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ORIGINAL ARTICLE
Education

Dermoscopy Education for Plastic Surgery Residents: How a Brief Theoretical Course and Practical Training Have an Impact

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Background: Currently, the evaluation of pigmented skin lesions relies on dermoscopy, which has become the standard of care. As melanoma is one of the principal areas of expertise in plastic surgery, it is essential that diagnostic skills be acquired during the course of specialization. This study aimed to assess the impact and effectiveness of a brief and intensive dermoscopy training program for plastic surgery residents.

Methods: This study was carried out on a group of 41 doctors, who were divided into three categories based on their experience in dermoscopy (none, intermediate, and advanced). A preliminary assessment of each participant's baseline knowledge was conducted by using a 15-query test. Subsequently, the participants attended a 90-minute lecture on diagnostic techniques and the process of differentiating between various skin lesions. To determine the effectiveness of the lecture in improving diagnostic skills, the participants were tested immediately after the lecture and again after a 3-month period.

Results: At the conclusion of the final examination, all three groups achieved an accuracy rate of at least 80% for dermatoscopic diagnosis. However, none of the groups was completely successful. The variations in diagnostic accuracy among the three groups are presented, and *P* values were calculated for each group.

Conclusion: The short, intensive course of dermoscopy has proven to have a significant positive impact on plastic surgeons in their postdegree training program.
(Plast Reconstr Surg Glob Open 2024; 12:e5970; doi: 10.1097/GOX.0000000000005970; Published online 10 July 2024.)

INTRODUCTION

Melanoma skin cancer accounts for 1.7% of all cancer diagnoses, with an estimated annual increase in its incidence between 4% and 6%, mostly among light-skinned populations.[1] Dermoscopy represents the current standard of care for evaluation of pigmented skin lesions, and its use during clinical examination of these lesions has been shown to increase diagnostic accuracy,[2–4] with a higher sensitivity and specificity rate[5] and fewer false positive diagnoses for physicians who were trained in dermoscopy, even briefly.[6]

Formally known as epiluminescence microscopy, dermoscopy is a noninvasive in vivo clinical technique that allows physicians to magnify and examine skin lesions of the epidermis, dermoepidermal junction, and papillary dermis[5] through the optical phenomenon of transillumination. This effect can be enhanced by applying oil or gel substances, though polarized-light dermoscopies do not require any interface with the skin.[7]

Various instruments can be used to perform dermoscopy: handheld instruments, the most widely used tool in the first-line examination; videodermoscopy, allowing images to be stored for a later reevaluation to detect early modifications suspicious for malignancy; and a confocal microscope, which optically scans the tissue for about 200 µm in depth, providing a sort of three-dimensional visualization of the lesion structure.

The pattern analysis method, the ABCD rule of dermatoscopy, Menzies scoring method, and the seven-point checklist were all considered valid algorithms for assessing skin lesions with dermoscopy at the First World Congress

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Received for publication January 16, 2024; accepted May 17, 2024.

DOI: 10.1097/GOX.0000000000005970

Disclosure statements are at the end of this article, following the correspondence information.

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of Dermoscopy held in Rome, Italy, in March 2001.[8] The use of these algorithms facilitates dermoscopy analysis of skin lesions, enabling early detection of melanoma and improving diagnostic accuracy, resulting in a better prognosis and a decrease in healthcare costs.[9]

Melanoma surgery is performed by the Clinic of Plastic Surgery at the University Hospital in Padova, which means that residents of the specialization course should be regularly trained on skin lesion evaluation in an outpatient setting. This study aimed to evaluate whether brief and intensive dermoscopy training can have an impact on the diagnostic accuracy of plastic surgery residents.

Takeaways

Question: How effective is a brief training in dermoscopy on plastic surgery residents in increasing diagnostic accuracy in early detection of melanoma skin cancer?

Findings: An intensive course of dermoscopy has proven to have a significant positive impact on plastic surgeons in their postdegree training program.

Meaning: Plastic surgery residents' ability to identify melanoma skin cancer with higher rates of accuracy and in earlier stages can be improved significantly even by a brief and intensive training in dermoscopy.

MATERIALS AND METHODS

This prospective study was conducted on a population of 41 physicians working in the Padova University Hospital, consisting of four intern doctors and 37 plastic surgery residents. The test comprised 15 questions, designed to evaluate the initial knowledge of each participant. Each query featured a macroscopic and dermoscopic image of a melanocytic lesion, accompanied by a concise anamnestic description. [**See figure, Supplemental Digital Content 1**, which displays the examples of clinical puzzle images used for the diagnostic test (A–D). Some anamnestic data were given with each puzzle to illustrate a realistic situation during an outpatient visit (below, left). **http://links.lww.com/PRSGO/D346**.] Participants were given 30 seconds to determine whether an excision or clinical follow-up was the more appropriate course of action. The correct answer for each question was subsequently demonstrated and discussed.

Following the test, participants attended a 90-minute lecture on diagnostic techniques and differentiation among various types of skin lesions. To evaluate the participants' understanding of the lecture's content, an additional test with a similar format, but new clinical queries, was administered.

To further enhance their diagnostic abilities, all residents were encouraged to read suggested materials after the second test. Moreover, each resident was required to attend the outpatient clinic for a minimum of 3 hours each week, where they gained hands-on experience in dermoscopy under the supervision of a senior tutor.

During this clinical training, the residents were responsible for evaluating pigmented skin lesions in an outpatient setting through visual and dermoscopic examination. A senior specialist conducted a double check for each lesion, questioning the trainer on the reasons for the excision or observation decision, and discussing the clinical features and therapeutic alternatives.

After an interval of three months, the participants were evaluated again to gauge their progress in diagnostic skills. The study population was categorized into three subgroups based on their prior experience in dermoscopy: interns and first-year residents, second- and third-year residents, and fourth- and fifth-year residents, who served as the control group (Table 1).

Considering the nonstandardized dermoscopy education provided during the residency program, we assumed that residents' confidence in managing skin lesions was uniform across all residency years. The potential for allocation bias arose from varying levels of self-education and career aspirations among residents. To address this, we assigned each resident to one of three groups based on the attending program and outpatient office schedule, which was determined by their course year at our institute.

Unfortunately, the blind allocation of groups was not feasible because it was based on the expected grade of training completed during the residency program. Therefore, we included four internal doctors who were slated to become residents in the following year in the first group, assuming that first-year residents had no prior experience with dermoscopy. All results were organized using Microsoft Excel, and the statistical significance was analyzed using a Student *t* test, with a significance level of 0.05.

RESULTS

The results of the single test for each group are presented in Table 2. A threshold of 75% accuracy was established before the examination, which corresponded to an average of 11.25 correct responses per test. The lecture

Table 1. Level of Expertise in Dermoscopy before Testing among the Study Population

Group	Size (n)	Skills
Students and year 1 residents	21	None
Year 2–3 residents	12	Limited
Year 4–5 residents	8	Moderate/advanced

Table 2. Average Score and its SD for Each Group/Test, Including the Variation in Percentage of Correct Answers between the First (Baseline) and Last Test for Each Group

Group	Test 1	Test 2	Test 3	Δ Test 1–3 %	Δ Test 1–3 *P*
Students and year 1 residents	8.24 ± 1.76	11.67 ± 1.28	12.57 ± 1.33	+28.87%	<0.00001
Year 2–3 residents	7.17 ± 1.40	11.33 ± 1.23	12.67 ± 1.23	+36.67%	<0.00001
Year 4–5 residents	8.75 ± 1.67	11.63 ± 1.19	12.5 ± 1.83	+19%	0.0076

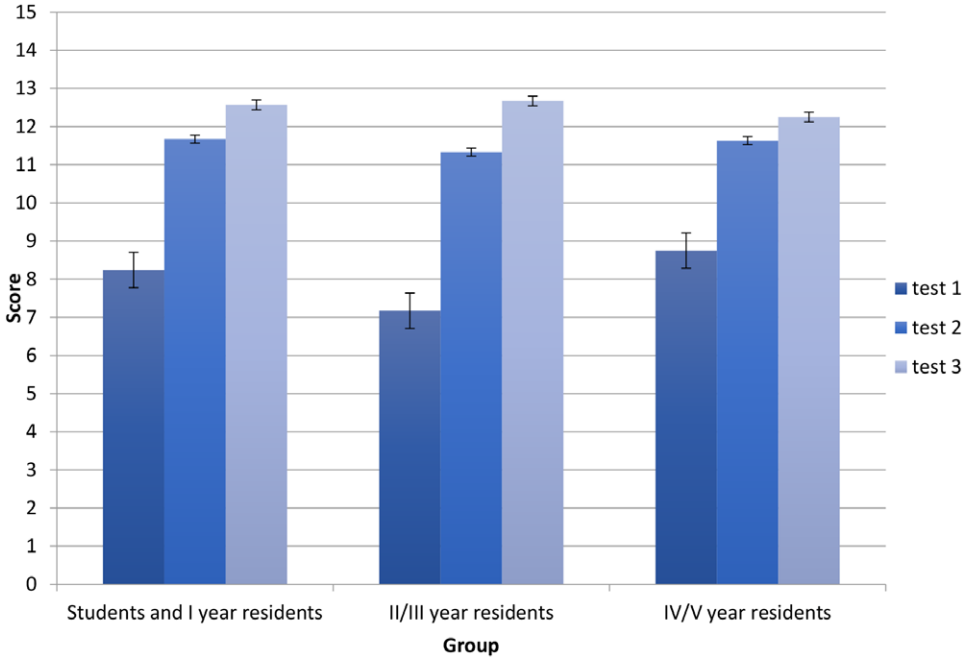

Fig. 1. The variation of average percentage of correct answers of each group among the three tests. The error bars indicate the SD of the mean value.

and clinical training were conducted between the baseline and final tests, and all participants were provided with suggested readings to focus on the topic. None of the three groups met the threshold of the baseline test, regardless of their expected education grade based on the year of their specialization course. However, the first test to assess comprehension of the lecture revealed that all groups successfully passed the threshold, and the final test confirmed this trend, with a slight improvement in performance. The second group showed the highest overall increase in the percentage of correct answers (36.67%). The variation between the first (baseline) test and the last one is reported for each group, along with the *P* value, which serves as the final outcome of the brief training course.

The differences in diagnostic improvement between the initial and final tests were statistically significant for each group, with *P* values of 0.0001, 0.0001, and 0.0076 for the first, second, and third groups, respectively. However, it seems that training had a more pronounced effect on the accuracy of the junior and middle groups.

The results of the study are presented in Figure 1, along with the SD of each mean value, which represents the outcome obtained by each group in a single test. Although diagnostic improvement was evident within each group from baseline to the final test, there was no discernible difference between the best results achieved by the three groups. Interestingly, the highest level of diagnostic accuracy was attained by the second limited-experience group, rather than by the third group, which is often considered the most skilled.

Finally, Figure 2 displays the progression of accuracy improvement over the course of training. The percentage of correct answers for each group ranged from 81.67% to 83.8%, indicating that a high level of performance could be achieved with a brief course, regardless of prior experience.

DISCUSSION

Dermoscopy is a valuable diagnostic tool for physicians, particularly for examining skin lesions during routine treatment of malignant melanoma and nonmelanoma skin cancer. Research studies have demonstrated the efficacy of brief, intensive training in enhancing diagnostic performance and facilitating early detection of melanoma.[4,6]

If dermoscopy is also integrated into the standard armamentarium of plastic surgeons, Percival et al conducted a survey using an electronic questionnaire to investigate dermoscopic activity among plastic surgeons and plastic surgery trainees at two Canadian universities.[10] The majority of participants were knowledgeable about the methodology of dermoscopy (n = 26; 96%), but only one participant reported using it in clinical practice. Nevertheless, all the participants indicated that they were involved in melanoma care. Lack of training and access to dermatoscopes were the reasons why participants did not use a dermoscope.[10] In another study, Vahedi et al conducted a telephonic survey among trainees across plastic surgery units in the United Kingdom.[11] The response rate was 50% (n = 19/38), and 95% of respondents (n = 18) were knowledgeable about the tools used to diagnose melanocytic lesions, while 89% (n = 17) were familiar with dermatoscopes. However, only 53% (n = 10) of respondents used the device, and only one person had received formal training. Despite not receiving formal training,

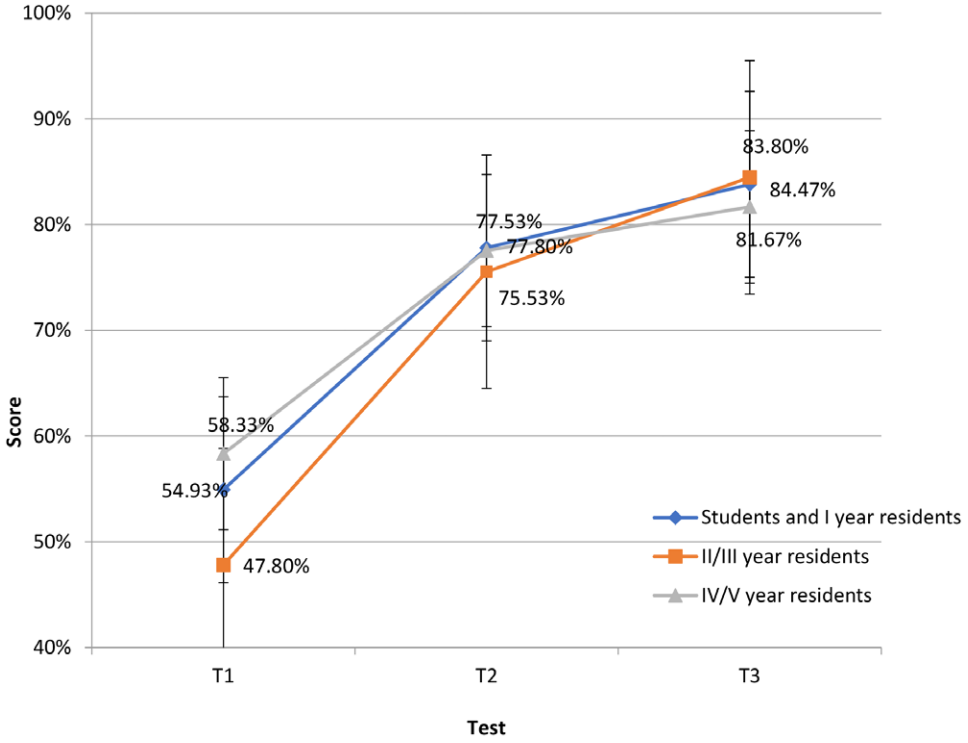

Fig. 2. The three groups' performance trends; each node represents the average percentage of correct answers for each group. At the end of the course, all groups showed an average correct response of over 80%.

many trainees found the device useful and would recommend it for future use.[11]

Stone and Downs[12] conducted a retrospective investigation to evaluate the efficacy of dermoscopy in increasing the diagnostic accuracy of plastic surgeons. The study population consisted of three plastic surgeons who had completed a dermoscopy course, each within the first five years of their appointment, and a senior dermatologist. This study compared the performance of these participants in recording their clinical diagnoses and comparing them with the histological diagnosis. The overall diagnostic accuracy was 73%, with the dermatologist achieving 80% accuracy compared with 70% for plastic surgeons.

The limitations of the study included the small sample size, lack of specificity for a particular lesion type, and varying experiences of the participants. The authors attributed the differences in outcomes to the use of dermatoscopy and clinical experience. The research also highlighted the risk of overdiagnosis of premalignant or malignant pigmented skin lesions using a dermatoscope.

The authors concluded that further training in dermoscopy is necessary for plastic surgeons, and another retrospective study demonstrated a partial increase in diagnostic accuracy when using a dermoscope.[13] Another potential advantage of dermoscopy is the evaluation of lesion borders before excision with Mohs micrographic surgery, which reduces the number of stages required to achieve free margins.[14]

Although several years of clinical practice in skin cancer diagnosis seem to be necessary, the positive impact of a dermoscopy course is well recognized. The course can be formal, consisting of lessons, tutored sessions, and learning tests, or brief, consisting of a lecture.[15–17]

Despite the lack of a universally accepted approach for teaching the use of this tool, which could potentially reduce the risk of misdiagnosis and overtreatment of benign lesions, there is evidence that various methods can be effective. Wang et al demonstrated this through their study, which involved providing a heterogeneous group of participants with a series of smartphone wallpapers that described the dermatoscopic features of common skin lesions. The participants underwent pre- and posttests without any formal teaching in between, resulting in an overall improvement in diagnostic accuracy.[18]

Although there is robust evidence in the literature that dermoscopy can improve diagnostic accuracy among plastic surgeons and general practitioners, there is a scarcity of data on the potential benefits of specific training for plastic surgery residents. Pescarini et al addressed this gap by retrospectively evaluating the performance of three plastic surgery registrars with similar skin cancer experiences and training in detecting malignant skin lesions. The study compared the number of lesion excisions with pathological findings and found an overall accuracy of 48% (224 of 466 lesions were considered pathological or atypical lesions).[19]

This study was significant because it assessed the diagnostic abilities of plastic surgery residents through a specific course, given that they will be considered experts in the field in the future, but are not currently receiving standard education in this methodology.

According to Townley et al, a one-day course of dermoscopy improved the diagnostic ability of qualified plastic surgeons. Based on this observation, we designed a short, intensive dermoscopy course for residents who underwent a baseline test, followed by a lecture and a learning test. After a consistent period of clinical practice under tutor supervision, another test was administered.[20]

Our results indicate that none of the participant groups reached the threshold value during the initial baseline test. Although the results of the first-year postgraduate specialization students and residents in plastic surgery may be understandable, as they likely have no prior clinical dermoscopy experience, the findings for the other two groups are less clear. Specifically, the baseline examination results for the "senior" participants in the study raise questions about the true competence in melanoma diagnosis among qualified plastic surgeons.

All participants demonstrated a considerable increase in diagnostic accuracy after training, as indicated by the results of the second and third tests. It is important to note that the complexity of the clues varied across the three tests, which required trainers to confront novel clinical scenarios each time. We deemed the difference between the first (baseline) and third (last) tests to be the most dependable indicator of training effectiveness. Consequently, we allowed a 3-month gap between the main training steps to provide the participants with the necessary inputs to enhance their skills. This timeframe was chosen to minimize potential bias that could arise from testing participants soon after the intensive course.

The following points are worth noting: the final level of proficiency attained by the three groups at the conclusion of the most recent assessment, all of which surpassed the 80% accuracy threshold in dermatoscopic diagnosis; however, none achieved complete success.

It may be argued that the efficacy of the course's instruction is restricted, as not all participants seem to have profited equally from it. For instance, the third group, comprising year 4–5 residents, was anticipated to display better outcomes but did not. This might be attributed to a suboptimal level of communication and instruction provided by the lecturer or a lack of student participation in the encouraged clinical activity and suggested readings.

It is possible that a more extensive and intensive training program is required to improve diagnostic accuracy beyond the 80% mark; however, it should be recognized that such a program would be significantly more demanding for participants.

Deciding whether to enhance the diagnostic skills of numerous physicians overall or to devote highly specialized instruction to select a few participants is a matter that warrants consideration.

Our perspective is that the rising incidence of skin cancer among the white population and the high rate of locally advanced melanomas at first diagnosis necessitate the training of the broadest audience of physicians, with the primary objective of promoting the earliest melanoma diagnosis, even if it means sacrificing a certain degree of accuracy.

Implementing methods to improve dermoscopy training with more extensive data and strict participant stratification will likely lead to better outcomes. Future prospects for skin cancer lesion diagnosis may involve the utilization of artificial intelligence as a highly effective diagnostic tool.

Phillips et al conducted an assessment of the dependability of a pretrained artificial intelligence algorithm for detecting melanoma by examining 1550 images of suspicious and benign skin lesions obtained from a variety of cameras. The algorithm assigns a numerical value to every image, indicating its confidence in determining whether the lesion is malignant or benign. The algorithm achieved a specificity of 64.8% at 100% sensitivity, which was slightly lower than that of the clinician (69.9%).[21]

An additional investigation was carried out to evaluate the efficiency of digital dermoscopy by comparing the diagnoses of an experienced dermatologist with those of a clinician with minimal training in this field, and then with those aided by computer technology.[22]

High sensitivity (92%) was observed in both the experienced dermatologist and the computer, whereas the inexperienced clinician had lower sensitivity (69%). The experienced dermatologist had the best specificity (99%), followed by the inexperienced clinician (94%), and lastly by artificial intelligence (74%). Artificial intelligence generated more false positives (26%) than experienced dermatologists (0.6%) and inexperienced clinicians (5.5%).

Even if not yet feasible for use in clinical practice, these studies highlight the significant progress made in diagnosis through the use of artificial intelligence and predict a growing reliance on this technology for skin cancer detection.

CONCLUSIONS

Despite the limitations and arguments, a short, intensive course of dermoscopy has proven to have a significant positive impact on plastic surgery residents during their postdegree training program. The emergence of better-trained specialists in the future will prevent patients from experiencing the harm caused by unnecessary surgery and will have a positive impact on healthcare economics. Yearly follow-up courses and tests are planned to provide data on each resident's progression over time, and will help keep information and knowledge up to date.

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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

REFERENCES

1. Lopes J, Rodrigues CMP, Gaspar MM, et al. Melanoma management: from epidemiology to treatment and latest advances. *Cancers (Basel).* 2022;14:4652.

2. Vestergaard ME, Macaskill P, Holt PE, et al. Dermoscopy compared with naked eye examination for the diagnosis of primary melanoma: a meta-analysis of studies performed in a clinical setting. *Br J Dermatol*. 2008;159:669–676.
3. Rosendahl C, Tschandl P, Cameron A, et al. Diagnostic accuracy of dermatoscopy for melanocytic and nonmelanocytic pigmented lesions. *J Am Acad Dermatol*. 2011;64:1068–1073.
4. Rosendahl C, Williams G, Eley D, et al. The impact of subspecialization and dermatoscopy use on accuracy of melanoma diagnosis among primary care doctors in Australia. *J Am Acad Dermatol*. 2012;67:846–852.
5. Bafounta ML, Beauchet A, Aegerter P, et al. Is dermoscopy (epiluminescence microscopy) useful for the diagnosis of melanoma? Results of a meta-analysis using techniques adapted to the evaluation of diagnostic tests. *Arch Dermatol*. 2001;137:1343–1350.
6. Augustsson A, Paoli J. Effects of a 1-day training course in dermoscopy among general practitioners. *Dermatol Pract Concept*. 2019;9:195–199.
7. Sonthalia S, Yumeen S, Kaliyadan F. Dermoscopy overview and extradiagnostic applications. In: *StatPearls [Internet]*. Treasure Island, Fla.: StatPearls Publishing; 2023.
8. Johr RH. Dermoscopy: alternative melanocytic algorithms-the ABCD rule of dermatoscopy, Menzies scoring method, and 7-point checklist. *Clin Dermatol*. 2002;20:240–247.
9. Ring C, Cox N, Lee JB. Dermatoscopy. *Clin Dermatol*. 2021;39:635–642.
10. Percival G, Nicholas C, Webb CE, et al. Assessing exposure to dermoscopy in plastic surgery training programs. *JPRAS Open*. 2021;29:178–183.
11. Vahedi A, Javed MU, Gorse SH. The use of dermatoscopy amongst plastic surgery trainees in the United Kingdom. *J Plast Reconstr Aesthet Surg*. 2015;68:e111–e112.
12. Stone CA, Downs AMR. Diagnostic accuracy of skin lesions amongst plastic surgeons and a dermatologist. *J Eur Acad Dermatol Venereol*. 2017;31:e533–e534.
13. Schein O, Westreich M, Shalom A. [Effect of dermoscopy on diagnostic accuracy of pigmented skin lesions emphasizing malignant melanoma]. *Harefuah*. 2009;148:820–3, 855.
14. Stahl A, Shir-Az O, Berl A, et al. Dermatoscopy as an aid for detecting tumor borders during mohs surgery. *Skinmed*. 2023;21:404–408.
15. Boespflug A, Guerra J, Dalle S, et al. Enhancement of customary dermoscopy education with spaced education e-learning: a prospective controlled trial. *JAMA Dermatol*. 2015;151:847–853.
16. Benvenuto-Andrade C, Dusza SW, Hay JL, et al. Level of confidence in diagnosis: clinical examination versus dermoscopy examination. *Dermatol Surg*. 2006;32:738–744.
17. Pokhrel PK, Helm MF, Greene A, et al. Dermoscopy in primary care. *Prim Care*. 2022;49:99–118.
18. Wang FY, Liu RF, Chuang G, et al. Smartphone wallpapers for dermoscopy training in medical students and residents. *Int J Dermatol*. 2019;58:345–349.
19. Pescarini E, De Antoni E, Azzena GP, et al. Diagnostic effectiveness of dermoscopy performed by plastic surgery registrars trained in melanoma diagnosis. *J Plast Reconstr Aesthet Surg*. 2020;73:716–722.
20. Townley WA, Cassell OC, Bowling J. Dermoscopy–time for plastic surgeons to embrace a new diagnostic tool? *J Plast Reconstr Aesthet Surg*. 2011;64:1386–1387.
21. Phillips M, Marsden H, Jaffe W, et al. Assessment of accuracy of an artificial intelligence algorithm to detect melanoma in images of skin lesions. *JAMA Netw Open*. 2019;2:e1913436.
22. Piccolo D, Ferrari A, Peris K, et al. Dermoscopic diagnosis by a trained clinician vs. a clinician with minimal dermoscopy training vs. computer-aided diagnosis of 341 pigmented skin lesions: a comparative study. *Br J Dermatol*. 2002;147:481–486.