

The Treatment of Acne Vulgaris using a Novel, Synchronous Intense Pulsed Blue Light and RadioFrequency Energy system

Lisa M. Kellett, M.D. and R. Stephen Mulholland, M.D.
Toronto, Ontario, Canada

ABSTRACT

Historically, there have been many improvements in lasers that have enabled their use in the treatment of skin diseases. For the most part these have concentrated on non-inflammatory skin pathology including rhytides, pigmented lesions, vascular lesions and tattoos. Recent advancements in technology have resulted in the development of multiple lasers and light sources that are able to treat inflammatory, dynamic skin diseases including Acne Vulgaris (acne). We describe the introduction of a novel dual combination technology that has shown impressive results in preliminary studies to affect the natural course of acne. The evidence to substantiate this is not only a resolution in the number of papules that were present at the start of treatment, but also a decrease in the formation of new papules. In addition, this technology is fast, has minimal adverse effects and is associated with zero recovery time.

INTRODUCTION

Acne has been estimated to affect over 90% of the human population at some point in their lives. The pathophysiology of acne is multifactorial: a disorder of keratinization of the lining of the pilosebaceous unit, an overgrowth of *Propionibacterium acnes* (*P.acnes*), hormonal factors and overproduction of oil. Multiple treatments are available including topical treatments in the

form of cleansers, creams, gels, lotions and masks. These consist of salicylic acid, vitamin A/tretinoin, benzoyl peroxide and antibiotic formulations. In addition, oral antibiotics and oral Isotretinoin (Accutane) are also used in the treatment of moderate acne. On average, the duration of time to achieve maximal effectiveness of topical or oral medications is about 3 months. Many side effects are associated with traditional therapies including skin irritation, erythema, cheilitis, dry eyes, liver and renal abnormalities, anemia, leukopenia, lupus erythematosus, pseudotumour cerebri, thyroid abnormalities, hypersensitivity reactions, fetal defects, diffuse skeletal hyperostosis, photosensitivity, irreversible night blindness, depression, hypertriglyceridemia and hypercholesterolemia.

Recent developments in the treatment of acne now go beyond traditional topical and oral therapies into the realm of lasers, light sources and radiofrequency. Some of these new light based therapies are 410-415 nm passive blue light systems which act to destroy porphyrins associated with *P.acnes*. The result is a destruction of *P.acnes*. These lasers claim to have an 80% response rate with a 60% decrease in development of papules at 4 weeks and a 70% decrease at 6 weeks. The long wavelength laser systems in the long pulsed YAG spectrum act directly upon the pilosebaceous glands.

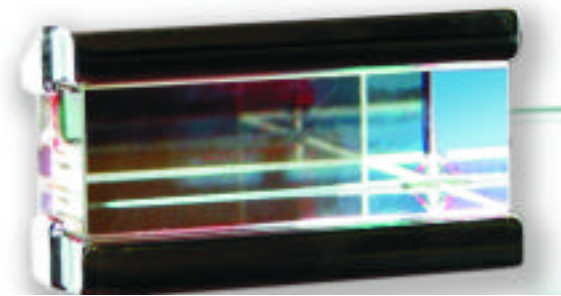


Figure1.
Close-up view of the pulsed blue light optical guide (440-600nm) and bi-polar RF electrodes. Treatment area 12mm x 25mm.

Pulsed Optical Energy (POE) and Radio Frequency

The newest innovation in acne treatment consists of a combination of Pulsed Optical Energy (POE), short wavelength blue light systems, similar to IPL™ (intense pulsed light) and Radio Frequency (RF). The treatments were performed using the Aurora™ (Syneron Inc.), which has an intense pulsed blue light optical head and RF treatment head (**Fig. 1**). This dual system acts on porphyrins through the short wavelength pulsed optical head (440nm - 600nm), while the RF is theorized to cause sebaceous gland atrophy. This synergistic optical energy profile and radio frequency is effective in treating two key factors involved in the pathophysiology of acne vulgaris; P.acnes and oil/sebum production. The short wavelength, blue pulsed light flash lamp targets porphyrins produced by P. acnes at the base of the pilosebaceous unit. The P.O.E. stimulates the formation of coproporphyrinogens and uroporphyrinogens, which are chemically unstable. The result is destruction of P.Acnes in the pilosebaceous unit. The RF energy causes radiophotothermolysis and atrophy of the sebaceous gland and a subsequent decrease in oil production.

As a result of targeting both P. Acnes and the sebaceous gland, it is a more potent and efficacious acne therapy than a passive, non-pulsed blue light source i.e. the Clearlight™ or a long pulsed YAG system targeting only the sebaceous gland i.e. the Smoothbeam™.

Treatment Protocol

The treatment protocol is to treat the entire face, not just active papules or pustules. The

hand piece consists of an Aurora head with contact cooling and containing an Intense Pulsed Optical crystal of short, blue light wavelength, between two bipolar, conducted radiofrequency electrodes. It is important during treatment that optimal contact is made with the skin to deliver the RF energy and, to deliver the available fluences of the optical energy safely. The contact cooling handpiece reduces the risk of thermal injuries to the skin with the short wavelength of light emitted. Similarly, "arcing" is possible with the radio frequency current, which can also result in overheating and burning. This treatment protocol targets sub clinical sebaceous glands with high bacterial loads and results in sebaceous gland atrophy. Inflammatory papules and pustules are treated with a second or third pulse, in a non-stacked fashion. The pulsed nature of the device allows a greater depth of penetration than passive "blue light" systems, thus delivering the blue light to greater depths in the dermis.

Each pulse emits a train of 10, 10ms pulses of pulsed light with wavelengths between 440nm to 600nm. The inter-pulse delay between each of these pulses is 10ms. The RF pulse is a constant 200 ms pulse duration. The fluences from the short wavelength pulsed light head range from 2-10 J/cm² and the RF up to 20 J/cm³. The protocol calls for two treatments/week over 6 weeks for a total of 12 treatments. Treatment is initiated at low POE and RF, then increased based upon skin type and response, weekly.

Indications and Contraindications

Indications for this dual combination therapy include acne vulgaris grades 1-4 (i.e. comedonal to nodulocystic), failure of Clearlight™ or other acne programs, skin types 1-6, and patients in whom systemic antibiotics or Accutane are contraindicated. Contraindications include unrealistic expectations, Accutane use within 3 months of treatment, photosensitization disorders, collagen vascular diseases (such as Lupus Erythematosus, Scleroderma, Dermatomyositis, Rheumatoid Arthritis and Mixed Connective Tissue Disease), and pregnancy.

Similar to the FotoFacial RF™, the entire face is treated using the Fotofacial overlap technique. A test spot is done in front of each ear to ensure a good endpoint and should demonstrate slight erythema. The treatment may result in minimal to moderate discomfort. This can be eliminated with the use of a topical

anesthetic cream applied 30 minutes prior to treatment. The duration of treatment is 30 minutes and can be delegated to a laser nurse. Active papules and pustules are treated with a double or triple pass. At the end of the treatment, there should be very mild, generalized erythema. In regions of the skin that are more pigmented or over active papules and pustules, more erythema might be present. Erythema usually lasts 30-90 minutes however, non-comedogenic makeup can be applied immediately after treatment.

Maintenance treatment

Acne is an inflammatory skin disorder responsive to a number of factors including hormones, stress and the environment. Because of this, unlike other skin lesions, which are treated with lasers and resolve, acne is not curable but can be controlled. Part of this control in our study was to develop a maintenance treatment program, which prolongs the benefits of the original treatment course. This program consists of two treatments a month.

Preliminary Study and Results

An initial study using a split face comparison resulted in a 100% response rate. A reduction of new papules of 70-80% was seen after 6 weeks and maintenance treatment was found to decrease the frequency and severity of outbreaks by 50% (**Fig. 2**)

Adverse Effects

With the exception of transient erythema, no adverse effects were noted. Patients were able to return to normal activities immediately with no downtime.

Conclusions

On the basis of our initial series of acne patients treated with synchronous pulsed optical blue light and radiofrequency energy, we have witnessed the following observations:

1. A series of synchronous, Intense Pulse Optical Blue light and Radiofrequency energy appears to provide significant reduction in active acneiform papules and pustules.
2. The intense pulsed optical, direct contact and RF energy synergy appears to be effective on both stage 1, inflammatory-papular and more advanced nodular cystic acne vulgaris pathologies.
3. Long term acne flares appear diminished in a large proportion of patients.
4. The treatments are very well tolerated and have very acceptable, negligible side effect profiles.

Figure 2



Before treatment



After 12 treatments, showing approximately 70% clearance of P. Acne.