Pattern Recognition using Morphologies of Anthropophilic and Zoophilic Dermatophytosis Lesions: Comparison between Final-Year Medical Students and Dermatology Residents

Sumanas Bunyaratavej, M.D., Rungsima Kiratiwongwan, M.D., Pichaya Limphoka, M.D., Kamonpan Lertrujiwanit, B.Sc., Charussri Leeyaphan, M.D.

Department of Dermatology, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand.

ABSTRACT

Objective: To compared pattern recognition abilities of final-year medical students and dermatology residents to distinguish and classify superficial fungal infections and resembling lesions.

Methods: The study was conducted at the Department of Dermatology, Faculty of Medicine, Siriraj Hospital, Mahidol University, Bangkok, Thailand, in 2019. The participants had to make diagnosis from 78 images including typical and atypical lesions within 50 seconds. No history or any description was given. The answer sheets were reviewed.

Results: Medical students (n = 18) and dermatology residents (n = 19) showed no significant differences in the means of overall accuracy scores. Residents demonstrated a statistically higher mean score than the medical students in diagnoses of anthropophilic infection with mostly presented with typical lesion. However, there were no significant differences in the mean scores for their diagnoses of zoophilic dermatophytosis as atypical lesions and other skin lesions.

Conclusion: Pattern recognition was helpful for the diagnosis of cutaneous dermatophytosis, especially in cases of typical lesions. Nonetheless, pattern recognition alone is insufficient for the diagnosis of atypical dermatophytosis lesions; analytical diagnostic skills should also be enhanced to an increase in the accuracies of atypical-lesion diagnoses.

Keywords: Morphological diagnosis; anthropophilic dermatophytosis; zoophilic dermatophytosis, accuracy; medical students; dermatology residents (Siriraj Med J 2020; 72: 488-491)

INTRODUCTION

Pattern recognition is an important clinical skill in dermatology.[1] Cutaneous dermatophytosis, a common skin infectious disease, is mainly caused by anthropophilic and zoophilic dermatophytes.[2] The recognition and classification of cutaneous dermatophytoses are based on clinical characteristics and lead to appropriate investigations.[3] The typical presentation of cutaneous dermatophytosis is a scaly, red, and slightly elevated lesion with an active border.[3] However, zoophilic infections frequently cause more inflammatory lesions[4] and may resemble other skin diseases, such as eczema and psoriasis, leading to a misdiagnosed pattern.[5] This study therefore compared the abilities of final-year medical students and dermatology residents to distinguish and classify skin lesions for superficial fungal infections and resembling lesions, as well as the participants' confidence levels.

MATERIALS AND METHODS

The investigation was conducted at the Department of Dermatology, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand, in 2019. The study protocol had been approved by the Siriraj Institutional Review Board (Si 197/2020). High-quality, representative, clinical images with proper exposure were selected by two clinical instructors. The 78 clinical images comprised anthropophilic cutaneous lesions (37 cases), zoophilic cutaneous dermatophytosis lesions (33 cases), and other skin lesions resembling cutaneous dermatophytosis (8 cases). Sample pictures that were used as questions were demonstrated in Fig 1. No history or any description was given. The participants had to state whether each image was a dermatophytosis, and they needed to provide a confidence-level score for each decision (1, low confidence; 2, moderate confidence; 3, high confidence). The decision for each image needed to be made within 50 seconds. All cases of anthropophilic and zoophilic dermatophytosis were confirmed with positive branching septate hyphae from potassium hydroxide examination, and with fungal culture results in Sabouraud's dextrose agar with cyclohexamide. The data from the response sheets were consolidated, and a retrospective review was undertaken of the accuracy scores and confidence scores of the final-year medical students and dermatology residents.

Data were analyzed using SPSS Statistics for Windows, version 18.0 (SPSS Inc., Chicago, IL, USA). The unpaired t-test was applied to compare the correct results and confidence scores of the final-year medical students and dermatology residents. A p-value of less than 0.05 indicated statistical significance.

RESULTS

A total of 37 participants consisting of 18 final-year medical students (48.6%) and 19 dermatology residents (51.4%) were enrolled. Their accuracy and confidence scores are detailed in Table 1. The final-year medical students and dermatology residents showed no significant differences in the means of their overall accuracy scores (41 ± 8.2 vs. 43.5 ± 10.5, respectively; $p = 0.421$). As to the diagnoses of the anthropophilic lesions, the dermatology residents demonstrated a statistically higher mean score (23 ± 5.9) than the final-year medical students (18.6 ± 5.3; $p = 0.014$). In contrast, there were no significant differences in the mean scores for their diagnoses of zoophilic dermatophytosis and other skin lesions. The dermatology residents had significantly higher confidence scores than the final-year medical students ($p < 0.05$) for the evaluations of the overall, anthropophilic, and zoophilic dermatophytosis images. On the other hand, the confidence scores of the 2 groups for the diagnoses of other dermatological conditions were not statistically different.

DISCUSSION

Pattern recognition is a necessary skill for dermatologic diagnosis.[1] This study revealed that the dermatology residents had a higher accuracy rate and greater confidence than the final-year medical students for the diagnosis of anthropophilic dermatophytosis. "Pattern recognition" refers to the process of matching a present case with examples from previous patients or prototypes of a disease stored in the diagnostician's memory. The process is normally very useful for diagnoses, especially in instances of typical lesions.[6,7] In the current study, the higher correct scores and confidence scores of the dermatology residents for the diagnoses of typical lesions may stem from their having more experience and the use of typical presentations of cutaneous anthropophilic dermatophytosis.

For both groups, the ability to diagnose zoophilic dermatophytosis, which usually presents with atypical
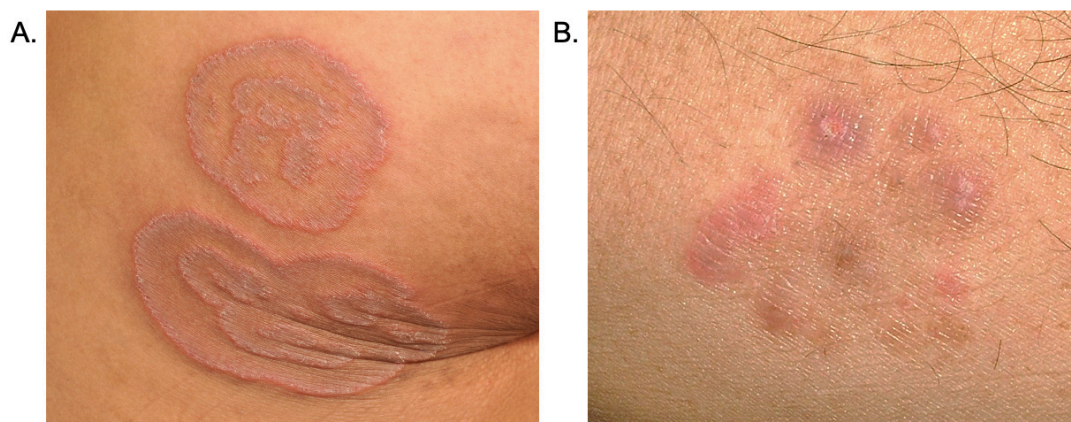

Fig 1. Sample pictures that were used as questions for **(A)** anthropophilic dermatophytosis and **(B)** zoophilic dermatophytosis

TABLE 1. Accuracy and confidence scores of final-year medical students and dermatology residents.

		Mean score ± SD		
	Total score	Final-year medical students (n = 18)	Dermatology residents (n = 19)	*P*-value
Accuracy scores				
Overall	78	41.0 ± 8.2	43.5 ± 10.5	0.421
Anthropophilic dermatophytosis	37	18.2 ± 5.3	23.0 ± 5.9	0.014*
Zoophilic dermatophytosis	33	15.6 ± 5.6	12.8 ± 5.2	0.098
Other dermatological conditions	8	7.2 ± 0.9	7.7 ± 0.7	0.093
Confidence scores				
Overall	234	138.8 ± 27.0	157.4 ± 15.0	0.022*
Anthropophilic dermatophytosis	111	66.8 ± 14.5	75.5 ± 7.3	0.030*
Zoophilic dermatophytosis	99	59.3 ± 11.8	66.5 ± 7.3	0.036*
Other dermatological conditions	24	15.5 ± 6.2	15.4 ± 7.1	0.964

* $p < 0.05$
Abbreviation: SD, standard deviation

lesions, was lower than that for anthropophilic lesions. Although there was no significant different in accuracy scores for the recognition of zoophilic dermatophytosis between final-year medical students and dermatology resident, final-year medical students intended to have a higher mean score. However, the dermatology resident had higher confidence scores than the final-year medical students. This result is similar to that reported by a previous investigation, which revealed that there was no correlation between confidence levels and the accuracy of diagnoses.[8] The misdiagnoses of zoophilic dermatophytosis by both groups may due to atypical presentations of zoophilic dermatophytosis having been used. This condition frequently results in highly inflamed lesions[4] that may resemble other skin diseases, such as eczema and psoriasis.[5] Other research reported that diagnostic errors for atypical dermatology conditions resulted from the ambiguities of atypical clinical lesions; moreover, only a little improvement in accuracy was gained with higher levels of clinician expertise.[7] That study suggested that atypical lesions may contain inadequate information for diagnostic purposes. To increase the diagnostic accuracy of medical students and dermatology residents, we suggest that more instruction with atypical lesions should be given, and with a greater frequency than typical lesions. Nevertheless, pattern recognition

alone may not be enough to make diagnoses for atypical lesions. The development of analytical and diagnostic skills within a framework utilizing patients' histories and physical examinations should also be enhanced in order to improve clinicians' abilities to discriminate between atypical skin-lesion types.

The limitation of this study is its small sample size. In addition, cutaneous dermatophytosis was the sole, representative skin disease used in this study. Further study with a larger sample size and a wider variety of skin lesion types is recommended.

In conclusion, pattern recognition was found to be a helpful clinical skill for the diagnosis of cutaneous dermatophytosis, especially in cases of typical lesions. Given that dermatology residents encounter typical skin lesions more frequently than medical students, they can develop a higher degree of pattern recognition skills and, in turn, expertise in the diagnosis of typical skin lesions. As to atypical skin lesions, it is recommended that training in pattern recognition for such lesions should be provided with more frequency than for typical lesions. Nonetheless, pattern recognition alone is insufficient for the diagnosis of atypical lesions: analytical diagnostic skills should also be enhanced. Collectively, such actions should contribute to an increase in the accuracies of atypical-lesion diagnoses.

ACKNOWLEDGMENTS

REFERENCES

1. Rimoin L, Altieri L, Craft N, Krasne S, Kellman PJ. Training pattern recognition of skin lesion morphology, configuration, and distribution. J Am Acad Dermatol 2015;72:489-95.
2. Hassanzadeh Rad B, Hashemi SJ, Farasatinasab M, Atighi J. Epidemiological Survey of Human Dermatophytosis due to Zoophilic Species in Tehran, Iran. Iran J Public Health 2018; 47:1930-6.
3. Kaushik N, Pujalte GG, Reese ST. Superficial Fungal Infections. Prim Care 2015;42:501-16.
4. Weitzman I, Summerbell RC. The dermatophytes. Clin Microbiol Rev 1995;8:240-59.
5. Hainer BL. Dermatophyte infections. Am Fam Physician 2003;67:101-8.
6. Costa Filho GB, Moura AS, Brandao PR, Schmidt HG, Mamede S. Effects of deliberate reflection on diagnostic accuracy, confidence and diagnostic calibration in dermatology. Perspect Med Educ 2019;8:230-6.
7. Norman GR, Rosenthal D, Brooks LR, Allen SW, Muzzin LJ. The development of expertise in dermatology. Arch Dermatol 1989;125:1063-8.
8. Landefeld CS, Chren MM, Myers A, Geller R, Robbins S, Goldman L. Diagnostic yield of the autopsy in a university hospital and a community hospital. N Engl J Med 1988;318: 1249-54.