

Reports on Scientific Meetings

Latest application of intense pulsed light on skin rejuvenation and acne treatment

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Organiser: The Hong Kong Society of Dermatology and Venereology

Part 1: Latest application of intense pulsed light on skin rejuvenation and acne treatment

Photodynamic therapy (PDT) has been increasingly used in medical practice. While the present application of PDT in Europe mainly includes superficial basal cell carcinoma and superficial squamous cell carcinoma, the use of PDT in United States extends to skin rejuvenation, acne vulgaris and hidradenitis suppurativa.

In principle, PDT is the combination of light and photosensitiser to create super oxygen radical that selectively destroys the target tissues. Various light sources have been used. These include red light, blue light, intense pulsed light (IPL) and pulsed-dye laser. The commonly used photosensitisers are 20% aminolevulinic acid (ALA) and methyl ester of ALA. Either drug should be applied on the skin

for some period of time prior to irradiation. The first one requires application for 14 to 18 hours, therefore the patient needs to visit the clinic twice in consecutive days. Although the latter one is more convenient, it still requires application for three hours under occlusion. Despite its efficacy in treating cutaneous malignancy, traditional PDT is limited by pain and discomfort. Moreover, downtime (as a result of the PDT effect) lasting up to a week is common. These limitations are minimised by modifying the parameters. Apart from shortening the drug incubation period to an hour (short contact), the newer technique significantly reduces pain and downtime making it more acceptable in the cosmetic market.

Actinic keratosis (AK) is a common condition that should be treated because of its unpredictable outcome. Both 20% ALA and methyl ester ALA are currently indicated for non-hyperkeratotic AK located on face and scalp. Although the PDT-treated patients suffer from PDT effect for a week with oedema and crusting, significant clearance of AK was documented in previous studies. Interestingly, the patients also noticed improvement of skin texture after PDT. Subsequent trials with blue light confirmed that this improvement could occur as early as one month after the treatment. The speaker found that short contact ALA combining with IPL was equally effective in skin rejuvenation. Only two to three treatment sessions were required. The adverse

effects were mild oedema and erythema that lasted for only one day. However Asian skin may require different parameters to achieve the best result.

The production of porphyrins by *P. acne* is utilised for photodynamic destruction of these micro-organisms in the management of acne vulgaris. While antibiotic is widely used, its onset of action is slow. Moreover, a significant proportion of *P. acne* (40%) is resistant to antibiotics. On the other hand, PDT works faster and avoids the problem of antibiotic resistance. Initially blue light was used with success. Subsequent trials with IPL or red light were also promising. Three to four treatment sessions are often necessary to achieve clearance. Although recurrence of acne was observed six months post-treatment, PDT could be delivered again and used as a maintenance therapy. PDT is a useful alternative treatment for moderate to severe acne vulgaris that may require isotretinoin.

As PDT selectively destroys pilo-sebaceous unit by blue light, it can be used in hidradenitis suppurativa. Although various methods are proposed to treat this condition, none of them are satisfactory. According to some trials, PDT could suppress the disease activity effectively. The disease-free period was up to 15 months.

The use of PDT continues to expand. Whether PDT, as an adjuvant therapy, can improve the efficacy of biologics in the treatment of psoriasis remains to be determined.

Part 2: Update on skin repigmentation

Psoriasis is a chronic, non-contagious skin disorder affecting 1-3% of the population. It affects seven million people in the USA and is the seventh commonest reason for dermatology visit there. High dose, targeted ultraviolet (UV) B therapy is one of the new devices developed for treatment

of psoriasis. It combines the proven benefits of UVB therapy with the latest advances in targeted light technology. High dose, targeted UVB therapy improves both inflammatory skin condition and leukodermas and has been approved by the FDA in the US for the treatment of psoriasis, vitiligo, atopic eczema and seborrhoeic dermatitis. It can be used as monotherapy or in combination with other treatment modalities for psoriasis especially when the response to other forms of therapy is unsatisfactory. The advantage of such therapy is its potential to reduce the total number of treatment prior to disease resolution and thus reduce the risk of skin cancer and other adverse effect of UVB. The emitted wavelength of high dose targeted UVB therapy lies between 290 to 320 nm with peaks at 311 nm and 314 nm. Both continuous and single pulse modes are available. The pulse width is 0.5 to 2 seconds and fluence can be adjusted between 50 to 400 mJ/cm². The handpiece can deliver the light to a precisely targeted treatment area.

Leukodermas include vitiligo, hypopigmentation secondary to injury to skin, idiopathic guttate hypomelanosis and white stretch marks. Hypopigmentation secondary to injury to skin is common in the US. Up to 50% patients developed hypopigmented scars after reduction mammoplasty and up to 20% laser resurfacing cases developed hypopigmentation. Vitiligo affects 1-2% of the world population and 95% develop lesions before 40 years old. It affects all the races and both sex equally. Stretch marks can be divided into erythematous stretch marks and hypopigmented or white stretch marks. The former respond well to vascular lasers while the latter are very difficult to treat as one has to repigment and reverse the atrophic element of the lesions. Stretch marks can arise from endocrine disorders, steroid use or abuse, rapid growth spurt or rapid weight gain. Within a stretch mark, there are thinning and flattening of epidermis due to stress shattering of collagen fibrils, as well as breakage and retraction of elastin fibres in the reticular dermis.

Treatment of stretch marks is usually disappointing. Glycolic acid and tretinoin are not very effective whilst microdermabrasion need bleeding and pain to get benefit. As a whole, the accepted treatment modalities of leukodermas may include camouflage makeup, dermabrasion, pigment cell transplantation, excimer laser and high dose targeted UVB therapy. In a study by Berstein et al, seven patients with leukodermas received 10 to 14 treatments at 3 to 10 day intervals and an average repigmentation of 70% normal pigment was achieved. However, maintenance therapy is required due to loss of around 50% repigmentation at three months follow up. In the speaker's experience, 75-100% pigment restoration can be achieved with 6 to 15 treatments of high dose targeted UVB therapy. Stretch marks typically respond more quickly whilst thick avascular scars are most resistant to therapy and may require more treatment sessions. Another study by Alexiades et al showed an improvement of up to 80% in seven patients with hypopigmented scars after up to 14 treatments with high dose targeted UVB. The speaker also conducted a study on the treatment of stretch marks in 50 patients with high dose targeted UVB and more than 30% repigmentation was achieved. In real practice of delivering high dose targeted UVB therapy, the

speaker recommended performing minimal erythemogenic dose (MED) testing in cases of psoriasis and eczema but not in leukodermas. He proposed to adopt the starting dose of 125 mJ/cm² for leukodermas and 250 mJ/cm² for psoriasis followed by 25% increment in the absence of redness (reduced to 10% increment in case of perceptible redness).

In conclusion, high dose targeted UVB therapy is a new useful therapy for psoriasis and leukodermas. Further studies are necessary to determine the optimal parameters and explore the possible combination of such therapy with others such as intense pulsed light and cosmetic Nd:YAG laser.

Learning points:

Recent advances in photodynamic therapy have allowed its application beyond superficial skin cancers. High dose targeted UVB therapy has shone new light on the treatment of leukodermas. On the other hand, the effectiveness of these latest therapies still needs to be compared with that of conventional management.