CANCER of the external auditory canal is infrequent, with an incidence of approximately 1 per million population per year. Because of difficulties in evaluating the temporal bone preoperatively, there has been no generally used staging system of these tumors and therefore it is difficult to compare the results of different groups. In 1990, Arriaga et al from the University of Pittsburgh (Pa) proposed a staging system for squamous cell carcinoma (SCC) of the external auditory meatus, based on preoperative clinical examination and computed tomographic (CT) findings. Some authors have used this staging system, which was revised in 2000. There is currently no generally accepted staging system for non-SCC tumors, so we decided to use the Pittsburgh staging system also for patients with non-SCC.

Although surgery is nearly always performed, no consensus exists as to the type of procedure that should be chosen. Some authors advocate en bloc resection (eg, partial, subtotal, or total temporal bone resection)—the extent of which is determined by preoperative imaging techniques. Others do not believe that the extent of the tumor can be judged preoperatively and hence advocate that surgery should be guided by intraoperative findings in a piecemeal manner. The morbidity and mortality have been reported to be less when using this method. However, the extent of the recommended surgery varies, as does the use of adjuvant radiotherapy. The aim of this study was to evaluate the results of surgically treated cancer of the external auditory meatus at our department, which has a population basis of approximately 1 million people.

RESULTS

Twenty consecutive patients (10 women and 10 men) who had surgery for cancer...
PATIENTS AND METHODS

The records of all patients who had undergone surgery for cancer of the external auditory meatus from January 1, 1979, to July 1, 2000, at our department were retrospectively reviewed. Patients with carcinoma in situ were not included. Age, sex, symptoms, TNM status at the time of operation, histological diagnosis, and type and extent of surgery were recorded.

The operations were classified according to the definitions given by Austin et al: (1) Local canal resection—removal of all or part of the cartilaginous external canal and the skin of the external canal. Local canal resection may involve removal of a portion (but not all) of the bony canal or removal of the tympanic membrane. Local canal resection does not constitute an en bloc resection of the external canal. Local canal resection was occasionally combined with mastoidectomy, removal of incus and malleus, and/or parotidectomy, but in all local canal resections some of the osseous external auditory canal was left. (2) Partial temporal bone resection—en bloc removal of the entire external auditory canal (cartilaginous and bony part) through a mastoid approach; the facial nerve is identified and the temporal bone contents are removed lateral to the facial nerve (including the tympanic membrane with the malleus and incus). This operation was performed in 1 patient only.

Adjuvant therapy (postoperative irradiation, chemotherapy), sequelae, recidivism, and status at follow-up were also recorded. Only patients with at least 2 years of follow-up or recurrence were included in the survival data. The criteria of the revised Pittsburgh staging system were used with respect to T status and stage (for definitions, see Table 1). Even though the classification was originally devised for SCC, we have now classified all cancers according to the system to make our results more comparable to those of other groups. The results for SCC and non-SCC are reported separately.

of the external auditory canal were included. All cases were previously untreated primary cancers at inclusion. Initially, all patients had surgery. Two patients had previously been irradiated in the ear region, 1 patient because of a contralateral tonsillar cancer (6600 rad [66 Gy]; 11 years earlier) and 1 patient (6000 rad [60 Gy]; 28 years earlier) because of a hypophyseal adenoma. Six patients (30%) had a history of previous chronic external otitis. The median age at the time of diagnosis was 67 years (range, 31-87 years).

The most frequent presenting symptoms were otorrhea (9 patients), sensation of occlusion of the ear (8 patients), and pain (7 patients). Itching and hearing loss were present in 4 patients each. Only 1 patient had had bloody otorrhea. The duration of symptoms at the time of referral was stated in 16 patients and was 6 months (median) (25%-75% range, 2-7 months; total range, 1-72 months).

The histological diagnosis was SCC in 10 (50%) of the patients, basal cell carcinoma in 4 (20%), adenoid cystic carcinoma in 3 (15%), adenocarcinoma in 1 (5%), crumenous carcinoma in 1 (5%), and malignant fibrous histiocytoma in 1 (5%).

The patients were staged according to the Pittsburgh system (Table 1). Tomography of the temporal bone or CT scanning was performed in 12 patients. In 8 patients the extent of the tumor was judged from peroperative observations and histological examinations. One patient had lymph node metastases (N1) at the time of surgery. None had distant metastases.

One patient underwent partial temporal bone resection. The other patients had local canal resection. The extent of a resection was determined by the size and location of the tumor and in case of doubt, guided by frozen section microscopy. If the tumor was located in the bony meatus and there was no macroscopically bony involvement, bone was grinded away near the tumor. If necessary, further resection (eg, mastoidectomy or parotidectomy) outside the meatus was performed in a piecemeal manner (Table 2). There was no perioperative mortality.

Peroperatively, in 9 of 10 patients with non-SCC, the surgery was macroscopically thought to be complete. However, the final histopathological examination showed that only 3 patients had negative margins (no cancer at the margins of the resection). Among the 10 patients with SCC, surgery was thought to be complete in 5 and incomplete in 5. These observations were confirmed by histopathological examination. Hence, in 10 of the 20 patients, the surgery was complete (no cancer at the margins of resection at histopathological examination). Postoperative irradiation was given to all patients with incompletely resected tumors (5 non-SCC and 5 SCC). One patient (patient 15) was merely given irradiation treatment toward her neck metastases due to earlier radiotherapy. One of the patients with completely resected tumor received radiotherapy (patient 3). Sequelae
after the treatments were minor, and most frequently observed in the patients treated with irradiation. Chronic otorrhea was observed in 7 patients. The patient who had partial temporal bone resection had conductive hearing loss and trismus.

Two patients died of unrelated causes within 2 years after surgery and were excluded from the survival data. The median duration of follow-up was 47 months (mean [range], 60.2 [2-148] months). Twelve patients (67%) (6 with SCC and 6 with non-SCC) were cured. All 6 cases of recurrence developed in patients with incompletely resected tumors (patients 5, 8, 9, 10, 16, and 18) (Table 2). Recurrence was diagnosed 2 to 116 months (median [mean], 6 [24.5] months) after the operation. Only 1 of 13 patients with stage I or II disease developed recurrence (metastases in the lumbar spine), which occurred 10 years after the resection of an adenoid cystic carcinoma. Among the 4 patients with incomplete resection of a stage I or II cancer, only the patient with adenoid cystic carcinoma developed recurrence. Four of 10 patients with SCC and 2 of 8 patients with non-SCC developed recurrence. The stage-related cure rates are given in Table 3. At recurrence, 5 patients were treated with chemotherapy (patients 5, 9, 10, 16, and 18), 2 underwent further operation (neck dissection and resection in the aural region) (patients 5 and 8), and irradiation was given to the patient with lumbar metastases (patient 16).

The main finding of this study is that local canal resection, guided by the findings during surgery and aided by frozen section microscopy, is a reasonable approach for cancer with limited involvement of the external auditory canal (stages I and II). This procedure resulted in a cure rate of 92% without any significant morbidity. The only exception to cure was an adenoid cyst carcinoma, suggesting that patients with this histological diagnosis may warrant more aggressive treatment. In more advanced cancers (stages III and IV) the same approach resulted in incomplete resections and recurrence in every case despite postoperative radiotherapy. This indicates that a more dramatic surgical approach should be used in the more advanced stages.

The results are comparable to most others regarding age and sex.1-4,8,9 This study has a higher proportion of stage I and II cancers, 75%, compared with other studies using the same staging system (proportion of stage I and II ranging from 33%-54%).3,4,10

The lack of a generally accepted staging system makes it difficult to compare the results of different groups. Since this type of tumor is rare, it is difficult for a single center to obtain sufficient experience. This is probably one of the reasons why there are no randomized or controlled trials.
studies (11 per a search of MEDLINE). Therefore, a standardized staging (and treatment) system is particularly desirable for these tumors. In 1990, the Pittsburgh group proposed a staging system for SCCs of the external auditory meatus based on data from 39 patients of whom 33% had had a CT scan. Other authors have used this staging system. A minor revision was added in 2000. In the present retrospective study that includes cases from the pre-CT era we classified patients with cancer of the external auditory canal based on clinical and CT findings according to the Pittsburgh classification, although CT was performed in only 35% of the patients. We used this classification to make our data comparable to those of other groups since in this infrequent disease with a poor prognosis it is important that information from the usual small series can be subjected to, for example, meta-analysis. This is also the reason why we used the classification for the non-SCC of the external auditory canal that is even more infrequent than SCC. Since the stage-related survival rates for SCC and non-SCC in this study are similar, we find no contradictions to apply the Pittsburgh staging system also on non-SCC of the external auditory meatus. Due to the small numbers in the present study it was impossible to determine, by multivariate analysis, if the staging system has independent prognostic significance. Moody et al found a direct correlation between the staging system and the 2-year survival rate.

In a meta-analysis, based on 26 publications with information on a total of 144 patients, it was concluded that patients with carcinoma confined to the external auditory canal had similar survival rates, regardless of whether the operative procedure was mastoidectomy, lateral temporal bone resection (defined as “removal of the osseous and cartilaginous external auditory canal, incus and malleus”), or subtotal temporal bone resection (as lateral temporal bone resection with “additional removal of the otic capsule”); furthermore, the addition of radiotherapy to lateral temporal bone resection did not improve survival. If the disease extended into the middle ear, the results of the meta-analysis suggested that survival of patients treated with subtotal temporal bone resection was better than those treated with lateral temporal bone resection or mastoidectomy. These conclusions are in accordance with those of the present study as detailed below.

The mortality rates in the present study for the early stages (stage I, 9% and stage II, 0%) are comparable to or better than those reported by other groups. Our mortality rates for the more advanced stages (stages III and IV, 100%) are comparable to or worse than those of others. This is probably because none of our patients with advanced disease had tumor-free margins after surgery. As found by Pfreundner et al, patients who had their tumors resected with free margins had a 5-year survival rate of 100%, whereas the survival rate was only 66% in those where the tumor had not been completely removed. Our data support this: All patients with negative margins at surgery were cured. The overall recurrence rate among patients with positive margins at surgery was 67% (25% in stages I and II; and 100% in stages III and IV). Thus, our data suggest that for stage I and II tumors, there is no reason to use large resection of the temporal bone, as long as postoperative radiotherapy is given in case of incomplete resection. The only exception to this may be in the case of adenoid cyst carcinoma. In more advanced cancer, however, postoperative radiotherapy is not an alternative to complete resection.

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