



## Non-Melanocytic Skin Cancers of the Head and Neck: A Clinical Study in Jeju Province

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**Background** Jeju Island is geographically and socioeconomically distinct from the mainland of South Korea. Thus, the presentation and management of non-melanocytic skin cancers (NMSC) of the head and neck may differ from those in other regions of the country. We compared the clinical characteristics and treatment modalities of NMSC on Jeju Island with the findings of similar regional studies.

**Methods** Patient data, including age, sex, diagnosis, tumor site, treatment, and recurrence, were obtained from the medical and pathology records of patients diagnosed with NMSC between January 2010 and June 2015.

**Results** In total, 190 patients (57 men) with a mean age of 75 years (range, 42–97) were assessed. Overall, 203 NMSCs were diagnosed, including 123 basal cell carcinomas and 80 squamous cell carcinomas. The tumor sites included the nose, cheeks, periorbital area, and lips (n = 55, 54, 25, and 20, respectively). We identified 92 T1-stage and 60 T2-stage tumors, and 120 cases were treated with wide surgical resection and 17 cases were treated with radiation therapy at the medical center. Of the 120 cases treated surgically, 69 required reconstructive surgery using a local skin flap, 22 required full-thickness skin grafting, and 12 underwent primary closure. Basal and squamous cell carcinomas recurred in 2 and 1 cases, respectively.

**Conclusions** Compared to the reports from other regions, the average patient age was 10 years higher, with a marked female preponderance. While the proportion of squamous cell carcinoma was higher than in other regions, the tumor distribution and surgical management profiles were similar.

**Keywords** Skin cancer / Basal cell carcinoma / Squamous cell carcinoma

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### INTRODUCTION

The rates of skin cancer have increased worldwide because of the growing elderly population, increased environmental pollution, and ozone depletion due to industrial growth. In countries where fair-skinned Caucasians comprise the majority, malignant

skin tumors are reported to be the most common type of cancerous tumor [1,2]. Basal cell carcinoma (BCC) and squamous cell carcinoma (SCC) are the most common types of non-melanocytic skin cancer (NMSC). Their incidence rates are known to be significantly lower in the Asian population than in the Caucasian population; however, they have steadily become

more common in Korea in recent years [3-5].

Among the risk factors associated with skin cancers, excessive exposure to ultraviolet (UV) rays has the strongest influence. UV exposure increases with increasing altitude, decreasing latitude, increasing outdoor activities, and increasing age.

Jeju Island, located in the southernmost part of Korea, has a subtropical climate. It is exposed to high levels of UV rays, and a large proportion of the residents make a living by working outdoors. Therefore, a high incidence of skin cancer is expected in its population. Skin cancers are most commonly found in the head and neck region, where the UV exposure is high [6]. However, no long-term retrospective study of skin cancers of the head and neck has been conducted within a single medical center in Jeju. Furthermore, discussions regarding clinical experiences in Jeju Province are almost non-existent.

Therefore, we conducted a retrospective analysis using data from patients who visited Jeju National University Hospital with NMSC of the head and neck during the 5.5-year period of this study. The type of NMSC, clinical characteristics, and treatment modalities used were identified for comparison with relevant data obtained from other regions of the country.

## METHODS

A retrospective analysis was performed using the medical and pathological records of patients with malignant tumors of the head and neck who were diagnosed at the Department of Plastic Surgery at a single medical center in Jeju between January 2010 and June 2015. The final analysis included only those patients with a histologically confirmed diagnosis of NMSC. The data included patient sex and age, proportion by tumor type, tumor location within the head and neck area, tumor size, and treatment method. Comparisons were made between BCC and SCC.

## RESULTS

In total, 190 patients were diagnosed with NMSC of the head and neck at Jeju National University Hospital during the 5.5-

year study period between January 2010 and June 2015. Of these patients, 113 (59.5%) were diagnosed with BCC, while 77 (40.5%) were diagnosed with SCC (Table 1).

### Sex and age distribution

There was an overall female preponderance in the study sample, with 133 female patients (70.0%) and 57 male patients (30.0%), corresponding to a male-to-female sex ratio of 1:2.3 (Table 1). The age of the study sample ranged from 42 to 97 years, with an average of 75 years. A majority of the patients (42.6%) were in their 70s, 30% were in their 80s, and 15.8% were in their 60s. Thus, 76.3% of the patients in our study were 70 years old or older (Table 2).

The male-to-female sex ratio in patients with BCC was 1:2.26 (Table 1). Patients in their 70s accounted for 41.6% of those with BCC, followed by those in their 80s (27.4%) and 60s (18.6%). Of the patients with BCC, relatively few (9.8%) were aged < 50 years. The average age of the patients with BCC was 73.8 years (Table 2).

The male-to-female sex ratio for patients with SCC (Table 1) was 1:2.5. Patients in their 70s accounted for 44.1% of the patients with SCC, followed by those in their 80s (33.8%) and 60s (11.7%). The average age of patients with SCC was 77.1 years (Table 2).

### Location of tumors

We identified 203 tumors in the sample, with an average of 1.07 tumors per person. With regard to the cosmetic units of the face, the nose was the most common site of skin cancer (27.1%), followed by the cheek (26.6%), the periorbital area (12.3%), and the lips (9.9%).

The 123 cases of BCC were found in 113 patients, producing an average of 1.09 tumors per person. The nose was the most common site of BCC (38.2%), followed by the periorbital area (17.1%), the cheeks (12.2%), the lips (8.9%), the forehead

**Table 1. Sex distribution by tumor type**

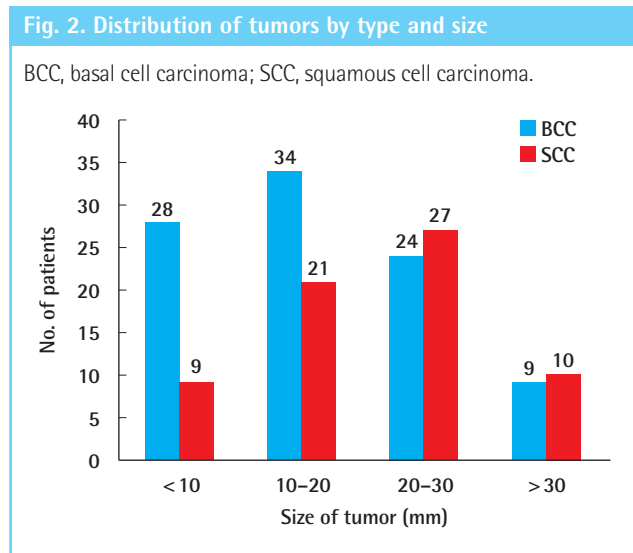
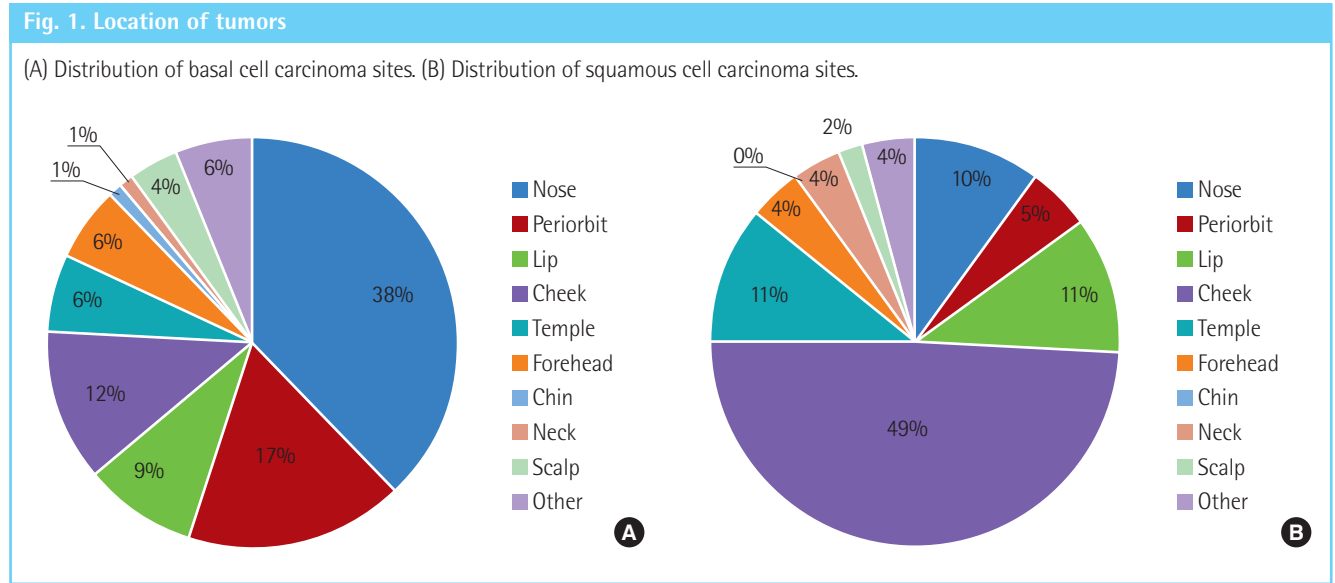
	NMSC	BCC	SCC
Total no. of patients	190 (100)	113 (59.5)	77 (40.5)
Male patients	57 (30.0)	35 (31.0)	22 (28.6)
Female patients	133 (70.0)	78 (69.0)	55 (71.4)
Total no. of tumors	203 (100)	123 (60.6)	80 (39.4)

All values are presented as number (%).  
NMSC, non-melanocytic skin cancer; BCC, basal cell carcinoma; SCC, squamous cell carcinoma.

**Table 2. Age distribution by tumor type**

Age (yr)	NMSC (n = 190)	BCC (n = 113)	SCC (n = 77)
40-49	4 (2.1)	2 (1.8)	2 (2.6)
50-59	11 (5.8)	9 (7.9)	2 (2.6)
60-69	30 (15.8)	21 (18.6)	9 (11.7)
70-79	81 (42.6)	47 (41.6)	34 (44.1)
80-89	57 (30.0)	31 (27.4)	26 (33.8)
90-99	7 (3.7)	3 (2.6)	4 (5.2)
Average age	75.0	73.8	77.1

All values (except the average age) are presented as number (%).  
NMSC, non-melanocytic skin cancer; BCC, basal cell carcinoma; SCC, squamous cell carcinoma.



(6.5%), the temple (5.7%), and the scalp (4.1%) (Fig. 1A).

The 77 patients with SCC had a total of 80 tumors, resulting in an average of 1.04 tumors per person. However, their pattern of distribution differed from that seen in the BCC subgroup. The most common site of SCC was the cheeks (48.7%), followed by the lips (11.2%), the temple (11.2%), and the nose (10.0%) (Fig. 1B).

**Size of tumors**

According to the initial examination records, the most common tumors were 10–20 mm in size (34.0%), followed by 20–30 mm (31.5%), and < 10 mm (22.8%). T1-stage tumors accounted for 56.8% of cases, while T2-stage tumors accounted for 43.2%. When stratified by tumor type, the plurality of tumors in the BCC subgroup (35.8%) were 10–20 mm in size, followed by tu-

mors < 10 mm (29.4%), and 20–30 mm (25.3%). T1-stage tumors accounted for 65.2% of all the BCCs. Among the SCC cases, the plurality were 20–30 mm in size (40.3%), followed by 10–20 mm (31.3%), > 30 mm (14.9%), and < 10 mm (13.5%). T2-stage tumors accounted for 55.2% of all SCCs (Fig. 2).

**Treatment methods**

In total, 137 patients were treated after being diagnosed with cancer, of whom 120 were treated with wide surgical excision and reconstruction, while 17 were treated with radiation therapy. Of the patients treated surgically, 69 (57.5%) required reconstruction with a local flap and 22 (18.3%) required a full-thickness skin graft (FTSG). In 12 patients (10.0%), primary closure was possible. Six (5.0%) patients required a combination of 2 or more surgical techniques. After the wide excision, a local flap was the most common surgical treatment modality in both BCC (61.7%) and SCC (52.3%) cases. This was followed by FTSG (17.8% and 19.6% in BCC and SCC, respectively) and primary closure (9.6% and 10.8% in BCC and SCC, respectively) (Fig. 3).

**Recurrence**

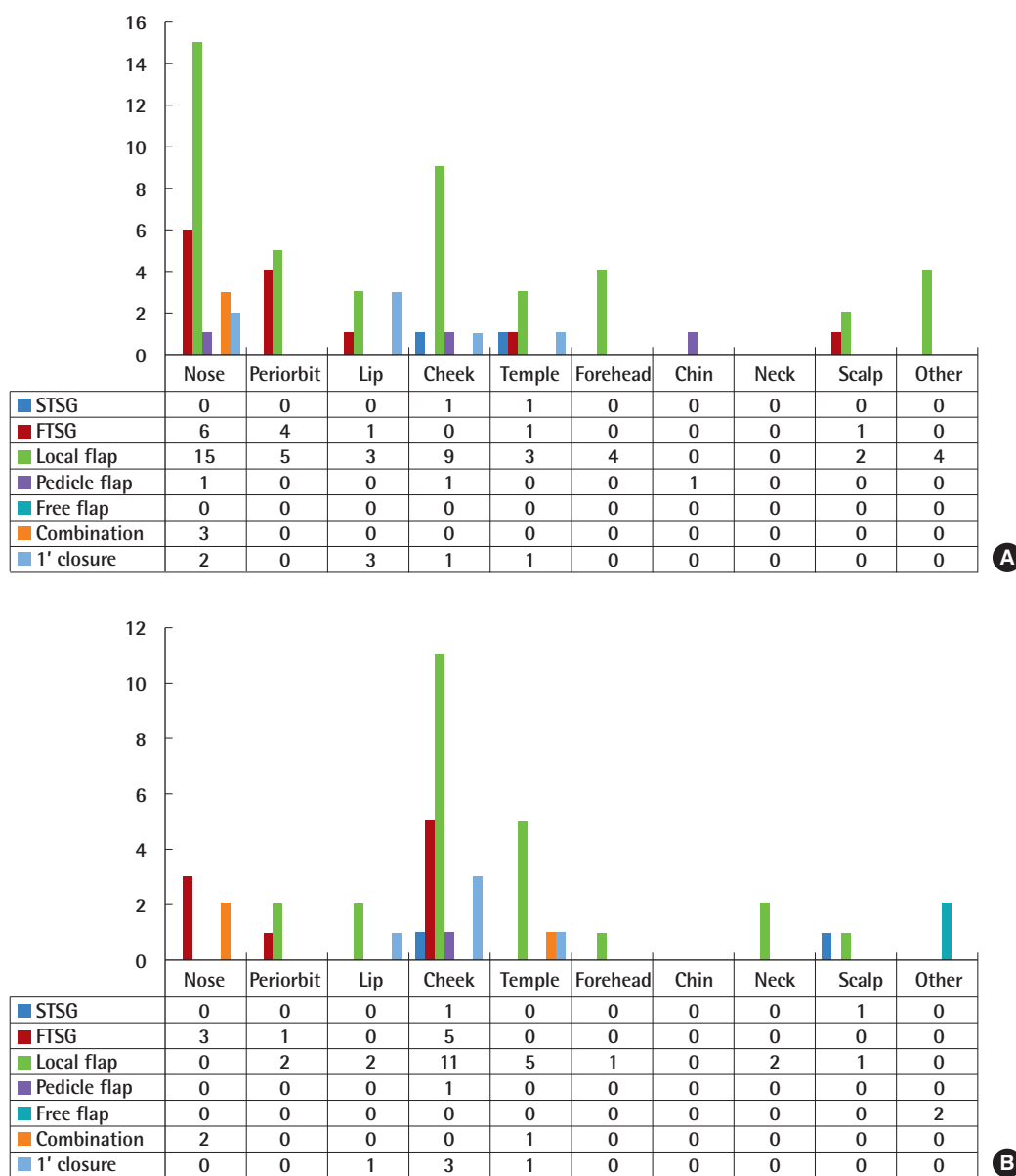
Three cases showed recurrence after treatment: 2 cases of BCC and 1 case of SCC.

**DISCUSSION**

This study was based on the clinical records of 190 patients who were treated at Jeju National University Hospital. Jeju Island is separated from the mainland of South Korea and is geographically and socioeconomically different from the mainland. Due

**Fig. 3. Treatment methods**

(A) Reconstructive surgical methods used by basal cell carcinoma (BCC) site. (B) Reconstructive surgical methods used by squamous cell carcinoma (SCC) site. STSG, split-thickness skin graft; FTSG, full-thickness skin graft; 1' closure, primary closure.



to the physical and psychological distance, the outflow of skin cancer patients to the mainland is uncommon. In addition, Jeju National University Hospital, as a major community hospital, plays a dominant role in the diagnosis and treatment of skin cancer patients. Therefore, we concluded that Jeju University Hospital is representative of Jeju Island in the field of skin cancer management.

Compared to the statistics reported in countries such as Australia and Israel, where fair-skinned Caucasian people comprise the majority of the population, the skin cancer incidence rate in

Korea is significantly lower [1], and skin cancers account for only 1.7% of all malignant tumors reported in Korea [6]. However, the elderly population (65 years and older) has grown rapidly in the recent years, from 9.5% in 2010 to 12.7% in 2014. In addition, the increase in environmental pollutants, which hasten ozone depletion, is leading to an increase in the incidence of skin cancer in Korea [6].

The incidence rates of skin cancer were reported to be 0.25% during 1973–1983 [7], 0.76% during 1984–1989 [8], 1.02% during 1990–1995 [9], and 1.76% in 2011 [6]. As shown in

these studies, the incidence of skin cancer is increasing in Korea.

NMSC most commonly occurs in the head and neck area where UV exposure, the most significant risk factor of skin cancer, is the highest. While excessive UV exposure is the strongest risk factor for BCC, various other factors such as burn injuries, scar tissue, immune suppression, and X-ray imaging are known to contribute to the development of SCC. However, most SCC cases tend to involve the trunk or other body parts, rather than the face. In contrast, SCC appearing in the head and face region typically starts as either a precancerous lesion (such as actinic keratosis, keratoacanthoma, or Bowen disease) or as a primary lesion. The latter point leads us to suggest that UV exposure is nonetheless the greatest risk factor for SCC of the head and neck.

Whereas SCC is less affected by UV exposure than BCC, BCC develops when a tumor suppressor gene is mutated by excessive UV exposure. The head and neck are most vulnerable to UV exposure, explaining the prevalence of BCC in this anatomical area.

In a Korean study by Lee et al. [10], roughly 90% of all BCCs occurred in the head and neck region. This is higher than the proportion reported in a study of a Caucasian population (70%) [11]. Jeju Island, located in the southernmost part of Korea, has high levels of UV radiation. Furthermore, a large proportion of its population works outdoors, with high outdoor activity indices. These factors contribute to a higher incidence of skin cancer than in other regions in the country.

The proportions of BCC and SCC in this study were 59.5% and 40.5%, respectively, indicating that BCC was slightly more common in the area, as seen in previous Korean studies [12,13]. However, we found that the proportion of SCC on Jeju Island was higher than reported by Seo et al. [4] (BCC 78.1% vs. SCC 21.9%) or Hwang et al. [12] (BCC 75.7% vs. SCC 24.3%). In this regard, continuous monitoring will be required.

In terms of sex, the previous consensus was that men are more susceptible to skin cancer than women, as they tend to have a higher outdoor activity index. However, recent studies have suggested a higher rate of skin cancer in women than in men. This can be attributed to women's increasing participation in society, longer average life span, and the consequent increased exposure to UV rays [4,12,13].

This study found a male-to-female ratio of 1:2.33, higher than the ratios of 1.16:1 reported by Seo et al. [4] in 2002 and 1:1.45 reported by Kim et al. [13]. The higher proportion of female patients with skin cancer in Jeju is thought to be due to the higher rate of female participation in economic activities, and the consequently higher UV exposure, rooted in the particular characteristics of the area.

We found a sex ratio of 1:2.23 for BCC in the population of Jeju Island. This ratio is markedly higher than that reported in Seoul (1:1.11) by Kim et al. [14].

We found a sex ratio of 1:2.5 for SCC, again reflecting the fact that the skin cancer pattern on Jeju Island is characterized by a female preponderance.

Individuals in their 70s represented the plurality of patients with head and neck NMSC on Jeju Island (42.6%), 76.3% of the patients on Jeju Island were 70 years old or older, and the mean age of these patients was 75 years. This is markedly higher than the average age of 62.5 years reported by Kim et al. [14] in 2008. Even when comparing the proportion of the elderly population (70 years or older) across the nation, it is clear that skin cancer tends to affect an older population on Jeju Island, as evident in the proportion of 67% reported by Kim et al. [13] in the Cheollah region in 2011, whereas the proportion in the Gyeonggi region was 54.3%, as reported by Hwang et al. [12] in 2011. The result is thought to be attributed to the increasing average life span and the increased concerns about skin cancer among the middle-aged and elderly population.

In terms of the age distribution of BCC on Jeju Island, individuals in their 70s accounted for a plurality (40.8%) of the sample, with an average age of 73.8 years, higher than that reported in Gyeonggi (66.8 years) [12] and Seoul (63.6 years) [14]. Similarly, most SCCs were found in patients in their 70s (44.1%), with an average age of 77.1 years, consistent with the average age of 74.5 years reported in other regions.

NMSC of the head and neck most commonly affected the nose (27.1%), followed by the cheeks (26.6%), the periorbital area (12.3%), and lips (9.9%). Panje and Ceilley [15] suggested that the nose, periorbital area, and lips are most vulnerable to skin cancer, as skin cancers of the face typically occur along the embryological suture lines. Similarly, the most common BCC site was the nose (38.2%), followed by the periorbital area (17.1%) and cheeks (12.2%). Kopf [16] identified the nose as the most common site for BCC (25%). Other Korean studies have also singled out the nose as the most common site for BCC, accounting for 30.2% and 45.2% of all head and neck BCCs as reported by Kim et al. [14] and Lee et al. [17], respectively. The most common SCC site in the face is the cheek, accounting for 48.7% of all the head and neck SCCs. This is similar to that observed in the Chonnam region as reported by Kim et al. [13], and in the Gyeonggi region as reported by Hwang et al. [12].

Regarding tumor size, 56.8% of the tumors observed in our study were smaller than 20 mm, while 43.2% were over 20 mm. Over half of the T1-stage tumors were treated surgically. However, a plurality of the BCCs (35.8%) were 10–20 mm in size,



and 65.2% were T1-stage tumors. In contrast, a plurality of the SCCs (40.3%) were 20–30 mm in size, and 55.2% were T2-stage tumors. This may have occurred because SCC tends to grow at a faster rate than BCC.

Of the 190 patients with NMSC, 120 underwent wide surgical excision, with a majority (57.3%) requiring local flap reconstruction. Local flap reconstruction typically produces the most aesthetically satisfying results, and is the most useful method for reconstructing skin defects in the head and neck area. However, if the tumor is located where it can alter a person's landmark features, or if the tumor is too large to be effectively covered with a local flap, skin grafting techniques, including FTSG, are also commonly performed. In cases where the tumor is small, or the skin elasticity is low due to the aging process, primary closure was used. The most common reconstructive surgical technique used after both BCC and SCC excision was a local flap, followed by FTSG and primary closure. This result is in agreement with the data from other medical centers.

During the study period, recurrence (total rate, 1.6%) was observed in 2 BCC cases and 1 SCC case. This result is low in comparison with data from other medical centers (4.8%–10%). This positive outcome is attributed to the fact that surgical treatment was chosen as the primary treatment option, and skin cancer surgery guidelines were stringently followed, with the safety margins set at 3–5 mm for BCC and 5–10 mm for SCC, and the resection margins were confirmed via frozen biopsy in the operating room.

It is meaningful that in comparison to reports from other regions, the average age was 10 years higher, with a marked female preponderance. Further epidemiologic studies of all skin cancers, including melanoma and other parts of the body, should be conducted to compare these findings with other regions.

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