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Review

Cochlear implants in Belgium: Prevalence in paediatric and adult cochlear implantation

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ABSTRACT

Objectives: Belgium, and especially the northern region called Flanders, has been a centre of expertise in cochlear implants and early hearing screening for many years. Cochlear implants are reimbursed by the Belgian National Institute for Health and Disability (BNIHD) Insurance in adults and in children since October 1994. More than 20 years later, we would like to measure the prevalence of cochlear implants in adults and in children till now.
Materials and methods: Based on scientific research data on the prevalence of severe to profound hearing loss in adults and in children and on the number of implantations from the data of the BNIHD, we could measure the percentages of paediatric and adult CI users in comparing to the number of CI candidates.
Results: The degree of utilisation of cochlear implantation varies considerably between the paediatric and the adult population. On average, 78% of deaf children are receiving cochlear implants, but in adults only 6.6% of CI candidates are receiving one.
Conclusion: There are big differences in Belgium in utilisation of cochlear implants between adults and children. Because of the underutilisation of cochlear implants, especially in adults, we have to work on raising the general awareness of the benefits of cochlear implants, and its improvement in quality of life, based on cost-effectiveness data and on guidelines for good clinical practice.

1. Introduction

Belgium has been a centre of expertise on neonatal hearing screening and cochlear implants (CI) for many years. The Belgian National Institute for Health and Disability Insurance (NIHDI) reimburses cochlear implants in children and adults since October 1994 [1], initially only in patients with a bilateral total sensory deafness. In March 2006 [2], the reimbursement criteria were refined into:

- pure tone average thresholds of 85 dB HL or greater at 500, 1000 and 2000 Hz;
- latency of peak V in brainstem auditory evoked potentials at 90 dB HL or higher;
- little or no benefit from hearing aids.

In post-lingual deafened children, a phoneme score, using monosyllabic words at 70 dB, of less than 30% has to be noted with hearing aids, which indicates that they do not give sufficient benefit.

In 1998, as the first region in Europe and already two years before the recommendations of the Joint Committee on Infant Hearing [3] were published, the Flemish public child care organization 'Kind en Gezin' (Child and Family) started a Universal Neonatal Hearing Screening Programme in Flanders [4]. Approximately 99% of all newborns are screened every year. By integrating screening, diagnosis, early intervention and rehabilitation in one programme (via a well-defined cooperation protocol between different caregivers and health services), it became a unique project [5]. But the French speaking part of Belgium (Wallonia) started only 10 years later (2009) with neonatal hearing screening of newborns in hospitals, but not for those who are born at home [6]. This results in the fact that more and also younger children are implanted in Flanders in comparing to Wallonia.

A Belgian pilot project on bilateral implantation was already initiated in 2003 in which 42 children under 12 years have received a contralateral CI. The children had to meet several criteria in order

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to be considered for this project: presence of a full insertion of the electrode array, having showed good cooperation with the rehabilitation and good audiometric results with their first CI and a normal anatomy of the second ear (cochlea and cochlear nerve). The outcomes of this project [7,8] justified a standard reimbursement of the second implant in children younger than 12 years, which has officially been effective since February 2010 [9].

2. Prevalence of hearing loss

In March 2015, the World Health Organization [10] reported that about 5% of the world's population has a disabling hearing loss (328 million adults and 32 million children). Approximately one third of people over 65 years of age are affected by disabling hearing loss. Of the total group of hearing-impaired people, about 10% have a severe to profound hearing loss [11].

The estimated prevalence of permanent bilateral childhood hearing impairment (> 40 dB HL) varies from 1 to 1.2 per 1000 for newborns and increases to 1.62–1.68 per 1000 at the age of 16 [12,13]. Of all newborns who have bilateral hearing loss, 25–30% have a profound loss (> 90 dB HL) and 20–25% a severe loss (71–90 dB HL) [4,14], which means 45% are CI candidates based on the current Belgian guidelines.

Concerning the prevalence of permanent adult hearing loss, a national survey from Davis in the UK [12] is still the best and most detailed study. His data show that 0.4% of the population have a hearing loss exceeding 85 dB HL and 0.3% a hearing loss exceeding 95 dB HL.

3. Impact of hearing loss on quality of life and health

Hearing loss in older adults is highly prevalent and badly undertreated [15]. Current research suggests that loss of hearing has much wider, far-reaching health and social consequences. Impairment of this important sense reduces the ability to hear, listen, comprehend and communicate [16], leading to social isolation, loss of independence and depression [17]. The social isolation that often results from hearing loss may itself lead to mental ill health.

Hearing loss more than doubles the risk of depression in older people [18], and there is evidence that hearing loss is associated with cognitive decline [19]. People with mild hearing loss have nearly twice the chance of going on to develop dementia as do people with normal hearing. The risk increases threefold for those with moderate hearing loss and fivefold for those with severe hearing loss [20].

There is also significant co-occurrence of hearing loss with other long-term conditions including cardiovascular disease, diabetes, dizziness, and chronic rheumatism, as they are all experienced widely among older people [21].

4. Potential CI candidates

Looking at the current selection criteria for cochlear implantation in Belgium, nearly every child and adult with a bilateral profound hearing loss (> 85–90 dB HL), a functioning auditory nerve, and good health is a potential CI candidate. They can be born deaf or have a sudden or progressively acquired hearing loss, as depicted in Fig. 1 in which all possible CI candidates are placed together in a reservoir. Only a certain percentage of candidates will be implanted, depending on the local reimbursement system, selection criteria (e.g. good physical condition and motivation), and awareness of the possibilities and benefits of cochlear implants.

The criteria mentioned above apply for 'conventional' cochlear implants. However, presently there are more and more people receiving cochlear implants for high frequency hearing loss where their low-frequency acoustic hearing is preserved. This type of cochlear implant is often referred to as a hybrid cochlear implant or as combined electric and acoustic stimulation (EAS) [22]. Unilateral or single-sided deafness (SSD) is another promising application for cochlear implants. Implanting these patients has the potential to enhance their ability to communicate, to suppress their tinnitus, and to increase their quality of life [23].

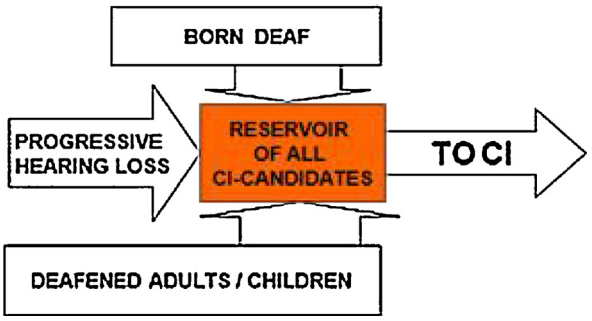

Fig. 1. Flow diagram of potential CI candidates.

4.1. Paediatric CI candidates in Belgium

The number of newborns in Belgium is presently about 125,000 per year, of which 1–1.2‰ (i.e., 125–150 children) have a bilateral hearing loss [4,5]. Knowing that the prevalence of childhood bilateral hearing loss increases till 1.68 per 1000 at age 16, it means that we have yearly approximately 200 children with a bilateral hearing loss.

Of these children, it is assumed that approximately 45% (i.e. 90 children) have a severe to profound bilateral hearing loss [4,13], qualifying them for implantation. In comparing to this total number (90) of paediatric CI candidates, the NIHDI shows a yearly number of 70 paediatric cochlear implants, which means that 78% of the paediatric CI candidates receive a CI. In Flanders' region, publications show even 90–94% [24], which means that percentages are below 78% in the Brussels and Wallonia region. This average of nearly 80% is comparable to the situation in the neighbouring country the Netherlands [25] and higher than the 50% rate in the US [26].

4.2. Adult CI candidates in Belgium

As mentioned earlier, the study of Davis (1995) on the incidence of hearing loss in the adult UK population is still the best and most detailed available. He reported that in the age group 18–80 years old, 0.4% had a hearing loss > 85 dB HL and 0.3% had a profound hearing loss above 95 dB HL. So using the Davis' data we can estimate the total number of CI candidates within any adult population in Western Europe.

With a population of nearly 9 million over 18 years of age in Belgium and a reimbursement threshold of > 85 dB HL (=0.4%), there are 36,000 adult CI candidates in Belgium. Till today, only 2400 of the 36,000 CI candidates, i.e. 6.6% of the adults who might have benefited from an implant, have received one. According to these data, there has been a steady annual growth in the number of adults receiving implants since the reimbursement of CIs in Belgium between 1994 and 2002. Since then, however, there has been no further growth. In Fig. 2, you can see an overview since 1994 of the number of cochlear implants for which there was an approval from the NIHDI.

Although the rate of underutilization is comparable to that seen in the USA by Sorkin (6%) and the Netherlands (8.4%) by De Raeve and van Hardeveld, it represents only half of the number of implants in Germany and Austria [25]. The percentage of CI users in these