

Cobbler's Cut: An Innovative Technique for Middle Ear Dissection

Kamal Singh^{1*}, Basant Lal Sirohiwal², Aarti Rohilla¹, Sudha Chhabra¹ and Gopal Gupta¹

¹Department of Anatomy, Pt. B. D. Sharma Post Graduate Institute of Medical Sciences, Rohtak-124001, Haryana, India

²Department of Forensic Medicine, Pt. B. D. Sharma Post Graduate Institute of Medical Sciences, Rohtak-124001, Haryana, India

Abstract

The Temporal bone is a valuable resource to study ear diseases and to teach anatomy to both undergraduate and postgraduate medical students. It is one of the most complicated bones of the skull. Methods of dissecting the middle ear have been described in the text books of Anatomy [1], Pathology and Forensic Medicine [2,3]. Those methods mainly involve the piece meal removal of the bone to expose the tympanic antrum and opening the middle ear cavity which requires a lot of time and expertise. The Present study was conducted on 200 Temporal Bones of 100 unidentified cadavers during Medico-legal Post-mortem Examination. We have devised a new and a very simple method to dissect the temporal bone. Dissection was carried out with the help of a single sharp edged chisel cut named as *Cobbler's Cut* that quickly exposes the middle ear cavity and helps in the easily procurement of the ear ossicles (Malleus, Incus & Stapes). It was found to be successful in 86% of the cases for the easy procurement of the complete set of ear ossicles bilaterally. The cadaveric ear ossicles could be of great help for the research purposes in Forensic Medicine and ENT.

Keywords: Middle Ear Cavity; Ossicles; Chisel; Cobbler

Introduction

The Temporal bone is a valuable piece of resource for the purpose of study of ear diseases and to teach its anatomy. It is one of the most complicated bones of the skull. Methods of dissecting the middle ear have been described in the text books of Anatomy [1], Pathology and Forensic Medicine [2,3]. The most commonly used method is the Piece Meal Removal of the bone or chipping/snipping off the bone into pieces. Specimens are rarely available for such difficult topics, even in the well-established departments of various colleges, all over the world. Many of the medical professionals have ever seen the real ossicles in their life time. The methods adopted earlier were intricate and time consuming. Moreover, they also required sophisticated instruments like Electric Autopsy Saw Laurensen [4]. Whereas, in the present technique within 20 minutes the ear ossicles are dissected and procured hence it is the *Fastest and Easiest* as compared to the other methods. However, it does not require any sophisticated and costly instruments and has been proved useful in both undergraduate and graduate teachings.

Materials and Methods

The Present study was conducted in the Department of Anatomy in collaboration with the Department of Forensic Medicine at Pt. B. D. Sharma PGIMS, Rohtak. The study was conducted on 200 intact Temporal Bones of 100 unidentified cadavers during Medico-legal Post-mortem Examination. An Ordinary light Hammer, Chisel, Fine Forceps and Probe or Needle were the only specialized equipment's required for the cobbler's cut and dissection (Figure 1). After removing the calvaria or with it, the temporal bone was first cleared off all the soft decomposed tissues attached to the bone simply by using gauge pieces. Then the intact temporal bone was removed from the remaining portion of the skull with the help of the chisel manually. The ear ossicles were removed and the same were dried in the shade at room temperature and preserved for further study.

Steps of Dissection

Removal of temporal bone from skull

Steps taken for removal of the intact temporal bone from the skull during post-mortem examination:-

1. The zygomatico-temporal suture is cut open firstly by chisel (Figure 2).
2. Then Chisel is penetrated through the parieto-temporal suture and pushed on the lateral side making the temporal bone relieved from the skull, intact with its all parts (Figure 3).

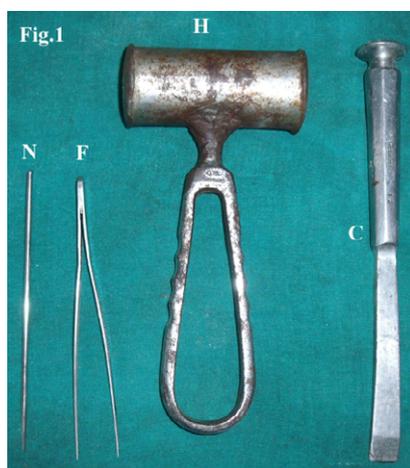


Figure 1: Showing Hammer (H), Chisel (C), Fine Forceps (F) and Probe or Needle (N).

***Corresponding author:** Kamal Singh, Department of Anatomy, Pt. B. D. Sharma PGIMS, Rohtak-124001, Haryana, India, Tel: +91-9812531007; E-mail: drkamalanatomy@gmail.com

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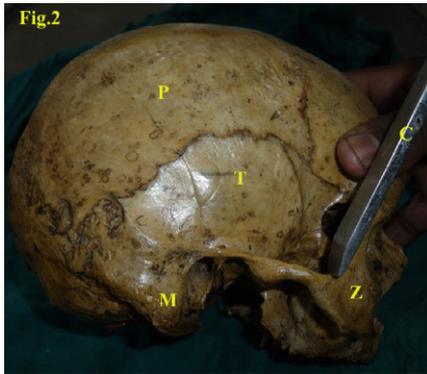


Figure 2: Showing Parietal (P), Temporal (T), Zygomatic Bones, and Chisel (C) on the Zygomatico-Temporal suture.

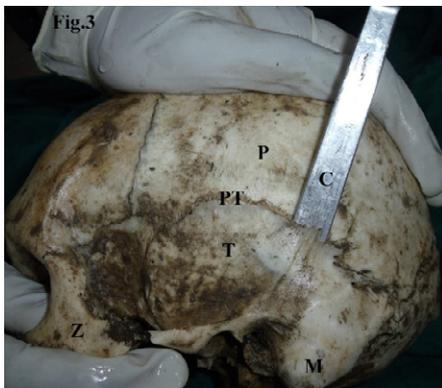


Figure 3: Showing Chisel (C) in the Parieto-Temporal (PT) suture of the skull.

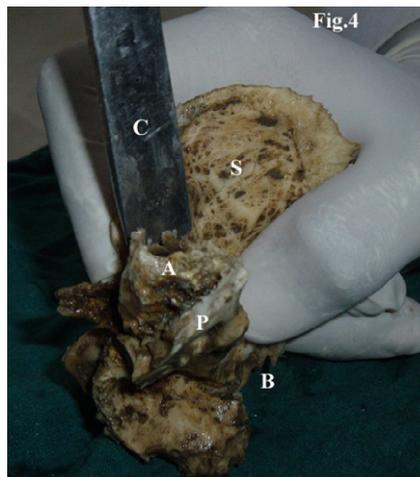


Figure 4: Showing the Temporal bone kept in an upright position making Base (B) of the Squamous (S) part and the Apex (A) of the Petrous (P) part pointing upwards.

Cobbler's Cut/Section of the temporal bone (Middle Ear Cavity)

1. The temporal bone is kept and hold in an upright position making squamous part as its base and the apex of the petrous part facing towards the sky (Figure 4).

2. The chisel is placed between the two portions i.e. squamous and petrous parts of the bone and hit vertically and gently by a hammer till the time there appears a Crack (*Cobbler's Cut*) in between the two parts of the temporal bone (Figures 5 and 6).
3. Then with precise and gentle manual force these two portions were easily separated in two unequal halves of the middle ear (Figure 7).
4. Thus temporal bone was easily divided into two parts, one with the tympanic membrane and two ossicles i.e. malleus and incus as the lateral part (Figure 8); and other with an oblique wall bearing third ossicle i.e. stapes as the medial part (Figure 9). Thus, we pass through a plane between the incudostapedial joint.
5. Now, from the exposed parts the ossicles can be easily picked up by fine forceps. The Incus bone is taken out first by a disarticulation of incudomalleal joint.
6. The chorda tympani nerve, branch from facial nerve also crosses through the middle ear running from posterior to anterior across the tympanic membrane on its medial surface, passing between malleus and incus bones and crosses the medial side

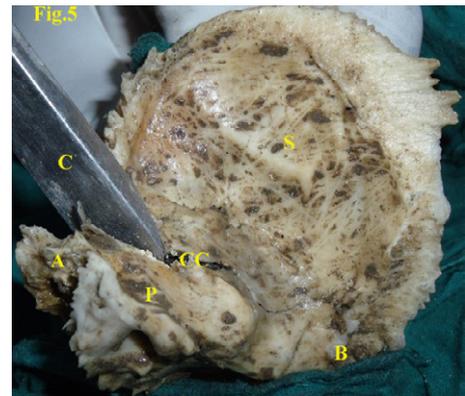


Figure 5: Showing Chisel (C) in the Crack i.e. *Cobbler's Cut* (CC) in between the two parts of the Temporal Bone i.e. Petrous (P) and Squamous (S).

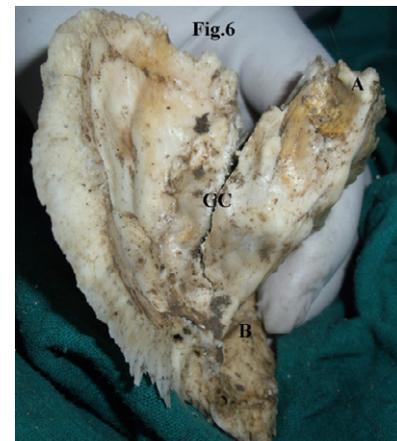


Figure 6: Showing Superior view of *Cobbler's Cut* (CC), extending from Apex (A) to Base (B).



Figure 7: Showing Two portions i.e. Medial (M) and Lateral (L) of the temporal Bone separated in two unequal halves.

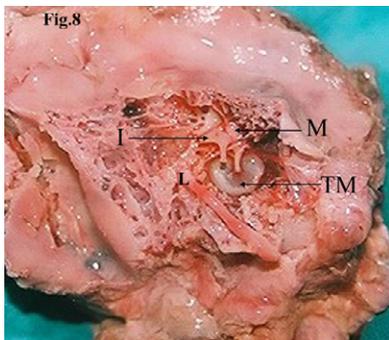


Figure 8: Showing Dissected specimen showing Malleus (M) and Incus (I) with intact Tympanic Membrane (TM) on the Lateral (L) wall of middle ear cavity.

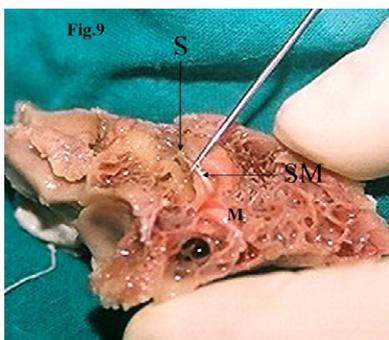


Figure 9: Showing Dissected specimen showing Stapes (S) with intact Stapedius Muscle (SM) on the Medial (M) wall of middle ear cavity.

of the neck of malleus (Figure 8). The nerve is cut through and then the Malleus bone is removed by peeling its handle off from the tympanic membrane.

7. Stapes bone is taken out with precaution as it is placed in the oval window and can easily be pushed into the internal ear if not taken care. With the help of a fine needle it can be elevated from the oval window first from one side and then from other side of the foot plate of stapes bone (Figure 9).

Results

The Cobbler's Cut method was performed in 200 Temporal Bones

to evaluate the efficacy and reasonability of the technique, received from both sides of 100 cadavers during post-mortem examination. By this method one can quickly expose the middle ear cavity and procure the ear ossicles (Malleus, Incus & Stapes). The complete sets of ossicles were successfully procured in 86% subjects (172 temporal bones). Whereas, in 14% subjects (28 temporal bones), we could not be able to collect the complete set of ossicles as some of the bones were found to be missing or might be broken into multiple small unrecognisable pieces during the procedure. So, only 12 Malleus, 20 Incus and 10 Stapes were retrieved out of these 28 temporal bones. 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.

Discussion and Conclusion

Human temporal bones provide an irreplaceable resource for study of the pathology and patho-physiology of disorders of hearing, balance, taste, and facial nerve function [5]. Temporal bone anatomy has traditionally been taught using cadaveric specimens [6] and the block method (BM) of harvesting human cadaveric temporal bones for otolaryngology resident education and training [7]. However, Endoscopic cadaveric dissection of the middle ear allows a very good visualization of the epitympanic diaphragm, Prussak's space and middle ear anatomy in general, that until now, have been performed using a microscope [8].

The term 'Cobbler's Cut' was used here on the basis of observations made during the authors visit to a cobbler's shop for repairing shoes who was using his chisel like instrument with 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 expose it taking out the ossicles from it and it was found to be easy and practical for the purpose of procurement of ossicles.

During dissection hall teaching of undergraduates, we anatomist have observed that by the time dissection of the ear is scheduled for the teaching of the undergraduates, the skull is almost completely disintegrated and is hardly of any use for the specific study of middle ear including ossicles. So, this method can be used as a routine procedure for the learning of complete temporal bone anatomy that will add in the enhancing of knowledge of not only under/post graduates in general but also the nascent ENT surgeons in particular who are always have a paucity of such specimens.

The *Cobbler's Cut* Method proves to be the easiest, less time consuming and least destructive method of dissection as compared to the traditional methods of piece meal removal of bone as chipping away the roof (tegmen tympani) or snipping off done for exploring the middle ear cavity and mastoid air cells [2,3]. Those methods were more time consuming and less productive, hence less advantageous. Moreover, the view of the internal structures and anatomical features of the middle ear cavity by this technique are more apparent (Figures 8 and 9) needs no further elaborations. Moreover, the ossicles so received can be used for potential further study for forensic aspects [9] as well as ENT prospective.

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