Chang WT and Tong MCF, J Otolaryng Head Neck Surg 2020, 6: 046
DOI: 10.24966/OHNS-010X/100046

HSOA Journal of Otolaryngology, Head & Neck Surgery

Methodology

Adopting Chopsticks Technique in Endoscopic Ear Surgery - An Alternative to Single-Handed Operations

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Background

Endoscopic Ear Surgery (EES) is gaining increased attention in the field of otology operations. Being highly successful in the surgical management of middle ear pathologies through various techniques with otological outcomes comparable to traditional methods. Even lateralskull base approaches for the management of acoustic neuromas can be performed safely with EES. Although EES is becoming more common, the single-handed operation continues tohinder the adoption of ESS. With the conventional training in microscopic surgery using both hands, single-handed ESS imposes a psychological and a training barrier. The narrow external auditory canal limits the number of instruments and the movement of the instruments and theendoscope. EES requires one hand to hold the endoscope, leaving only one hand available for theoperation. The challenge of a single-handed operation is especially obvious with bleeding, wherethere is a frequent need to switch and clean instruments resulting in a more cumbersome andpotentially longer operation time while the learning curve is being traversed.

In light of the benefits brought by ESS in otology, a technique mimicking the use of chopsticks provides a solution to single handed EES. Chopsticks are shaped as a pair of equal-length sticks, and have been used as kitchen and eating utensils in the Orient for over six centuries. Thistechnique was first described in laparoscopic surgery [1,2]. Similarly, in the field of otorhinolaryngology, the chopsticks technique with an endoscope and suction for functional endoscopic sinus surgery was also described to reduce time for suction and improve operative field visualization [3]. During tonsillectomy, the chopsticks technique allows simultaneous use of two instruments held in one hand [4]. During EES, the narrow ear canal severely limits the use of multiple instruments and requires frequent changeover of instruments. The chopsticks technique allows surgeons to hold and operate two instruments in one hand. It can conveniently perform various surgical operations in a timely fashion without the need of conversion between two instruments. The operation duration can be shortened as the two instruments can perform various surgical operations, leading to less swapping of instruments, easier control of bleeding and manipulated tissue.

Here we depict the chopsticks technique in EES to address the challenges faced by a single-handed operation during EES and to allow the operation to progress efficiently by switching between various types of instruments during EES.

Keywords: Chopstick technique; Endoscopic ear surgery; New surgical technique; Single hand operation

Chopsticks Technique Approach

Chopsticks are commonly used in Asian countries such as China, Japan and Korea. With globalization most people in the world are also familiar with the use of chopsticks. Holding instruments in one hand allows surgeons to perform various operations in a narrow canal. The technique also allows surgeons to easily change over from two instruments to one instrument, which can shorten the operation time. The way of holding the instrument is the same as holding chopsticks (Figure 1a). Two otologicsurgical instruments can form a pair of chopsticks. The first instrument rest comfortably on the webspace and the tip of the ring finger. The second instrument is the main instrument for movement andsingle instrument operations. It is pinched with the thumb, the index finger and the middle finger, as if holding a pencil. As the second instrument held by three fingers can move freely up and down, itcan easily switch to single instrument operation from double instruments operation without putting down the instrument (Figure1b).

Figure 1a: Double instruments of chopsticks technique.

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Citation: Chang WT, Tong MCF (2020) Adopting Chopsticks Technique in Endoscopic Ear Surgery - An Alternative to Single-handed Operations. J Otolaryng Head Neck Surg 6: 46.

Received: August 07, 2020; **Accepted:** September 08, 2020; **Published:** September 15, 2020

Figure 1b: Single instrument operation of chopsticks technique.

It reduces the operation time. By different movements, two sharpincrements, e.g. Rosen's needle dissector, can act as to cut, to dissect, to pinch, and to grab bydifferent movements. Example of the technique as showed below with a piece of rubber (Figures 2a, 2b,2c). The chopsticks technique is applicable to different instruments. For example, two dissectors (Figure 3a), a KTP LASER and a suction (Figure 3b), a burr and a suction (Figure 3c). If the instruments are too big to be accommodated into the external auditory canal, this technique of holding instruments can also apply to switch-over method in which we hold two instruments by one hand, one instrument is put outside the ear canal and one instrument inside (Figure 4).

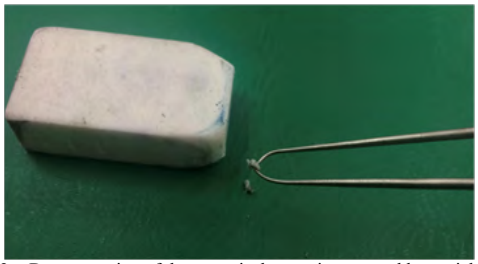

Figure 2a: Demonstration of three surgical operation on a rubber - picking up.

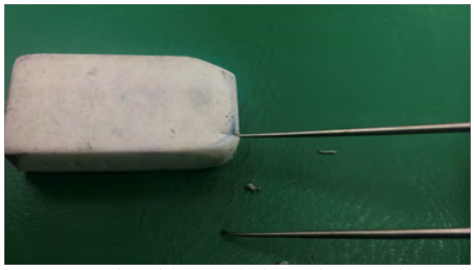

Figure 2b: Demonstration of three surgical operation on a rubber - Dissection.

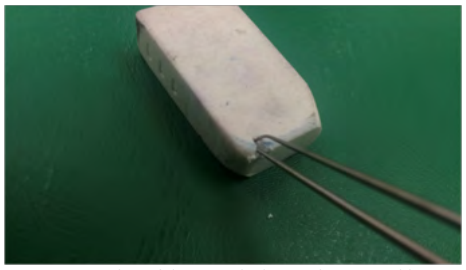

Figure 2c: Demonstration of three surgical operation on a rubber - Spreading.

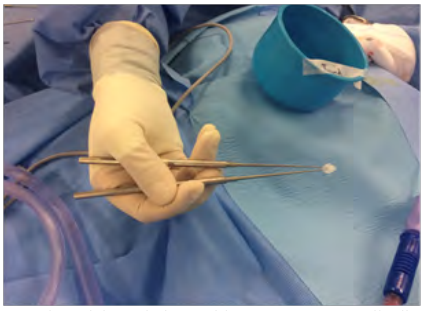

Figure 3a: Chopsticks technique with two Rossen's needle dissectors.

Figure 3b: Chopsticks technique with a KTP LASER and a suction.

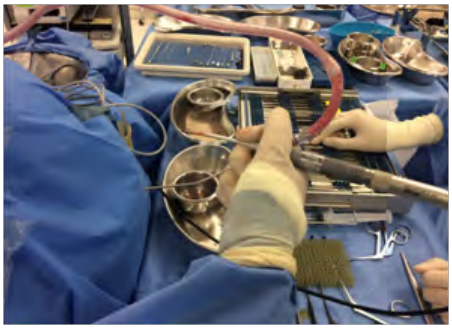

Figure 3c: Chopsticks technique with a burr and a suction.

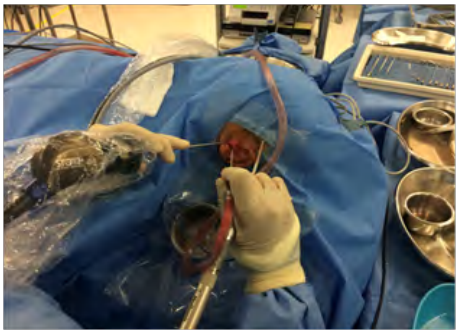

Figure 4: Switch over technique (2 instruments in one hand, only suction in).

Discussion

Endoscopic procedures are minimally invasive and effective, and becoming more popular inotologic surgeries. However, it depends on the experience of the surgeons. Some studies evaluated the learning curve of endoscopic tympanoplasty. It took approximately 50 operations to have asignificant progress of the surgeon and to master endoscopic tympanoplasty [5,6]. Surgeons who are well trained in microscopic otology surgery hesitate to perform endoscopicotologic procedures due to their concern with not being able to use both hands and the need forspecialized training and experience. A two-handed operation has its advantages. While one hand is holding the instrument, the other hand can be holding the suction for blood and irrigation fluidsuction, or holding the instrument for stabilization. During endoscopic operation, while one hand isoccupied by the endoscope, the other hand can only work on its own for the whole procedure.

The chopsticks technique is the solution to some of the limitations of single-handed surgery inendoscopic ear surgery. The endoscope is held in one hand while the other hand is holding two instruments as if holding chopsticks (Figure 5a). The index finger and middle finger can move the upper instrument up and down to pick up bones and tissue, and spread open the tissue and doing dissection. In tympanoplasty, it is challenging to hold and place the graft with one hand because thegraft can be easily stuck on the instrument and can be hard to detach. With the chopsticks technique,the graft can be held tightly and be placed in the exact location (Figure 5b), the gelfoam can be held and placed to middle ear without adhering to the tip of the needle (Figure 5c). These maneuvers can be performed by different instruments, with instruments being switched over when used. Withchopsticks, we can perform a variety of procedures with a single pair of instruments, that does not need swapping of instrument, which can potentially shorten EES.

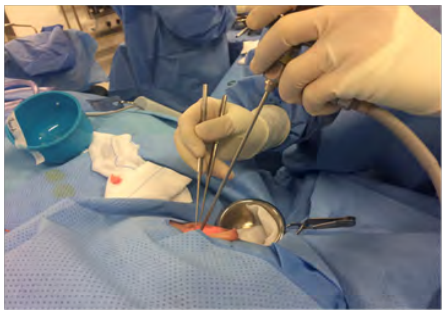

Figure 5a: Holding the endoscope in one hand and two instruments with chopsticks technique in the other hand.

Figure 5b: Holding the graft with chopsticks technique.

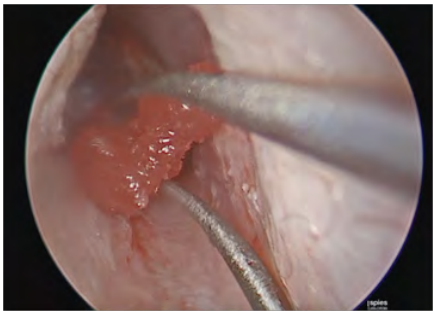

Figure 5c: Holding the Gelfoam with chopstick technique.

Although the Chopsticks technique is appealing to use, limitation of this techniques includes the finger coordination on holding two instruments on one hand. This technique requires good coordination with four fingers positioning instruments with precision and application of the right vector of force to handle two instruments seamlessly.

Another limitation is a distal target, for example, the treatment of an acoustic neuroma EES. Thetwo instruments in one hand will from a narrow angle, where the instruments are closer together limiting the range of movement of the instruments distally. Generally, from the experience of the author, objects in the middle ear and the mastoid can be easily reached by the chopsticks but not further distally. An extended application of the technique would be when operating on vascular tumors (2 instruments including a suction can be held); Use of LASER (2 instruments including one LASER fiber and one suction); use of drilling system (2 instruments including one burr and one suction). There were fore than 250 otology/neurotology cases operated with assistance of the chopstick techniques, no complications have been reported. To further improve the use of this technique there needs to be further designed instruments withaspecific tip, hand grip and learning tools.

Conclusion

The chopsticks technique is practical and feasible to overcome the challenges of single handedsurgery in EES. Further evaluation will be needed to understand the learning curve and range of application of this technique in EES.

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