascular Lesions

Biography:

A paediatrician completing a post CCT fellowship in Paediatric Dermatology, Great Ormond Street Hospital, London.

Background: Verrucous Vascular Malformations (VVM) are rare congenital vascular anomalies composed of capillaries and veins in the dermis and extend into subcutaneous tissue. They are slow-flow, of varying sizes and are often associated with bleeding, ulceration, infection and disfiguring progression.

Objective: To assess if laser therapy plays a singular role in management of VVM.

Method: A patient from our vascular birthmark database was reviewed following pulsed-dye laser treatments over 8 years. Clinical notes, MRIs and photos were used to evaluate outcome. He first presented at 7 weeks of age with a well-defined, raised birthmark on the right chest wall and abdomen with significant draining veins and purplish/brown blebs within the malformation. It became more heterogenous over time with hyperkeratotic areas. In the evaluation, an ultrasound and MRI scan with gadolinium enhancement were performed and the results discussed at our MDT consisting of specialists caring for complex vascular anomalies patients.

Results: The images revealed extensive prominent veins within the subcutaneous tissue considered unsuitable for sclerotherapy. Due to body surface area involved and risk of recurrence, surgical intervention was not an option either. Following laser treatments (double pass, using triple wavelength approach), the lesion demonstrated flattening, colour reduction, no bleeding and no further hyperkeratosis. Conclusion: The treatment of VVM is complex and requires a multidisciplinary team approach. Early laser treatment is beneficial in improving cosmetic appearance, reducing bleeding, infection and progression. Approach to treatment options should be tailored to symptoms and functional difficulties. We recommend laser treatment as a 1st line choice.

O.26 Treatment of iatrogenic vulval lymphangiectasia using a surgical ablative and fractional carbon dioxide laser

Dr Florence Robinson¹, Miss Emma Hitchens², Dr Kay Thomas², Dr Antonio Orlando², Dr Daniel Keith²
¹North Bristol NHS Trust, Bristol, United Kingdom, ²Dermatology Department, North Bristol NHS Trust, Bristol, United Kingdom

Session B: Lasers in Dentistry and Vascular Lesions

Biography:

Foundation year 2 Doctor at North Bristol NHS Trust.

We present a 56-year-old lady who was diagnosed with Dermatofibrosarcoma Protuberans (DFSP) of the pubic area in 1987. She went through several excision surgeries and recurrences culminating in a radical wide excision and flap repair in 2005. Since the final surgery she had suffered with persistent symptoms of swelling and discomfort of the vulva and leaking fluid and blood into her underwear. On examination she had oedema and small vesicles affecting her right labia majora. Skin biopsy confirmed a diagnosis of iatrogenic lymphangiectasia. We trialled laser ablation of the lymphangiectasia. Under topical and local anaesthetic a 10600nm Carbon Dioxide Laser (SmartXide Touch, Deka, USA) was used first freehand to vapourise the lymphangiectatic vessels (Power 0.8-2.0W; 7" Surgical Handpiece; Smart Pulse). This was followed by fractional ablation of the field (Power 8W; Dwell Time 500 microseconds; Spacing 500 micrometres; Stack 2; Smart Scan; Deka Pulse). Follow up at 3 months showed her symptoms to have completely resolved. She reported the area healed within 1 week and since then the lymphangiectatic vessels had not returned. Our case joins a growing body of evidence demonstrating that CO₂ lasers can be used to treat vulval lymphangiectasia with good cosmetic results. In particular we have shown a safe and effective use of a combination of surgical ablative and fractional carbon dioxide laser in the treatment of iatrogenic vulval lymphangiectasia.

O.27 Low Level Laser Therapy for Hypothyroidism caused by Hashimoto's Disease

Ms Ruth Phypers¹, **Prof. Venera Berisha-Muharremi²**

¹Laser Medicine, London, United Kingdom, ²Medical Faculty, University of Prishtina, Prishtina, Kosovo

Session C: Photobiomodulation (PBM) therapy: lasers and LEDs in medicine and dentistry

Biography:

Ruth Phypers builds on her experience in leading-edge technology since 1992, combining extensive health and recovery knowledge with Low Level Laser technology to offer Photobiomodulation Therapy at Laser Medicine London. Based in Harley Street, London, Ruth applies therapeutic laser protocols developed over 40 years of extensive research.

Biography:

Prof. Venera works at the Faculty of Medicine, at the University of Prishtina in Kosovo since 2004. First as an assistant in the Department of Anatomy and then in that of Internal Medicine where she continues to work but from 2017 as a Professor.

A collaborative project to establish an effective Low Level Laser Therapy (Photobiomodulation Therapy) protocol for the treatment of Hypothyroidism caused by Hashimoto's Disease.

Summary:

There have been four significant published clinical trials, which indicate positive results for treating hypothyroidism caused by the autoimmune condition, Hashimoto's Disease (HD). Jointly, we aim to assess previous clinical trials proving the effectiveness of LLLT/PBMT for treating hypothyroidism caused by Hashimoto's Disease and to establish an effective treatment plan that incorporates the application of LLLT/PBMT, for new and existing patients.

We aim to establish appropriate parameters for an effective protocol / suggested treatment plan, which is accessible, affordable and provides long term improvements in thyroid function.

Method:

We discuss the mechanisms and methodology to develop an effective working PBMT protocol to include the following:

- Overview of previous clinical trials.
- Overview of Hashimoto's Disease and Hypothyroidism.
- Identification of suitable candidates for treatment.
- Identified measures to monitor and assess treatment protocols.
- Description of 3-month protocol, to include the application of Low Level Laser treatments.
- Other elements considered within the 3-month protocol to include supplements and nutrition.
- Current findings from our work, in clinic, with patients in London and Prishtina.

Conclusions:

This is current work in progress, with a number of patients in London and Prishtina. We would like to share our findings so far.

INV.09 Photobiomodulation and Antimicrobial Photodynamic Therapy as adjunct in the prevention and treatment of osteonecrosis of the jaws

Professor Ramille Lima¹

¹Christus University Centre, Lima, Brazil

Session C: Photobiomodulation (PBM) therapy: lasers and LEDs in medicine and dentistry

Biography:

Professor at Christus University Center, College of Dentistry, Professor and advisor at Christus University Center Post-graduate program in Dental Sciences
PhD (2014) in Clinical Dentistry, Federal University of Ceará (BR) and New York University (USA)
MSc (2009) in Clinical Dentistry, Federal University of Ceará (BR)
DDS (2006), Federal University of Ceará (BR)

The treatment of osteonecrosis of the jaws associated with radiotherapy (osteoradionecrosis) (ORN) and Medication-related osteonecrosis of the jaws (MRONJ) remains a challenge, which often requires aggressive surgical approaches. However, recent studies have shown that specific adjuvant treatments such as; photobiomodulation and antimicrobial photodynamic therapy associated with minimally conservative surgery can be considered, as an effective and safe in the treatment and prevention of ORN and MRONJ. This presentation will report a case with the presence of ORN where multiple extraction was needed. Low-level laser therapy and antimicrobial photodynamic therapy were used for ORN treatment and prevention. The presentation will also highlight the results of experimental research in which photobiomodulation therapy and antimicrobial photodynamic therapy were used to treat MRONJ induced in rats

INV.10 Role of Photobiomodulation Therapy in Modulating Oxidative Stress in Temporomandibular Disorders

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Session C: Photobiomodulation (PBM) therapy: lasers and LEDs in medicine and dentistry

Biography:

- Professor ac in Department of Surgical Sciences and Integrated Diagnostics/University of Genoa (UniGe)
- An Associate Specialist in Department of Oral Surgery at King's College Hospital in London/UK.
- Registered Specialist in Oral surgeon in UK.
- Honorary Associate Professor at UCL-Eastman Dental Institute in London/UK, where she is the coordinator and lead of Fellowship Courses in Laser Dentistry for dentists, hygienists and therapists.
- Senior educator, clinician and experienced researcher. She lectures nationally and internationally on the use of photobiomodulation, antimicrobial photodynamic therapy and surgical laser in various oral applications and diseases. She has been invited to present her work at several international conferences, as an invited/keynote presenter. She achieved her PhD in Photomedicine from UniGe in 2020 with distinction and has received publications in over 35 peer reviewed papers on the use of phototherapy in dentistry.
- Executive Board Member of British Medical Laser Association (BMLA) and Chair of Scientific Committee.

The pathogenesis and aetiology of temporomandibular disorder (TMD) are complex and not clearly understood. Nevertheless, oxidative stress and reactive oxygen species play a vital part in TMD pathogenesis and its progression. Photobiomodulation (PBM) therapy is an effective treatment modality, as monotherapy of various light sources of single wavelength or in combination of two wavelengths, in improving chronic pain, functionality, anxiety/depression and, subsequently, quality of life in patients with TMD.

In this talk is addressing, a systematic review and meta-analysis of human randomised controlled trials (PROSPERO registration; ref CRD 42020198921), which is aimed to govern PBM therapy efficacy in TMD. PRISMA guidelines and Cochrane Collaboration recommendations were followed. Differences in pain reduction assessment by qualitative measurement with visual analogue scale (VAS), pain pressure threshold (PPT) and maximum mouth opening (MMO) were calculated with 95% confidence intervals and pooled in a random effects model with a subgroup analysis, evaluating the role of follow-up duration. Heterogeneity was analysed using Q and I² tests. Publication bias was assessed by visual examination of funnel plot symmetry. Qualitative analysis revealed 46% of the 44 included studies showed a high risk of bias. Meta-analysis on 32 out of 44 studies revealed statistically significant intergroup differences (SSID) for VAS (SMD = -0.55; 95% CI = -0.82 to -0.27; Z = 3.90 (p < 0.001)), PPT (SMD = -0.45; 95% CI = -0.89 to 0.00; Z = 1.97 (p = 0.05)) and MMO (SMD = -0.45; 95% CI = -0.89 to 0.00; Z = 1.97 (p = 0.05)), favouring PBMT compared to control treatment strategies. Sensitivity analysis revealed SSID (SMD = -0.53; 95% CI = -0.73 to -0.32; Z = 5.02 (p < 0.0001)) with low heterogeneity (T₂ = 0.02; χ^2 = 16.03 (p = 0.31); I₂ = 13%). Hence, this review, for first time, proposed suggested recommendations for PBM therapy protocols and methodology for future extensive TMD research

INV.11 A novel four wavelength, high pulse repetition laser for hair removal

Dr Mario Trelles¹

¹Spanish Society of Surgical Medical Lasers (SELMQ), Spain

Session D: Skin Lasers

Biography:

MD and PhD Maxima Cum Laude, General Surgeon, Plastic Aesthetic and Reconstructive Surgeon. American Board Diploma for Lasers in Aesthetic Surgery

Consultant Plastic-Aesthetic Surgeon, Vilafortuny Laser Centre / Plastic Section, Jumeira, Dubai (UAE).

Professor and Chair of the Master Program “Lasers in Medicine & Surgery in Dermatology and Aesthetics for Post Graduated Medical Doctors”, Official College of Physicians & University of Barcelona, and the Nebrija University, Madrid, Spain.

Introduction

In our prospective study, we have evaluated the efficacy and clinical safety of a novel four-wavelengths diode laser for photoepilation (Milesman Compact Blend®) and have compared the outcomes obtained in our study with other newly emerging equipment presented in medical literature.

Importance of the study: Milesman Compact Blend® is the only laser in the market that emits pulses of four different wavelengths acting at the same time (755 nm, 810 nm, 940 nm and 1064 nm), and incorporating a specific sophisticated system of vertical emission perpendicular to the actuation plane for depositing delivered from a large window-nozzle. Good clinical results have been described by many users of this equipment, but no clinical studies have been reported to date of initiation of our investigation.

Design

12 volunteers (8 women and 4 men) were included in a split-body randomized controlled clinical trial where one control armpit was shaved with a razor and the hair of the other armpit was removed with the Milesman Compact Blend®. Three treatment sessions at 1-month intervals were carried out in three consecutive months. Hairs in each armpit were evaluated before treatment and three months after the third treatment session. Standardized photographs were compared using the GAIS (Global Aesthetic Improvement Scale), in order to rate the degree of epilation improvement. A computerized count of signals corresponding to hairs was used with a validated software. Results were calculated indicating the arithmetic mean (m), mode (M), range (R) and percentages (%). Bibliographic references provided in the discussion of the study enable the comparison between the results of Milesman Compact Blend® and other laser hair removal system recently introduced into the market.

Results

Visual comparison of standardized photographs before and after treatments with Milesman Compact Blend® obtained a mean of 3.3/4 points on the GAIS scale (m=3.3; M=3, R=2-4), which is equivalent to an approximate hair removal efficacy of 70%. This percentage is fully consistent with the results obtained through the computerized count of hair signals per normalized area with an average hair removal efficacy of 73% (m=73%, R=56%-87%). Treatments were well tolerated and a mild transient erythema was noticed following treatment with no other negative signs and no any type of complications.

Conclusion

Milesman Compact Blend® represents an important technological innovation in the field of laser hair removal with a comparable or superior efficacy to that of other equipment recently evaluated in the literature. It is lightweight, easily to be transported, simple to handle, effective and efficient. Further clinical trials are necessary to expand on these preliminary results in order to be shared with the medical community.

SS.05 Next generation medical LED phototherapy - clinical advantages**Mr Dale Needham¹**

¹Aesthetic Technology Ltd, United Kingdom

Session E: Nursing and Therapist session

Biography:

Dale Needham, Managing Director of Aesthetic Technology Ltd who manufacture the Dermalux LED system, is a global authority in LED design and engineering.

Dale will be discussing the science of LED, key considerations of an LED device for best results and some of the myths around the LED Phototherapy treatment. Dale will also talk through product certifications and the implications of the new Medical Device Regulations in our sector. LED Phototherapy is now recognised as an essential skincare modality for successful aesthetic practice, due to its versatility, application across a wide range of indications and role in the foundation good skin health. However, success with this treatment is determined by the delivery of precise and proven energy parameters for optimum cellular activation.

SS.06 The role of LED phototherapy to assist laser treatments for hidrenitis suppurativa

Mrs Roxana Chiru¹, Professor Sandip Hindocha¹, Sr Kerry Muggesson¹,

¹Bedford Hospital NHS Trust, United Kingdom

Session E: Nursing and Therapist session

Biography:

Mrs. Roxana Chiru, MD, PhD, BTEC (LASER), FRCSRO (PLAST)

Mrs. Roxana Chiru is a plastic, reconstructive, aesthetic and laser surgeon, fully accredited and on the Specialist Register with the GMC. She works at the Plastic Surgery and Laser Treatment Centre Bedford Hospital NHS Trust as a Consultant Plastic Surgeon.

Mrs. Roxana Chiru has trained in Romania (Bucharest), Switzerland (Zurich), Austria (Vienna) and UK (London, Liverpool). She has a PhD in oncological breast surgery and the BTEC Professional Certificate in Medical Laser & Light Therapies, levels 4 and 5.

HS is a debilitating and high morbidity condition which provides a challenge for the surgeon and patient. Difficulties in management medically, surgically or even with non surgical adjuncts such as laser still create many episodes of recurrence.

The plastic surgery and laser centre at Bedford Hospital has been introduced to LED phototherapy (MD tri-wave light, Dermalux) which has a strong scientific basis to assist in the healing of wounds in these patients and in addition reduce the risk of recurrence.

We have recently trialed this product as an adjunct to surgical excision and alongside lasers in aid to promote healing along the proliferative and remodelling phases of wound healing.

We have seen that there is sufficient improvement in the clinical state of the wound. We propose that LED phototherapy is a useful modality to be used alongside laser treatments to provide an alternative or adjunct therapy to lasers.

INV.12 Protecting against COVID-19: is Far-UVC safe and effective?**Dr Ewan Eadie¹**

¹NHS Tayside, Dundee, United Kingdom

Session F: Basic Science and Safety

Biography:

My research interest is in dosimetry and accurate metrology of optical radiation sources and the impact on healthcare and public health. This includes ultraviolet, visible and infrared radiation in environmental, healthcare and cosmetic settings. With improved dosimetry comes a greater understanding of the interaction between optical radiation and tissue.

Since the initial stages of the coronavirus (COVID-19) pandemic in late 2019, there have been multiple technologies and interventions claiming to provide protection against transmission of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). One such light-based technology is the Krypton-Chloride (KrCl) excimer lamp. Unofficially known as Far-UVC, the KrCl lamp emits a narrowband of ultraviolet-C radiation with a peak wavelength of 222 nm. Like other wavelengths of UVC, Far-UVC is absorbed by nucleic acids causing photochemical changes that prevent a pathogen from reproducing; effectively inactivating it. In addition, strong absorption in the skin's stratum corneum and the eye's tear layer appear to result in Far-UVC being safer than other UVC wavelengths produced by, for example, low pressure mercury lamps. These attributes contribute to the potential for use of Far-UVC as an optimal disinfection technology to assist in the reduction of infectious disease transmission.

Led by a research team in the East of Scotland, a multi-disciplinary group of physicists, astronomers, engineers, virologists, chemists and clinicians have been undertaking research for more than two years, to investigate the efficacy and safety of KrCl lamps for inactivation of pathogens in occupied spaces. In this presentation we will review the research findings from this group, place them in the context of other published material and present exciting new data from unpublished ongoing research studies. We will highlight some of the research questions that remain unanswered and explore the nuanced relationship between pathogen inactivation and reduction in disease incidence.

INV.13 Basics of laser-tissue interactions for dummies (and experts too ;-)**Prof. Rudolf Verdaasdonk¹**

¹University Of Twente, The Netherlands

Session F: Basic Science and Safety

Biography:

Rudolf Verdaasdonk is professor of Medical Physics & Technology at the University of Twente. He has over 35 years of expertise in clinical applications of lasers for treatment and diagnostics. Using advanced testing facilities, he performs studies in view of patient safety, innovation and valorisation of new medical technologies.

Physicians like to have a feeling what tissue effect they can expect using lasers at specific settings for the desired effect. Extensive physics and modelling is not necessary. A basic understanding can be obtained from simple deductions and illustrated with video tutorials from in-vitro experiments.

The many parameters of influence are reduced to a simple equation: the amount of energy that is deposited in a particular volume of tissue within a particular length of time. Knowing that ~2J of energy is necessary to ablate 1 mm³ of tissue, the tissue effect in the initial volume can be predicted. The beam diameter has a major impact on tissue effect either by focusing or varying the distance to the tissue. E.g. a CO₂ laser with a typical 20 μm absorption depth, can drill a 50 mm deep hole within 0.1 sec when the beam is in focus. In addition, physicians should be aware that the dynamics of the ablation process of

tissue is non-linear and can be divided in phases: coagulation (~60-80 C), desiccation, water vaporization (~100 C), disintegration, carbonization (>300 C), changing the optical properties significantly. During tissue heating, most of the energy is 'consumed' in water vaporization and the temperature will remain around 100 C for a longer time. Important rules of thumb can be derived from this basic knowledge.

O.28 Production of a Dataset Containing Penetration Depth of Light into Skin from 200–1000 nm

Ms Louise Finlayson¹, Isla Barnard¹, Lewis McMillan¹, Ewan Eadie³, Sally H. Ibbotson², Tom A. Brown¹, Kenneth Wood¹

¹School of Physics and Astronomy, University Of St Andrews, St Andrews, United Kingdom, ²Photobiology Unit, University of Dundee, Ninewells Hospital, Dundee, United Kingdom, ³Photobiology Unit, NHS Tayside, Ninewells Hospital, Dundee, United Kingdom

Session F: Basic Science and Safety

Biography:

Louise is a PhD student and part of the EPSRC Centre for Doctoral Training in Applied Photonics. Her research focuses on using Monte Carlo Radiative Transport simulations to model light transport and resulting fluence rate in biological tissues such as skin and more recently, the brain.

The role of visible and infrared light-based treatments in dermatology is constantly increasing, with positive outcomes in skin cancer treatment, laser therapy and wound healing. One consideration for light source selection is the wavelength penetration depth into skin. Finding clear and detailed data showing this can be challenging. This study's aim was to produce such a dataset, where results for any spectrum containing wavelengths from 200–1000 nm can be gained. This will aid the understanding of current phototherapeutic treatments and the design of new ones.

Monte Carlo radiative transfer (MCRT) methods were used to track photon packets from diffuse and direct sources through a 3-dimensional, 6-layer skin model, with Fitzpatrick phototype I. Unique optical properties were applied to each layer over the range 200–1000 nm to increase the accuracy of results. Separate simulations were run in 1 nm increments for the full wavelength range.

A detailed picture of the normalised fluence rate at depth for each wavelength was produced. For example, a direct light source at 532 nm resulted in 5% transmission at a depth of 2 mm into skin. In comparison, at 810 nm, there was 71% transmission at the same depth. A 630 nm diffuse light source penetrated 0.1 mm with 90% transmission versus 0.9 mm for a direct light source. A web application for these data was developed to allow users to upload any spectrum and be given a downloadable dataset showing the fluence rate of each wavelength over the depth of the skin model.

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