The Science, Reality, and Ethics of Treating Common Acquired Melanocytic Nevi (Moles) with Lasers

In this issue, Wang, *et al*. reported the use of 100-Microsecond Alexandrite Laser for selected acquired melanocytic nevi.[1] The use of lasers in congenital acquired melanocytic nevi (CAMN or moles) is fraught with many practical issues and scenarios that need to be properly understood before using this modality.[2] This is more so in pigmented skin, where the results do not reflect the enthusiastic outcome reported in fairer skin types.[3] Most of the experience for treating "moles" emanates from the use of lasers in congenital melanocytic nevi (CMN), where the normal mode ruby laser is used to target the nevus cells, which are larger than the melanosomes and thus require alonger pulse duration.[2,4,5] Despite multiple Q-switched laser treatments of CMN, residual nevomelanocytic nests may remain unaffected in the deeper sections of the treated CMN, as demonstrated by the presence of nevus cells in the upper reticular dermis below a microscopic subtle scar.[1,3] This accounts for the high recurrence rates and is an advocate for postlaser biopsy.[2,4,5]

Like any other indication, the use of lasers in pigmented lesions begins at the helm of laser physics and depends on the absorption spectra of the target chromophore, which is the melanocyte (melanosome). In congenital nevi, there are other issues like variegation of pigment and depth. In moles (CAMN), freckles, and lentigines, the target chromophore lies either in the epidermis (freckles, lentigines) or in the dermis (CAMN), which influences the success of the pigment lasers employed for therapy. For melanin, there is a wide array of lasers that can be used ranging from the green lasers (PDL, QSw, Nd: YAG 532) to the far infrared lasers (CO 2 10, 600 nm, Er: YAG2940 nm). The second important proviso is to minimize the heat damage that requires optimal setting of the pulse duration of the laser. Thus, a laser with a pulse duration less or equal to the TRT should be employed. This depends on the size of the target tissue that dictates thermal relaxation time (TRT), which is 0.25-1.00 μs for the melanosome and 0.1 ms (100 μs) for the melanocyte.[2] Herein lies the logic of using nanosecond lasers (Q switched) to treat pigmented lesions like lentigines, freckles, and Nevus of Ota and the futility of this in treating "moles" with nanosecond lasers. Lack of reproducible results in CAMN can be attributed to the fact that the target nevus cell occur in clusters and are of larger size than melanocytes and, thus, need a millisecond laser for effective ablation.[2] This is the main reason why normal mode, non pulsed lasers, and far infrared lasers are used to treat CAMN.[2,4,5] The third requirement is to achieve an adequate depth to target the chromophore for which the red (Ruby 694 nm, Alexandrite 755 nm) and near-infrared (QswNd: YAG 1064 nm) lasers (approximately 600–1100 nm) are ideal. These lasers combine selective absorption by melanin with an appropriate skin penetration. Based on these three principles, the devices useful for treating melanocytic lesions are of two basic classes:[2,5] far-infrared skin resurfacing lasers and pulsed lasers/IPLs. The pulsed lasers are further divided into long-pulse (millisecond) devices, which tend to target relatively large pigmented structures such as hair follicles and "nests" of nevus cells, and short-pulse (Q-switched nanosecond lasers) devices, which are capable of targeting individual pigmented cells. Histologically, though CAMN have both isolated nevo-melanocyte cells and "nests" or clusters of cells.[2,5] Thus, ideally, a mixture of lasers targeting both should be used, with the use of short (ns) pulses and long (ms) pulses.[2,5] This is the reason why melanocytic nevus are better treated with a combination of lasers. Recent studies[4] used pulsed CO_2 ostensibly to ensure fine ablation of the epidermis, followed by a Qs fd Nd: YAG, Qs Nd: YAG, or Qs ALex laser. The logic employed in the use of combination lasers[4,5] (normal mode and Q-switched ruby laser, CO_2 and Qs AL, CO_2

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and Qsfd Nd: YAG laser, CO_2 and Q-switched ruby laser) was to expose the otherwise unaffected, deep-sited naevomelanocytes to the pigment-specific laser. Nevus cells in the superficial dermis are additionally removed by the CO_2 laser. Alternatively, for a smaller "mole" (<1.5 cm), a short-pulsed Er: YAG would be an ideal tool as apart from the pulse duration (300-1000 μs), the Er:YAG has a predictable depth (5 μm/J/cm^2), minimal thermal damage (20–30 μm), and a high absorption coefficient of water (Er:YAG 12,800 cm^{-1}; CO_2 800 cm^{-1}) and is thus capable of a far finer and safer superficial ablation with minimal sequel. A comparison of various modalities at our centre shows that the combined or pulsed ablative method is better than using the Qsw lasers for CAMN [Figure 1].

There are numerous unanswered and paradoxical issues with the use of lasers for CAMN. Though in pigmented skin, the Qsw Nd: YAG (1064 nm) is ideal as it selectively spares the epidermal pigment and has a deeper penetration; the clearance rates in AMN are thus far from satisfactory.[2] Moreover, even the non pulsed lasers have recurrences and is largely dependent on the period of follow-up.[5] The dilemma of pre laser classification of the AMN, which requires a biopsy, is the more important role of postlaser biopsy. This is important to assess the depth of tissue damage and to identify the remnant nevus cells, which in turn predicts recurrence. Persistence of nevus cells in the deeper layers of the dermis has been observed in all treated nevi, except in junctional nevus. This is explained by the fact that melanin pigment is rarely present in deeper nevus

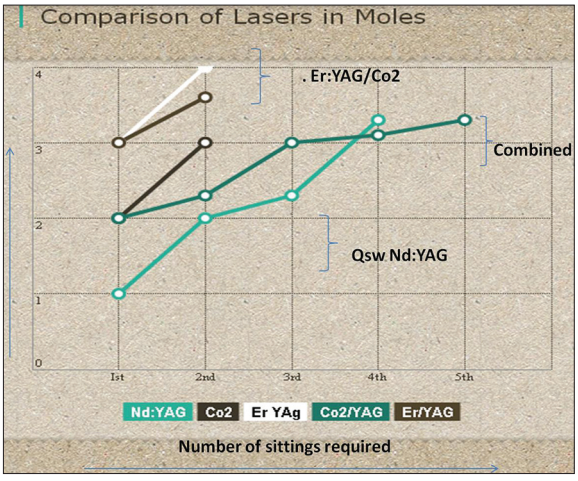

Figure 1: A comparison of the number of sittings (X axis) and response (0–4 percentile improvement) shows that the pulsed Er:YAG and pulsed CO_2 achieved the maximum improvement by the second sitting, while the QswNd:YAG required multiple sitting to achieve similar results. A combined modality of Er:YAG with QswNd:YAG achieved optimal results in two sittings. The ultrapulsed pulsed CO_2 and Q sw ND:YAG required multiple sittings as we used a dose of 2 J/cm^2. (Department records)

cells and the inability of ruby and Alexandrite lasers target the deep nevus cells. The pathology in AMN varies depending on whether they are lentigo simplex or junctional nevus or dermal compound nevi, thus the depth of the target nevus cell will vary and thus no single laser (red or infrared spectrum) will be able to target all types of AMN. Paradoxically, histological features of melanoma are often present in benign melanocytic nevi that not only requires a expert histopathologist but may also be complicated by tissue changes seen in a postlaser therapy biopsy.[6,7] Most laser surgeons felt safe while treating melanocytic lesions with hair, which were presumed to be benign (benign hair sign); but, a recent hotly debated report has shown that this is not always true.[8]

The issue of melanoma arising as a consequence to laser therapy is debatable.[2] Though some believe that selective destruction of abnormal melanocytes is a means for reducing the number of cells at risk for malignant transformation, it is also possible that laser or other treatments may inadvertently stimulate transformation to melanoma. There have been reports of histological atypia (pseudomelanoma) in patients with melanocytic nevi that were treated by CO_2 lasers as well as lasers for hair removal.[6] Probably, racial differences need to be taken into consideration as, in Asians, the incidence of melanoma has been reported to be between 0.2 and 2.2 per 100,000, which is much lower than that among westerners.[9] Furthermore, the most common sites for the development of melanoma among people with colored skin are areas not directly exposed to the sun, such as palmar, plantar, subungual, and mucosal surfaces. This accounts for the liberal use of lasers for the treatment of melanocytic nevi in Asian countries. However, it must be pointed out that malignant transformation takes time and, if the patient consults an oncosurgeon or oncologist, it may not always reflect in the long-term complications in dermatological practice. This is exemplified by the development of carcinoma bladder in patients of pemphigus on cyclophosphamide, wherein it takes 15 years to develop the complication[10] and rarely presents to the treating dermatologist.

It has been shown that, of the three common benign lesions that patients often ask their dermatologist to remove, seborrheic keratoses (SKs), melanocytic nevi (MN), and fibroepithelial polyps (FEPs) or skin tags, on histological scrutiny, a malignancy can be detected even when they look clinically benign to the primary care physician, surgeon, or dermatologist.[11] For lesions submitted as MN, the malignancy rate varied from 1.7% to 6%.[12] The relevant question is how confident is the clinician that the lesion is completely benign (which should be 100% if the lesion is not submitted)? Under the ethical principle of beneficence, i.e., acting in the best interest of the patient,

and consistent with the physician's characterization as a fiduciary for the patient, it is essential that specimens should be submitted to a dermatopathology laboratory for review.[11,12] In some cases, a dermatologist may have competing ethical considerations when asked by an anxious patient to perform a biopsy on a benign-appearing lesion. Beneficence may cause a physician to perform the biopsy to alleviate patient anxiety; however, this dilemma can compete with the ethical concept of stewardship. Stewardship addresses physicians' responsibility for not only their patients but also for the care of society as a whole. It is my opinion that, with the high degree of recurrence with most pulsed and Q switched lasers, a physician is under no ethical obligation to provide what is essentially a futile care. If the issue is of preventing malignancy, serial digital and dermatoscopic photography could suffice. But if it is of cosmetic improvement, the patient must be told upfront that there is a possibility of recurrence. In a litigious society, it would be ideal to do a biopsy as it can predict the possibility of recurrence and obviate the physician's concern of being sued if a malignant lesion develops in future. The alternatives are, in essence, surgical excision, laser treatment, and no treatment. Excision offers the most definite result and reduction of melanoma risk, although melanoma can arise from a deep remnant of a nevi, if giant, even after excision.

Probably, there is a lot to be learnt and done for treating "moles," and the use of a normal mode pigment laser or an ablative pulsed laser would be a good starting point. In this era where the physician–patient relationship remains contractual with fiduciary implications, a histopathology is essential at some point both for medicolegal and scientific reasons. It is absolutely necessary to discuss these issues openly with the patients in the context of alternatives, overall benefits, and risks. Of course, there are merits in shave removal of CAMN, but this technique in itself is frought with recurrences. The advantages are that the tissue sampled can be sent for histology the disadvantage include that it is impossible to predict the depth of the excision in terms of nevomelanocytes location. As has been previously reviewed, the use of lasers in most dermatological indications, including acne and scars,[13] may not always mirror the dramatic results of the laser industry, and this is possibly true for "moles" as well.

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