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CLINICAL REPORT

The Importance of a Full Clinical Examination: Assessment of Index Lesions Referred to a Skin Cancer Clinic Without a Total Body Skin Examination Would Miss One in Three Melanomas

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Traditional clinical teaching emphasises the importance of a full clinical examination. In the clinical assessment of lesions that may be skin cancer, full examination allows detection of incidental lesions, as well as helping in the characterisation of the index lesion. Despite this, a total body skin examination is not always performed. Based on two prospective studies of over 1,800 sequential patients in two UK centres we show that over one third of melanomas detected in secondary care are found as incidental lesions, in patients referred for assessment of other potential skin cancers. The majority of these melanomas occurred in patients whose index lesion turned out to be benign. Alternative models of care – for instance some models of teledermatology in which a total body skin examination is not performed by a competent practitioner – cannot be considered equivalent to a traditional consultation and, if adopted uncritically, without system change, will likely lead to melanomas being missed. ***Key words: melanoma; skin cancer; screening; teledermatology; total body skin examination.***

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Traditional clinical teaching emphasises the importance of a full clinical examination for accurate patient assessment and management. In the assessment of index lesions that may be skin cancer there are several cogent arguments for examining the whole of the patient's skin (i.e. a total body skin examinations (TBSE)). First, the incidence rate of skin cancer is so high that patients may present with more than one cancer at a single time point, but be unaware of the non-index lesion (if, for instance it is on a body-site that is hard to observe, such as the mid-back). Second, the diagnostic process for any particular lesion should be influenced by factors beyond the index lesion. Perhaps the clearest example of this would be the use of the 'Ugly Duckling' sign, in which the assessment of an individual pigmented lesion is heavily influenced by the morphology of other non-index pigmented lesions (1, 2).

Although we know of no systematic data on this topic, some of the authors have been increasingly aware of a tendency for clinicians – both in primary and secondary care – to fail to fully undress patients who present with index lesions for which skin cancer is a possible diagnosis. The reasons for this change are unclear, but may relate to time pressures in clinical practice, changing norms about patient consent, and scepticism about the rate and importance of searching for incidental lesions and hence the value of a TBSE. This topic has a particular timeliness given attempts to replace conventional clinical examination with teledermatology. There are various proposed models of teledermatology, involving different degrees of investigation of an individual patient. In some instances, clinical recommendations are made based on a photograph of an index lesion without assessment of the rest of the patient's skin by a certified physician (3, 4).

The present study is an attempt to produce estimates for the magnitude of the following problem: what proportion of melanomas would we expect to miss if physicians only examine the index lesion, rather than conducting a TBSE? We describe two prospective studies, performed in two separate UK dermatology departments; one is a district general hospital, the other a central teaching hospital. We prospectively recorded on a consecutive series of patients the numbers of index melanomas (based on the referred index lesion) and incidental melanomas (based on the results of the TBSE) in patients referred to two skin lesion cancer clinics.

METHODS

Study 1. The numbers of incidental melanomas were determined in a cohort of patients referred by primary care physicians for dermatological assessment of index lesions suspicious for any type of skin cancer (i.e. non-melanoma skin cancer and melanoma). The study was undertaken prospectively at a district general hospital that serves a defined geographic population in the West of Scotland (Stobhill Hospital, Glasgow). In this hospital the Dermatology department runs a weekly half-day skin lesion clinic, alternating between Tuesdays and Fridays, to which all referrals for the diagnosis of any type of skin cancer are assigned. All patients who attended the Friday fortnightly skin lesion clinic over a 9-month period between January and

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October 2010 were asked to participate as part of a larger research study involving photography of skin tumours. All participants had their index lesion recorded and photographed, along with any incidental lesions that were deemed by a consultant dermatologist to merit a biopsy. These incidental lesions were identified during a TBSE, which was routinely offered to all patients at the time of index lesion evaluation.

Study 2. In the second study, melanoma diagnoses were investigated in a hospital with a different geographical location that served a larger population. This study was undertaken prospectively at the Edinburgh Royal Infirmary, Edinburgh, a central University teaching hospital in the South-east of Scotland. In this centre the Dermatology department runs twice weekly full-day lesion clinics, again on Tuesdays and Fridays, to which all lesion referrals from primary care are sequentially assigned. All patients who attended the Friday weekly skin lesion clinic over a 6-month period between July and December 2011 were enrolled.

In Study 2 (but not Study 1) the full demographics of the total referred patient population were recorded, along with the details of all index and incidental melanomas identified during the study period. Coupled with cancer registry data produced by the Information Services Division (ISD) (5) for the same area (South-East Scotland), we were able to estimate how many melanomas we might have expected to see within our referred population.

Ethics and statistics

NHS Lothian research ethics committee granted permission for the study and NHS Greater Glasgow and Clyde research and development approved the site extension for Stobhill Hospital.

All data was entered into a spreadsheet and then exported into 'R' for graphing and statistical analysis (6).

RESULTS

Study 1. Three-hundred and thirty-six patients met the inclusion criteria and agreed to participate. The mean age was 54 years (range 16–95), and 60% were female (203/336). This represents an enrolment rate of 87% (336/386) of the total eligible patients who attended the clinics over this period. Patients under the age of 16 ($n=7$) or with a lesion on a sensitive body site ($n=9$) were ineligible due to ethical approval constraints surrounding the photography of lesions (Study 1 was nested within a larger research study requiring photography of individual lesions – this photographic study is not germane to the present findings). These patients and the other patients ($n=34$) who did not wish to be photographed all had benign index lesions and no incidental malignancies.

Twenty-three additional incidental lesions were biopsied. The diagnoses and distribution of all the index lesions referred ($n=336$) and incidental lesions biopsied ($n=23$) are summarised in Table I. The majority of the index lesions referred were not malignant (85%, 287/336), although a further 15% (51/336) of these referrals were for what might be termed "pre-malignant" or "dysplastic" conditions (intra-epithelial carcinomas, actinic keratoses, dysplastic naevi and keratoacanthomas).

Table I. *The diagnoses and distributions of all referred index lesions (*n = *336) and all biopsied incidental lesions (*n = *23) from Study One.*

	Index lesions *n* (%)	Incidental lesions *n* (%)
Diagnosis		
Actinic keratosis	18 (5.4)	
Angiosarcoma	1 (0.3)	
Adenexal tumour – benign	5 (1.5)	1 (4.3)
Basal cell carcinoma	36 (10.7)	7 (30.4)
Chondrodermatitis nodular helicis	5 (1.5)	
Cysts – benign	4 (1.2)	
Dermatofibroma	7 (2.1)	
Haemangioma	6 (1.8)	
Intra-epithelial carcinoma	21 (6.2)	4 (17.4)
Keratoacanthoma	1 (0.3)	
Lentigo	16 (4.8)	
Lichenoid keratosis	6 (1.8)	
Melanocytic naevus – benign	85 (25.3)	
Melanocytic naevus – dysplastic	11 (3.3)	6 (26.1)
Melanoma/Melanoma *in situ*	4 (1.2)	5 (21.7)
Pyogenic granuloma	5 (1.5)	
Seborrheic keratosis	69 (20.5)	
Squamous cell carcinoma	8 (2.4)	
Viral Wart	9 (2.7)	
Other (dermatoses – not lesions)	19 (5.7)	
Distribution		
Lip	5 (1.5)	
Ear	12 (3.6)	
Nose	18 (5.4)	2 (8.7)
Face	70 (20.8)	5 (21.7)
Scalp	16 (4.8)	
Neck	9 (2.7)	
Trunk	50 (14.9)	2 (8.7)
Back	73 (21.7)	7 (30.4)
Upper limb	35 (10.4)	
Lower limb	48 (14.3)	7 (30.4)

In total, 9 melanomas were diagnosed in the study cohort. Four of these melanomas were index lesions, giving a pick up rate of 1.2% (4/336) of referred index lesions. None of these index melanomas were melanoma *in situ* (MIS), and their mean Breslow depth was 0.42 mm. Five incidental melanomas were identified during TBSEs of the study cohort, equating to a pick up rate of 1.5% (5/336). Three of these incidental melanomas were MIS, and the mean Breslow depth of the (invasive) melanomas was 0.32 mm. Therefore the index to incidental melanoma ratio was 4:5, with 56% of the melanomas in the study cohort detected incidentally. In all 5 of these incidental melanomas the index lesion had been benign (Table II).

Study 2. One-thousand five-hundred and fifteen patients attended the skin lesion clinics over the 6-month period. The mean age was 57 years (range 3–99) and 60% (912/1,515) were female. The study population, sorted by age and sex, is graphically presented in Fig. S1 (available from https://doi.org/10.2340/00015555-1625).

In total, 29 melanomas were diagnosed in the referred population. Twenty of these melanomas were index lesions, giving an index melanoma rate of 1.3% (20/1,515) of referred lesions. Thirty percent (6/20) of

Table II. *The characteristics of the 5 incidental melanomas identified during Study 1, along with the details of their final clinical diagnosis of the corresponding referred index lesion*

Incidental melanomas			Referred index lesion	
No.	Breslow depth	Site	Diagnosis	Site
1	Melanoma *in situ*	Leg	Dermatitis	Torso
2	Melanoma *in situ*	Back	Haemangioma	Face
3	Melanoma *in situ*	Back	Seborrheic keratosis	Back
4	0.3 mm	Back	Seborrheic keratosis	Back
5	1.3 mm	Leg	Seborrheic keratosis	Back

these index melanomas were MIS, and the mean Breslow depth of the (invasive) melanomas was 1.03 mm. Nine incidental melanomas were identified by TBSE in the referred patients, with a pick-up rate of 0.6% (9/1,515) of patients referred. Again, a third (3/9) of these incidental melanomas were MIS, and the mean Breslow depth of the (invasive) melanomas was 0.47 mm. The index to incidental melanoma ratio was 20:9, with 31% of melanomas diagnosed as incidental lesions. In the majority (5/9) of these incidental melanomas the index lesion was not malignant (Table III).

Based on age- and sex-standardised melanoma incidence rates for South East Scotland (Information Services Division, ISD, NHS Scotland) (5) this group of patients – if they were members of the general population rather than high risk skin cancer patients – would have been expected to develop 0.58 invasive melanomas over a 12-month period. The count of incidental lesions seen was however almost ten times higher, with six invasive melanomas detected.

DISCUSSION

The data clearly show that a substantial proportion of the melanomas detected at our skin lesion clinics are incidental findings discovered because we perform a TBSE, in addition to examination of the referred index lesion. Such diagnoses make a significant contribution to total melanoma numbers. Single index lesion assessment resulted in a melanoma pick up rate of 1.3% (24/1851) compared to 2.1% (38/1,851) for the assessment incorporating a total body skin examination, due to an incidental melanoma rate of 0.8% (14/1,851). Failure to perform a TBSE would lead to over one third of melanomas being missed.

With a total of 1,851 patients consecutively recruited, these two studies are the largest cohort(s) published that prospectively investigated the rate of incidental melanomas in patients referred to skin lesion clinics. Furthermore, despite the obvious geographical and demographic differences between our two UK studies and those previously published (see Table IV), the ratios of incidental to index melanomas at 5:4 and 9:20 are within those found for what might be considered 'high risk' populations (7–9).

Table III. *The characteristics of the 9 incidental melanomas identified during study Study 2, along with the details of the final clinical diagnosis corresponding the referred index lesion*

Incidental melanomas			Referred index lesion	
No.	Breslow depth	Site	Diagnosis	Site
6	Melanoma *in situ*	Arm	Actinic keratosis	Face
7	Melanoma *in situ*	Neck	Seborrheic keratosis	Back
8	Melanoma *in situ*	Arm	Cyst	Back
9	0.24 mm	Arm	Chondrodermatitis nodular helices	Ear
10	0.43 mm	Back	Basal cell carcinoma	Cheek
11	0.5 mm	Arm	Squamous cell carcinoma	Scalp
12	0.66 mm	Back	Basal cell carcinoma	Back
13	0.8 mm	Leg	Melanocytic naevus	Leg
14	1.6 mm	Back	Melanoma *in situ*	Cheek

In keeping with previous UK studies most of the patients referred to our lesion clinics did not have malignant lesions (10). In addition, the majority of those with incidental melanomas were referred with lesions that turned out to be benign. If teledermatology of index lesions alone – without a TBSE performed by a dermatologist – had been employed these patients might have been returned to primary care without further examination, and presumably without detection of the melanomas. We do not know if the referring physicians failed to identify these incidental melanomas because they did not perform a TBSE, or because the incidental melanomas were misdiagnosed as benign. We note, however, that 4 of the 14 incidental melanomas identified were likely to have been in the referring physician's field of view at the time of initial index lesion examination (see Tables II & III – melanoma numbers 3, 4, 12 & 13). The fact that many of the incidental melanomas were located alongside benign index lesions suggests that the referring physicians did not possess the necessary skills required to consistently choose the single most relevant index lesion to submit for expert assessment.

The value of routinely including a TBSE within general dermatology consultations, even when the patient's presenting complaint does not specifically require such a complete full body examination, has been reported previously, with incidental melanoma pick up rates of 0.3% (11) and 0.6% (12). The crucial differences between these studies and the two presented in this manuscript are that our studies were exclusively on patients referred because of concern about skin cancer, and because we specifically examined the differences in melanoma pick up rates between single lesion assessment and TBSE. Although the apparent higher rate of incidental melanomas in our cohort(s) might only be due to demographic differences between the patient populations, it is also to be expected that patients referred with suspicious index skin lesions have a higher rate of incidental melanomas than the general dermatological patient population.

The incidental melanomas we detected based on TBSE would have most probably been detected at a

Table IV. *Details of the three studies identified in the literature where comparisons were made between the rates of 'incidental' and 'index' melanomas. Also included in the table are the details of the two studies described in this manuscript*

Study design	Location	Population	Index:Incidental melanoma ratio	Incidental melanomas (%)
Prospective cohort	Glasgow, UK (Study One)	336 skin lesion patients	4:5	56
Prospective cohort	Edinburgh, UK (Study Two)	1,515 skin lesion patients	20:9	31
Retrospective cohort	Connecticut, USA (9)	400 skin lesion patients	5:6	55
Retrospective case series	Perth, Australia (7)	94 melanoma patients	37:57	61
Retrospective case series	Florida, USA (8)	126 melanoma patients	55:71	56

later stage, perhaps when patients themselves noted them. Although we do not know when this might have been, given the importance attached to early diagnosis in melanoma, as a group, the patients' prognosis would have been adversely affected. In the present studies the Breslow thickness of the incidental melanomas was lower (but not formally statistically significantly so) in those melanomas detected as incidental lesions (mean 0.42 mm vs. 0.93 mm, *t*-test $p = 0.08$). Such findings are in keeping with previous work that has demonstrated thinner Breslow depths in those patients diagnosed with melanoma who have undergone recent TBSE (13).

There is one other finding that is worth commenting on because it is germane to issues about performing total skin examinations and screening, or searching out melanomas in those who do not present to their medical practitioner with a suspicious pigmented lesion as the principal complaint.

In Study 2, we used age and sex data to make a very rough estimate of how many melanomas we might have expected to find in the patient group we studied. This is not a straightforward task for a number of reasons. For instance, relating the number of incidental lesions present at the single point in time when we examined patients, to the rate of appearance of index lesions over a period of time presenting to medical services, depends on how long lesions are present on an individual before an individual presents to medical services. This in turn influences the 'pool' of subclinical disease that exists at any one time in the community, but which is not captured by incidence rates. Furthermore, as highlighted above, the patient group examined are likely to be at a higher risk for melanoma because many of them had been referred with other suspected skin cancer lesions, although of course only a minority turned out to have skin cancer. We cannot take these factors into account by just age and sex standardisation, but feel our results may inform the work of others. The finding of 6 incidental invasive melanomas at a particular time point against an expected total melanoma count of 0.6 over a one-year period in the patients we examined is a tenfold difference. We suggest that this large difference is surely in keeping with the idea that there is a significant pool of lesions that are present in the community that clinically and pathologically are identical to other index lesions that are diagnosed as melanoma, although whether all these lesions would progress to metastatic disease is unclear (14).

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REFERENCES

1. Grob JJ, Bonerandi JJ. The 'ugly duckling' sign: identification of the common characteristics of nevi in an individual as a basis for melanoma screening. Arch Dermatol 1998; 134: 103–104.
2. Gachon J, Beaulieu P, Sei JF, Gouvernet J, Claudel JP, Lemaitre M, et al. First prospective study of the recognition process of melanoma in dermatological practice. Arch Dermatol 2005; 141: 434–438.
3. Perednia DA, Brown NA. Teledermatology: one application of telemedicine. Bull Med Libr Assoc 1995; 83: 42–47.
4. Warshaw EM, Lederle FA, Grill JP, Gravely AA, Bangerter AK, Fortier LA, et al. Accuracy of teledermatology for nonpigmented neoplasms. J Am Acad Dermatol 2009; 60: 579–588.
5. Information Services Division (Scotland). Cancer statistics for malignant melanoma of the skin. 2012; http: //www.isdscotland.org/Health-Topics/Cancer/Cancer-Statistics/Skin/#melanoma: Accessed July 2012.
6. R Development Core Team. R: A Language and Environment for Statistical Computing. Vienna: R Foundation for Statistical Computing; 2011.
7. Cherian P, Tait CP. Melanoma in private practice: do dermatologists make a difference? Australas J Dermatol 2009; 50: 257–260.
8. Kantor J, Kantor DE. Routine dermatologist-performed full-body skin examination and early melanoma detection. Arch Dermatol 2009; 145: 873–876.
9. Viola KV, Tolpinrud WL, Gross CP, Kirsner RS, Imaeda S, Federman DG. Outcomes of referral to dermatology for suspicious lesions: implications for teledermatology. Arch Dermatol 2011; 147: 556–560.
10. Weatherhead SC, Lawrence CM. Melanoma screening clinics: are we detecting more melanomas or reassuring the worried well? Br J Dermatol 2006; 154: 539–541.
11. Argenziano G, Zalaudek I, Hofmann-Wellenhof R, Bakos RM, Bergman W, Blum A, et al. Total body skin examination for skin cancer screening in patients with focused symptoms. J Am Acad Dermatol 2012; 66: 212–219.
12. Moran B, McDonald I, Wall D, O'Shea SJ, Ryan C, Ryan AJ, Kirby B. Complete skin examination is essential in the assessment of dermatology patients: findings from 483 patients. Br J Dermatol 2011; 165: 1124–1126.
13. Aitken JF, Elwood M, Baade PD, Youl P, English D. Clinical whole-body skin examination reduces the incidence of thick melanomas. Int J Cancer 2010; 126: 450–458.
14. Rees JL. The melanoma epidemic: reality and artefact. BMJ 1996; 312: 137.