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Epidemiology and secondary prevention of melanoma in rural southern Queensland

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Epidemiology of melanoma in rural southern Queensland

Objective

The objective of this study is to define the epidemiology of melanoma in rural communities in southern Queensland.

Design

The design used was a 6-year clinical record audit of melanoma cases identified by billing records and electronic clinical records, confirmed and typed with histology.

Setting and Participants

This study was based in seven agricultural communities on the Darling Downs with patients presenting to local primary care clinics.

Main outcome measures

Outcomes measured were confirmed type, depth and anatomic distribution of melanoma identified at these practices during the study period.

Results

The results from 317 cases of melanoma found anatomic and subtype distribution was different to that reported previously from the Queensland Cancer Registry. A high proportion of melanoma-in-situ and lentigo maligna were found in the overall epidemiology of melanoma in these rural communities.

Conclusions

Conclusions drawn from these findings is that melanoma risk is not so much lesser in rural, inland communities compared to coastal and metropolitan regions, but different. These differences may relate to comprehensive data capture available in rural community studies and to different sun exposure and protection behaviours contributing to different subtypes and anatomic distribution.

What is already known on this subject

- Cancer morbidity and mortality, including for melanoma, are generally less favourable in rural areas of Australia,
- Rural lifestyle and health care access are proposed to contribute to these outcomes, and
- No specific epidemiology for inland rural communities is available.

What this paper adds

- The epidemiology of melanoma in inland rural communities is different to that measured state-wide in Queensland,
- The high rate of early stage melanoma found here does not support delays in diagnosis in this region,
- Early identification and local management of melanoma in rural general practice contributes to different and early stages of melanoma identified, and
- More comprehensive research detailing melanoma epidemiology is possible with electronic clinical records available in primary care practices.

Key words

Rural

Melanoma

Epidemiology

Introduction

Cancer morbidity and mortality are generally less favourable in rural areas of Australia with an estimated additional 9000 deaths in the decade form 2001-2010 compared to metropolitan Australia.[1] More specifically, an age-adjusted fatality rate for melanoma was found to be 20% higher in rural areas, attributed to differences in access and management practices in rural areas.[2] Inner regional areas of Australia have the highest incidence of the four commonest notifiable cancers, including melanoma.[3] Accordingly, on the eastern Darling Downs in Queensland, there is a modest collective rate ratio (1.07) of the five commonest cancers recorded (Breast, Colorectal, Lung, Melanoma and Prostate Cancers) compared to the Australian population, however, this is largely due to the significantly greater age standardised incidence rate (ASIR) of melanoma (87.2/100,000 people) over the Australian rate (49.3/100,000).[4] Notably, this rate on the Darling Downs is also higher than the Queensland ASIR of melanoma (73.3/100,000).[5]

The region was noted to have a similar incidence of melanoma to Queensland in 2002, but has had a significantly higher rate of increase in melanoma over preceding two decades.[6] At this time, coastal regions were considered higher risk for melanoma than rural, inland regions, due to different sun exposure in the “rural lifestyle”. In fact, by 2014, the region of the Darling Downs and West Moreton Primary Health Network (PHN) was alongside the Gold Coast PHN reporting highest ASIR of melanoma in Queensland. The reported rates are higher than those in (rural) central and northern Queensland and well above western Queensland.[7] However, there is limited specific epidemiology of the nature and management of melanoma presenting in rural inland regions such as the Darling Downs. The largest industry in the region is agriculture. Outside the city of Toowoomba, there are rural communities which are small (ASGC-RA MMM 4-5) with health care generally delivered

only by primary care providers.[8] Considering earlier concerns of specialist care access and a rural lifestyle contributing to different melanoma epidemiology the aim of this research was to determine the epidemiology and management of melanoma presenting in rural communities of the Darling Downs.

Methods

This study used a clinical record audit of melanoma cases identified by billing records in rural medical practices in seven rural communities on the Darling Downs over a six-year period. These communities included Clifton (population 1456 people in the 2016 Census), Warwick (population of 12,222), Pittsworth (3294 residents), Millmerran (1543 residents), Kingsthorpe (1867 residents), Oakey (population 4705 people) and Goondiwindi (population 6,355). While the populations listed reflect the towns, practices also serve surrounding farming areas.

Cases were identified by billing records of specific Medicare item numbers for the management of melanoma and by review of cases billed for biopsy of a lesion. All cases identified from Medicare billing data were linked to histology reports from specialist pathologists available through the patient's electronic clinical record (ECR). For inclusion in the study all cases needed to be confirmed and typed from these histology reports. Typing of melanoma was undertaken and categorised using terminology employed by reporting histopathologists.

Melanoma cases were included from biopsy when the histology reported melanoma. Caution was exercised that individual melanoma were not double counted. Cases of second melanoma were scrutinised to determine whether they were second primary or recurrence of an earlier

primary melanoma. Study records were anonymised upon extraction of data from the ECR to ensure that identified clinical records did not leave the respective practice. Descriptive analysis of histologically-confirmed tumour type is provided with anatomical distribution and relative tumour density (RTD) on defined body sites. RTD was calculated by dividing the proportion of tumours occurring at a specified site by the proportion of skin area of that site. The study was approved by the RACGP NREEC and supported with funding by the Skin Cancer College of Australasia. Clinical investigators were medical students attached to the rural practices where the study was conducted. The process was overseen by a designated clinical supervisor at each practice.

Results

Overall, 317 melanoma were identified, typed and clinical circumstances reviewed. Patients were predominantly males (183, 58%). Ages of these patients ranged from 26 to 102 years with a mean age of 68 years (SD 14) for males and 65 years (SD 17) for females. Thirteen patients were diagnosed with two primary melanoma in this six-year period of sampling. Nine patients were diagnosed with second primary melanomas having a history of earlier primary melanoma diagnosed prior to the sampling period. One patient was diagnosed with a recurrence of a primary melanoma diagnosed and treated prior to the sample period. Therefore there were 294 patients seen with first primary melanoma. They had the same gender distribution (42% female). Of these, 13% were melanoma greater than 1mm thick at diagnosis.

Notably, of the 13 patients with two primary melanoma in this period, seven (2% of 294) were found to have two lesions diagnosed as melanoma concurrently. One of these patients was considered to have a cutaneous metastasis. Patients with more than one melanoma

diagnosed in the period, or a history of melanoma previously, averaged 78 years of age. Compared to the Queensland registry data, males were less prevalent in both the total series of melanoma cases and individuals with first primary melanoma.

Table 1: Age distribution of patients diagnosed with melanoma

The patient group diagnosed with melanoma in these Darling Downs communities were significantly (χ^2=19.8, p<0.01) older (Table 1) than those across the State of Queensland.[9] Thirty-one cases were diagnosed on biopsy before definitive excision and 44 cases were referred for further care. Referral reasons were for wider margins of excision most commonly, and for primary excision following biopsy typically for deeper melanoma. Cases with melanoma greater than 1mm depth not referred (n=27) were generally older patients (median age 79 years) including many with nodular melanoma (n=13, median age 80 years).

Table 2: Anatomical distribution and relative tumour density of melanoma

The anatomic distribution of melanoma diagnosed in these rural communities were found to be significantly different (χ^2=9.6, p<0.05) (Table 2) to that previously reported from the Queensland Cancer Registry.[9] Most notable were differences in head and neck and limb RTD. In this series, lesions on the trunk were mostly posterior (n=98), not readily detectible by the individual. Superficial spreading melanoma were the most commonly diagnosed melanoma in this series. These were more distributed to the upper body. They are the most common melanoma diagnosed on younger patients and 81/148 (55%) were invasive at diagnosis, representing 67% of all invasive melanoma diagnosed.

The highest density of lentigo maligna (LM) tumours was on the head and neck. The average age of these patients at diagnosis of LM was 71 years and 23/95 (24%) were invasive at diagnosis, representing 19% of invasive melanoma.

Nodular melanoma were more common among older patients. A high proportion of nodular melanoma (17/19, 89%) were invasive at diagnosis representing 14% of invasive melanoma found.

A high proportion (87%) of melanoma diagnosed by these General Practitioners were 1 mm or less when treated. These were evenly distributed between males and females.

Discussion

This study examines the nature of melanoma presenting in rural communities in southern Queensland from clinical data derived from primary care practices. It has illustrated some notable differences to previous population-level studies. The seven practices from which these cases were drawn serve rural communities - ASGC-RA MMM 5 and one MMM category 4 community. The region has a higher median age (40.4 years) than the Australian population (37.2 years) and our data has not been age-standardised as the Queensland Cancer Registry. Notwithstanding, these findings illustrate differences to the conventional epidemiology of melanoma described from population-level studies. These may arise for a number of reasons such as the nature of sun exposure and protection in rural communities and the model of health services available.

This study has a number of strengths. Using this method we were able to capture more comprehensive data at the community level. Completeness of data captured was high and

more detailed with the addition of related clinical and demographic information from the ECR. The data is also more specific to the community providing more internally valid epidemiological data that could help in making more accurate assumptions about etiology and preventive interventions. However, there may be a concurrent risk of reduced external validity or generalizability to other rural areas.

In this rural region, a major difference to population-level findings is a gender variation. Males (58%) were under-represented in this rural series compared to the 67.5% of Queenslanders diagnosed with (first) melanoma in the 2005-2009.[8] Depth, level and anatomic distribution of melanoma in the Queensland population is available from the Queensland Cancer Registry (QCR) and reported in previous studies.[8,10] The distributions described in the QCR data were also found to be different to that seen in these rural communities.

Melanoma type varies with the pattern of sun exposure, age and site and site distribution of melanoma subtypes have been noted to be changing in Queensland.[10,11,12] Compared to this large dataset investigating invasive melanoma in the Queensland Cancer Registry from 1982-2008, we found a lower proportion of invasive superficial spreading melanoma (67%) than previously described (78%), but a higher proportion of lentigo melanoma (19%) in this region than recorded in the QCR between 1982-2008 (9%) and a comparable proportion of nodular melanoma (14%) to Queensland (13%). These distributions, particularly the higher proportion of lentigo melanoma, found on the head and neck, likely reflect the chronic sun exposure, lower recreational sun exposure and older population in these rural communities and is consistent with that previously described for lentigo melanoma.[13]

Another potential aetiology for variance in these locally generated rural findings is inclusion of in situ lesions in the analysis. Approximately half of all SSM and three quarters of LM are found in these practices at the in situ stage. Studies from the QCR for the period 1982-2002 recognize in situ lesions increasing in incidence over the period at a greater rate than invasive melanoma.[6] The investigators have proposed greater diagnosis in primary care as the potential source. From the raw data of the QCR presented in this report, 35% (20,712) were in situ melanoma. Our findings certainly support the understanding that in situ lesions are increasing as a proportion of melanoma diagnosed, at least in this series generated from primary care practice data.

All of these rural community general practices provide services including identification and management of melanoma. They tend to find a high proportion of superficial spreading melanoma typically among younger patients and high proportion of lentigo maligna melanoma, most densely represented on the head and neck, found in the in situ phase of growth. The rate of identification of early lesions is notable with 87% of melanoma diagnosed and treated with a depth of 1mm or less. This is markedly greater than the proportion of melanoma recorded in the QCR from 1982-2006 (66%), and is also better than the proportion previously diagnosed in this range in rural areas of Queensland (69%).[2] In this study by Coory et al. that investigated rural:urban factors in survival from melanoma, proposed upstream factors were socioeconomic disadvantage and downstream factors were higher cancer risk factors (smoking, sun exposure) and delays in diagnosis, comorbidities and treatment disparities. The high rate of early stage melanoma found here does not support delays in diagnosis being as active in this region.

Regarding access to treatment, in this series, most cases were managed locally. A minority of cases were referred for further management (n=44, 14%). Such management in public facilities from these communities require patient travel from one to three hours by road. Cases not transferred for whom management might be expected to include referral for further evaluation of nodal spread (>1mm depth),[14] were older patients (median age 79 years) half of whom had high-grade nodular melanoma (n=13). Along with depth, these are two major negative influential determinants for melanoma survival.[15] While access to referred management services has been suggested as a barrier to patient care in rural environments and the decisions taken by these patients may have been influenced by distances and logistics of distant referrals, the counter argument that must be considered is whether further investigation to lead to further intervention is not consented or indeed contraindicated considering co-morbidities and life expectancy. While patients can be reassured that these findings indicate rural practices are finding thin, early stage melanoma and manage most of these melanoma locally, further research of the reasons for non-referral from rural locations is be required.

Our findings indicate that it is more accurate to describe melanoma epidemiology as different in inland, rural communities, than what has been previously reported in coastal and metropolitan regions and Queensland-wide. These differences warrant further investigation, but appear to arise from being able to gather comprehensive data in rural communities, where probable differences in sun exposure and protection behaviours contribute to different subtype and anatomic distributions of melanoma; and the model of health services available from rural GP finding melanoma earlier and managing them locally.

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Table 1: Age distribution of patients diagnosed with melanoma

Age group	Darling Downs		Queensland	
(years)	no.	(%) [95% CI]	no.	(%) [95% CI]
<30	4	(1.3) [0.4-3.0]	193	(4.6) [4.0-5.2]
30-39	15	(4.7) [2.8-7.5]	307	(7.3) [6.5-8.1]
40-49	30	(9.5) [6.6-13.1]	534	(12.7) [11.7-13.7]
50-59	43	(13.6) [10.1-17.7]	702	(16.6) [15.5-17.8]
60-69	73	(23.0) [18.6-27.9]	862	(20.4) [19.2-21.7]
70-79	91	(28.7) [23.9-33.9]	994	(23.6) [22.3-24.9]
80+	61	(19.2) [15.2-23.9]	626	(14.8) [13.8-15.9]

Table 2: Anatomical distribution and relative tumour density of melanoma

Melanoma characteristics and relative tumour density[a]	Tumour location[‡] and body surface area				Total
	Head and neck 9% No. (%) [95% CI]	Trunk 32% No. (%) [95% CI]	Upper limb 19% No. (%) [95% CI]	Lower limb 40% No. (%) [95% CI]	
No. of melanoma by location:					
Queensland Registry[b]	747 (23.0) [22-24]	1194 (36.7) [35-38]	633 (19.5) [18-21]	679 (20.9) [20-22]	3253
Qld RTD	2.55 [2.44-2.67]	1.15 [1.09-1.19]	1.02 [0.95-1.11]	0.52 [0.05-0.55]	
Darling Downs series	67 (21.1) [17-26]	117 (36.9) [32-42]	82 (25.9) [21-31]	51 (16.1) [12-20]	317
DD RTD	2.35 [1.89-2.88]	1.15 [1.00-1.31]	1.36 [1.11-1.63]	0.40 [0.30-0.050]	
Type of melanoma:					
Superficial Spreading Melanoma	19 (12.8) [8-19]	60 (40.5) [33-49]	39 (26.4) [20-34]	30 (20.3) [14-27]	148
SSM RTD	1.43 [0.89-2.11]	1.27 [1.03-1.53]	1.39 [1.05-1.79]	0.51 [0.35-0.68]	
Lentigo maligna melanoma	35 (36.8) [28-47]	25 (26.3) [18-36]	22 (23.2) [16-32]	13 (13.7) [8-22]	95
LMM RTD	4.09 [3.11-5.22]	0.82 [0.56-1.13]	1.22 [0.84-1.68]	0.34 [0.20-0.55]	
Nodular melanoma	3 (15.8) [4-37]	3 (15.8) [4-37]	11 (57.9) [35-78]	2 (10.5) [2-31]	19
NM RTD	1.75 [0.44-4.11]	0.49 [0.13-1.16]	2.05 [1.84-4.11]	0.26 [0.05-0.78]	
Unspecified/Other	10 (18.2) [10-30]	29 (52.7) [40-66]	10 (18.2) [10-30]	6 (10.9) [5-21]	55

Melanoma characteristics and relative tumour density[a]	Tumour location[‡] and body surface area				Total
	Head and neck 9% No. (%) [95% CI]	Trunk 32% No. (%) [95% CI]	Upper limb 19% No. (%) [95% CI]	Lower limb 40% No. (%) [95% CI]	
Depth of invasion:					
Depth ≤ 1mm	56 (21.2) [17-27]	103 (39.0) [33-45]	59 (22.3) [18-28]	46 (17.4) [13-22]	264
RTD ≤ 1mm depth	2.36 [1.89-3.00]	1.22 [1.03-1.41]	1.18 [0.95-1.47]	0.44 [0.33-0.55]	
Depth 1.01-2.0mm	5 (27.8) [11-51]	4 (22.2) [8-45]	8 (44.4) [23-67]	1 (5.6) [1-25]	18
RTD 1.01-2.0mm depth	3.09 [1.22-5.67]	0.69 [0.25-1.41]	2.34 [1.21-3.52]	0.14 [0.03-0.63]	
Depth 2.01-4mm	2 (15.4) [3-42]	3 (23.1) [6-51]	7 (53.8) [27-79]	1 (7.7) [1-33]	13
RTD 2.01-4mm depth	1.71 [0.33-4.67]	0.72 [0.19-1.59]	2.83 [1.42-4.16]	0.19 [0.03-0.83]	
Depth >4mm	1 (12.5) [1-48]	0 (0)	5 (62.5) [28-89]	2 (25.0) [4-61]	8
RTD >4mm depth	1.39 [0.11-5.33]	0 [0-0]	3.29 [1.47-4.68]	0.63 [0.10-1.53]	

[a]Calculated as the ratio of the proportion of tumours at a specific anatomical site to the proportion of skin surface area at that site, ratio and [95% CI].

[b] Whiteman D, Baade P, Olsen C (2005).

Abbreviations: RTD, relative tumour density; SSM, Superficial Spreading Melanoma; LM/LMM, Lentigo Maligna/Lentigo Maligna Melanoma; NM, Nodular Melanoma