Curettage prior to Mohs' Micrographic Surgery for Previously Biopsied Nonmelanoma Skin Cancers: What Are We Curetting? Retrospective, Prospective, and Comparative Study

MING H. JIH, MD, PHD, PAUL M. FRIEDMAN, MD, LEONARD H. GOLDBERG, MD, AND ARASH KIMYAI-ASADI, MD

DermSurgery Associates, Houston, Texas

BACKGROUND. **Curettage prior to excision and Mohs' micrographic surgery for nonmelanoma skin cancer is performed based on the assumption that the curette will remove softer, more friable tumor-infiltrated dermis and leave structurally intact normal skin. This assumption, however, has not been objectively examined in the dermatologic surgery literature.**

OBJECTIVE. **We performed a study to examine the ability of curettage to selectively remove and delineate nonmelanoma skin cancer prior to Mohs' micrographic surgery.**

METHODS. **The study included 150 previously biopsied basal cell and squamous cell carcinomas less than 1.5 cm in size. We conducted (1) a retrospective study of 50 tumors curetted prior to Mohs' surgery by a surgeon who routinely curettes preoperatively; (2) a prospective study in which a surgeon who routinely does not curette preoperatively curetted 50 tumors prior to Mohs' surgery; and (3) a comparative historical group of 50 noncuretted tumors treated with Mohs' surgery by the latter surgeon. All curetted tissue was evaluated histologically.**

RESULTS. **Only 50% of the curetted tissue demonstrated the presence of tumor in the curettings, but in 76% of these, the curette left residual tumor at the surgical margins. Of the other 50% in which the curette removed only non–cancer-containing skin, 34% had tumor present at the surgical margin. Overall, the curette removed tumor, leaving no residual tumor at the surgical margins in only 12% of lesions. Comparison with historical noncuretted tumors operated on by the same surgeon showed that curettage did not affect the mean number of stages or the proportion of tumors requiring more than one stage for histologic clearance.**

CONCLUSION. **Although curettage may be helpful in debulking friable skin prior to Mohs' micrographic surgery, it does not reliably delineate the extent of a tumor.**

MING H. JIH, MD, PHD, PAUL M. FRIEDMAN, MD, LEONARD H. GOLDBERG, MD, AND ARASH KIMYAI-ASADI, MD, HAVE INDICATED NO SIGNIFICANT INTEREST WITH COMMERCIAL SUPPORTERS.

TYPICALLY, THE curette is used prior to excisional and Mohs' surgery for tumor debulking and the delineation of subclinical tumor spread.[1] The curette is a surgical instrument with a handle connected via a neck to the head, which is a round metal ring that is semisharp on one side, making the curette capable of scraping but not cutting normal dermis. The rationale for preoperative curettage is that the curette will remove more friable tumor-infiltrated dermis while sparing normal skin. This assumption, however, has not been objectively examined in the dermatologic surgery literature.

We systematically evaluated the tissue removed by curettage prior to Mohs' micrographic surgery for previously biopsied nonmelanoma skin cancer to assess the efficacy of preoperative curettage in delineating tumor margins.

Methods

Phase I: Retrospective (Group 1)

One of the authors (P.M.F., surgeon 1) routinely performs curettage prior to Mohs' micrographic surgery and histologically examines the curetted tissue for evaluation of the histologic properties of the tumor. The clinically apparent margins of each tumor are marked, followed by moderately aggressive curettage by surgeon 1 with several passes of a number 3 curette over the visible portion of the tumor and its peripheral border. The curetted tissue is placed directly from the curette onto a cryostat chuck covered with water-soluble frozen-section medium to avoid tissue loss during histologic processing. A layer of tissue is then

Address correspondence and reprint requests to: Ming H. Jih, MD, PhD, DermSurgery Associates, 7515 Main, Suite 210, Houston, TX 77030, or e-mail: ming_jih@yahoo.com.

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excised with a 0.5 to 2 mm margin encompassing the curetted defect. Serial sections (between 5 and 12), 4 to 6 μm in thickness, are prepared from the lateral and deep surgical margin as well as the curetted tissue, stained, and examined histologically. If tumor is present at the surgical margin, additional layers of tissue are excised and examined microscopically until complete histologic margin control is attained.

In the first phase of this study, a retrospective analysis of 50 consecutive patients with previously biopsied primary basal cell carcinoma (BCC) or squamous cell carcinoma (SCC) up to 1.5 cm in size treated with Mohs' micrographic surgery by surgeon 1 was included. For each tumor, the histologic diagnosis, anatomic location, and preoperative size were recorded, as were the number of stages of Mohs' micrographic surgery required. Given that the histologic subtypes were typically not included in the pathology reports, this information was not recorded. BCCs indicated as being morpheaform, however, were excluded from the study.

If the curettage specimen revealed the presence of tumor, the tumor was designated "curette positive," and if no evidence of tumor was seen in the curettage specimen, the tumor was designated "curette negative." In addition, the presence of residual tumor in the subsequently excised tissue specimen examined histologically was noted. Accordingly, tissues demonstrating the presence of tumor were designated "tissue positive" and those with no residual tumor were designated "tissue negative." Only the surgical margins were examined histologically, and the center of the excised tissue was not serially sectioned.

Phase II: Prospective (Group 2)

One of the authors (L.H.G., surgeon 2) does not perform curettage of tumors prior to Mohs' micrographic surgery. In the second phase of this study, a prospective analysis of 50 consecutive tumors with biopsy-proven primary BCCs or SCCs up to 1.5 cm in size that were treated with Mohs' micrographic surgery by surgeon 2 was included. As a matter of deviation from this surgeon's standard practice, curettage was performed by surgeon 2 for debulking of tumors and delineation of their margins prior to Mohs' micrographic surgery. Frozen sections of the curetted tissue and the peripheral surgical margins were obtained as discussed in phase I, and tumors were evaluated accordingly.

Phase III: Comparative (Group 3)

In the third phase of the study, the 50 consecutive patients who were treated by surgeon 2 in a prospective fashion with curettage (group 2) were compared with 50 consecutive primary BCCs and SCCs up to 1.5 cm in size that were treated immediately prior to the study by the same surgeon with Mohs' micrographic surgery (group 3). These patients did not have curettage prior to surgery but, rather, were treated with the standard approach of surgeon 2, as described above.

Statistical Analysis

Informed consent was obtained from all patients. Statistical comparisons were performed using the chi-square test and the *t*-test for proportions. Tumor surface area was estimated using the formula

$$\pi xy \div 4$$

where x and y are the two diameters of the tumor.

Results

There was no difference in histologic type or dimensions between the tumors in the three groups (Table 1). Most tumors (80%) were located on the face. Group 2 had a significantly higher percentage of facial tumors than group 1 ($p < .01$) and group 3 ($p < .05$).

Tumors in group 1 and group 2 received preoperative curettage. Overall, 50% of the curetted tissue demonstrated the presence of tumor in the curettings (curette-positive tumors), and 50% included only normal skin, scar tissue, and/or granulation tissue with no histologic evidence of tumor (curette-negative tumors) (Table 2). The percentage of curette-positive tumors was similar in groups 1 and 2 (46% and 54%, respectively).

The 100 tumors in groups 1 and 2 were divided into four types based on the histologic findings in the curetted tissue and the sections prepared from the surgical margins (Table 2):

1. Thirty-eight percent had tumor present in the curetted tissue and had residual tumor at the surgical margin.
2. Thirty-four percent had no tumor present in the curetted tissue and no tumor present at the surgical margins.
3. Sixteen percent had no tumor present in the curetted tissue but had tumor present at the surgical margins.
4. Twelve percent had positive curettings and no tumor at the surgical margins.

Overall, there was no difference in curette positivity between group 1 and group 2 (46% vs 54%).

The percentage of curette-positive tissue did not depend on anatomic location (Table 3). However,

Table 1. Comparison of Histologic Diagnoses and Tumor Dimension and Location in the Study Groups

		Group 1	*Group 2*	*Group 3*	*Overall*
n		50	50	50	150
Dimensions	Length, cm	0.78 ± 0.32	0.81 ± 0.28	0.82 ± 0.35	0.81 ± 0.31
	Width, cm	0.58 ± 0.21	0.70 ± 0.26	0.66 ± 0.32	0.65 ± 0.27
	Surface area, cm^2	0.39 ± 0.28	0.49 ± 0.33	0.50 ± 0.43	0.46 ± 0.36
Histologic diagnosis, *n* (%)	BCC	35 (70)	39 (78)	41 (82)	74 (77)
	SCC	10 (20)	6 (12)	8 (16)	16 (16)
	SCC in situ	5 (10)	3 (6)	1 (2)	8 (6)
	Basosquamous	0	2 (4)	0	2 (1)
Location	Facial, *n* (%)	35 (70)	46 (92)	37 (74)	118 (79)
	Nose	12	24	16	52
	Cheek	9	8	6	23
	Temple	6	3	1	10
	Auricular	3	4	5	12
	Chin	3	1	1	5
	Forehead	1	3	4	8
	Periorbital	1	2	2	5
	Lip	0	1	2	3
	Nonfacial, *n* (%)	15 (30)	4 (8)	13 (26)	32 (21)
	Scalp	2	3	5	10
	Neck	2	0	1	3
	Trunk	1	0	5	6
	Extremity	10	1	2	13

BCC = basal cell carcinoma; SCC = squamous cell carcinoma.

tumors that were curette positive had a larger surface area than those that were curette negative ($0.51 \pm 0.33\,cm^2$ vs $0.38 \pm 0.29\,cm^2$; $p < .05$). In particular, tumors that were 0.5 cm or less in maximal dimension were most likely to be curette negative. In these tumors ($n = 23$), only 26% were curette positive compared with 57% of tumors larger than 5 mm in greatest dimension ($n = 77$) ($p < .01$). Histologic diagnosis of the tumor had an effect on curette positivity because 43% of BCCs were curette positive compared with 50% of SCCs in situ, 75% of SCCs, and 100% of basosquamous carcinomas ($p < .05$ when comparing BCCs with other tumors). Tumors that were curette positive were more likely to require more than one stage for tumor clearance ($p < .01$).

Comparison of groups 2 and 3 was performed to determine whether the addition of curettage decreased the need for additional stages for surgeon 2. The tumors in these two groups did not differ statistically in terms of size, location, or histology. In group 2 (surgeon 2 with preoperative curettage), the mean number of stages required was 1.36 ± 0.63, with 15 (30%) tumors requiring more than one stage for tumor clearance. In group 3 (surgeon 2 without preoperative curettage), the mean number of stages required was 1.42 ± 0.81, with 14 (28%) tumors

Table 2. Histologic Findings in Curette Specimen and Tissue Sections

Group	N	*Curette+*	*Curette−*	*C+, T+*	*C+, T−*	*C−, T+*	*C−, T−*
1	50	23 (46)	27 (54)	18 (46)	5 (10)	12 (24)	15 (30)
		(32–60)	(40–68)	(23–49)	(2–18)	(12–36)	(17–43)
2	50	27 (54)	23 (46)	20 (40)	7 (14)	4 (8)	19 (38)
		(40–68)	(32–60)	(26–54)	(4–24)	(0–16)	(24–52)
Total	100	50 (50)	50 (50)	38 (38)	12 (12)	16 (16)	34 (34)
		(40–60)	(40–60)	(28–48)	(6–18)	(9–23)	(25–43)

C+ = curette positive; C− = curette negative; T+ = tissue positive; T− = tissue negative.
Data are presented as the number of lesions in each category followed by the percentage of lesions in that category and the 95% confidence interval for each percentage.

Table 3. Curette Positivity by Anatomic Location

Location	n	*Curette Positive*	*% (95% CI)*
Facial	81	42	52 (41–63)
Nose	36	18	50
Cheek	17	8	47
Temple	9	5	56
Auricular	7	3	43
Chin	4	3	75
Forehead	4	3	75
Periorbital	3	1	33
Lip	1	1	100
Nonfacial	19	8	42 (20–64)
Scalp	5	2	40
Neck	2	1	50
Trunk	1	0	0
Extremity	11	5	45
All	100	50	50 (40–60)

requiring more than one stage for tumor clearance. Statistically, these differences were not significant.

Discussion

Curettage is commonly performed prior to excisional and Mohs' micrographic surgery to debulk tumors and more accurately define their margins.[1] Although the mere presence of tumor at the surgical margin after curettage does not imply that curettage does not help delineate the tumor, the absence of tumor in the curettings does. Our study revealed that in half of cases, the curette removed only non–tumor-infiltrated epidermis and pieces of dermis. Moreover, when there is no tumor in the curettage specimen, one-third (32%) of the time there is tumor present at the margins of the Mohs' excision specimen. This indicates that the curette is perhaps a selective remover of soft, healing, previously biopsied skin and not necessarily of tumor-containing skin. Another way to look at our data is that the curette did not remove any tumor in 50% of cases (curette-negative tumors). In an additional 38% of cases (curette-positive, tissue-positive tumors), the curette left tumor at the surgical margins and therefore did not delineate tumor margins. As such, the curette performed its task of removing and delineating tumor in, at most, 12% of cases. The 100 tumors in groups 1 and 2 can be divided into four types based on the histologic findings in the curetted tissue and slides prepared from the surgical margins (see Table 2):

1. Thirty-eight percent had tumor present in the curetted tissue and had residual tumor at the surgical margin. In these cases, although the curette did remove tumor, it left behind tumor at the surgical margin, thus not distinguishing the tumor from normal skin.
2. Thirty-four percent had no tumor present in the curettings and no tumor at the surgical margins. For such cases, there are two possibilities. One possibility is that the curette removed only normal skin, leaving behind the entirety of the residual tumor, but given that we examined only the surgical margins, any tumor present in the center of the excised specimen was not visualized. The second possibility is that these lesions had no residual tumor after the biopsy; therefore, the curette removed only normal skin, granulation tissue, and scar tissue.
3. Sixteen percent had no tumor present in the curetted tissue but had tumor present in the surgical margin. In these cases, the curette removed no tumor, thus selectively removing only normal and friable skin.
4. Twelve percent had positive curettings but no tumor at the surgical margins. Only in these cases can the curette be considered helpful in specifically delineating tumor.

The results of a study such as ours are somewhat linked to the aggressiveness of curettage performed prior to Mohs' micrographic surgery. Although this is difficult to standardize, our use of two surgeons mitigated somewhat against individual variations in the aggressiveness of curettage used or in the amount of tissue removed in the first stage of Mohs' micrographic surgery. Of note, our study included only previously biopsied tumors referred for Mohs' micrographic surgery and thus cannot be generalized to tumors that have not been previously biopsied.

In dermatologic practice, curettage is commonly combined with another treatment modality, such as electrodesiccation or excisional surgery, because it is commonly believed that curettage alone is not sufficient to adequately distinguish a tumor from normal skin. However, a recent study reported a 95% cure rate for properly selected BCCs treated with aggressive curettage alone.[2] This study, however, did not histologically confirm the absence of persistent tumor. Indeed, in a study by Suhge d'Aubermont and Bennett of 45 BCCs on the head and face treated with curettage and electrodesiccation, residual tumor was detected microscopically in 46.6% of tumors.[3]

In a previous study by Torres and colleagues, it was found that if one rebiopsies a previously biopsied BCC or SCC, in 41% of cases, there would be no tumor in the tissue obtained from the second biopsy.[4] However, even for cancers in which the second biopsy failed to reveal tumor, tumor was seen during Mohs' micrographic surgery in nearly two-thirds of cases (63%).

If a shave biopsy fails to remove tumor in 41% of previously biopsied BCCs and SCCs, it is not surprising that the curette fails to remove tumor in 50% of such tumors.

Two previous studies suggest that preoperative curettage may be associated with a decreased risk of positive surgical margins in excisional and Mohs' micrographic surgery for BCCs.[5,6] In one of these studies, curettage removed an average of 1.7 mm of normal-appearing skin surrounding a tumor.[6] Based on our results demonstrating that the curette predominantly removes non–cancer-containing skin, one wonders whether curettage, if performed aggressively, merely increases surgical margins without improving the precision of tumor removal. As such, curettage plus standard 4 mm excisional surgical margins may be equivalent to 6 mm surgical margins without curettage.

The study by Ratner and Bagiella contended that if preoperative curettage is not performed, one would need a second stage of Mohs' surgery in 99% of BCCs removed with a 1 mm surgical margin.[6] Taking a 2, 3, or 4 mm margin would necessitate an additional stage in 87.5%, 57.9%, and 29.5% of tumors, respectively. Our study refutes these results because the addition of curettage to the practice of surgeon 2 did not affect the number of stages required to clear tumors. In that study, the overestimation of the need for additional margins if curettage is not performed is due to their assumption that the entirety of their curettings, as well as their additional surgical margins, was wholly infiltrated by tumor. This assumption, however, was untested and is negated by our study. Indeed, in group 3, in which curettage was not performed, removing 1 to 2 mm of tissue around the visible portion of the tumor resulted in the need for additional stages in only 28% of tumors, far less than the 87.5 to 99% predicted by Ratner and Bagiella's study.

During Mohs' micrographic surgery, sparing of tissue is of significant concern, especially in areas of cosmetic or functional significance, raising concern that curettage aimed at delineating tumor margins may unnecessarily enlarge a surgical defect. When treating a patient with Mohs' micrographic surgery, one must consider the fact that after a biopsy, 24% of nonmelanoma skin cancers have no histologic residual.[7] For such tumors, aggressive curettage can create a larger defect, with no potential improvement in the accuracy of the procedure. It is prudent, therefore, to distinguish between the two purposes of curettage performed prior to Mohs' micrographic surgery.[8] One is to curette rather aggressively to define and delineate the subclinical spread of tumor, a use that our study refutes. The second is to gently remove friable tissue to produce a shallow ulcer that allows a thin, beveled layer of tissue to be excised without creating a defect larger than the visible tumor.

In our study, the presence of tumor cells in curettage samples was correlated with a greater number of Mohs' surgery stages required for tumor clearance. That the curette did remove tumor in these cases, however, does not mean that the curette delineated the tumors because at least 76% of these curette-positive tumors had residual tumor in the frozen sections. As such, the presence of tumor in a curettage specimen appears to merely indicate more extensive spread of tumor. This fact is reflected by our finding that tumors with a larger surface area are more likely to be curette positive.

Dermatologic surgeons are aware of a number of problems that are encountered during preoperative curettage because the curette typically does not remove tissue in a uniform fashion with smooth, sharply defined borders. If curettage yields jagged edges, it is difficult to take a uniformly narrow specimen during Mohs' surgery. Curettage can create shearing forces in the skin just outside the curetted area that lead to epidermal loss during tissue processing, making it difficult to attain complete histologic margin control of the epidermis.[9] Severely photoaged skin in areas such as the forearm and cheek is removed by the curette in sheets, leaving overhanging pieces of epidermis at the edges. The curette is also difficult to use in the periorbital region owing to the thin, mobile skin.[8] When the curette perforates through the dermis, it becomes very difficult to obtain an adequate superficial Mohs' layer. Finally, curettage does not help distinguish nonfriable BCCs, including morpheaform and recurrent ones, from normal skin.[8]

Our study brings into question the utility of the curette as a surgical instrument that delineates the extent of a tumor prior to Mohs' micrographic surgery for nonmelanoma skin cancer. Although surgeons may find light debulking curettage helpful in attaining a thin piece of tissue for pathologic processing, the curette has a limited role as a tumor-defining instrument. In addition, preoperative curettage does not reduce the number of stages of Mohs' micrographic surgery required to attain histologic clearance of a nonmelanoma skin cancer.

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