SHORT COMMUNICATION

Diagnostic Accuracy and Safety of Teledermoscopy for Cutaneous Melanoma Triage in Northern Sweden

Virginia ZAZO[1], Antonia BOMAN[2]* and Nirina ANDERSSON[2]
[1]*Department of Innovation and Research Grants, County Council of Västerbotten and* [2]*Dermatology and Venereology, Department of Public Health and Clinical Medicine, Umeå University, SE-901 85 Umeå, Sweden. *E-mail: antonia.boman@umu.se*
Submitted Jun 20, 2023. Accepted after review Oct 30, 2023
Published Feb 7, 2024. DOI: 10.2340/actadv.v104.15302. Acta Derm Venereol 2024; 104: adv15302.

The incidence of cutaneous melanomas in Sweden is among the highest in Europe. Early detection and excision are crucial for the prognosis. However, evaluation of skin tumours is difficult, and access to dermatology specialist competence is limited, especially in the northern region of Sweden. Previous melanoma research in the county of Västerbotten has indicated that a time delay to diagnosis and treatment is common. The time delay could be decreased by facilitating access for patients, and by reducing unnecessary referrals (1). Dermoscopy is an important tool to increase diagnostic safety, and to decrease unnecessary excisions (2–4). Lead times from initial contact to diagnosis and treatment can be reduced by using teledermoscopy (TD), whereby the dermatologist evaluates suspected lesions from a distant location (3). TD evaluation of suspected cutaneous malignancies has been incorporated in clinical routine in the county of Västerbotten since 2014. The aim of this study is to evaluate the reliability and accuracy of TD for triage of suspected cutaneous melanomas in the county of Västerbotten, Sweden.

MATERIALS AND METHODS

All patients diagnosed with histopathological cutaneous melanomas (Appendix S1) ($n=135$), at the department of pathology, Umeå University Hospital, Umeå, Sweden, during 2019 were included in this retrospective cross-sectional study. Patients who underwent TD evaluation of the lesion ($n=95$) were further reviewed. Every melanoma was reviewed regarding Breslow thickness (tumour thickness (mm)), previous TD consultation, and TD recommendation (positive: monitoring/excision; negative: no monitoring/excision). The sensitivity of TD assessment of suspected cutaneous melanomas was the primary outcome measure. Secondary outcome measures was the number of patients who previously (<2 years) sought care for the same lesion and received TD.. These cases were reviewed retrospectively by 2 dermatologists and with medical record review regarding the date of TD, presence of dermoscopy photographs, localization, TD recommendation, compliance, and Breslow thickness. According to the guidelines in Västerbotten for patients seeking primary healthcare centres (PHC) for evaluation of skin lesions, general practitioners (GPs) take photographs (close-up and with dermoscopy). The referring GP denotes "TD" in a referral to the dermatology clinic including recommended clinical data (previous melanoma, size, localization, palpated elevated/flat/hard, duration, evolution and symptoms). The dermatologist evaluates the photographs together with clinical information and responds with a preliminary diagnosis, and treatment suggestion (1: no intervention, 2: monitoring after 3 months with new images, 3: excision). For comparison of Breslow thickness, Student's *t*-test was used (IBM SPSS version 26, Armonk, NY, USA).

RESULTS

During 2019, 6,250 TD consultations were performed. Of the 135 diagnosed cutaneous melanomas (*in situ* or invasive), 95 cases had been evaluated using TD. The median age was 66.6 years (range 25–98 years) and 56.2% were men (Table SI). The mean Breslow thickness of invasive melanomas was 1.55 mm and the proportion of patients with Breslow thickness ≤ 1.0 mm was 60%. Of the 95 cases evaluated with TD, 94 had an accurate recommendation, resulting in a sensitivity of 98.9%. In the 1 case with inaccurate recommendation, dermoscopy photographs were missing. This lesion was located on the scalp, Breslow thickness 0.5 mm, and diagnosed 11 months after the first TD consultation. There were no significant differences in Breslow thickness ($p=0.4$), age ($p=0.8$), or sex ($p=0.3$) between patients evaluated with or without TD consultations. Of the patients diagnosed with melanomas with previous TD evaluations, 3 (2.2%) had sought care for the same lesion at a previous occasion between 2017 and 2019 without being diagnosed as a melanoma (**Table I**). In 2 of the patients further review showed that the assessors were not concordant in their evaluation. The first case was initially assessed as benign and no treatment or monitoring was recommended. The patient consulted a physician 1 year later, and a new TD consultation resulted in a melanoma diagnosis. In the second case, the patient had previously consulted healthcare twice for a cutaneous lesion. The first evaluation was made with TD and the second with physical examination, although not resulting in further treatment.

Table I. Cutaneous melanomas where previous teledermoscopy (TD) did not lead to a melanoma diagnosis

	1	2	3
Year of the first TD evaluation	2018	2017	2017
Macro images	Yes	Yes	Yes
Dermoscopy images	Yes	Yes	Yes
Localization	Scalp	Arm	Arm
TD recommendation	[a]	[a]	[b]
Compliance with the recommendation	Yes	Yes	No
Recommendation by retrospective reviewer A	[c]	[c]	[b]
Recommendation by retrospective reviewer B	[a]	[a]	[b]
Breslow thickness at diagnosis in 2019, mm	0.5	*In situ*	*In situ*

[a]No further follow-up, excision or biopsy; [b]Follow-up at 3 months; [c]Excision/biopsy.

In the third case, short-term monitoring in 3–4 months, as recommended by the PHC, did not occur. The patient consulted the PHC 2 years later and TD consultation led to the melanoma diagnosis.

DISCUSSION

In conclusion, this study shows that TD is safe and efficient for the evaluation and triage of cutaneous melanomas in the county of Västerbotten, Sweden. Of all cutaneous melanomas, 70% were evaluated using TD consultations. Correct diagnosis was present in 94 of 95 cases, resulting in a very high sensitivity (98.9%). In previous studies, TD has shown sensitivity for melanoma diagnostics, ranging between 48% and 100%, depending on lesional severity and assessor experience (5).

Breslow thickness is the strongest prognostic variable for melanoma survival. For several years, the median thickness for melanomas in Sweden has been approximately 1 mm at diagnosis (6). The prognosis for thin melanomas, < 1 mm is good; patients rarely relapse and die from the disease. One of the quality indicators for management of melanomas is the proportion of Breslow thickness ≤ 1 mm. In the current study population, 60% had a Breslow thickness ≤ 1 mm, compared with 58% in the whole country and 42% in the north healthcare region (6). This indicates a high degree of early diagnosis. TD requires high sensitivity, since a false-negative diagnosis can have fatal consequences. In this study, there was a very low risk of false-negative results. The only misdiagnosed case lacked dermoscopy photographs. If this occurs, a new TD consultation should be demanded, which was missed in this case. Addition of dermoscopy photographs has shown significantly better results than macroscopic photographs alone (7). Lack of dermoscopy photographs can lead to wrong diagnosis or delay clinical progression. We suggest development of a control function to avoid this, e.g. compulsory attachment of clinical and dermoscopy photographs to a referral before it is sent.

Another question is whether melanomas could be discovered earlier. An international investigation showed that 20–33% of all patients with melanoma previously consulted a physician for the same lesion, indicating potential for improvement in diagnostic precision (8). In this study, 3 patients had previous TD consultations for the same lesion. In 2 cases, the evaluation by retrospective reviewers were not concordant, indicating particularly difficult cases. One lesion was localized to the scalp, previously described as a localization not suitable for TD (9). In this case, the second consultation resulted in a melanoma diagnosis, but the lesion was thin (Breslow thickness 0.5 mm). In the second case, a lesion on the arm was evaluated twice, both with TD and physical examination, without being diagnosed as a melanoma. In the third case, the short-term monitoring recommended did not occur. Nevertheless, the time delay did not affect the prognoses in these cases.

Strengths of this study are that it included all patients diagnosed with cutaneous melanomas for 1 year and investigated in a real-life setting. Limitations include the relatively short time-period and limited number of cases. Although the retrospective design has limitations concerning overestimation of sensitivity, the results provide an overview and insights into potential improvements.

In conclusion, TD is well-functioning and safe for triage of cutaneous melanomas in the county of Västerbotten, Sweden. The method has a high sensitivity for correct handling of suspected melanomas, contributing to more rapid diagnosis and treatment. It is important to ensure accurate image and information transfer in order to minimize errors.

ACKNOWLEDGEMENTS

This study was supported by grants from the Inheritance Fund, University Hospital of Northern Sweden, and by the Nordic Telemedicine Center and the Remote Healthcare Funding, County Council of Västerbotten, Umeå, Sweden.

The study was approved by the Regional Ethics Committee at the University Hospital, Umeå, Sweden.

The authors have no conflicts of interest to declare.

REFERENCES

1. Hajdarevic S, Hornsten A, Sundbom E, Isaksson U, Schmitt-Egenolf M. Health-care delay in malignant melanoma: various pathways to diagnosis and treatment. Dermatol Res Pract 2014; 2014: 294287.
2. Borve A, Dahlen Gyllencreutz J, Terstappen K, Johansson Backman E, Aldenbratt A, Danielsson M, et al. Smartphone teledermoscopy referrals: a novel process for improved triage of skin cancer patients. Acta Derm Venereol 2015; 95: 186–190.
3. Dahlen Gyllencreutz J, Johansson Backman E, Terstappen K, Paoli J. Teledermoscopy images acquired in primary health care and hospital settings – a comparative study of image quality. J Eur Acad Dermatol Venereol 2018; 32: 1038–1043.
4. Kittler H, Pehamberger H, Wolff K, Binder M. Diagnostic accuracy of dermoscopy. Lancet Oncol 2002; 3: 159–165.
5. Dinnes J, Deeks JJ, Chuchu N, Ferrante di Ruffano L, Matin RN, Thomson DR, et al. Dermoscopy, with and without visual inspection, for diagnosing melanoma in adults. Cochrane Database Syst Rev 2018; 12: CD011902.
6. Swedish Melanoma Registry (SweMR). The Swedish National Quality Registry for Cutaneous Malignant Melanoma 2009–2019. [Accessed 01-06-2020] Available from: https://statistik.incanet.se/Hudmelanom/
7. Ferrandiz L, Ojeda-Vila T, Corrales A, Martin-Gutierrez FJ, Ruiz-de-Casas A, Galdeano R, et al. Internet-based skin cancer screening using clinical images alone or in conjunction with dermoscopic images: a randomized teledermoscopy trial. J Am Acad Dermatol 2017; 76: 676–682.
8. Blum A, Ingvar C, Avramidis M, von Kannen A, Menzies SW, Olsson H, et al. Time to diagnosis of melanoma: same trend in different continents. J Cutan Med Surg 2007; 11: 137–144.
9. Vestergaard T, Prasad SC, Schuster A, Laurinaviciene R, Andersen MK, Bygum A. Diagnostic accuracy and interobserver concordance: teledermoscopy of 600 suspicious skin lesions in Southern Denmark. J Eur Acad Dermatol Venereol 2020; 34: 1601–1608.