

Retrieval of Ossicles by Cobbler's Cut

Kamal Singh, Aarti Rohilla

Department of Anatomy, Pt. B. D. Sharma PGIMS, Rohtak, Haryana, India

SUMMARY

As the ossicles are the smallest bones, they are well protected in temporals and pose difficulty in their retrieval. For the retrieval of the ossicles we require a method which does not disturb the normal anatomy of the tympanum along which intact bones can be taken out. Two hundred fifty temporal bones were dissected by Cobbler's cut technique to assess its efficacy and reasonability for the retrieval of the ossicles.

This technique quickly exposes the middle ear cavity and helps in easy retrieval of the the ossicles with preservation of the normal anatomy of the tympanic cavity. The complete sets of ossicles were successfully retrieved in about 86-89% of cases; whereas, in only 11-14% cases we could not be able to collect the complete set of ossicles. The Cobbler's cut technique proves to be a reasonably good method for the retrieval of intact ossicles.

Key Words: Cobbler – Ossicles

INTRODUCTION

The temporal is among the most complicated bones of the skull. It forms the transition between the cranial wall and the base. It is surrounded by many vital structures. The bony framework of the temporal bones contains multiple air spaces. The most complex of these spaces is the middle ear cavity (tympanum), which is shaped like a RBC standing on one end. The tympanum is housed with the tiny bones (Malleus, Incus, Stapes), which are best observed under magnification only. They

are often lost during skeletal recovery and seldom studied (Romanes, (1986).

Many stones are to be upturned by undergraduate and graduate students and ENT Surgeons for understanding the anatomy of the tympanum with its bones. For purposes of learning the anatomy of the ear diseases, the temporal bone serves as a potential research material.

Dissection of the middle ear is a complicated procedure, and only a few methods for dissecting the middle ear have been described in the textbooks of Anatomy (White et al., 2012) and ENT. The most common method described is the Piecemeal Removal of the bone to expose the middle ear. The rare availability of specimens all over the world for such difficult topics, even in the well-established departments of various colleges, still makes it an interesting topic for research. Moreover, artificial models of ossicles are used at the majority of the institutes for teaching purposes. The earlier adopted methods required sophisticated instruments like the electric autopsy saw (Laurenson, 1965). They were intricate, time-consuming, and do not preserve the anatomy of middle ear. Moreover, the retrieval of the complete set of ossicles is a most challenging task. The purpose of the study was to procure the complete set of intact ossicles in a minimum time with the least destruction of the middle ear cavity without any sophisticated instruments. It has proved useful in both undergraduate and graduate teachings.

MATERIALS AND METHODS

As a continuation of our previous work (Singh et al., 2014), a total of 250 intact temporal bones were retrieved during the medico-legal post-mortem examination of 125 unidentified cadavers for procurement of ossicles. The procedure involved the use of an ordinary hammer, a chisel,

Corresponding author: Dr. Kamal Singh. Department of Anatomy, Pt. B. D. Sharma PGIMS, Rohtak-124001, Haryana, India. Mobile: +91-9812531007.

E-mail: drkamalanatomy@gmail.com

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fine forceps and a needle as the instruments.

Procedure followed for dissection

After removing the calvaria, the temporals were firstly cleared off from all the soft tissues attached to the bone including the mastoid processes. Removal of the Intact Temporal Bone was done by opening the zygomatico-temporal suture firstly with the bone cutter, and then inserting the chisel through the parieto-temporal suture and pushing to the lateral side, thus relieving the temporal bone from the skull.

Dissection of the temporal bone by Cobbler's cut

Positioning of Temporal Bone: Upright position with squamous part as its base and the petrous part as apex.

Making of Cobbler's Cut: Between the squamous and petrous parts of the bone the chisel is placed vertically and hit gently by a hammer until there appears a crack (**Cobbler's Cut**) (Fig. 1A) in between the two parts. Then precise and gentle manual force is applied between these two portions so that it is separated in two unequal halves, i.e. the lateral and medial parts passing through the incudostapedial joint. The lateral part bears the tympanic membrane and two ossicles, i.e. malleus & incus; and the medial part with an oblique wall bearing the third middle ear bone i.e. stapes (Figs. 1B, 1C).

Retrieval of Ossicles: Now the Ossicles can be retrieved easily one by one. The Incus bone is taken out first by a disarticulation of the incudomalleal joint. The retrieval of the malleus requires cutting of the chorda tympani nerve crossing the medial side of the neck of the malleus, as well as the peeling its handle off from the tympanic membrane. The removal of stapes requires great caution, as it is placed in the oval window and can be easily be pushed into the internal ear if not taken care. It is elevated with the help of a needle from the oval window first from one side and then from other side of the foot plate of the stapes bone (Fig. 1C).

RESULTS AND DISCUSSION

Two hundred fifty temporal bones were dissected by using Cobbler's Cut method, and the efficacy and reasonability of the technique was assessed. Our findings suggest that by this method middle ear cavity exposure is quick, and the retrieval of ossicles (Malleus, Incus & Stapes) is easy with the preservation of the normal anatomy of the tympanum. It hardly took 20 to 25 minutes for retrieval of a complete set of intact ossicles from the temporals.

The complete sets of ossicles were successfully retrieved in about 86-89% of cases; whereas, in only 11-14% cases we could not be able to collect the complete set of ossicles. The bones were found to be missing or might be broken during manipulations and became un-recognisable. The missing of ossicles in their house might be due to the consequences of decay or infestation of fauna and flora on these unknown decomposed dead bodies.

Temporal bones provide an irreplaceable resource for study of the patho-physiology of disorders of hearing, balance, taste, and facial nerve function (Nadol, 1966). For otolaryngology resident education and training, the block method (BM) of harvesting human cadaveric temporal bones were used (George and De, 2010; Walvekar et al., 2010). The epitympanic diaphragm, Prussak's space and middle ear anatomy is having a very good visualization by Endoscopic cadaveric dissection, but it requires sophisticated instruments using a microscope (Marchioni et al., 2010).

For the retrieval of the ossicles we require a method which does not disturb the normal anatomy of tympanum along with which the intact bones can be taken out. The piece removal method is a blind method in which we are nibbling the bone in bits and pieces, and there are high chances of damages to the bones. Moreover, the retrieval of stapes is a challenging task, as it is a fragile bone,

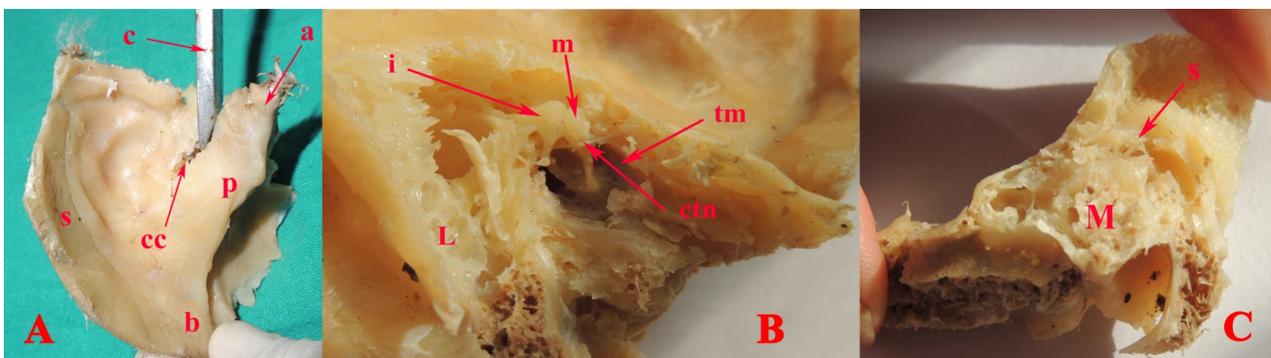


Fig 1. A) Showing chisel (c) in Cobbler's cut (cc) with squamous (s) and petrous (p) parts of the temporal bone with apex (a) and base (b). **B)** Malleus (m), incus (i), chorda tympani nerve (ctn) and tympanic membrane (tm) on the lateral (L) wall of middle ear cavity can be observed. **C)** The stapes bone (s) located on the medial (M) wall of middle ear cavity.

and, because of its placement over oval window, there is a high risk of slipping into the internal ear.

All these problems are overcome by Cobbler's Cut technique, in which the stapes can be easily removed with the help of a needle. Moreover, the anatomy of the tympanic cavity is also retained, which can be used as a potential source of teaching to the medical students and surgeons.

The term '**Cobbler's Cut**' was used on the basis of the authors' visit to a cobbler's shop for repairing shoes, who was using his chisel-like instrument with a wooden handle for cutting the extra part of shoe leather with the force of his palm on the wooden handle. So, the same method was applied on the temporal bone to retrieve out the ossicles from it.

Conclusion

This technique proves to be the easiest, least time-consuming and least destructive method of dissection as compared to the traditional methods of piecemeal removal of bone for exploring the middle ear cavity and retrieving of the ossicles. The internal structures and anatomical features of the middle ear cavity are well preserved and serve a cherry on the cake (Figs. 1B, 1C). The ossicles thus retrieved can be used for further research purposes (Singh et al., 2012; Singh et al., 2016).

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