

Technical Note

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Orthopedic Surgery Position Enhances Safety in Adults with Cervical Rigidity during Cochlear Implantation

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Abstract: Cochlear implantation is the therapy used for patients with severe to profound sensorineural hearing loss. For the success of the surgery, it is important that each surgical step is performed with meticulous precision, starting from the correct patient's position on the operating table. In elderly or obese patients, this can be difficult to achieve due to cervical rigidity. In these cases, the orthopedic position is an excellent choice to perform a mastoidectomy accurately, ensuring a safe procedure and avoiding unpleasant complications.

Keywords: sensorineural hearing loss; cochlear implantation; mastoidectomy; surgical step

1. Introduction

The number of hospitals specialized in cochlear implants has recently increased and so has the number of people who can benefit from such devices.

A cochlear implant is the standard treatment for patients with sensorineural hearing loss ranging from severe to profound one [1]. The surgical procedure for cochlear implantation aims to atraumatically insert the cochlear implant electrode array into the cochlea. Surgeons must access from the surface of the temporal bone to reach the round window (Figure 1B). In standard procedures, this access is created by removing portions of the mastoid bone through a mastoidectomy (Figure 1A) with antro-atticotomy and posterior tympanotomy [2,3].

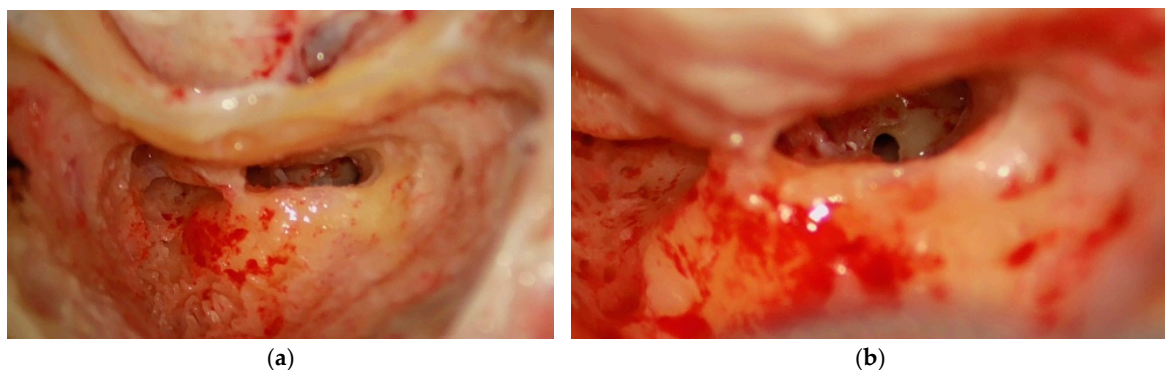


Figure 1. (a) Mastoidectomy; (b) The view of the round window.

Despite many advantages, different kinds of complications might occur and they must be studied very carefully.

First of all, the correct patient's position on the operating table is crucial for otology surgery as it can directly impact the access to the surgical site, the stability during the surgery procedure and a comfort post implantation for the patient. The essential prerequisite for performing a safe surgery

procedure avoiding surgical complications or fatal consequences is the position of the patient's head which must be rotated 180 degrees toward the opposite side of the surgeon position.

While this approach is suitable in the majority of cases, certain anatomical variations or medical conditions may require alternative positioning strategies to optimize surgical access and minimize risks.

The degree of head mobility varies widely among the population. It can be different from one patient to another and it can also change within the same person based on the moment of his/her life. For example, elderly or obese patients may be affected by neck stiffness.

In such cases, the issue can be overcome by rotating the operating table; however, sometimes, the correct view to perform posterior tympanotomy is still not achieved.

Our aim is to explain our strategy, inspired by orthopedic surgery⁴, in order to overcome this challenge. We guarantee that using this original position during cochlear implantations, an optimized surgical exposure to undertake an optimal posterior mastoidectomy and view of the round window, will be obtained even in patients with significant cervical rigidity. This new method guarantees a safe procedure for both patient and surgeon.

2. Materials and Methods

Our clinic has performed cochlear implantation surgeries on 63 adult patients, with remarkable emphasis on safety and anatomical precision since 2021. Among these patients, 10 people underwent surgery using orthopedic positioning techniques.

2.1. Description of the Clinical Techniques

Standard position during cochlear implantation is supine with the head rotated 180 degrees toward the opposite side of the surgeon position. In some patients, this correct position, may not be possible. Sometimes, for example in cases of severe cervical arthrosis or obese patients, the angle of head rotation may be limited to an angle range within 45 degrees. The rotation of the bed is a surgeon's expedient to obtain a good field to perform a mastoidectomy. On the whole, it increases the instability of the procedure and it exposes the patient to higher risk of complications.

The orthopedic position used in "hip replacement surgery" can be adopted to avoid this impediment (Figure 2B). We decided to proceed with this new method in all the cases where the patient's head rotation was less than 130 degrees (Figure 2A).

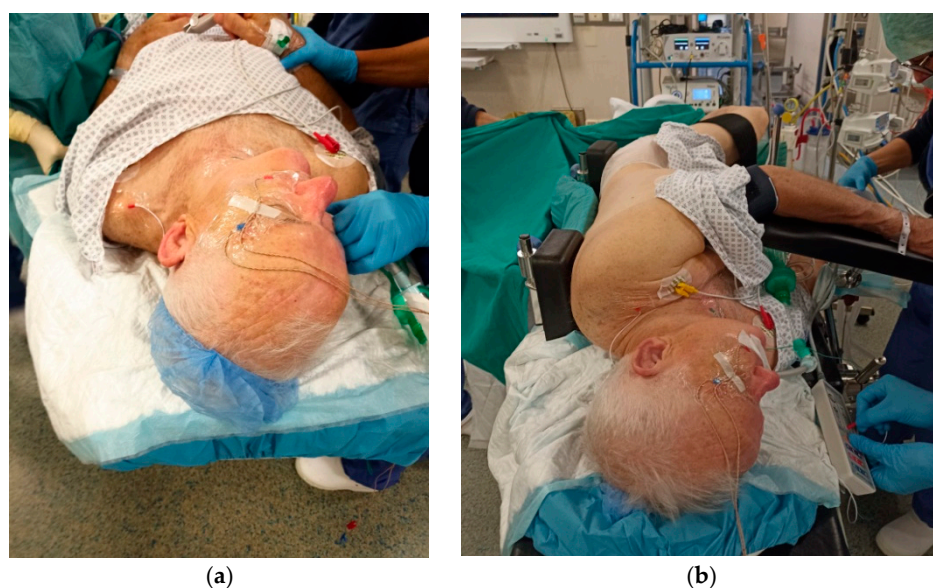


Figure 2. (a) Patient's head rotation less than 130°; (b) "orthopedic position".

The patient is operated on lateral decubitus, on the contralateral side to the surgical site. The stabilization is guaranteed by supports placed posteriorly, over the sacrum and another cranial at the

scapular level. If the patient's stability is not well obtained, an anterior fixator must also be used, over the pubic symphysis or over the ipsilateral anterior superior iliac spine (Figure 3A,B) [4]. The upper limb, on the same side of the surgery, is fixed anteriorly over a support perpendicular to the chest. The contralateral upper limb can be left alongside the body or extended like the ipsilateral limb to allow further access available to the anesthetist. In this position, cervical spine stiffness is no longer a problem, and furthermore, no rotation of the operating table is necessary.

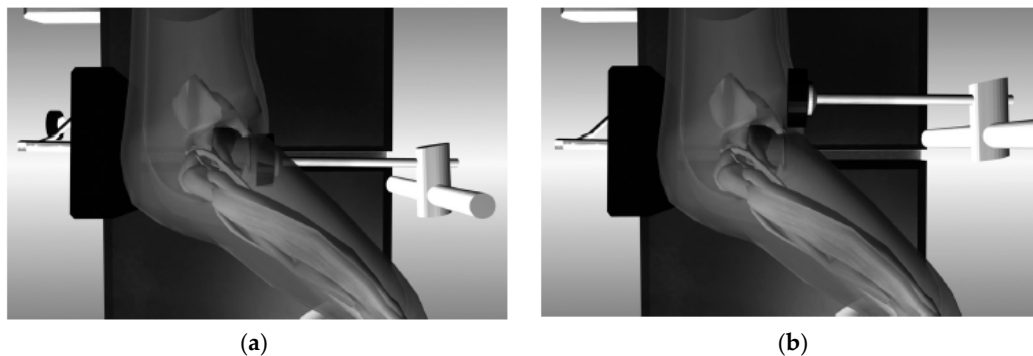


Figure 3. Patient's stability in "hip replacement surgery" [4]. (a) The anterior support is placed over the pubic symphysis or (b) over the anterior superior iliac spine.

3. Results

3.1. Safe Mastoidectomy Using "Hip Replacement Surgery"

Otologic surgery, especially cochlear implant surgery, must be performed with meticulous attention. The otologist is aware that any minimal angular variations from the standard position can make posterior tympanotomy difficult and, worst-case scenario, it can lead to not recognize the round window or any other anatomical structures, causing surgical complications or unsuccessful cochlear implant placement. Especially in elderly or obese patients, cervical spine stiffness can be a limitation for the correct surgery position.

In all cases, the patient position like a "hip replacement surgery" allows for maximum of 180 degrees head rotation toward the opposite side of the surgeon's position, enabling safe mastoidectomy and posterior tympanotomy that is performed without having to rotate the patient's head or the operating table.

4. Discussion

Authors should discuss the results and how they can be interpreted from the perspective of previous studies and of the working hypotheses. The findings and their implications should be discussed in the broadest context possible. Future research directions may also be highlighted.

5. Conclusions

In conclusion, the importance of precise patient positioning in cochlear implant surgery cannot be underestimated. The above described alternative technique, inspired by hip replacement surgery positioning, offers a recommended solution for cases in which the standard positioning proves to be inadequate due to cervical spine stiffness or other rotation issues. By ensuring optimal visualization and access to the surgical site, this approach increases safety and efficiency, benefitting both the surgeon and the patient.

This technique may contribute to improving outcomes in cochlear implant surgery, particularly in challenging cases.

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Conflicts of Interest: Declare conflicts of interest or state.

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