Characteristics of non-melanoma skin cancers in Native American patients treated with Mohs micrographic surgery

Catherine N Tchanque-Fossuo[1] MD MS, Niharika Ravichandran[1] BS, Naiara S Barbosa[2] MD

Affiliations: [1]Department of Dermatology, School of Medicine, University of New Mexico, Albuquerque, New Mexico, USA, [2]Department of Dermatology, Mayo Clinic, Jacksonville, Florida, USA

Corresponding Author: Naiara S Barbosa MD, Department of Dermatology, Mayo Clinic, 4500 San Pablo Road, Jacksonville, FL 32224, Tel: 904-953-6402, Email: nsbroggio@gmail.com

Abstract

Despite the lower incidence of non-melanoma skin cancers in skin of color populations, greater morbidity and mortality have been reported. Literature describing non-melanoma skin cancers in Native Americans is scarce. We designed a retrospective review study aimed to evaluate the characteristics of non-melanoma skin cancers (basal cell carcinoma and squamous cell carcinoma) in Native American patients treated with Mohs micrographic surgery between January 2015 and August 2020, at a single academic center. Twenty-six patients with 28 tumors were identified; 12 squamous cell carcinomas (92% well-differentiated) and 16 basal cell carcinomas (94% nodular). Most tumors were on the head and neck, with mean size of 563mm^2 (squamous cell carcinomas) and 350mm^2 (basal cell carcinomas). Tumor clearance was achieved in one stage for 75% of tumors. Recurrence was seen in two patients with squamous cell carcinoma. No mortality reported, although follow up was limited. Few Native Americans patients underwent Mohs micrographic surgery for non-melanoma skin cancers. Squamous cell cancers were larger, lower risk while basal cell carcinomas were predominantly nodular. Average time from biopsy to Mohs micrographic surgery was three months. Further studies are needed to better characterize non-melanoma skin cancers in Native Americans and to identify barriers to prompt care.

Keywords: American Indian, basal cell, cancer, carcinoma, Mohs surgery, Native American, non-melanoma, skin of color, squamous

Introduction

Skin cancer rates are considerably lower in skin of color populations (Hispanic/LatinX, Asian, African American, Native American, Pacific Islander) compared to White populations [1]. However, cutaneous malignancies in skin of color patients are more likely to have atypical presentation, delayed diagnosis, and aggressive course, resulting in greater morbidity and mortality [2-5].

There is scarce literature on skin cancers in Native Americans, who represent approximately 1.3% of the total population [6]. Previous studies have estimated non-melanoma skin cancer incidence of 2% in Native Americans [7] compared to 20-30% in Whites in the U.S. [3]. Data regarding non-melanoma skin cancer characteristics, treatment outcome, and mortality in Native Americans populations is lacking.

New Mexico is a majority-minority state with 11% of the population identifying as Native Americans [6]. Many Native Americans are referred to the University of New Mexico for specialized care, providing us the unique opportunity to better understand the clinical presentation and management of cutaneous malignancies in this population. The goal of this study was to describe the characteristics and outcomes of non-melanoma skin cancer in patients identified as Native Americans who underwent treatment with Mohs micrographic surgery.

Methods

A retrospective review study was conducted of Native Americans patients who underwent Mohs

micrographic surgery between January 1, 2015 and August 1, 2020 at a single academic center. All patients self-identifying as Native Americans (including the terms "Native American," "Alaskan Native," and "American Indian") in the electronic medical record were included. A detailed chart review was performed to retrieve demographic data, tumor characteristics, procedure information, time from biopsy to treatment, recurrence, and mortality. This study was approved by the University of New Mexico Institutional Review Board.

Results

Twenty-six Native American patients (14 male, and 12 female) met inclusion criteria. Sixteen (61.5%) were classified as Fitzpatrick skin type 4, eight (31%) as type 3, and two (7.5%) as type 2. Fitzpatrick skin type was determined by two board-certified dermatologists who independently reviewed patient photos. In total, 28 tumors were treated with Mohs micrographic surgery and most (93%) were located on the head and neck. Twelve were squamous cell carcinomas (92% well-differentiated, 8% in situ) with mean tumor size of 563mm^2 and 16 were basal cell carcinomas (94% nodular and 6% superficial; 37.5% documented as pigmented), with mean tumor size of 350mm^2. Overall, the mean time from biopsy to Mohs micrographic surgery treatment was 101 days (range 10-895 days). Tumor clearance was achieved on the first Mohs micrographic surgery stage for 75% of the tumors. Further characteristics are presented in **Table 1**.

For squamous cell carcinoma, perineural invasion (≥0.1mm) was present in two tumors noted to be larger at presentation, 625mm^2 and 1600mm^2. These were the only two (16.6%) tumors staged as T2b according to Brigham and Women's Hospital (BWH) squamous cell carcinoma staging [8]. Four (33.3%) tumors were staged as T3 according to American Joint Committee on Cancer 8th edition (AJCC), [8], all ≥4cm in diameter. Additional squamous cell carcinoma staging details are presented in **Table 2**.

Recurrence was reported in two patients with squamous cell carcinoma; neither had a prior history of skin cancer, immunosuppression, or comorbidities. One patient was a 71-year-old man with a squamous cell carcinoma classified as T2a per BWH and T2 per AJCC, located on the distal penile

Table 1. *Cohort demographics and non-melanoma skin cancer characteristics.*

	SCC Total (%) N=12	BCC Total (%) N=16
Gender		
Male	7 (58.3)	7 (43.7)
Female	5 (41.7)	9 (56.3)
Age, years (mean)	76.9	65.5
History of skin cancer		
Yes	3 (25)	1 (6)
No	9 (75)	15 (94)
History of solid organ transplant		
Yes	2 (16.7)	0 (0)
No	10 (83.3)	16 (100)
Tumor Type		
Primary	12 (100)	15 (94)
Recurrent	0 (0)	1 (6)
Time from biopsy to MMS in days (mean)	69	119
Tumor Location		
Scalp	1 (8.3)	0 (0)
Eyelid	1 (8.3)	0 (0)
Temple	1 (8.3)	0 (0)
Cheek	4 (33.3)	4 (25.0)
Ear	2 (16.7)	1 (6.25)
Nose	1 (8.3)	10 (62.5)
Neck	0 (0)	1 (6.25)
Anogenital area	1 (8.3)	0 (0)
Lower extremity	1 (8.3)	0 (0)
Final tumor size mm^2 (mean)	563	350
Number of MMS stages for tumor clearance		
1	8 (66.7)	13 (81.2)
2	1 (8.3)	3 (18.8)
3	1 (8.3)	0 (0)
4	1 (8.3)	0 (0)
Tumor histology		
Invasive, well-differentiated	11 (91.7)	-
In situ	1 (8.3)	-
Nodular	-	15 (94)
Superficial	-	1 (6)
Pigmented	-	6 (37.5)
Tumor recurrence	2 (10.1)	0 (0)
Post-op follow-up in days (mean)	123	193.8

BCC, basal cell carcinomas; MMS, Mohs micrographic surgery; SCC, squamous cell carcinomas.

Table 2. *Squamous cell carcinomas: Brigham and Women's Hospital and American Joint Committee on Cancer 8th edition staging.*

	Total (%) N=12	Mean time from biopsy to Mohs micrographic surgery, days	Recurrence N=2
BWH*			
T1	2 (16.7)	46.5	
T2a	8 (66.7)	74.2	1
T2b	2 (16.7)	83	1
AJCC 8th Edition*			
T1	2 (16.7)	46.5	
T2	5 (41.6)	42.5	1
T3	5 (41.6)	302.6	1
*Summary of the Brigham and Women's Hospital and the American Joint Committee on Cancer 8th Edition Tumor (T) Classification Systems [8]			
Brigham and Women's Hospital			
T1	0 High-risk factor[a]		
T2a	1 High-risk factor		
T2b	2-3 High-risk factors		
T3	4 High-risk factors or bone invasion		
American Joint Committee on Cancer 8th Edition			
T1	<2 cm in greatest diameter		
T2	≥2 cm, but <4 cm in greatest diameter		
T3	Tumor ≥4 cm in greatest diameter or minor bone invasion or perineural invasion or deep invasion[b]		
T4a	Tumor with gross cortical bone and/or marrow invasion		
T4b	Tumor with skull bone invasion and/or skull base foramen involvement		

BWH, Brigham and Women's Hospital; AJCC, American Joint Committee on Cancer.

[a]High-risk factors include tumor diameter ≥2 cm, poorly differentiated histology, perineural invasion of nerve(s) ≥0.1 mm in caliber, or tumor invasion beyond subcutaneous fat (excluding bone invasion, which upgrades tumor to T3).

[b]Deep invasion defined as invasion beyond the subcutaneous fat or >6 mm (from the granular layer of adjacent normal epidermis to the base of the tumor), perineural invasion measuring ≥0.1 mm in caliber or presenting with clinical or radiographic involvement of named nerves without skull base invasion or transgression.

shaft. The tumor measured 625mm^2 and was cleared with one stage of Mohs. Recurrence occurred 5 months later, and the patient was found to have metastasis to the inguinal, pelvic, and hilar lymph nodes. He underwent chemotherapy out-of-state without additional follow-up at our institution. The other patient was an 86-year-old woman with a squamous cell carcinoma on her right upper eyelid measuring 1600mm^2 with perineural invasion, classified as T2b per BWH and T3 per AJCC; this tumor cleared with two stages of Mohs. She was recommended to undergo adjuvant radiation treatment but declined. Recurrence occurred 12 months later, but the patient did not have continued follow-up with us.

Many patients had a short follow-up time, average of 163 days (range 0-464 days), but no mortality was reported.

Discussion

Non-melanoma skin cancers are amongst the most common malignancies in the U.S. [1,9-12]. Despite the increasing literature on non-melanoma skin cancer in various races and ethnicities, there continues to be a scarcity of information regarding their incidence and characteristics in Native Americans.

Higher rates of morbidity and mortality have been reported in Native Americans compared to other races, including other minority groups [13]. Cancer is one of the leading causes of death for Native American individuals. They are more likely to be diagnosed at older ages and at later stages compared to White individuals. This may be due to the lack of cancer screening programs in rural communities, a high uninsured rate, and decreased access to care [13].

This retrospective review attempted to characterize non-melanoma skin cancer treated with Mohs micrographic surgery in Native Americans population with the ultimate goal of enhancing prompt diagnosis and treatment. The mean age at time of squamous cell carcinoma diagnosis and Mohs micrographic surgery treatment was slightly higher (76.9) compared to basal cell carcinoma (65.6). Only one tumor (basal cell carcinoma) was a recurrent cancer and only four (15%) patients had a

previous history of skin cancer. The majority of the skin cancers involved sun-exposed areas on the head and neck.

There were two patients with squamous cell carcinoma (both Brigham and Women's Hospital T2a; one American Joint Committee on Cancer 8th edition T2 and one T3) on immunosuppression due to kidney transplant and neither patient had a prior history of skin cancer or experienced recurrence. A study evaluating the prevalence of skin cancer in Native Americans kidney transplant recipients concluded that rates of skin cancer in Native Americans solid organ transplant patients seem to be much lower compared to White recipients [7].

The majority of the basal cell carcinoma tumors were nodular subtype and 37.5% were pigmented. A higher frequency of basal cell carcinoma pigmentation is commonly reported in skin of color patients [3,4]. Such tumors may be more difficult to distinguish in darker individuals compared to their classic pearly appearance found in lighter individuals [1,3-5]. Therefore, it is critical that health care providers receive appropriate training to recognize non melanoma skin cancer presentation in all skins.

The majority of the tumors (75%) cleared in one stage. Squamous cell carcinoma tumors requiring additional stages (four) were significantly large. The three basal cell carcinoma that needed additional Mohs micrographic surgery stages were located on the nose. The average time from non-melanoma skin cancer diagnosis to Mohs micrographic surgery treatment was 3.3 months, which seems longer than expected at our institution. However, we do not have comparable data for other populations. The squamous cell carcinoma tumor with the longest wait time, 252 days, required the most Mohs micrographic surgery stages (four) for clearance. Furthermore, the higher squamous cell carcinoma staging tumors (Brigham and Women's Hospital T2b and American Joint Committee on Cancer 8th edition T3) had longer mean wait time to treatment than the lower stages squamous cell carcinoma. Longer wait time from biopsy to treatment did not seem to affect the number of Mohs micrographic surgery stages required for basal cell carcinoma clearance.

Limitations of our study include its retrospective nature, relatively short follow-up time, lack of a control group, and a small cohort from a single center. Data on time from clinically apparent tumor to biopsy and actual number of non-melanoma skin cancer diagnosed in Native Americans patients who met criteria for Mohs micrographic surgery treatment were unavailable. Access to health care remains a major obstacle for rural and Native Americans communities. In New Mexico, dermatologic care is additionally complicated by the small number of dermatologists and Mohs micrographic surgery surgeons in our state. This might partially explain the overall limited follow-up time for our cohort post Mohs micrographic surgery, with 9 (35%) patients having no follow-up at all after treatment at our institution. Promoting sun behavior education and accessible skin cancer screening to Native American communities can be invaluable in minimizing health disparity [14,15].

Conclusion

Skin of color populations have a lower rate of non-melanoma skin cancer, but higher morbidity and mortality in comparison to White populations, possibly due to lack of access to care and delay in diagnosis and treatment. Non-melanoma skin cancer in Native American patients have not been well-described. Our study characterizes patients and tumors treated with Mohs micrographic surgery at our institution. Although the average wait time from biopsy to treatment was longer than expected and tumors were larger in size, most were lower stage, with low recurrence and no reported mortality. Follow-up data were limited which may be reflective of the difficulty accessing specialized care. Additional studies evaluating non-melanoma skin cancer incidence, treatment, barriers to care, and outcomes in Native Americans are needed to optimize skin cancer care to these populations.

Potential conflicts of interest

The authors declare no conflicts of interest.

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