

*A ten-year experience with the Munich method of micrographic surgery: a report of 93 operated cases**

Dez anos de experiência com cirurgia micrográfica pelo método de Munique: relato de 93 casos operados*

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Abstract: BACKGROUND – Mohs surgery is one of the most effective treatments for basal cell carcinomas. The expansion of its concepts enabled developing other equally effective methods to check surgical margins, and the Munich method is an example.

OBJECTIVES – To evaluate the effectiveness of the Munich method of micrographic surgery in a ten-year cohort study.

METHODS – Ninety-three patients with a total of 96 skin tumors were treated with the Munich method of micrographic surgery, taking part in a follow-up protocol, from May 1994 through July 2004.

RESULTS – Of all tumors, 61.4% were recurrent, 42.3% were recurrent more than once, and 53% were of the sclerodermiform type. The mean larger diameter was 1.58cm, and the mean smaller diameter was 1.10cm. In 95% of the cases, total extirpation of the tumor was obtained in three stages. The most common site was nasal (46.3%), followed by periocular (18.9%) and frontal (11.5%). Two patients were lost in follow-up. Of the 96 operated tumors, only 11 had a follow-up time shorter than 2 years. Fifty-six patients were followed for at least 5 years, and 45 (47.3%) for over 6 years. A single relapse was observed, which took place in the sixth year of observation.

CONCLUSION – The Munich method is an efficient method of micrographic surgery, as good as the Mohs method. This study provides further evidence that the concept of micrographic surgery must be broadened to surgical excision with microscopic margin control, rather than linking it exclusively to the term “Mohs micrographic surgery”.

Keywords: Surgery; Mohs surgery; Skin neoplasms; Reoperation

Resumo: FUNDAMENTOS – A cirurgia de Mohs é um dos métodos mais eficazes de tratamento dos carcinomas basocelulares. A expansão de seus conceitos possibilitou o surgimento de outros métodos de checagem de margens cirúrgicas igualmente eficazes. O método de Munique é um exemplo disso. OBJETIVOS – Avaliar a eficácia da cirurgia micrográfica pelo método de Munique em um estudo de coorte com 10 anos de duração.

MÉTODOS – 93 pacientes com 96 tumores cutâneos foram tratados com cirurgia micrográfica pelo método de Munique, participando de um protocolo de acompanhamento, no período de maio de 1994 a julho de 2004.

RESULTADOS – 61,4% dos tumores eram recidivados; 42,3% eram recidivados mais de uma vez; 53% eram do tipo esclerodermiforme. A média do maior diâmetro dos tumores foi de 1,58cm e do menor 1,10cm. Em 95% dos casos se obteve a extirpação total do tumor, com até três estágios. A localização mais comum foi a nasal (46,3%), seguida da periocular (18,9%) e da frontal (11,5%). Perdeu-se o contato apenas com dois pacientes. Dos 96 tumores operados, apenas 11 têm tempo de seguimento inferior a dois anos. 56 pacientes foram seguidos por pelo menos cinco anos, e 45 (47,3%), por mais de seis anos. Apenas um caso de recidiva foi verificado, tendo ocorrido no sexto ano de observação.

CONCLUSÃO – O método de Munique é um método eficiente de cirurgia micrográfica, tanto quanto o método de Mohs. Este trabalho fornece mais um indício de que o conceito de cirurgia micrográfica deve ser ampliado para cirurgia microscopicamente controlada, e não ficar ligado estritamente ao termo cirurgia de Mohs.

Palavras-chave: Cirurgia; Cirurgia de Mohs; Neoplasias cutâneas; Reoperação

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* This study was carried out in three different institutions: from 1994 to 1998 at the Santa Casa de Belo Horizonte (MG), Brazil. From 1998 to 2004, at the Hospital Biocor – Belo Horizonte (MG), Brazil and as of 2002, at the Hospital de Caridade de Florianópolis (SC) Brazil.

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INTRODUCTION

The genius of Frederick Mohs in developing a rather effective method to microscopically control the margins of a surgical specimen, along with his perseverance in resisting the initially deeply rooted concepts of the surgeons of his days, allied to the adhesion of the dermatologists to his method, established, over more than 60 years of history, the grounds for the scientific and practical recognition granted nowadays to Mohs micrographic surgery as one of the most effective and scientifically proven methods of surgical treatment for basal cell carcinomas and other skin cancers.

The method was introduced in the 1930's by the so-called chemosurgery, which consisted of the *in vivo* tumor tissue fixation by a special paste containing zinc chloride.¹ This fixation, besides being very painful, took 24 hours or longer, depending on the size and depth of the tumor to be treated. Only after complete fixation was the exeresis of the previously curetted tumor performed, which was thereafter submitted to microscopic analysis to check surgical margin. If the margins showed tumor involvement, a new tissue fixation cycle was started, until no tumor was observed on the excision margins. The intense pain caused by this procedure, along with prolonged tissue fixation cycles, made Mohs's chemosurgery a method that was difficult both to endure and to perform.

In 1953, Frederick Mohs once again brought an innovation. In an eyelid tumor surgery, he introduced the fresh tissue method.² Tissue fixation was abolished, and the tissue was examined by frozen sections. However, Frederick Mohs continued using chemosurgery for another twenty years, until the 1970's, when Stegman and Tromovitch presented a series of cases operated by the fresh tissue method.³ From that moment on, chemosurgery was definitively abandoned, and Mohs micrographic surgery (the fresh tissue method) expanded throughout the world.

Mohs chemosurgery was taken to Germany in the 1960's by Günter Burg, who had been an intern with Frederick Mohs himself. It was used for about four or five years at the dermatology clinic of the Munich University (Ludwig-Maximilians-Universität – LMU München), and was then gradually replaced by the fresh tissue method. Burg used to call the surgical margin control method that he started using in Munich "histographic surgery". It was a method with all the characteristics of a true surgical excision with microscopic margin control, but technically it was very different from the method originally described by Frederick Mohs. Burg, however, did not stay long in the field of surgery. His work

was continued by Birger Konz, another pupil of professor Otto Braun-Falco, a qualified surgeon, who took over as head of the dermatological surgery service of the clinic. Konz did not consider the modifications introduced by Burg to the Mohs method important, for his surgeries were also microscopically controlled. Until the 1990's, all those who worked at LMU München thought that the microscopically controlled surgery they had been performing for over 20 years was the Mohs micrographic surgery.⁴ This concept underwent a thorough re-analysis in 1992, and the method developed at LMU München was finally individualized and is since named the "Munich method".⁵ Its curing rates are as high as those of the Mohs method. The present work summarizes an experience in reproducing the German technique in Brazil, with the same efficiency and precision.

MATERIAL AND METHODS

From May, 1994, through June, 2004, 93 patients with a total of 96 skin tumors were treated with micrographic surgery by the Munich method. The patients were operated at the Department of Dermatology of Santa Casa de Belo Horizonte, from May 1994 to 1998, at the Hospital Biocor (Belo Horizonte, MG) from 1998 through 2004, and at the Hospital Caridade (Florianópolis, SC) since 2002. The isolated or combined indications to perform the procedure were: a) relapsed tumors (a tumor was considered as relapsed only if it arose again at the same location and within a maximum period of two years after the last therapeutic intervention); b) very ill-limited tumors; c) tumors whose histological subtype characterized an infiltrative growth pattern, such as the sclerodermiform, micronodular, solid-infiltrative basal cell carcinoma, squamous cell carcinomas or adnexal tumors with high relapse capacity; d) tumors located in regions where sparing healthy tissue was of functional or even esthetic importance. The patients were included in a follow-up protocol, and the main parameters concerning the patient, the tumor and the surgery were recorded in a database for further analysis. Over 10 years, regular annual contacts were made, directly (dermatological examination by the author or by fellow dermatologists) or indirectly (by phone), so as to detect any relapse of the operated tumors, thus attempting to establish the effectiveness of the procedure.

The procedure was performed under local anesthesia, on an outpatient basis whenever possible, using a microscopically controlled surgery method, in which the surgical specimen is duly mapped and

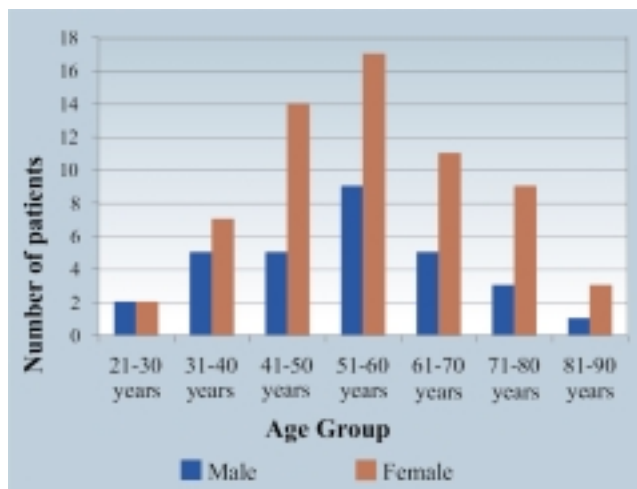
topographically oriented, in order to be processed in a cryostat and histologically interpreted by the Munich micrographic method. According to this method, previously described in detail,^{6,7,8} the whole surgical specimen is embedded, reversed, undivided (if its size allows it), and frozen in this position, so the sections are made serially from the bottom towards the surface of the epidermis, as parallel to it as possible, and collected every 50-100 micrometers, until the whole specimen has been processed in the cryostat. In this manner, a tridimensional representation of the entire surgical piece is obtained, in which the tumor and its relations with the surgical margin are observed.

RESULTS

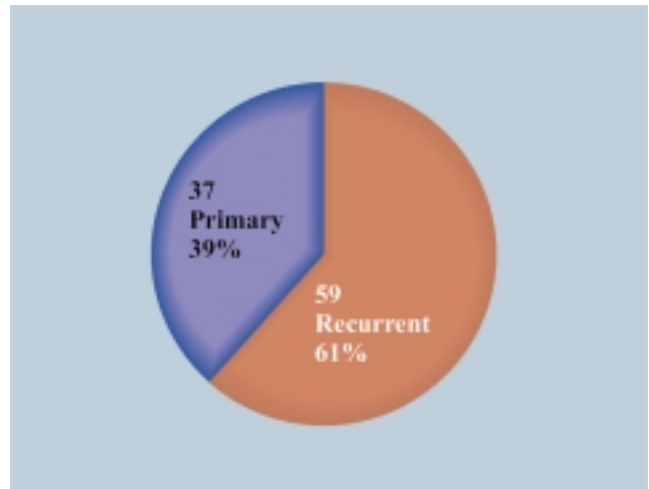
Of the 93 patients, 30 were males and 63 females, age range of 21-90 years (Graph 1). The mean age was 55 years. Most patients (36) came from the metropolitan region of Belo Horizonte, followed by the inland of Minas Gerais (31 patients). Sixteen patients were from Florianópolis, and three from the inland of Santa Catarina. Seven patients came from other States (DF, PE and MT).

Fifty-nine out of the 96 tumors (61.4%) were relapsed, and 25 (42.7%) of them were relapsed more than once (Graph 2). Graph 3 shows the distribution of the patients with more than one relapse. The mean time of progress of the tumors until micrographic surgery was 35.15 months, varying from the minimum of 2 and the maximum of 240 months. The largest tumor diameter found was 5cm, and the smallest was 0.3cm. The mean size of the 96 tumors was 1.5cm x 1.1cm.

GRAPH 1: Distribution of patients per age and sex



GRAPH 2: Distribution of primary and recurrent tumors. Out of 96 recurrent tumors operated, 25 had relapsed more than once (see graph 3)



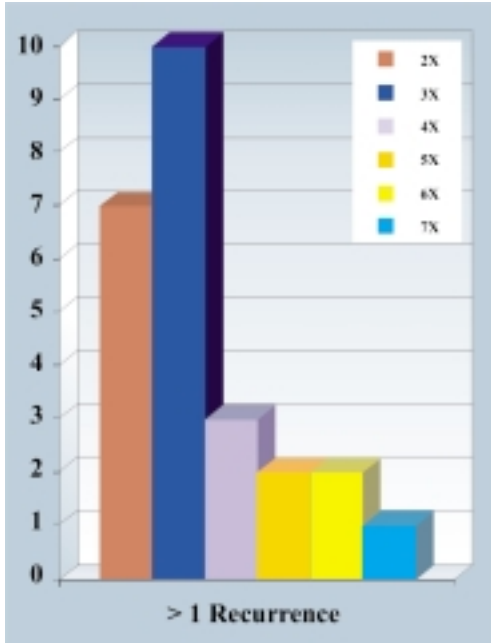
Approximately 79% of the cases were located in the nasal (45 – 46.8%), periocular (19 – 19.7%) and frontal (11 – 11.4%) areas, respectively. Other sites were the perioral (6 tumors), maxillary (4 tumors), mandibular (3 tumors), temporal and auricular (2 tumors each) regions and the nasomaxillary (3 cases) and temporomaxillary (1 case) transition regions (Graph 4).

Fifty-three percent of the tumors (51) were basal cell carcinomas of the sclerodermiform type, although 10 of them presented a mixed histological pattern (8 sclerodermiform/solid and 2 sclerodermiform/multicentric). In one case, no tumor was found. Classifying the tumors as infiltrative and expanding types, the first ones represented 60% versus 38.5% of the second type. In detail, 41 basal cell carcinomas of the sclerodermiform type, 27 solid, 7 superficial multicentric, 15 mixed-pattern (8 sclerodermiform/solid, 2 sclerodermiform/multicentric, 2 adenoid/solid, 2 solid/micronodular, 1 solid/multicentric), 2 squamous cell, 1 micronodular basal cell carcinoma, 1 microcystic adnexal carcinoma and 1 eccrine syringoepithelioma were treated (Chart 1).

In approximately 95% of times it was possible to perform total exeresis of the tumor in up to three stages. In detail, 43 tumors were extirpated with a single stage, 35 with two stages, 13 with three stages, 3 with four, and finally 2 tumors needed five stages to be completely extirpated (Graph 5).

Regarding the time needed to perform the entire procedure, from the beginning of exeresis to the end of reconstruction, 22 cases (22.9%) required a variable time span of one to three hours, 35 cases (36.4%) needed from four to five hours, 30 cases from

GRAPH 3: Number of patients with more than one recurrence



six to eight hours, 2 cases from ten to twelve hours, and 2 cases required eighteen hours. The mean time spent on these cases was 5 hours and 10 minutes. In 5 cases, due to problems inherent to the patient's clinical condition or even to their convenience, the total procedure time exceeded 24 hours. In three cases the entire procedure took two days, and in another two cases, five days (Chart 2).

Flaps were the most commonly used reconstruction type (53 cases), followed by grafts (21 cases), primary closure (15 cases), and a combination

GRAPH 4: Most common sites of tumors in approximate percentage

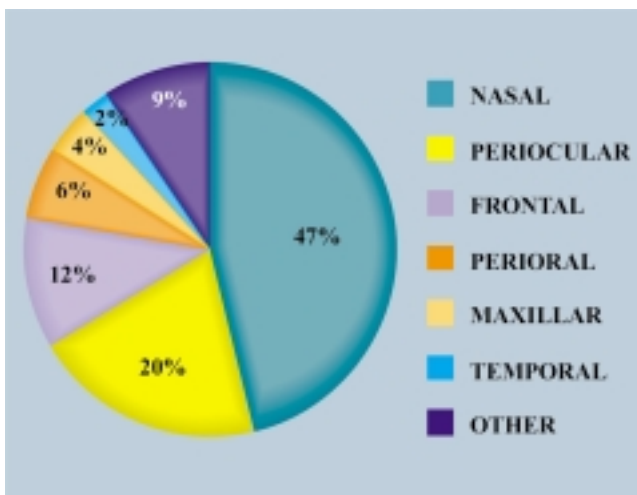


CHART 1: Most common histological types of tumors operated *

Histological type	Number of tumors
Sclerodermiform basal cell	41
Solid basal cell	27
Mixed basal cell	15
Superficial multicenter basal cell	7
Squamous cell carcinoma	2
Micronodular basal cell	1
Microcystic adnexal carcinoma	1
Eccrine syringoepithelioma óide	1
Total Tumors	95

* There was no tumor in one case

of flap and graft in four cases. In three cases, spontaneous healing was chosen (Graph 6).

In this series, 53 tumors needed more than one stage for their total exeresis. In most of them (34 cases – 64%) the residual tumor could be seen in the last stage.

During the ten-year study, 47% of the patients completed over six years of follow-up, and 59% over five years; 10% of the patients have been followed-up for less than one and a half year. Two patients were lost in follow-up. A single case of relapse was observed, in the sixth year of follow-up.

GRAPH 5: Number of surgical stages

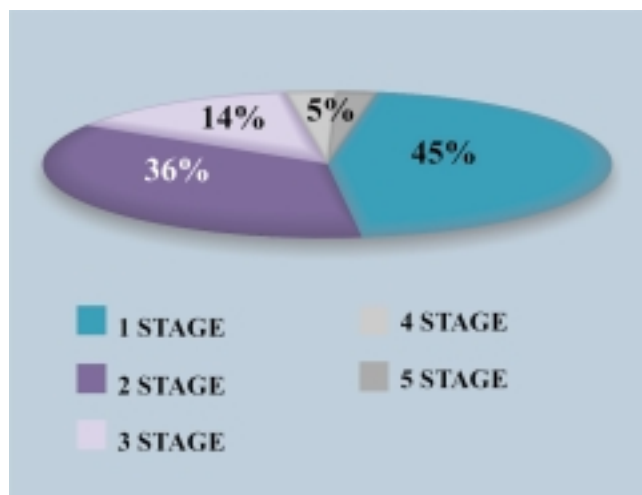


CHART 2: Mean surgical time*#

Mean time	Number of cases
1-3 Hours	22
4-5 Hours	35
6-8 Hours	30
10-12 Hours	2
18 Hours	2
2 days	3
5 days	2
Total tumors treated	96

* Total time from exeresis to end of surgical reconstruction

Mean surgical time: 5 hours and 10 minutes

DISCUSSION

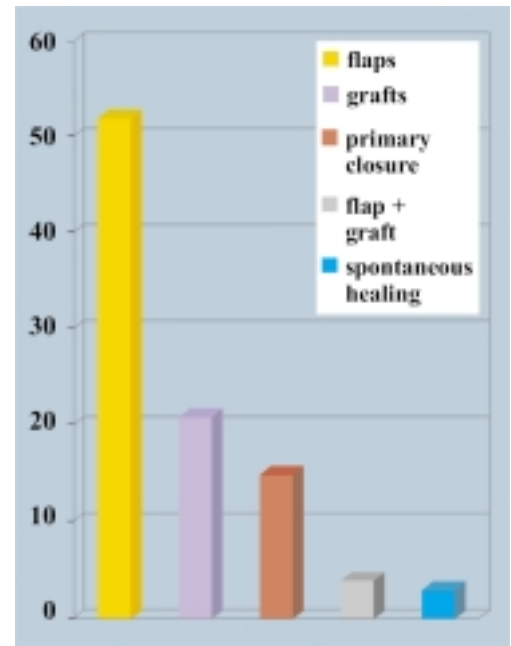
In this study, there were twice more women than men, although the literature reports the male gender as the most affected by basal cell carcinoma.^{9,10} We believe, however, that our finding is not in contradiction with the literature, since our sample does not consist of all the cases of basal cell carcinoma observed during a given period of time, but rather of cases referred to us for specific treatment, aiming at the highest therapeutic effectiveness; in other words, ours was not a random sample.

The mean age of the patients was 55 years, range of 21-90 years. Micrographic surgery is the most indicated procedure in younger patients, i. e., in those in which the tumors, in view of their biological characteristics (mainly the basal cell carcinomas) are likely to have a long time left to worsen the patients' quality of life, with several relapses or destruction of important anatomic structures, mainly of the face. The indication in elderly patients should however not be discarded, provided they are in good clinical condition and have a preserved quality of life.

Most of the patients reported here came from the capital cities and the inland of the States of Minas Gerais and Santa Catarina. This information reflects only the locations where the study was carried out and has no direct relationship whatsoever with the prevalence of skin tumors in either Brazil or those two states.

Approximately two thirds of the sample consisted of recurrent tumors, almost half of which relapsed more than once. The mean progression time was three years, and the mean tumor size was 1.5cm at the largest diameter, 79% of them located in the nasal, periocular and frontal regions. These data show that the operated tumors had a poor prognosis.

GRAPH 6: Reconstructions used in 96 tumors



In such cases, the indication for micrographic surgery is virtually mandatory; otherwise, it is hard to prevent new relapses. Multiple relapses in skin tumors are a reflex of the wrong concept that the therapy of such tumors, which are not an immediate threat to life, may be ineffective the first or even the second time, but that cure can always be achieved the next time.¹¹ If the indications to perform a micrographic surgery are always respected, the possibility of this phenomenon to occur becomes minimal, that is, micrographic surgery should not be seen as the last resource, but rather as a valid alternative, mainly when the tumor is not yet too complicated, since its efficiency can also fall with the number of relapses.¹²

Possibly, one reason for several relapses is lack of adequate surgical planning. It is not enough to diagnose the tumor in order to choose conventional surgery as a therapeutic weapon. Surgical planning based on the application of the concept of safety margin is rather imperfect, mainly when tumors with poorly visible margins are concerned.¹³ Although there is no close correlation between the clinical form and the histopathological aspect of a tumor,¹⁴ infiltrative tumors are generally associated with ill-limited margins. It would be more logical to make the surgical planning considering the histological picture and not only the clinical picture.¹¹ Thus, any tumor with an infiltrative histological pattern would, due to its greater tendency to present an unpredictable subclinical growth, be in principle a primordial indication for

micrographic surgery. The sample presented here was composed of 60% of tumors of the infiltrative type.

Micrographic surgery by the Munich method presents some differences over the classical Mohs surgery, among which a smaller mean number of stages.⁷ In the present series, exeresis was concluded with three stages in 95% of the cases, and the mean procedure time was 5 hours and 10 minutes. There are only few data in the literature regarding these parameters, but a survey carried out with the Mohs method revealed that only 56% of the surgeries had three stages, in average.¹⁵ Regardless of the micrographic surgery variant used, it is important to point out that, even though it is a technically more complex and longer procedure, it should not be left aside among the indications for solving a case of skin cancer. The high efficacy rate justifies the immediate adoption of such more complex measures in order to avoid poorer prognosis, spending more time to solve the problem and having to perform more surgeries.

In the last stage, the relation between tumor and surgical margins was observed in 60% of cases, which does not occur in the Mohs method. In theory, the relation tumor/margin in the Munich method should always be seen, even in the last stage. There are situations, however, that may hinder or even avoid visualization of the tumor in the last stage of the surgery. There is a technical limit that makes it impossible to warrant that there is or is not a residual tumor, even during a micrographic surgery. This can occur more frequently in conventional surgeries, when involved margins are shown. This occurred in one of the cases presented here, in whom no tumor was found in the micrographic surgery. The patient had been operated for a basal cell carcinoma near the lacrimal caruncle and the pathological examination had shown a tumor touching the surgical margin. Tridimensional micrographic surgery by the Munich method allowed ensuring there was no residual tumor. A more detailed discussion about this apparent paradox¹³ and the differences between the micrographic surgery methods are out of the scope of this article and can be consulted separately.^{6,7}

The complexity of a micrographic surgery is directly correlated to complexity of the tumor itself. The cases in which exeresis time exceeded eight hours were precisely those in which the indication for the procedure was too long postponed. Micrographic surgery not being indicated due to strictly economic factors or scarcity of qualified professionals to perform

the procedure is currently a paradigm in Brazil that has to be solved. While in the US, the popularization of this method, allied to its recognized efficacy, make patients request the procedure, 16 in Brazil, micrographic surgery is not even known by the entire medical category.^{*} A direct reflex of this fact is the inclusion of the method in the new Hierarchical Brazilian Classification of Medical Procedures (CBHPM – acronym in Portuguese) only with its better known variant (the Mohs micrographic surgery) and with a value that is not compatible with its complexity.

We observed a single case of relapse, in the sixth year of follow-up. We question, however, if it was actually a true relapse or if it was a new tumor arising. The patient had a tumor on the left lower eyelid and his entire complexion was rather photodamaged, and he had already had other tumors. The operated tumor was a mixed basal cell carcinoma (solid and superficial-multicentric). The patient only noted the nodular-ulcerated lesion near the scar, in the last year of follow-up, when the study was concluded. A true relapsed tumor is one appears up to the second year of follow-up.^{11,17} It is not always possible to distinguish between a new tumor and the relapse of an old one, especially due to the fact that mutations of protein P-57 have already been described in the photodamaged skin around skin tumors, which might explain the recurrence of new tumors in the same location.¹⁸⁻²²

CONCLUSION

The present sample was composed of cases with poor prognosis, both in view of the number of relapses and of the histological type of most of the tumors. Nevertheless, our study showed that the Munich method of micrographic surgery is comparable to the Mohs method as to efficacy, representing evidence that the concept of micrographic surgery should be expanded to surgical exeresis with microscopic margin control, rather than being restricted to the term Mohs micrographic surgery. □

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