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Deep Canal Hearing Aids – A Concept, Not a Style

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In the late 1980s and early 1990s, a series of events occurred that brought fitting hearing aids more deeply into the ear canal to the radar screen, so to speak.

Much of this movement was activated by an article written in 1988 by Killion, Wilber, and Gudmundsen[1] in which they showed that making contact with the bony portion of the ear canal could reduce the occlusion effect significantly. This was something that Zwislocki had alluded to in a 1953 article.[2] This author experienced the same impact on the occlusion effect in the mid 1980s with the introduction of a very small stock canal hearing instrument that terminated deeply into the ear canal, and that were not vented.[3]

In 1988, a hearing aid dispenser in Las Vegas[4] encouraged this author to help him convince his manufacturer (Miracle-Ear) to fulfill his requests for ITC (in-the-canal) hearing aids that had extra long canals intended to make contact with the ear canal's bony structure. He was reporting excellent results in eliminating the occlusion effect, among other customer favourable reactions. After two years of experience in learning how to take ear impressions, how to build the instruments properly, and following customer interviews and data collection, the first systematic fitting rationale and procedure for deep canal ITC hearing aids was published.[5]

To the best of this author's knowledge, the first use of the term "peritympanic," in referring to deep fit hearing aids was used in 1990[6] in reporting on three cases fitted with modular/stock, soft canal instruments made by Bausch & Lomb. The intended definition was to convey an instrument that terminated in close proximity to the tympanic membrane.[7]

That deep canal hearing aids could be evaluated easily using probe microphone real ear measurements occurred in 1991,[8] and that a modified deep canal technology using minimal contact in the cartilaginous portion of the ear canal, but making contact more deeply in the bony canal produced greater high frequency gain at 4000 Hz, and five of eight subjects reported less occlusion effect and improved speech discrimination.[9]

These first published reports toward deep canal fittings were intended primarily to overcome the dreaded occlusion effect that hearing aid wearers were experiencing with hearing aids that terminated in the cartilaginous portion of the ear canal or to confirm that the deeper fit produced increased high-frequency response when measured via real ear probe microphone and/or through functional gain.

Deep Canal Hearing Aid Fittings as Part of a Manufacturer's

Product Offering

In 1991, this author was contacted by Philips Hearing Instruments of the Netherlands and was contracted to serve as a consultant to a new product they intended to introduce, the XP Peritympanic Hearing Instrument (Figure 1). This was a product designed specifically for deep canal fittings and engaged dispenser involvement in ways never before practiced. An ear impression was to be made of the entire ear canal, including an imprint of the tympanic membrane. Because of this, special training was required for the taking of ear impressions, along with proper tools and materials for this to occur. The final fitting rationale and test results were published in 1992.[10]

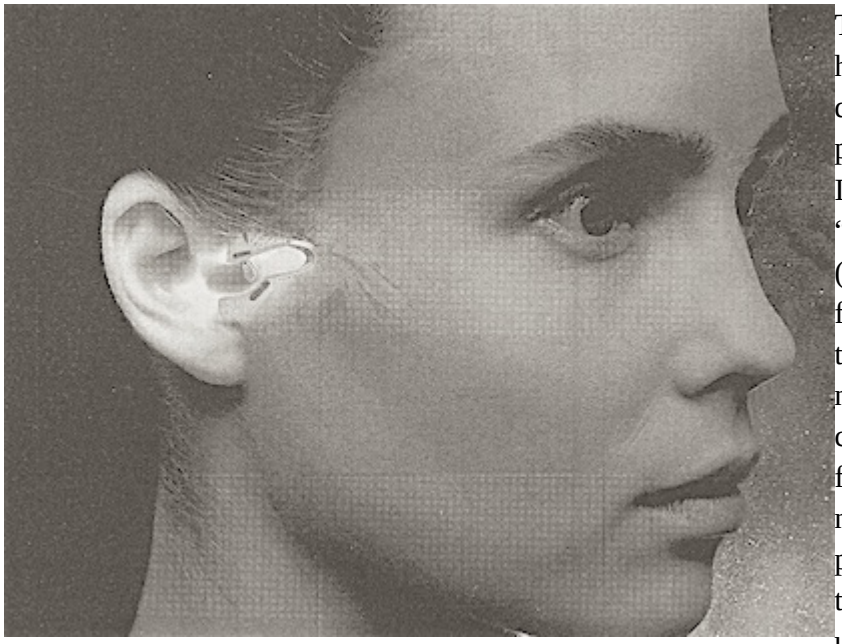

Figure 1. The Philips XP Peritympanic hearing instrument. Its positioning deep within the external auditory canal makes it essentially invisible and also offers significant acoustic benefits.

The Philips XP Peritympanic hearing instrument introduced a dramatic approach to fitting a product into the ear canal. Initial comments by "experienced" audiologists (primarily those who were not fitting hearing aids) was that this was dangerous and would never be acceptable – the ear canal was too "delicate" to be fooled around with and should not have a product placed as proposed. Forward to today and to the IIC hearing aid to understand that perhaps some people might be better off to hold their comments.

On the other hand, consumer interest was very high, and because of this, those dispensers who fit hearing aids requested for and received training programs which were conducted worldwide in order for dispensers to receive the necessary training. Major problems encountered ended up not related primarily to initial concerns, but to the size of components in order to get the instrument placed as deeply as it was intended, and at the same time to be concealed within the ear canal. Additionally, many dispensers were uncomfortable with taking ear impressions to the tympanic membrane, and

competitor manufacturers sought a way to capitalize on this interest by “shortening” the process, resulting in the CIC (completely-in-canal) style.

Deep Canal is Not a Hearing Aid Style

A “deep canal” instrument is not a style, but relates to where the instrument terminates within the ear canal. This is generally accepted as being past the second bend of the ear canal. There is no faceplate or microphone location requirement. Therefore, an instrument that has its shell or any of its components outside the ear canal, but fit into or beyond the second bend of the ear canal, is considered a deep fit. For example, a BTE (behind-the-ear), ITE (in-the-ear), ITC, CIC, IIC (invisible-in-canal), or Peritympanic instrument could be considered a deep fit, *depending on where the instrument terminated*, regardless of its faceplate or microphone positioning.

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