**Prospects of underwater technique in cochlear implantation for inner ear preservation**

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We have been performing cochlear implantation by using underwater technique since 2014. A small-diameter tube is placed in epitympanum, and the perfusate is introduced to submerge round window niche under a microscope. The advantages of submerged in the perfusate are that (1) bone powder and fine bleeding at the time of drilling are washed away so that the round window can be confirmed more clearly, and (2) it is intended to reduce physiological damage of cochlea by using the perfusate which has similar ion components to perilymph and also reduce physical damage by preventing unexpected air contamination into inner ear.

Regarding the former (1), it is usually carried out under a microscope, but it requires some practice due to the reflection and refraction of the water surface. an “underwater” endoscope seems to have an advantage in this point because it is much easier to obtain a better operative view. Contrary it is more difficult to handle an electrode by using an endoscope owing to the requirement of one-hand technique. Therefore, we have developed a holding device for cochlear implantation by using an underwater endoscope. Prototypes were made and verified with temporal bone models. Then an induction of the electrode was simplified.

As for the latter (2), saline has been used as the perfusate until 2016, but recently, we are using artificial cerebrospinal fluid (CSF). Artificial CSF contains glucose and electrolytes such as bicarbonate, calcium, and magnesium, and it has been reported that artificial CSF is superior in the protection of cranial nerve tissue in the field of brain surgery. We expect that artificial CSF perfusate similar to the perilymph is suitable to maintain the physiological environment of the inner ear and induce better outcomes.

The cases, surgical techniques, and related research results in our department are demonstrated in this presentation.