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Surgical Innovations in Vision Restoration: Leveraging Cochlear Implant Success for Subretinal Implant Placement*

The primary outcomes were patient safety and e ectiveness in the short term. In the ýrst phase of the multicenter

Keywords: Cochlear-implant expertise; Zygoma; Photoreceptor; Microphotodiode array; Photosensor array

Introduction

Signi cant progress has been achieved in the eld of neuroprosthetics in recent years, particularly in the creation of subretinal implants for blind patients. ese implants show considerable potential for recovering eyesight in those with retinal degenerative illnesses including retinitis pigmentosa. Extraocular surgical approaches have evolved as a promising way for e ectively implanting these devices, using lessons from the eld of cochlear implants. e lessons learnt from cochlear implants and how they opened the path for the development of extraocular surgical methods for subretinal implants are discussed in this article [1].

Cochlear implants restore hearing by replacing the peripheral acoustic receptor with an electronic device. us, a number of groups have been pursuing the possibility of restoring vision to blind patients by replacing the photoreceptive function with technical devices since the early 1990s. Most inherited retinal illnesses cause progressive degeneration of photoreceptors, o en resulting in blindness in the patient's middle age with no treatment available. e remaining visual pathway is still mostly functional.

Several types of electronic retinal implants are either commercially available or under development for the treatment of inherited retinal degenerations. All of these implants have a light-capture unit as well as an electrode array for stimulating retinal neurons, primarily those in the inner retina [2].

While other groups prefer an epiretinal approach with a camera on the outside, our aim was to restore vision by implanting a microelectronic light sensitive device in the subretinal space that can transform light a er ampli cation into electrical signals for stimulating bipolar cells. is method makes use of natural eye movement, which leads to more natural visual perception. However, the insertion approach looks to be more di cult because to the speci c placement in the subretinal area, which is not a standard ophthalmological surgical operation. Furthermore, the energy supply and parameter settings are communicated from a small external portable unit to an implant housing, which is similar to cochlear implants placed in the retroauricular area, via a receiver coil and electronic circuits. As a result, the retina implant extraocular surgical approach is heavily reliant on CI know-how but had to be designed from scratch because the power and signal supply cables had to be brought forward to the orbital area rather than the cochlea.

The success of cochlear implants

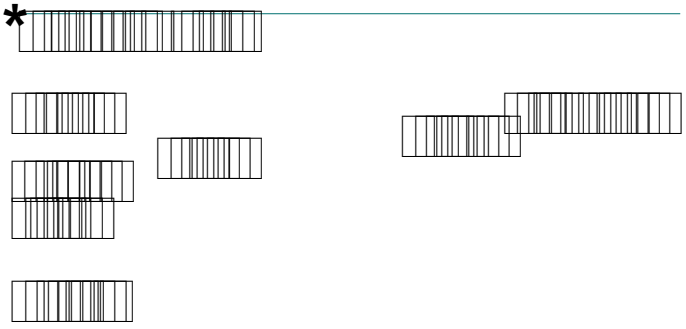
Cochlear implants, which stimulate the auditory nerve directly, have revolutionized the treatment of profound hearing loss. Internally, an electrode array is introduced into the cochlea, bypassing the damaged hair cells and providing electrical stimulation to the auditory nerve. Researchers have been inspired by the success of cochlear implants in recovering hearing ability to investigate similar approaches for vision restoration [3, 4].

The concept of subretinal implants

Subretinal implants attempt to restore vision in people with retinal degenerative disorders by directly stimulating the remaining functional retinal cells. Subretinal implants, unlike cochlear implants, are meant to communicate with the remaining healthy retinal cells, such as bipolar and ganglion cells, to convey visual information to the optic nerve. A microelectrode array is surgically implanted beneath the retina in these implants [5].

Adapting the cochlear implant approach

Extraocular surgery for subretinal implants is based on the lessons acquired from cochlear implants. Both types of implants necessitate precise and sensitive surgical procedures to provide the best possible results. Surgeons have used their cochlear implant surgery capabilities, such as precision manipulation of delicate structures, to undertake subretinal implant procedures.



Surgical techniques

Making a tiny incision in the sclera and producing a retinotomy for implant implantation is the extraocular surgical method. is approach improves access to the subretinal area, lowering the danger of injuring the eye's fragile tissues. e subretinal implant's electrode array is carefully introduced through the retinotomy and positioned beneath the retina to ensure optimal contact with the remaining functional retinal cells. A er the implant is in place, the incision is closed, and the