Dermatology Practical & Conceptual

Enhancing Dermoscopy Learning with Stereoscopic 3D Imaging

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Introduction

Dermoscopy is a cost-effective tool for early detection of skin cancer [1,2]; however, its diagnostic accuracy is highly dependent on adequate training. Traditional educational strategies, including online and in-person courses, lectures, workshops, hands-on training, case-based learning, digital platforms, and self-guided learning, have demonstrated efficacy [3]. These methods, however, rely predominantly on two-dimensional (2D) dermoscopic images. While magnified 2D images aid in the effective recognition of dermoscopic structures, they do not always replicate the limited magnification, depth, and perspective encountered in clinical practice. To date, no dermoscopy training method has addressed this limitation by incorporating additional visual strategies, such as stereoscopic visualization.

Stereoscopy (3D imaging) creates depth perception by presenting two slightly offset images, mimicking natural human binocular vision [1]. In medical education, stereoscopic 3D imaging has been shown to enhance spatial understanding, knowledge retention, and learner engagement across diverse disciplines, including anatomy, pathology, geometry, physics, computer science, and geology [2,3]. Learners exposed to stereoscopic materials often perform better on assessments and report higher satisfaction, underscoring the pedagogical value of this tool.

Findings

Recognizing the highly visual nature of dermoscopy and the proven benefits of both stereoscopic imaging and gamified learning [4,5], we piloted the use of a stereoscopic retroviewer as a teaching adjunct during a two-day dermoscopy course held in November 2023. Each participant received a retroviewer loaded with five reels, each containing seven stereoscopic dermoscopic images representing five key categories: i) facial lesions, ii) lesions on

sun-damaged skin, iii) acral lesions, iv) atypical nevi, and v) scalp (Figures 1–2). Unlike conventional dermoscopy textbooks, which present static magnified images, the retroviewer recreates real-world dermoscopic conditions by restoring depth perception and approximating the clinical field of view, thereby bridging the gap between textbook images and bedside skin examination.

Participants completed a pre- and post-course survey assessing dermoscopic pattern recognition, diagnostic confidence, and management decisions as well as a satisfaction survey focused on the retroviewer. Of the 60 participants, 21 completed the satisfaction survey. Among respondents, 52.4% had more than three years of dermoscopy experience, while 14.3% had less than one year. Notably, 70% reported improved recall of dermoscopy structures, and 71.4% described the retroviewer as "slightly" or "very comfortable" to use on a 5-point Likert scale. Furthermore, 61.9% indicated they were "likely" or "very likely" to use the retroviewer again for educational purposes. Five participants requested extensive use of the tool in future courses.

Conclusion

These finding suggest that stereoscopic 3D imaging is a feasible and engaging adjunct to dermoscopy education. By replicating depth and perspective, the retroviewer may help learners transition from highly magnified textbook or digital images to real-life dermoscopic practice, thereby enhancing recall, pattern recognition, and engagement. While its impact on diagnostic accuracy compared to established modalities remains to be determined, these preliminary results highlight its potential as a valuable educational innovation. Further research is needed to validate its role in dermoscopic skill acquisition, long-term knowledge retention, and clinical practice. Thus, integrating stereoscopic 3D imaging into dermoscopy training, particularly when combined with gamified

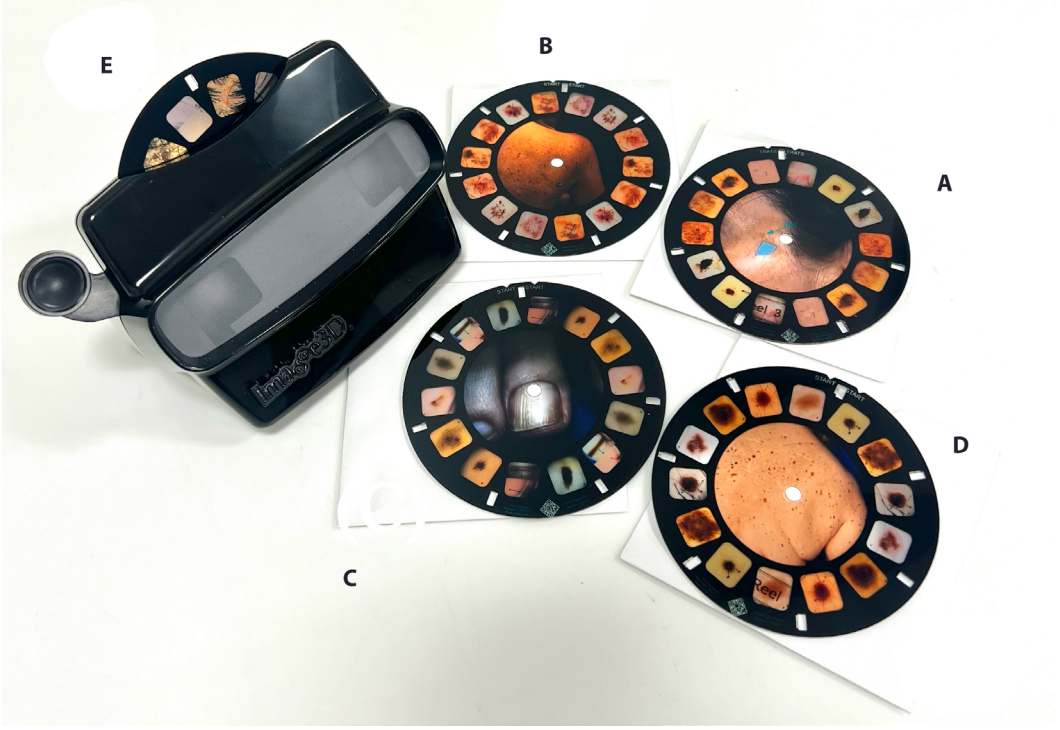

Figure 1. Retroviewer device with five reels, each focusing on a specific category: (A) facial lesions; (B) lesions on sun-damaged skin; (C) acral lesions; (D) non-glabrous skin: nevi and melanoma; and (E) trichoscopy. Each reel contains seven different dermoscopy images.

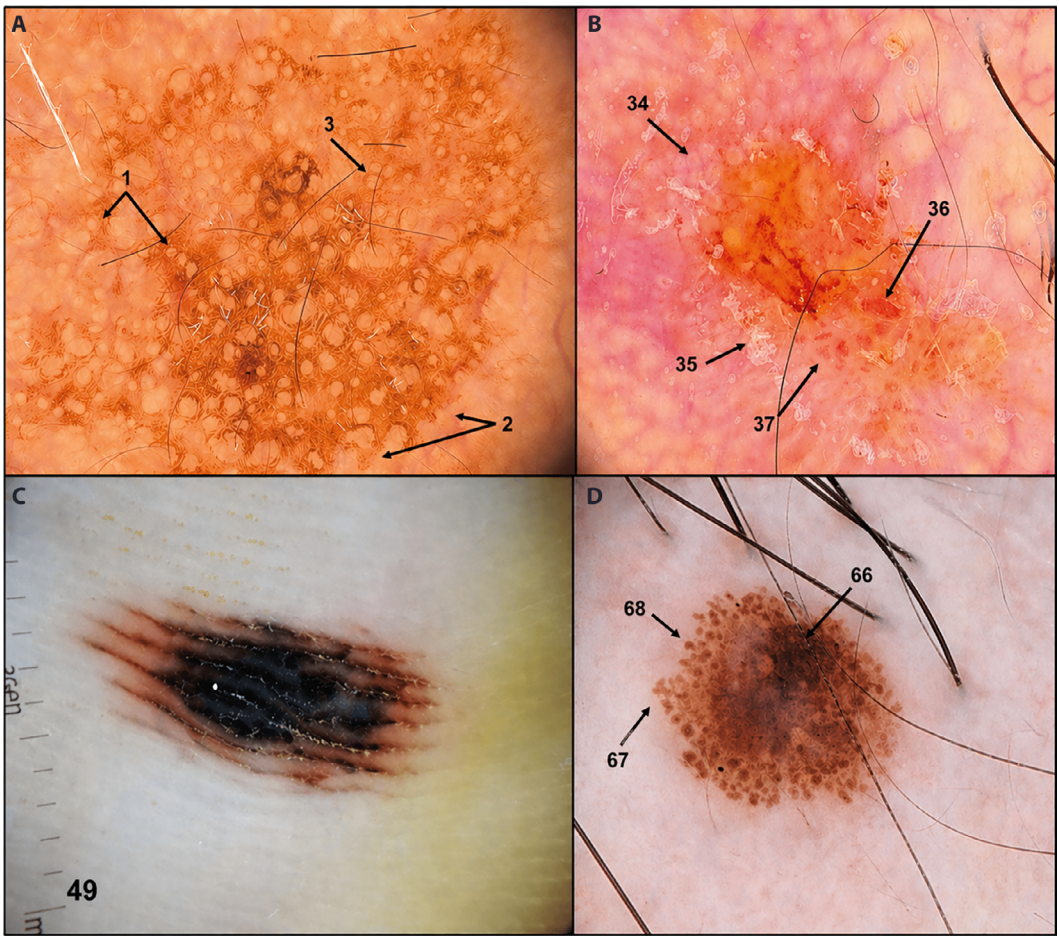

Figure 2. A) Dermoscopy images of skin lesions displayed in the retroviewer, including a solar lentigo on facial skin; B) a squamous cell carcinoma on sun-damaged skin; C) a melanoma on acral skin; D) a Spitz nevus.

strategies, may represent a valuable adjunct in teaching and understanding dermoscopic structures.

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