Journal of Plastic, Reconstructive & Aesthetic Surgery (2019) 72, 290–293

JPRAS
An International Journal of Surgical Reconstruction
www.JPRASurg.com

Skin shop: A new model for high-volume skin cancer care

M. Taib*, BM. Adams

Department of plastic and reconstructive surgery, Waikato District Health Board, New Zealand

Received 2 April 2018; accepted 28 October 2018

KEYWORDS
New Zealand;
Non-melanoma skin cancer;
BCC;
SCC;
Local anaesthetic;
High volume

Summary *Introduction:* Non-melanoma skin cancer incidence is increasing in New Zealand. Increased cost of care has led to service pressure and a review of models of care. A high-volume skin surgery service at Waikato Hospital has been developed to reduce service costs. This study examines the oncological safety of the new model.
Methods: Prospective data for all skin lesions excised were collected from December 2014 to December 2016. Primary outcomes were rate of complete excision, rate of incomplete excision and rate of narrow excision.
Results: A total of 2076 lesions were excised: 92% were complete, 4.2% were narrow and 3.2% were incomplete.
Conclusion: The rate of narrow and incomplete excisions was low in a service delivered by supervised surgical registrars. The Skin Shop model is safe, inexpensive and suitable for adaptation to safely reduce the cost of skin cancer surgery.

Introduction

Non-melanoma skin cancer (NMSC) is endemic within New Zealand and is the commonest form of cancer diagnosed. Treatment of NMSC consumes approximately 8% of the total cost of treatment for all cancers in New Zealand. [1] The Waikato District Health Board provides plastic surgery services for a primary population of 450,000 and tertiary plastic surgery services for 890,000 patients in the Midland region. As part of this service, the Department of Plastic and Reconstructive Surgery provides an ambulatory local anaesthetic service for patients requiring excision of lesions for skin cancers or suspected skin cancers called Skin Shop. The service is staffed by registrars and supervised by consultant plastic surgeons.

Despite its high incidence and cost of treatment, a diagnosis of NMSC does not require notification to the Ministry of Health. Consequently, there are limited national data on the incidence of NMSC in New Zealand. Brougham et al retrospectively reviewed histology reports for 26,400 patients who underwent surgical excision for NMSC between 1997 and 2007 and estimated that the incidence of basal cell carcinoma (BCC) and squamous cell carcinoma (SCC) was increasing by 4% and 1.1% during that 10 year period in the population served by that laboratory.[2,3]

* Corresponding author.
E-mail addresses: mujeeb.taib@waikatodhb.health.nz (M. Taib), Brandon.adams@actrix.co.nz (BM. Adams).

https://doi.org/10.1016/j.bjps.2018.10.014

Table 1 Summary of published studies of excision rates for NMSC.

Authors	Study type	NMSC type	Operator	*N*	Incomplete excision rate (%)
Pua et al.[6]	Retrospective case-control	BCC and SCC	Consultant	453	2.2 BCC 1.34 SCC
Masud et al. [10]	Retrospective case-control	BCC	Consultant and trainee registrar	2586	7.1
Bogdanov-Berezovsky et al.[11]	Retrospective cohort	BCC and SCC	Consultant	369	6.8
Hitchcock and Talbot[12]	Retrospective case-control	BCC and SCC	Consultant, registrar, GP	1833	14
Thomas et al.[13]	Prospective case-control	BCC and SCC	Consultant and trainee registrar	150	3.3
Su et al.[4]	Prospective case-control	BCC	Consultant and trainee registrar	1214	11.2
Tan et al.[5]	Prospective case-control	SCC	Consultant and trainee registrar	517	6.3

N (number of lesions), NMSC type (non-melanoma skin cancer type), BCC (basal cell carcinoma), SCC (squamous cell carcinoma).

Increasing incidence of NMSC has led to increased service demand for skin cancer surgery in public hospitals with plastic surgery services and a desire to manage costs without reducing oncological safety and quality of outcome.

One important measure of oncological safety for NMSC surgery is the rate of histological incomplete excision. In addition, complete excision with narrow histological margins (less than 1 mm) may result in additional treatment being required, thus leading to increased morbidity and higher treatment costs.

There are few studies that have looked at excision margins for NMSC in New Zealand, and the power of these studies is limited by the small number of cases included or retrospective analysis. The lowest incomplete excision rates in large international studies are restricted to consultant-level operators or are retrospective cohort analyses.

There have been other retrospective studies carried out, and one of the largest studies by Brougham et al reviewed 46,359 surgical excisions of NMSC in the lower half of the North Island.[3] The lowest rates for BCCs were 9.5% by plastic surgeons and 38.5% by dermatologists. Similarly, for SCCs, the rates were 9.8% by plastic surgeons and 28.7% by dermatologists.

A prospective study conducted at the Peter McCallum Institute in Australia between January 2001 and December 2002 had an 11.2% rate of incomplete excision from 1214 BCCs excised[4]). A similar study focusing on SCCs[5] was conducted at the same centre with a rate of incomplete excision of 6.3% from 517 lesions (Table 1).

A retrospective review of 453 lesions by two consultant dermatologists from January to December 2004 showed an overall incomplete excision rate of 2.2%, with rates of 1.34% for BCCs and 3.9% for SCCs. [6] In total, 45.9% of the lesions were excised from the head and neck region. A weakness of this review was its retrospective nature. Another retrospective review of 2586 BCC excisions from 1717 patients by Masud et al. showed a higher incomplete excision rate of 7.1%.[10] These excisions were performed by consultant plastic surgeons and specialist registrars, which is strength of this paper, although its retrospective nature is a weakness.

Bogdanov-Berezovsky et al. reviewed outcomes for their treatment of NMSC between consultant surgeons and registrars between January and December 2009.[11] Their results showed a significant difference between consultant surgeons and registrars with incomplete excision rates of 4.1% and 8.7%, respectively.

The aim of our study was to examine the outcomes of our local anaesthetic skin cancer service by measuring our rates of complete, incomplete and narrow excisions for NMSC.

Skin shop

Most surgeries for NMSC at Waikato Hospital are performed under local anaesthetic in our 'Skin Shop' procedure rooms. The Skin Shop model involves two operating theatres, each staffed by a surgical registrar. Consent, marking up and local anaesthetic infiltration occur in a third procedure room, which then 'feeds' the other procedure rooms. This model has provided an efficient, low-cost, high-volume local anaesthetic surgery procedure unit.

Operative plans are made by consultant plastic surgeons in an outpatient clinic before the Skin Shop appointment. A consultant surgeon is available for supervision of registrars in the Skin Shop, but consent and surgical markings are routinely performed by registrars based on the dictated consultant plan.

Aim

The aim of this paper is to determine the oncological safety of the new Skin Shop model.

Method

Patients with skin cancer or suspected skin cancer were assessed by a consultant plastic surgeon, and an excision and reconstruction plan was determined. Patients were booked on a waiting list and return to have their procedures under

Table 2 Oncological outcomes of surgical treatment through Skin Shop.

Lesion (*n*)	Complete% (*n*)	Narrow% (*n*)	Incomplete% (*n*)
BCC (968)	88.4% (856)	6.2% (60)	5.4% (52)
SCC (843)	91.6% (772)	4.0% (34)	4.4% (37)
Melanoma (261)	100% (261)		
Merkel cell carcinoma[3]	100%[3]		
Total (2076)	1920	94	189

BCC (Basal cell carcinoma), SCC (squamous cell carcinoma).

local anaesthetic in our ambulatory local anaesthetic theatre.

Procedures are performed by registrars of varying experience from first-year registrars to final-year trainee registrars. A consultant plastic surgeon is available for supervision and advice as required. Patients are followed up in outpatient clinics for review of histology and surgical outcome.

Standard histological examination is performed using haematoxylin and eosin stain on formalin-preserved specimens. This examination is supplemented by immunohistochemistry where required. Synoptic reporting is common but not mandatory. All reports include diagnosis and measured peripheral and deep margins.

The primary outcome was excision margins. Lesions were determined to be complete if all measured histological margins were greater than 1 mm, excision was considered narrow if any measured margin was less than 1 mm. Margins were incomplete if the lesion is present at any histological margin. Demographic data including age and gender as well as the location of lesion and the experience of the surgeon were recorded. Lesions that are excluded from the analysis are those with expected positive margins, including incisional biopsies, punch biopsies and shave biopsies.

Results

Between December 2014 and December 2016, a total of 1922 patients with 3234 lesions had treatment through Skin Shop. The mean age of patients was 70.5 years (range 16 to 101 years). Males comprised 60.2% and females 39.8%.

Of the 3234 lesions excised, 2076 (64%) were malignant and 1158 were benign. Of the malignant lesions, 1920 (92.6%) lesions had complete histological clearance of more than 1 mm, 87 (4.2%) were narrowly excised and 66 (3.2%) were incompletely excised (Table 2).

For BCC, 88.4% of the lesions were completely excised and 6.2% and 5.4% were excised as narrow and incomplete, respectively. For SCCs, 91.6% of the lesions were completely excised and 4.0% and 4.4% were narrow and incompletely excised, respectively.

The total number of melanoma lesions excised was 261. These lesions were either excision biopsies, wide local excisions for local control or excisions of metastatic nodules. Three patients had Merkel cell carcinoma excised. One patient had a cutaneous adenocarcinoma excised.

Table 3 shows the outcomes of lesions that were excised based on surgeon experience. A significant proportion of the more complex head and neck excisions were performed by the Skin Shop Medical Officers and the surgical trainees, whereas simpler excisions of the trunks and limbs were performed by more junior non-training registrars.

Table 3 Outcomes of lesions excised by surgeon experience.

Surgeon	Malignant lesion excised	Commonest anatomical region
MOSS[2]	1132 (55%)	Head and neck (47%)
SET Trainee[4]	480 (23%)	Head and neck (56%)
Non-trainee[8]	464 (22%)	Trunk (44%)

Dysplastic naevi and atypical lentiginous proliferation accounted for 78 of the lesions excised. A total of 1089 lesions were excised as benign lesions, with the most common diagnoses being seborrheic keratosis (257) and actinic keratosis (206).

Discussion

This is the largest prospective study reviewing the outcome of NMSC in a plastic surgery unit in New Zealand. Our rates of incomplete excision compare favourably with those reported in previously published studies. Appropriate selection bias exists in the group analysed – patients assessed as very complex for Skin Shop are operated on in our main theatre complex by a consultant plastic surgeon.

The average age of our patients is 70.5 years, which is similar to that reported in other studies showing that NMSC is more common in the older population than in younger population.[7] Similarly, the proportion between males and females was comparable to that given in other studies showing that skin cancers[8] were more common amongst males than females.

Because of the lack of data on the incidence of NMSC, it is difficult to determine the best way to allocate resources for the management of these cancers. Some NMSCs are also treated without surgical excision and hence do not generate a histology report. It is also not mandatory for information about BCCs and SCCs to be recorded into the cancer registry; hence, there is difficulty in determining the outcomes of patients with NMSC.

This study showed that our rate of excision of benign lesions is 36%. The commonest benign lesion excised was seborrheic keratosis followed by actinic keratosis. As New Zealand has high rates of melanoma, there is a low threshold for excision of pigmented lesions, which have a history of change despite benign appearances. Similarly, as rates

of NMSC are high in our population, keratotic lesions that have failed topical treatment are treated with excisional biopsy, thus leading to an increased rate of excision of pre-malignant skin lesions. Increasing the prevalence of dermatoscopy may lead to fewer benign lesions being excised.[9]

Conclusion

Registrars may provide a safe, high-quality skin lesion service if consultant plastic surgeons appropriately select and plan resection and reconstruction plans. Our Skin Shop is one safe way to minimise the financial burden of skin cancer surgery.

Conflict of interest

The authors do not have any conflict of interest either financially or personally in this study.

References

1. O'Dea D. *The costs of skin cancer to New Zealand*. Wellington: Wellington School of Medicine, University of Otago; 2009.
2. Brougham N, Dennett ER, Tan ST. Non-melanoma skin cancers in New Zealand—a neglected problem. *NZ Med J* 2010;**123**(1325):59–65.
3. Brougham ND, Dennett ER, Tan ST. Changing incidence of non-melanoma skin cancer in New Zealand. *ANZ J Surg* 2011;**81**(9):633–6.
4. Su SY, Giorlando F, Ek EW, Dieu T. Incomplete excision of basal cell carcinoma: a prospective trial. *Plast Reconstr Surg* 2007;**120**(5):1240–8.
5. Tan P-Y, Ek E, Su S, Giorlando F, Dieu T. Incomplete excision of squamous cell carcinoma of the skin: a prospective observational study. *Plast Reconstr Surg* 2007;**120**(4):910–16.
6. Pua VS, Huilgol S, Hill D. Evaluation of the treatment of non-melanoma skin cancers by surgical excision. *Australas J Dermatol* 2009;**50**(3):171–5.
7. Reid B. Reducing the incomplete excision of non melanotic skin cancers in Australian general practice. *Aust Fam Physician* 2000;**29**(3):278–81.
8. Alam M, Ratner D. Cutaneous squamous-cell carcinoma. *N Engl J Med* 2001;**344**(13):975–83.
9. Carli P, De Giorgi V, Crocetti E, et al. Improvement of malignant/benign ratio in excised melanocytic lesions in the 'dermoscopy era': a retrospective study 1997–2001. *Br J Dermatol* 2004;**150**(4):687–92.
10. Masud D, Moustaki M, Staruch R, Dheansa B. Basal cell carcinoma: risk factors for incomplete excision and results of re-excision. *Plast Reconstr Aesthet Surg* 2016;**69**(5):652–6.
11. Bogdanov-Berezovsky A, Cohen AD, Glesinger R, Cagnano E, Rosenber L. Risk factors for incomplete excision of squamous cell carcinomas. *J Dermatol Treat* 2005;**16**(5-6):341–4.
12. Talbot S, Hitchcock B. Incomplete primary excision of cutaneous basal and squamous cell carcinomas in the Bay of Plenty. *N Z Med J* 2004;**117**(1192):848.
13. Thomas D, King A, Peat B. Excision margins for nonmelanotic skin cancer. *Plast Reconstr Surg* 2003;**112**(1):57–63.