ACKNOWLEDGMENT

This study was supported by a grant from the National Research Foundation of Korea (NRF-2010-0023545).

CONFLICTS OF INTEREST

The authors have nothing to disclose.

REFERENCES

1. Armstrong BK, Krickler A. The epidemiology of UV induced skin cancer. *J Photochem Photobiol B* 2001;63:8-18.
2. Shin JM, Chang IK, Lee YH, Yeo MK, Kim JM, Sohn KC, et al. Potential role of S100A8 in cutaneous squamous cell carcinoma differentiation. *Ann Dermatol* 2016;28:179-185.
3. Malanchi I, Peinado H, Kassen D, Hussenet T, Metzger D, Chambon P, et al. Cutaneous cancer stem cell maintenance is dependent on beta-catenin signalling. *Nature* 2008;452: 650-653.
4. Condello S, Morgan CA, Nagdas S, Cao L, Turek J, Hurley TD, et al. β -Catenin-regulated ALDH1A1 is a target in ovarian cancer spheroids. *Oncogene* 2015;34:2297-2308.
5. Rheinwald JG, Beckett MA. Tumorigenic keratinocyte lines requiring anchorage and fibroblast support cultured from human squamous cell carcinomas. *Cancer Res* 1981;41: 1657-1663.
6. Kim HK, Moon H, Lee KS, Moon HS, Kim BS, Kim DJ. Clonogenic assay of gastric adenocarcinoma stem cells. *Korean J Intern Med* 1987;2:163-169.
7. Taipale J, Beachy PA. The Hedgehog and Wnt signalling pathways in cancer. *Nature* 2001;411:349-354.
8. Hamburger AW, Salmon SE. Primary bioassay of human tumor stem cells. *Science* 1977;197:461-463.
9. Yang JS, Lavker RM, Sun TT. Upper human hair follicle contains a subpopulation of keratinocytes with superior in vitro proliferative potential. *J Invest Dermatol* 1993;101: 652-659.
10. Bossis I, Voutetakis A, Bei T, Sandrini F, Griffin KJ, Stratakis CA. Protein kinase A and its role in human neoplasia: the Carney complex paradigm. *Endocr Relat Cancer* 2004;11: 265-280.

<https://doi.org/10.5021/ad.2018.30.1.122>

The Conical-Shaped, Staged Laser Ablation Technique in the Removal of a Medium Sized Intradermal Nevus

Sang Hyung Lee, Seung Seog Han¹, Mi-Woo Lee, Sung Eun Chang

Department of Dermatology, Asan Medical Center, University of Ulsan College of Medicine, ¹I Dermatology Clinic, Seoul, Korea

Dear Editor:

The removal of an intradermal nevus is a common procedure in the dermatology clinic. However, if the nevus is large (> 3 mm), it is very difficult to remove without recurrence or scarring. If a nevus is removed too super-

ficially, it will recur or appear blue, similar to a blue nevus. On the other hand, if a nevus is removed too deeply, the extensive ablation will result in scarring or prolonged erythema. To obtain complete removal of a mole with better cosmetic results, we introduced the con-

Received September 13, 2016, Revised January 20, 2017, Accepted for publication February 21, 2017

Corresponding author: Sung Eun Chang, Department of Dermatology, Asan Medical Center, University of Ulsan College of Medicine, 88 Olympic-ro 43-gil, Songpa-gu, Seoul 05505, Korea. Tel: 82-2-3010-3460, Fax: 82-2-486-7831, E-mail: changse2016@gmail.com

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/4.0>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Copyright © The Korean Dermatological Association and The Korean Society for Investigative Dermatology

Fig. 1. (A) Conventional ablation technique: if the laser cauterizes very superficial levels of skin, the mole will recur, whereas if the laser removes very deep levels of skin, there will be scarring. (B) Conical-shaped, staged ablation technique: at the first operation, the nevus cells in deep layers of the dermis are removed completely, while a large portion of epidermis is preserved as much as possible. The remnant nevus cells (red circle) will be removed completely with the second operation in a staged fashion.

Fig. 2. (A) Before treatment: intradermal nevi measuring 3 mm and 8 mm size around the lip. (B) After the first operation: the nevus cells in deep layers of the dermis are eliminated through the small hole. (C) Forty days after the first operation: the lesion has a crater shape. Scar shrinkage makes the lesion smaller. (D) Follow-up photograph (7 months after the first operation): two lesions are completely removed with a minimal scarring.

ical-shaped, staged laser ablation technique using a CO₂ laser.

We present a 38-year-old man with two intradermal nevi (3 mm and 8 mm in diameter) around the lip (Fig. 1A). The first laser operation was performed in the shape of a cone (Fig. 1B, Fig. 2B). The approximate size of the laser entrance hole was 50%~70% of the diameter of the lesion, which preserves superficial epidermis as much as possible. The depth of ablation hole should be greater than the depth of the deepest part of the lesion, to completely removes the deepest part of the lesion and prevent recurrence. The deep components of the lesion are ab-

lated as much as possible, resulting in a conical shape. The second laser operation was performed 40 days after the first operation to remove the crater-shaped remnants (Fig. 2C). The intradermal nevi were removed with a good cosmetic result (Fig. 2D).

The advantage of the conical-shaped ablation technique is that more epidermis can be preserved than with conventional laser ablation, and the preserved epidermis may act as a “biological” dressing, protecting the underlying wound bed and supporting the newly forming epidermis. Because migration from the wound edge into center of each cell is important for reepithelization, preserving epi-

dermis through conical-shaped method could be helpful for wound healing process¹. The CO₂ laser is preferred over the erbium-doped yttrium aluminium garnet (Er:YAG) laser, because the CO₂ laser coagulates and shrinks collagens, and is able not only to control bleeding, but also to decrease the entrance hole size^{2,3}.

Serial-staged excision of large solitary lesions may be used if the lesion is too large to be resected in one procedure or to minimize scarring⁴. If there is some difficulty in removing all of the lesion at the first conical ablation, a second laser operation may be needed. Because the remnant is small and located more superficially than the pretreatment lesion, the second operation can be performed more safely and easily.

The disadvantage of the conical-shaped staged laser ablation is that it could be bothersome for patients because of the staged fashion and it requires more techniques, compared to conventional cylinder shaped laser ablation.

In conclusion, the use of the conical-shaped, staged laser ablation technique is useful in the management of a medium-sized intradermal nevus. The technique may be utilized in the treatment of other benign lesions located beneath the normal epidermis.

CONFLICTS OF INTEREST

The authors have nothing to disclose.

REFERENCES

1. Iwata Y, Akamatsu H, Hasegawa S, Takahashi M, Yagami A, Nakata S, et al. The epidermal Integrin beta-1 and p75NTR positive cells proliferating and migrating during wound healing produce various growth factors, while the expression of p75NTR is decreased in patients with chronic skin ulcers. *J Dermatol Sci* 2013;71:122-129.
2. Ross EV, Naseef GS, McKinlay JR, Barnette DJ, Skrobal M, Grevelink J, et al. Comparison of carbon dioxide laser, erbium:YAG laser, dermabrasion, and dermatome: a study of thermal damage, wound contraction, and wound healing in a live pig model: implications for skin resurfacing. *J Am Acad Dermatol* 2000;42:92-105.
3. Lim JY, Jeong Y, Whang KK. A combination of dual-mode 2,940 nm Er:YAG laser ablation with surgical excision for treating medium-sized congenital melanocytic nevus. *Ann Dermatol* 2009;21:120-124.
4. Arneja JS, Gosain AK. Giant congenital melanocytic nevi. *Plast Reconstr Surg* 2007;120:26e-40e.