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CLINICAL REPORT

Risk Factors for Incomplete Excision of Basal Cell Carcinomas

ALEX BOGDANOV-BEREZOVSKY[1], ARNON D. COHEN[1], RONEN GLESINGER[1], EMANUELA CAGNANO[2], YUVAL KRIEGER[1] and LIOR ROSENBERG[1]

[1]*Department of Plastic and Reconstructive Surgery and Burn Unit and* [2]*Pathology Department, Soroka University Medical Center, Faculty of Health Sciences, Ben-Gurion University of the Negev, Beer-Sheva, Israel*

Incomplete excision of basal cell carcinomas (BCCs) may be followed by recurrence of the tumor. In order to detect risk factors for incomplete excision of BCCs we performed a cross-sectional study of 1278 patients who underwent a primary excision of BCCs, during a four-year period, within an ambulatory and hospital plastic surgery department setting. Incomplete excision occurred in 159 of 1478 primary excisions of BCCs (10.8%) and was significantly associated with location of the tumors in the eyelids (OR 3.64, 95% CI 1.96–6.71), ears (OR 2.51, 95% CI 1.25–4.94), naso-labial folds (OR 2.26, 95% CI 0.99–5.04) and nose (OR 1.88, 95% CI 1.30–2.71). There was an inverse association with location of the tumors in the upper limbs (OR 0.44 95% CI 0.21–0.90), back (OR 0.12, 95% CI 0.02–0.48) or chest (OR 0.09, 95% CI 0.00–0.57). Baso-squamous differentiation was associated with incomplete excision of BCCs ($p=0.03$). No association was observed between incomplete excision of BCCs and gender, age, setting of the operation (ambulatory vs. hospital), clinical appearance of the lesion (suspected BCCs vs. other diagnoses) or diameter of the lesions. In conclusion, incomplete excision of BCCs was associated with location of the tumors in the eyelids, ears, naso-labial folds and nose. We recommend that in patients with BCCs located in these sites, surgeons should commence particular surgical measures to avoid inadequate excisions of the tumors.

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Alex Bogdanov-Berezovsky, MD, PhD, Department of Plastic and Reconstructive Surgery and Burn Unit, Soroka Medical Center, 84101 Beer-Sheva, Israel. E-mail: alexb@bgumail.bgu.ac.il

Incomplete excisions of basal cell carcinomas may occur in primary excisions of BCCs. As 10–40% of incompletely excised BCCs recur if left untreated, they present a therapeutic dilemma. Some authors recommend an immediate re-excision, whereas others advocate close observation for recurrences. Recurrent BCCs are difficult to treat and have a substantial subsequent recurrence rate (1–5).

The appearance of incomplete excisions and recurrences of BCCs has led to the spread of the use in Moh's micrographic surgical technique for excision of BCCs in certain locations, in particular, on the face. However, the cost-effectiveness of this procedure is still in debate (1). Medical institutions worldwide, as well as our department, are presently performing re-excisions in patients with incompletely excised BCCs.

When incompletely excised BCCs are re-excised, tumor cells are found in 7–66% of the re-excised specimen, depending on the method used to review the re-excised specimen, and the time lag between the first operation and the re-excision (6, 7). We have recently published a pathological assessment of re-excisions of 100 incompletely excised BCCs; it was found that tumor cells were found within the surgical scar in only 28% of the excisions (8). It is possible that tumor cells are destroyed during the inflammatory and repair processes which follow the excision, a phenomenon which has been referred to as the "disappearance theory" (8, 9).

There are numerous studies on risk factors for recurrence of BCCs, but only a few studies were published on the topic of risk factors that may play a role for incomplete excision of BCCs (7, 10–17). Risk factors for recurrence of BCCs are different than the risk factors for an incomplete excision of BCC, as residual tumor cells may disappear after an incomplete excision (8, 9). In the present study, we describe a large series of patients who underwent a primary excision of BCCs, in order to identify risk factors for incomplete excision of BCCs.

PATIENTS AND METHODS

The study was performed in the setting of the plastic and reconstructive surgery department of Soroka University Medical Center and regional community clinics. Included in the study were all patients who underwent an excision of BCC's between the years 1994–1997. The operations were performed by residents and consultant plastic surgeons. All the medical files of the patients who were included in the study were reviewed and clinical and pathological parameters were extracted. Excluded from the study were patients who underwent incisional biopsies, shave biopsies or were previously treated by irradiation or other modalities.

The pathologic reports were reviewed to assess the adequacy of the excisions, which was categorized into a dichotomous variable: complete or incomplete excision. Incomplete excision was defined as a pathologic report that indicated the presence of tumor cells at the surgical margins of the lesion. Specimens

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Table I. *Clinical features of patients with complete versus incomplete excision of basal cell carcinomas.*

	Complete excisions (1119 patients)	Incomplete excisions (159 patients)	All excisions (1278 patients)
Gender *n* (%)	Men: 632 (56.5%) Women: 487 (43.5%)	Men: 90 (56.6%) Women: 699 (43.4%)	Men: 722 (56.5%) Women: 556 (43.5%)
Age, years (mean (SD))	63.5 ± 13.6	65.0 ± 14.3	63.7 ± 13.7
Location of the operation *n* (%)	Hospital: 853 (76.2%) Ambulatory: 266 (23.8%)	Hospital: 128 (80.5%) Ambulatory: 31 (19.5%)	Hospital: 980 (76.7%) Ambulatory: 298 (23.3%)

Table II. *Sites of 159 incompletely excised basal cell carcinomas.*

Location	Total number of excisions	Number of incomplete excisions	Percent of incomplete excisions	Odds ratio (95% CI)*	*P* value
Peri-orbital	59	18	30.5	3.64 (1.96 – 6.71)	< 0.001
Ear	56	13	23.2	2.51 (1.25 – 4.94)	0.007
Naso-labial folds	42	9	21.4	2.26 (0.99 – 5.04)	0.042
Nose	265	49	18.5	1.88 (1.30 – 2.71)	< 0.001
Lower limb	56	7	12.5	1.19 (0.48 – 2.78)	NS
Cheek	160	16	10.0	0.92 (0.52 – 1.63)	NS
Temple	90	9	10.0	0.92 (0.42 – 1.94)	NS
Chin	11	1	9.1	0.44 (0.02 – 3.10)	NS
Scalp	106	9	8.5	0.77 (0.36 – 1.61)	NS
Forehead	146	12	8.2	0.74 (0.38 – 1.41)	NS
Lips	29	2	6.9	0.61 (0.10 – 2.69)	NS
Post-auricular	35	2	5.7	0.50 (0.08 – 2.17)	NS
Upper limb	179	9	5.0	0.44 (0.21 – 090)	0.024
Back	146	2	1.4	0.12 (0.02 – 0.48)	< 0.001
Chest	98	1	1.0	0.09 (0.00 – 0.57)	0.001
Total	1478	159	10.8	1 (Reference)	–

*Odds ratios and 95% confidence intervals were calculated as compared to incomplete excision rate for all lesions (reference).
NS – not significant.

with tumor cells only approaching the surgical margins were not regarded as an incomplete excision. Additional pathologic parameters of the tumors were extracted: BCC differentiation pattern, inflammatory response and solar changes (defined as either evidence of solar keratoses or solar elastoses).

Statistical analysis was performed using Epi-Info and SPSS software's. Means were compared using *t*-tests. Proportions were compared using Fisher exact test or chi-square test, as needed.

RESULTS

Included in the study were 1,278 patients who underwent excision of 1,478 BCCs between the years 1994 – 1997. The mean age of the patients was 63.7 years. There were 772 men (56.5%) and 556 women (43.5%).

Overall, there were 159 incomplete excisions (10.8%). There was no difference in age, gender or setting of the operation (ambulatory vs. hospital) between patients with incomplete excision as compared to patients with complete excision (Table I).

Incomplete excision of BCCs was significantly associated with location of the lesions in the eyelids, ears, naso-labial folds or nose. There was an inverse association between incomplete excision and location of the tumor in upper limbs, back or chest (Table II).

The diameter of the fixed tissue was similar in complete excision and incomplete excision of BCCs (0.81 ± 0.55 cm and 0.79 ± 0.48 cm, respectively). Baso-squamous differentiation was associated with incomplete excision; there was no association between incomplete excision and other differentiation patterns (Table III).

Table III. *Differentiation patterns of complete versus incomplete excisions of basal cell carcinomas.*

Differentiation pattern	Complete excisions (*n* = 1319)	Incomplete excisions (*n* = 159)
Ulcerative	345 (26.2)	51 (32.1)
Solid	77 (5.9)	7 (4.4)
Morphea type	16 (1.2)	4 (2.5)
Baso-squamous	76 (5.8)	16 (10.1)*
Unspecified	805 (61.0)	81 (50.9)

*$p = 0.03$.

Table IV. *Proportion of incompletely excised basal cell carcinomas according to the setting of the operation: An overview.*

	Number of lesions	Number of incomplete excisions	% of all excisions	Setting
Hallock & Lutz (11)	415	65	15.7%	Ambulatory
Bogdanov-Berezovsky (Present study)	1478	159	10.8%	Hospital department and ambulatory
Griffiths (7)	1392	99	7.1%	Hospital department and ambulatory
Kumar et al. (12)	879	41	4.7%	Hospital department
Fleischer et al. (10)	1459	243	16.6%	Hospital department
Schreuder & Powell (17)	51	7	13.7%	Hospital department

DISCUSSION

In the present study we describe risk factors associated with incomplete excision of BCCs, performed by residents and consultant plastic surgeons in a the setting of hospital plastic surgery department and ambulatory clinics. Overall, incomplete excisions were found in 10.8% of the time, a figure compatible with the reported literature (7, 8, 10–12, 17) (Table IV).

It was found that the main factor associated with incomplete excision of BCCs was the location of the tumors. Incomplete excisions were significantly associated with location of the lesions in the eyelids, ears, naso-labial folds and nose. This observation is in agreement with previous studies (4, 7, 10, 12, 18–21). For example, Fleischer et al. have found that tumors of the head and neck were more likely to be incompletely excised as compared to truncal tumors (10). Kumar described a high proportion of incomplete excision for BCCs located on the scalp, ears, canthi, eyebrows and nose (4, 12, 22). Tumors located in the embryonal fusion plains (e.g. eyelids and naso-labial folds) have a particular propensity for tumor infiltration and recurrence and require wider excisional margins (1).

In the present study, incomplete excisions were inversely associated with location of the tumors in the upper limbs or trunk. This may be due to the ability of the surgeons to perform a wider excision, without harming cosmetically important structures.

We have found that incomplete excisions were significantly associated with the presence of squamous differentiation. This observation was previously reported by Kumar et al, who had observed a higher incidence of squamous differentiation in incomplete excisions of BCCs (12). However, others have found that adenocystic and morphea types BCC are associated with high incomplete excision proportions (4). It is possible that the more aggressive BCCs, such as BCCs with baso-squamous, adenocystic or morphea types of differentiation, are associated with increased incomplete excision proportions because of the borders of this tumors are not sharply demarcated.

The setting where excisions of BCCs are performed may be another factor associated with the incomplete excision proportions. The percent of incomplete excisions of non-melanoma skin cancers was as high as 15.7% in ambulatory setting (11), as compared to 7.1–10.8% in combined hospital and ambulatory setting (7, 8, 12), and 4.7% only in a hospital setting (12). This raises an economic, as well as an ethical dilemma, regarding the design and structure for plastic surgery services, as performance of excisions of non-melanoma skin cancers in ambulatory clinics is associated with a higher proportion of incomplete excisions.

In a previous study, we described the results of re-excision of incompletely excised BCCs; tumor cells were found in only 28 of 100 re-excisions (28%) of incompletely excised BCCs (8). This observation is in agreement with previous studies, which described the proportions of positive re-excisions after incomplete excision of BCCs, ranging from 25% to 54%. In our study, we found that patients with residual tumor cells after re-excision of an incompletely excised BCCs, have significantly less inflammatory infiltrates as compared to patients without residual tumor cells. It is possible that this phenomenon, which was described as the theory of "disappearance" of tumor cells (9), occurs as part of the wound healing-process after the first excision, when not enough tumor cells are left to survive. However, as tumor cells may be found in up to 54% of the re-excisions (7), we recommend the approach of performing a re-excision of the region of the original operation (when feasible).

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