A Guide to Cancer of the Ear

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Benign and malignant tumors of the ear comprise a most unusual and, fortunately, rare group of neoplasms. The incidence is estimated at between one in 5,000 and one in 15,000 otologic conditions.

The author has retrospectively reviewed 100 patients with cancer of the ear, all of whom underwent temporal bone resections between 1951 and 1967. Results were first reported in 1973, allowing for a five-year follow-up period.

The most common site of origin was the auditory canal, followed respectively by the external ear, middle ear and mastoid. (Table 1.) The majority of patients, 86 of 100, had squamous carcinomas. (Table 2.) Basal cell carcinoma was seen in eight patients, all with cancer of the external ear. Two patients had adenocarcinomas; one arose in the auditory canal from ceruminous glands, and the other in the middle ear. In addition, two patients had malignant melanoma, one patient had spindle cell sarcoma, one, embryonal rhabdomyosarcoma, and one, malignant xanthoma.

External Ear
Cancer of the external ear usually affects elderly white men in their 70's, who have been exposed to some external irritant, such as frostbite or the actinic rays of the sun, superimposed on keratosis. About two-thirds of these lesions are basal cell carcinomas that may form large rodent ulcerations of the pinna, mastoid process and temporal region. Most other lesions are squamous carcinomas or, rarely, melanomas.

Auditory Canal
Tumors of the auditory canal are more prevalent among women, with a median age at diagnosis of 55 years. (Table 3.) Approximately one-third of patients experience chronic otorrhea; the remainder report a past history of infection, dating back six months to a year. Squamous cell carcinoma of the auditory canal was found in two patients with chronic lymphatic leukemia.

Middle Ear and Mastoid
Unlike cancer of the auditory canal, middle ear and mastoid tumors have an equal sex distribution. (Table 3.) The median age is similar, however, at 56 years. These patients also report a history of chronic otorrhea or infection. Cholesteatomas were detected in four of the 18 patients with cancer of the middle ear and mastoid. (Table 1.) A report from the University of Chicago showed that eight cancers of the mastoid process developed in radium dial painters.
Diagnosis
Erosion of the external ear by cancer is usually obvious, and a friable, bleeding ulceration may be readily biopsied. However, a chronically infected auditory canal that fails to respond to antibiotics and local therapy may pose a more subtle problem.

In our experience, the estimated time from initial symptoms to diagnosis averages about six months. Hearing loss with otorrhea is the earliest symptom. Vertigo and facial paralysis indicate advanced disease. Bleeding also occurs late in the disease, and pain accompanies bone erosion. Some patients have external swelling due to invasion of the parotid gland and sternomastoid muscle.

Mastoid films and tomograms usually reveal the extent of bone destruction. Retrograde jugular venography demonstrates possible invasion of the lateral sinus and jugular bulb area. Carotid angiography using the subtraction technique in the venous phase is also helpful.

Temporal Bone Resection Technique (Figure.)
This procedure involves a combined intracranial-extracranial approach. One or two malleable spinal puncture needles are usually inserted in the lumbar spinal canal to withdraw 50-100 cc. of cerebrospinal fluid. If severe osteoarthritis of the spine precludes the use of the needle technique, Lasix may be administered to shrink the size of the brain.

The craniotomy flap may be based superiorly or inferiorly, the former being preferable. However, if there is extensive involvement of the external ear and auditory canal, necessitating removal of the external ear, a posterior based or bi-pedicle scalp flap is utilized. High-speed Stryker air drills facilitate bony dissection. Bleeding from the lateral sinus is frequent and controlled with vascular silk and oxidized cellulose.

Not infrequently, cancer has spread to the dura and/or lateral sinus by the time of surgery. Salvage is best obtained by first resecting the temporal bone and then managing dural involvement. Segments of dura may be replaced with fascia; the temporal muscle is mobilized and rotated down to cover the exposed dura. If, however, extensive excision and replacement are required, it is nec-

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### TABLE 1.
ANATOMICAL SITE OF ORIGIN – 100 PATIENTS

| Site                          | Number of Patients |
|-------------------------------|-------------------|
| External ear with mastoid involvement | 20                |
| Auditory canal                | 62                |
| Middle ear and mastoid*       | 18                |

*Four patients had cholesteatomas.
necessary to rotate the scalp flap to cover the defect.
Operative mortality has been reduced from 10 percent in 1954 to less than five percent in recent years.

Pre- and Postoperative Radiotherapy
Preoperative supervoltage radiotherapy has become an established policy, since involvement of the eustachian tube and base of the skull are frequent. The usual tumor dose is between 3500 and 5000 rads.
When margins are doubtful, additional postoperative radiotherapy is indicated. Postoperative radiotherapy should not be considered as treatment for cancerous involvement of the dura or lateral sinus. Unless excised at surgery, these patients fail completely.

Complications
- Hemorrhage. A median blood loss of 1500 cc. is usually the result of venous hemorrhage from the jugular vein or petrosal sinus. Hypotensive anesthesia has considerably reduced this problem.

### TABLE 2.
PRIMAR Y AND SECONDARY TUMORS OF THE EAR

| Primary Tumors |
|----------------|
| Epithelial     |
| - Squamous cell|
| - Adenocarcinoma|
| - Malignant melanoma|
| Mesenchymal    |
| - Sarcoma      |
| - Malignant xanthoma|
| - Malignant glomus tumor|

| Secondary Tumors |
|------------------|
| Direct extension from: |
| - Parotid      |
| - Nasopharynx  |
| - Temporomandibular joint |
| Distant metastases from: |
| - Kidney       |
| - Lung         |
| - Breast       |
| - Prostate     |
Postoperative infection. Radiation therapy has lead to a high incidence of postoperative infection at the grafted site. The most common organism is pseudomonas aeruginosa, which is adequately controlled by

| Site of Cancer                  | Median Age (years) | Number of Males | Number of Females |
|---------------------------------|--------------------|-----------------|-------------------|
| External ear                    | 70                 | 15              | 5                 |
| Auditory canal                  | 55                 | 22              | 40                |
| Middle ear and mastoid          | 56                 | 9               | 9                 |

Figure. Temporal bone resection.
parenteral sodium colistimethate (Coly-Mycin M) combined with Ampicillin and local acetic acid dressing. Frequently, portions of the skin graft are lost and must be replaced. Permanent temporal decompression is present, so that skin coverage is essential.

- Cerebral herniation. If skin coverage of the dura is not intact, herniation may occur. It is then necessary to reduce the hernia and cover it with both fascia and skin flap.

- Cerebrospinal fistula. A dural defect must be grafted with temporal fascia and skin. If a cerebrospinal leak persists for more than 10 days, the wound should be reopened and the tear repaired. Meningitis and cerebral abscess are hazardous, especially with gram-negative infections.

- Facial nerve paralysis. Lateral lid fusions are carried out to prevent corneal ulceration. Facial sling repairs of the affected side with face lift may be undertaken at a later date. Facial-hypoglossal anastomoses have been successfully performed.

- Deafness. Complete deafness may occur on the operated side.

- Vertigo. Vertigo lasting from five to 15 days postoperatively is common, but unsteadiness may remain for several months.

- Carotid artery thrombosis. This may develop from trauma or laceration of the internal carotid artery during surgery. One patient had a thrombosis two days postoperatively, which resulted in hemiplegia.

Causes of Failure
Cancer of the temporal bone may spread to the base of the skull, intracranially to the dura and brain, and down the eustachian tube to the nasopharynx. Despite a radical surgical procedure, almost 60 percent of cancers locally recur. Further surgery, cryosurgery and radiation therapy have all been used, but with discouraging results. Cervical metastases occurred in 10 patients, all of whom underwent neck dissection during or after temporal bone resection. Only two patients were salvaged.

End Results
Temporal bone resections were performed on 100 patients with cancer of the ear. The overall five-year survival rate was 27 percent. For the 86 patients with squamous carcinoma, the five-year survival rate was 25 percent.

References
1. Read before a joint meeting of the Society of Head and Neck Surgeons and the American Society for Head and Neck Surgery, Hot Springs, Virginia, April 30, 1973. Reprint: Lewis, J.S.: Temporal bone resection. Review of 100 cases. Arch. Otolaryngol. 101:23-25, 1975.
2. Beal, D.D.; Lindsay, J.R., and Ward, P.H.: Radiation-induced carcinoma of the mastoid. Arch. Otolaryngol. (Chicago) 81:9-16, 1965.
3. Parsons, H., and Lewis, J.S.: Subtotal resection of the temporal bone for cancer of the ear. Cancer 7:995-1001, 1954.
4. Conley, J.: Concepts in Head and Neck Surgery. New York: Grune and Stratton, Inc., 1970.

The Modern Physician
The modern physician is required to be a scientific sophisticate, and if this charge were not enough, he must at the same time be knowledgeable in human affairs. In short, he is expected to know himself.—Charles D. Aring. JAMA 229:786, 1974.