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ORIGINAL ARTICLE

Survey of dermoscopy use by Taiwanese dermatologists



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ABSTRACT

Background: Dermoscopy is a useful technique for improving the diagnostic accuracy of various types of skin disorders. Although the technique has been widely adopted by European, Australian, and United States dermatologists, only limited information is available on the prevalence of dermoscopy use in Taiwan.

Objectives: We assessed the use and barriers to adoption of dermoscopy among Taiwanese dermatologists to determine the relationship between dermoscopy use and the characteristics of dermoscopy users.

Methods: A questionnaire of 20 items regarding demographic characteristics, dermoscopy training, and application was mailed to all dermatologists listed in the 2013 Taiwanese Dermatological Association registry.

Results: Of the 950 mailed questionnaires, 202 were returned and 195 were identified to be eligible. Of the valid respondents, 51.8% used dermoscopy and 62.1% had attended courses for dermoscopy training. Dermoscopy use was significantly associated with women ($p = 0.018$), residents ($p < 0.001$), young age ($p < 0.001$), dermoscopy training ($p < 0.001$), and owning dermoscopy books ($p < 0.001$). The majority of dermoscopy users practiced in medical centers ($p < 0.001$) and were involved in resident teaching ($p < 0.001$). If more convenient programs for dermoscopy training were offered (68.1%), the price of a dermatoscope was lowered (64.9%), or free trials were offered by dermatoscope vendors (58.5%), dermoscopy nonusers might be willing to use this technique.

Conclusion: This is the first published survey about the application of dermoscopy in Taiwan. Despite a low response rate and potential selection bias, our study revealed that dermoscopy is increasingly being accepted by Taiwanese dermatologists in daily practice. In addition, the study offered an opportunity to introduce all dermatologists to this technique.

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Introduction

Dermoscopy, also known as epiluminescence microscopy, dermatoscopy, or amplified surface microscopy, is a noninvasive technique useful for improving the diagnostic accuracy and confidence in identifying various types of skin diseases. It has had a substantial

impact on early detection of malignant skin tumors (malignant melanoma and nonmelanoma skin cancers).^{1–4} A previous meta-analysis revealed that the diagnostic odds ratio for melanoma using dermoscopy was 15.6 times higher than that by naked eye examinations. Dermoscopy significantly reduces the number of pigmented skin lesions excised for diagnostic verification, particularly among experienced users.^{5–7} A retrospective study by Carli et al⁸ demonstrated that the benign-to-malignant ratio of excised lesions decreased from 18:1 in the predermoscopy era to 4:1 with the use of dermoscopy among trained clinicians. By contrast, the diagnostic performance of dermoscopy nonusers did not improve during the study period. Using dermoscopy, even nonspecialist clinicians can improve the benign-to-malignant ratio of excised lesions.^{9,10}

Conflicts of interest: The authors declare that they have no financial or non-financial conflicts of interest related to the subject matter or materials discussed in this article.

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In addition to pigmented skin lesions, dermoscopy is useful in evaluating various cutaneous disorders, including ectoparasitic infestations, cutaneous/mucosal infections, hair and nail abnormalities, psoriasis, and other dermatological conditions, as well as some cosmetological conditions.^{11–14} For hair and scalp lesions, dermoscopy enables dermatologists to differentiate nonscarring alopecia from scarring alopecia, diagnose early androgenic alopecia, and provide quick diagnosis of tinea capitis.¹⁵ For papulosquamous lesions, specific dermoscopic features may be used to distinguish psoriasis from eczema, pityriasis rosea, lichen planus, or other skin tumors.^{16,17} With digital image-saving programs, dermoscopy is also a useful tool for evaluating a treatment outcome or long-term follow-up.

Dermoscopy has been widely adopted by European, Australian, and United States dermatologists. A 2011 nationwide survey conducted in Australia revealed that 98% of the dermatologists who responded use dermoscopy in their practice. The main reasons for using dermoscopy were as follows: (1) to increase confidence in clinical diagnosis, (2) to achieve greater accuracy than naked eye examination, (3) to detect melanomas at early curable stage, and (4) to reduce the number of biopsies performed.¹⁸ Another cross-sectional survey conducted in the United States in 2010 showed that 48% of dermatologists who responded use dermoscopy. The reasons provided for not using dermoscopy included lack of training, lack of interest, and prolonged time required for examination.¹⁹ To date, comprehensive information on the prevalence of dermoscopy use in Taiwan is little. This study assessed the use and barriers to adoption of dermoscopy among Taiwanese dermatologists.

Materials and methods

Ethics statement

This study was approved by the Institutional Review Board of Far Eastern Memorial Hospital, New Taipei City, Taiwan.

Study population and questionnaire

The survey was conducted among all Taiwanese dermatologists. A pilot study was completed first by 10 certified dermatologists, who provided feedback on the content and wording used in the questionnaire. The final questionnaire included 20 items regarding age, sex, number of years since residency, practice location and characteristics, number of cancer patients screened each month, time spent teaching, and dermoscopy use and training. Physicians who use dermoscopy were asked about the types of dermatoscope they use and the percentage of dermoscopy use when examining patients with pigmented lesions, papulosquamous lesions, ectoparasitosis, cutaneous infection, hair and nail lesions, and cosmetic procedure follow-ups. In addition, dermoscopy users were asked about the learning source of dermoscopy, reasons for dermoscopy use, average time spent in analyzing a single lesion, and how confident they were of their dermoscopy skills for assessing each type of skin condition. Nonusers were asked about the reasons for not using dermoscopy, and conditions under which they would be willing to use dermoscopy in the future.

A three-page questionnaire and a postage-paid return envelope were mailed to all the dermatologists listed in the 2013 Taiwanese Dermatological Association (TDA) registry. Health care facilities in Taiwan are classified into four types, namely, medical centers, regional hospitals, local hospitals, and private practice clinics. They are defined by scale, number of beds, and quality of medical and nursing care. Cities and counties are categorized according to the definition by the Bureau of National Health Insurance into the

following medical districts: Taipei, North, Middle, South, Kaohsiung–Pingtung, and East. Confidence was measured using a 5-point Likert scale ranging from 1 (not confident) to 5 (very confident). The scores were used to produce average values. To ensure quality control of data, 10% of the survey questionnaires were double-checked using a computer-generated random list.

Statistical analysis

We performed statistical analyses of the data obtained from all the questionnaires. Chi-square test and Student *t* test were used to analyze categorical data and continuous data, respectively. The level of statistical significance was defined as $p < 0.05$. Mean values (\pm standard deviation) and frequencies were used to present continuous variables and categorical variables, respectively. The statistical software used for logistic regression was SPSS for Windows (version 20.0; IBM SPSS Inc., Chicago, IL, USA).

Results

The questionnaires were mailed to the 950 dermatologists identified in the TDA registry. A total of 202 (21.3%) completed surveys were returned. Among these, seven questionnaires were excluded because of missing answers to the questions related to dermoscopy use. Finally, 195 questionnaires were analyzed.

Respondent characteristics

Of the valid respondents, 66.2% ($n = 129$) were men and 33.8% ($n = 66$) were women, with a mean age of 41 years, and 18.5% ($n = 36$) were residents. Most of the respondents worked in the Taipei medical district (57.9%, $n = 113$) and practiced in private clinics (50.8%, $n = 99$), followed by medical centers (33.8%, $n = 66$). Medical dermatology comprised an average of 63.3% of the clinical time of dermatologists, followed by cosmetic (17.3%) and surgical dermatology (11%).

Dermoscopy use

Of the 195 dermatologists, 51.8% ($n = 101$) declared that they use dermoscopy in their daily clinical practice. As shown in [Table 1](#), dermoscopy use was significantly associated with women ($p = 0.018$), residents ($p < 0.001$), young age ($p < 0.001$), fewer clinic hours ($p = 0.004$), attending classes for dermoscopy training ($p < 0.001$), and owning dermoscopy books ($p < 0.001$). The majority of the dermoscopy users worked in the Taipei and North medical districts ($p = 0.002$), practiced in medical centers ($p < 0.001$), and were involved in resident teaching ($p < 0.001$). Furthermore, dermatologists who spent more time in surgical dermatology and dermatopathology ($p < 0.001$) or managed more skin cancer patients (≥ 5 cancer patients/mo, $p = 0.006$) were prone to using dermoscopy. Most of the dermatologists used a polarized light contact dermatoscope (51.5%) and polarized light noncontact dermatoscope (49.5%). By contrast, a digital microscope with a universal serial bus connector (19.8%), nonpolarized light immersion contact dermatoscope (14.9%), and folliscope (2%) were less commonly used. The average time spent to analyze a single lesion was 1–5 minutes and < 1 minute in 47.5% and 42.6% of the dermoscopy users, respectively.

Training

More than half of the respondents ($n = 121$, 62.1%) reported that they attended classes for dermoscopy training. Younger physicians were more willing to attend such classes (≤ 40 years old, $p < 0.001$),

Table 1 Association of characteristics with dermoscopy use.

Characteristics ^a	Coding	Dermoscopy use		p
		Yes, N = 101	No, N = 94	
Age**	Years	37 ± 8.3	44.5 ± 9.1	<0.001
Time since residency**	Years	10.2 ± 8.2	17.2 ± 8.5	<0.001
Sex*	Female	42 (63.6)	24 (36.4)	0.018
	Male	59 (45.7)	70 (54.3)	
Practice position*	Resident	29 (80.6)	7 (19.4)	<0.001
	Attending physician	72 (45.3)	87 (54.7)	
Practice location*	Taipei and North medical districts	74 (60.2)	49 (39.8)	0.002
	Middle, South, Kaohsiung–Pingtung, and East medical district	27 (37.5)	45 (62.5)	
Medical constitution*	Medical center	54 (81.8)	12 (18.2)	<0.001
	Regional and district hospital, private clinic	47 (36.4)	82 (63.6)	
Clinic h/wk**	Hours	22.4 ± 13.1	27.8 ± 12.8	0.004
Patients seen/h	Patients	13.2 ± 13	14.9 ± 8.7	0.356
Skin cancer patients screening/mo*	≥5	32 (69.6)	14 (30.4)	0.006
	<5	69 (46.3)	80 (53.7)	
Practice activity**	Medical dermatology	57.2	69.9	<0.001
	Surgical dermatology	14.5	7.2	<0.001
	Dermatopathology	9.5	2.7	<0.001
	Cosmetic dermatology	16.4	18.2	0.471
Time spent teaching/wk*	≥2 h	40 (74.1)	14 (25.9)	<0.001
	<2 h	61 (43.3)	80 (56.7)	
Taken dermoscopy classes*	Yes	86 (71.1)	35 (28.9)	<0.001
	No	15 (20.3)	59 (79.7)	
Own dermoscopy books*	Yes	79 (74.5)	27 (25.5)	<0.001
	No	22 (24.7)	69 (75.3)	

Data are presented as %, n (%), or mean ± SD.

*p < 0.05, results of Chi-square test.

**p < 0.05, results of t test.

SD = standard deviation.

^a Statistics of each variable between dermoscopy users and nonusers.

and 94% (n = 34) of the residents were trained in dermoscopy, compared with 54.7% (n = 87) of the attending physicians. The users learned dermoscopy mainly by reading books and papers (80.2%) and attending classes (78.2%). Some users learned from experienced dermatologists (40.6%) or online programs (28.7%).

Dermoscopy application and confidence

Regarding the percentage of dermoscopy use in examining patients with specific skin conditions, pigmented lesions ranked first (65.5%), followed by hair and scalp disorders (34%), nail lesions (26.1%), and cutaneous infections (22.4%; [Table 2](#)). Three dermatologists reported using dermoscopy to examine patients with trauma or intracutaneous foreign bodies, and another three dermatologists used it for vascular lesions. In general, most users were confident (average score, 3.2 of 5) of their dermoscopy skills. Regarding specific types of skin conditions, the dermatologists were more confident of their skills in examining pigmented lesions (score, 3.6 of 5) and nail lesions (score, 3.3 of 5) and less confident in cosmetic procedure follow-ups (score, 2.6 of 5; [Table 3](#)). No statistical significance was observed between residents and attending physicians regarding the priority of dermoscopy use for various diseases and confidence in their skills.

Table 2 Percentage of dermoscopy use when examining different conditions.

Skin conditions	%
Pigmented lesions	65.5
Hair disorders/scalp lesions	34
Nail lesions	26.1
Cutaneous infections	22.4
Cosmetic procedure follow-ups	14.9
Papulosquamous conditions	13.4
Ectoparasitosis	10.6

Table 3 Confidence in dermoscopy skill when examining different conditions.

Skin conditions	Mean ^a
Pigmented lesions	3.6
Nail lesions	3.3
Hair disorders/scalp lesions	3.1
Cutaneous infections	2.8
Ectoparasitosis	2.7
Papulosquamous conditions	2.7
Cosmetic procedure follow-ups	2.6
All conditions	3.2

^a Rated on a 5-point Likert scale (1 = not confident, 2 = no difference, 3 = somewhat confident, 4 = confident, and 5 = very confident).

As evident in [Table 4](#), the most common reasons for dermoscopy use were achieving greater accuracy than naked eye examination (91.1%), increasing confidence in clinical diagnosis (77.2%), and increasing patient trust (77.2%). More than half of the users stated that dermoscopy enabled identifying skin cancers at early stages (66.3%) and reducing the anxiety of their patients (54.5%). For taking photos and saving images, 50.5% of the users had a camera or cell phone attached to their dermatoscopes. Most of the users (82.2%) anticipated an increase in the use of dermoscopy, and only 1% anticipated a decrease in the use of dermoscopy. Of the valid

Table 4 Reasons for using dermoscopy (n = 101).

Reason	%
Achieve greater accuracy than naked eye examination	91.1
Increase confidence in clinical diagnosis	77.2
Increase patient trust	77.2
Facilitate identifying skin cancers at early stages	66.3
Reduce patient anxiety	54.5
Use as a light source	47.5
Facilitate determining where to perform a biopsy in a large lesion	30.7
Reduce the number of biopsies	23.8

respondents, 99% dermatologists reported that they would recommend dermoscopy to other dermatologists.

Nonusers of dermoscopy

Of the valid respondents, 94 (48.2%) dermatologists stated that they did not use dermoscopy. Reasons provided for not using dermoscopy included lack of training (43.6%), dermoscopy was too expensive (33%), or belief that dermoscopy would not affect clinical decision making (30.9%). Some dermatologists reported that using dermoscopy is too time consuming (24.5%), or they are not interested in this technique (13.8%). In addition, a few dermatologists claimed that dermoscopy was not easily available or that they had already been using magnifiers in their daily practice (Table 5). Nonusers expressed willingness to use dermatoscope in the future in the following situations: (1) if more convenient training programs are made available (68.1%, e.g., if teaching courses were available online or classes were held in every medical district), (2) if the price of dermatoscopes was lowered (64.9%), or (3) if free trials were offered by dermatoscope vendors (58.5%). A few dermatologists ($n = 4$) mentioned that a more precise dermoscopic diagnostic flowchart or criteria should be developed and published. Five declared that because performing a skin biopsy in Taiwan according to clinical suspicion was convenient, the role of dermoscopy remained debatable. Four dermatologists claimed that they would rather believe the final pathological report than the dermoscopy findings.

Discussion

Dermatoscope is becoming an increasingly helpful tool in the diagnosis of various types of dermatological conditions in addition to examining pigmented lesions. Many previous studies have demonstrated its usefulness in the diagnosis of cutaneous infections, papulosquamous conditions, and hair and nail disorders.^{11–17} Half of the dermatologists in this study reported that they use dermoscopy in their clinical practice. This result is compatible with the findings of the 2010 survey conducted among 3238 U.S. dermatologists (48%),¹⁹ and highlights that dermoscopy is increasingly being adopted by Taiwanese dermatologists. However, the rate of dermoscopy use is still lower than that reported in the 2011 Australian survey (98%) and the 2013 French survey (94.6%).^{18,20} Because Australia has the highest incidence rate of cutaneous melanoma in the world, utilization of dermoscopy is recommended for practitioners in examining pigmented skin lesions.

Similar to the results of previous studies, we found that dermoscopy use was associated with young age, residency, and having attended training courses. The attendance rates in classes for dermoscopy training were much higher among residents than among attending physicians. In general, younger physicians may have stronger interest in learning new techniques, particularly during residency, than do attending physicians. Another crucial reason is that dermoscopy-related topics have been included in the

board examination for dermatology specialists in recent years. In Australia, dermoscopy teaching in dermatology-training curriculum comprises formal courses, such as extensive online programs, case study-based teaching, and teaching in dermatology outpatient clinics.²¹ We recommend integrating dermoscopy teaching more intensively into residency training programs.

Because dermoscopy was originally introduced for diagnosing pigmented lesions, few dermatologists in this study used dermoscopy for examining nonpigmented lesions (35% for hair disorder, 26% for nail lesions, 18% for cutaneous infestations, and 11% for papulosquamous conditions). In addition, most dermoscopy users were more confident in examining pigmented lesions than other types of skin conditions. Numerous studies have supported the use of dermoscopy in diagnosing nonpigmented lesions, and these findings deserve further clinical applications.^{3,11–17}

In this study, dermoscopy users spent their clinical time more in surgical dermatology and dermatopathology than nonusers. This result differs from the findings in a previous United States study, which reported that dermoscopy users spent more time in medical dermatology and less time in surgical dermatology or dermatopathology.¹⁹ Dermoscopy enables dermatologic surgeons to detect malignant skin tumors at early stages, reduce the number of unnecessary excision, and define demarcation of surgical margins. A careful inspection of dermoscopic images together with the corresponding specimen enables dermatopathologists to decide whether all representative dermoscopic features are also present histopathologically. Thus, serial or additional sections from other blocks can be ordered when underlying histopathologic structures of dermoscopy features, clearly visible on the dermoscopic images, are not present in the histologic specimen.²²

The reasons for not using dermoscopy provided an essential insight. Lack of training was the main factor limiting its use according to a previous study.¹⁹ Our study reinforced this finding, indicating that 43.6% ($n = 41$) of the nonusers declared lack of training as the reason for nonuse. Some dermatologists suggested adding more training courses in every medical district ($n = 16$) and online programs ($n = 3$). Several free online dermoscopy training programs are already available, such as IDS e-learning (www.dermoscopy-ids.org) and Dermoscopy (www.dermoscopy.org). IDS e-learning is designed by the International Dermoscopy Society and contains an educational section composed of short video tutorials. Dermoscopy provides interactive atlas of dermoscopy covering pigmented and nonpigmented skin lesions. Recent mobile apps (Dermoscopy Two Step Algorithm, Virtual Dermatoscope) offer a more convenient and efficient manner to improve skills required for interpretation of dermoscopic patterns.

One third of the nonusers ($n = 31$) thought that dermatoscope was too expensive. This rate was higher than that reported in the United States (6.6%).¹⁹ In another Australian survey, over half of the trainees did not own a dermatoscope most likely because of its cost; however, many training institutions supplied clinicians with dermatoscopes.²¹ If medical centers, regional hospitals, or even private clinics could offer public dermatoscopes, the use of dermoscopy might increase. Regarding the time required for dermoscopic examination, nearly one fourth of the nonusers ($n = 23$) considered that dermoscopy is time consuming, but most of the users spent < 5 minutes to analyze a single skin lesion. A previous study found that the time required for a complete skin examination in skin cancer screening by dermoscopy is 142 seconds, which is significantly longer than the 70 seconds required for naked eye examination.²³ Although quantifying the quality of an examination with and without dermoscopy is difficult, complete examination with dermoscopy requires < 5 minutes, which is a reasonable amount of time to potentially make a more accurate clinical diagnosis than naked eye examination.

Table 5 Reasons for not using dermoscopy ($n = 94$).

Reason	%
Lack of training	43.6
Too expensive	33
Would not affect clinical decision making	29
Too time consuming	24.5
Lack of interest	13.8
Difficulty in availability	8.5
Willingness to use but not yet obtained dermatoscope	6.4
Use of magnifiers as an alternative in daily practice	3.2

Because of the coverage of National Health Insurance system, the charge for a skin biopsy is relatively cheap in Taiwan. Arranging a skin biopsy is convenient and available even in private clinics. Under these circumstances, dermatologists may prefer to order a skin biopsy than perform a dermoscopy examination for patients. However, skin biopsy is an invasive procedure, which may be associated with some postoperative complications. Patients have to wait for a period to obtain their pathology reports. Dermoscopy is a noninvasive technique, which can assist dermatologists in making primary diagnosis and treatment plans in a few minutes. Among experienced users, dermoscopy is also useful in reducing the number of biopsies performed and enabling them to determine where to perform a biopsy for a large lesion.^{5,18,20} Thus, dermoscopy may play an important role in clinical decision making and is worth popularizing in Taiwan.

The results of this study should be carefully interpreted because of certain limitations. First, the response rate (21.3%) was lower than that of several previous surveys,^{18,19,21} probably because the caption of the questionnaire indicated that it pertained to dermoscopy use. Dermatologists not interested in, or unfamiliar with, dermoscopy may have discarded the questionnaire. Conversely, dermatologists using dermoscopy may feel more involved and therefore may have responded more than nonusers. The questionnaire also contained detailed questions about the application of dermoscopy, particularly for specific types of skin conditions, and the confidence in using this technique. Thus, reading and completing the questionnaire may have required a prolonged time, which could have lowered the response rate. Second, the response rate was higher from residents than from attending physicians, and the rate of dermoscopy use was also higher among residents. Younger dermatologists are generally more interested in learning new techniques and expressing their opinions. Third, the participants from Eastern and Southern Taiwan were fewer than those from Northern Taiwan, probably because most training courses and lectures are held in Northern Taiwan. Dermatologists from other medical districts might be less likely to realize the usefulness of dermoscopy. The aforementioned factors may introduce a sampling bias of users versus nonusers completing the survey, which might have overestimated dermoscopy use. Despite these limitations, this survey provided general information about the prevalence of dermoscopy use, and showed attitudes toward dermoscopy among Taiwanese dermatologists.

In conclusion, this is the first published survey on the application of dermoscopy in Taiwan. Our study revealed that dermoscopy is increasingly being accepted by Taiwanese dermatologists because it is currently used by more than half of the respondents. Most of the dermoscopy users declared that this technique was more accurate than naked eye examination and might improve confidence in clinical diagnosis. Lack of training is a main factor responsible for the limited use of dermoscopy. We suggest that more convenient and generalized training courses be offered and dermoscopy training be incorporated earlier in the curriculum of dermatology residency training. Finally, reimbursement for dermoscopic examination approved by National Health Insurance may be an incentive for use.

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