TREATMENT OF BLUE RUBBER BLEB NAEVUS SYNDROME-LIKE CUTANEOUS VENOUS MALFORMATIONS WITH A 1064 NM, LONG PULSE ND:YAG LASER

ROBERT Mc Donald
BMed, MMed, FACD
Dermatologist, Randwick, NSW, Australia

ABSTRACT
A 40-year-old man presented with bluish, compressible skin lesions typical of the venous malformations of the blue rubber bleb naevus syndrome. Attempts to treat the lesions by sclerotherapy were unsuccessful. Laser photocoagulation using a 1064nm Nd:YAG laser was effective.

The clinical manifestations of the syndrome are reviewed and the theoretical basis for the success of Nd:YAG laser treatment is discussed in the case presentation.

Key words: blue rubber bleb naevus syndrome, Nd:YAG laser.

Case Report
A 40-year-old male presented to a vascular clinic with small, compressible, 3-6mm blue dermal papules distributed sparsely on his limbs and trunk. Several lesions had been intermittently painful. The patient declined a skin biopsy, but based on the characteristic clinical features, a provisional diagnosis of BRBNS was made. By definition, this diagnosis requires identification of extracutaneous lesions, which were not found in this patient (gastrointestinal endoscopy, cerebral CT and cardiac ultrasound examination were normal). Thus the lesions have been referred to as: “blue rubber bleb naevus syndrome-like cutaneous venous malformations.”

Address Correspondence to: Robert McDonald, Suite 2a, 66 High St, Randwick, Sydney NSW, AUSTRALIA 2031 Telephone: +61 2 9398 2200 Fax: +61 2 9326 7286 Email: a.torda@unsw.edu.au
Initial efforts to sclerose several lesions with 0.2-1.0% sodium tetradecyl sulfate (STS) proved unsuccessful. This was in part, due to patient related factors (aversion to needles and low pain threshold), nonetheless, the concentrations of STS used were not sufficient to effect improvement in the lesions treated. It was then decided to attempt to ablate the lesions by laser photocoagulation. Based on the anatomico-histological features of the lesions in this syndrome, a long pulse width, 1064nm Nd:YAG laser (Lyra; Laserscope) was chosen. Test treatments with two sets of parameters were used. Treatment with a 5mm spot size, 80msec pulse duration, and a fluence of 160 j/cm² proved more effective than a smaller spot size (3mm), 60msec pulse and fluence 300j/cm². Immediately after a single laser pulse a significant reduction in the size of the lesions was observed. The treatment caused moderate discomfort similar to a rubber band flicked against the skin, which was short lived and well tolerated by the patient. An audible snap emanating from the target was also apparent with laser pulses. Mild erythema and oedema was evident several minutes following treatment. Four to six weeks later the majority of lesions were imperceptible. (Fig 1) Minor, transient hyperpigmentation that resolved within 8 weeks was observed at some treated sites. One site became inflamed 2 weeks post treatment and formed a small, superficial ulcer and a subsequent 1-2mm, subtle scar. No recurrence of treated lesions was observed at 12-month follow-up. 

**Discussion**

The cutaneous lesions which characterize the BRBNS comprise large, ectatic vascular lumina. These are located in the deep dermis and subcutis. Endothelial cells only line the superficial lumina, whereas deeper lumina have a better developed vessel wall with smooth muscle. Because of the deep location of the lesions, nonselective treatment methods e.g. electrosurgery and CO2 laser, have a relatively high risk of scarring through injury to surrounding tissue. Nevertheless, Olsen et al. report good cosmetic results with CO2 laser.

Modern vascular lasers provide an effective means of treating a range of vascular abnormalities. Superficial lesions e.g. acquired facial telangiectasia are in many practices treated with a variety of lasers systems including 532 nm KTP lasers and 585-590nm pulse dye lasers. These wavelengths are preferentially absorbed by haemoglobin which enables selective targeting of vascular structures. Their optical penetration* in skin approximates 400 to 600 um, which limits their use to the treatment of structures within the superficial dermis. Long pulse Nd:YAG lasers which have recently been introduced for hair removal, leg vein treatment and facial rejuvenation, emit 1064nm wavelength light which has less affinity for haemoglobin but significantly greater penetration through the skin (1600um) than shorter wavelength lasers. This allows targeting of deeper vascular structures including the venous malformations of the BRBNS.

Selective removal of the venous malformations also requires a pulse width or exposure time that approximates the thermal relaxation time of the target. Treating within this constraint limits energy absorption to the venous malformations and minimises the diffusion of heat from the venous malformations to the surrounding tissues. Consequently, nonspecific thermal injury is reduced and the risk of pigment changes in the skin and scarring is minimised. The thermal relaxation time for a structure can be calculated and is proportionate to the square of its size. Because the patient did not allow a biopsy to be performed measurement of the diameter of the lumina of the abnormal vessels was not possible. However, based on the known size of normal venules within the dermis and the fact that the venous malformations in the BRBNS comprise large ectatic venules, it can be assumed that their diameters are in the order of 100 to 500um or greater. The estimated thermal relaxation time for a 300um vessel is approximately 40 msec. The long pulse 1064nm laser has a variable pulse width from 10 to 100 msec. This allowed the use of exposure times appropriate for selective targeting of the venous malformations in the patient.

The venous malformations of the BRBNS may be treated effectively with a long pulse Nd:YAG laser. Untoward effects are minimized through an understanding of the principles of laser therapy that allows selection of operating parameters appropriate for the target. The technique described in this report may be applicable to the management of a range of different vascular anomalies and provides a treatment option that is often highly acceptable to patients.

**Disclosure:** The author has no commercial affiliations, current or past, which would pose a conflict of interest.

* expressed as the depth to which 50% incident light penetrates
References


Figure 1: Blue rubber bleb naevi on forearm. Arrows mark lentigines, for orientation.

Figure 2: Post treatment.