The Internal Auditory Canal

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Surgery of the internal auditory canal has today become a new horizon for the otologist. The knowledge of its anatomy and normal variation is therefore essential. The most important aspect is the variation in dimensions. The present study compares the dimensions of the canals on the two sides in the same individual. One method of study is by preparing casts of the internal auditory canals in cadaveric temporal bones. The other is a radiographic study by using tomograms in the frontal projection. The study reveals that although the diameters of the canals vary a great deal from person to person, the diameters of the canals of the two sides are usually fairly well-matched, especially in the vertical diameter.

Introduction

The internal auditory canal, also commonly referred to as the internal acoustic meatus, is strategically located in the petrous part of the temporal bone and is an important landmark in the posterior cranial fossa. It is of interest, both to the neurosurgeon and the otologist in view of its contents which are vital for the normal audio-equilibratory function and facial mobility faculties, which one can ill afford to lose.

Material and Methods

Fifty pairs of adult temporal bones, of various age groups were studied. All the bones were examined under an operating microscope to rule out any pathological dilatation of the internal auditory canals. The horizontal and the vertical diameters of the porus acusticus were measured under the operating microscope. The canal was cleared out thoroughly. Pieces of soldering wire were heated in a glass tube till they melted, and then the molten material was poured into the internal auditory canal (Fig. 1). (The molten material conforms to the shape of the canal perfectly and solidifies on cooling, in approximately 5-15 seconds). The casts were now properly labelled and then the temporal bones were broken open to extract the casts (Fig. 2). Care was taken to see that the cast itself was not damaged. The following measurements were taken on the cast.

Fig. 1. Solidified cast seen in situ.

Fig. 2. 5 pairs of casts seen in various aspects.
and 15 females. All of them were 30 normal individuals, 15 were males and 15 normal individuals were taken. Of the skull, in the frontal view of 30 normal individuals, 15 were males and 15 females. All of them were between the age of 20 and 50 years.

The following parameters of the canal were measured:

1. Shape
2. Vertical diameter
3. Length of anterior wall
4. Length of posterior wall
5. All the measurements were done in the frontal view tomograms,
6. to the nearest mm. and
7. corrected for 30% magnification factor, inherent in tomography.

**Mensuration**

The diameters of the porus acousticus were measured under an operating microscope, with the help of calipers before the material for making the cast was poured into the canal.

The vertical diameter was taken as the distance between the superior and inferior lips. The transverse diameter was measured from the posterior lip to the convexity where the anterior wall of the canal merged into the posteromedial wall of the petrous pyramid.

**Casts**

The various measurements recorded on each cast were as follows:

- **Vertical diameter from its floor to its roof.**

- **Horizontal diameter, from its anterior to posterior wall.**

- **Anterior wall, from lamina cribrosa, to the blunt anterior margin of porus.**

- **Roof from Lamina cribrosa, to the upper margin of porus.**

- **Posterior wall, from Lamina cribrosa to the most concave part of lip of posterior wall, medially.**

- **Floor, from Lamina cribrosa, to the inferior margin of porus.**

**Shape of the canal** was taken to be:

1. **Straight**—when variation of vertical or horizontal diameter was less than 1 mm, all along its length.
2. **Oval**—when the diameter at the two ends was smaller than the middle diameter by more than one mm.
3. **Narrow medially,** when the medial diameter was less than at any other portion of the canal, by more than one mm.
4. **Narrow laterally**—when the lateral diameter was less than at any other portion of the canal by more than one mm.
5. **Narrow in the middle**—when the middle diameter was less than at both ends of the canal by more than one mm.

- **The site of origin of the Crista falciformis** in relation to the mid-point of the vertical diameter at the Lamina cribrosa, was noted.

The **length of the Crista falciformis** was measured from its lateral end to its medial end which was indicated by a notch produced on the cast. The distance of the **Foramen singularare** from the posterior lip of the porus was measured. The depth of the notch produced by the **Bills' Bar** was noted.

**X-rays**

- **Shape**—classified with measurement taken just medial to Lamina cribrosa, medial end of posterior wall, and point of greatest variation between these two, if any.

1. **Straight**—when the difference in diameter was not more than 1 mm anywhere in the canal.
2. **Narrow medially**—when medial end was at least 1 mm smaller than at any other portion of the canal.
3. **Narrow laterally**—when lateral end was at least 1 mm smaller than at any other portion of the canal.
4. **Oval**—when diameter of middle portion was more than at either end by more than 1 mm.

- **Vertical diameter:** Perpendicular to long axis of canal. Maximum, minimum and average diameters were noted.

- **Length of posterior wall from Lamina cribrosa, to the deepest portion of concave lip of posterior wall, which normally appears distinct and regular in tomograms. In plain X-rays there may be some difficulty in distinguishing the posterior wall from the anterior wall.**

- **Length of anterior wall from Lamina cribrosa to most medial point of its inferior lip. Sometimes difficult to measure accurately because of the gradual blending of the anterior wall of the porus with the posteromedial aspect of the petrous pyramid.**

- **Crista falciformis**—
  - Ratio of visualization
  - Length
  - Position in relation to vertical diameter

**Results**

The results of the study are given in Tables I to VIII.

**Crista falciformis**

The site of origin of the Crista falciformis was in all bones, found to be at or above the mid-point of the vertical diameter of lateral end of the canal.

**Minimum length**.. 1 mm
**Maximum length**.. 6 mm
**Average length**.. 2.5 mm