

# AN ANALYSIS OF DISSERTATIONS AND THESES ON COCHLEAR IMPLANT IN THE PERIOD OF 2000 TO 2010

## *Uma análise das dissertações e teses sobre implante coclear no período de 2000 a 2010*

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### ABSTRACT

**Purpose:** to meet national research on cochlear implant (CI) and is aimed at verifying how the object of study has been discussed in the areas of knowledge, highlighting the studies related to education, it is necessary to understand the difficulties that the person CI faces to learn and communicate. **Method:** of bibliographical study of quantitative and qualitative character developed from the national scientific and academic production published on the CAPES Theses Database on-line after the regulations and directions of the Ministry of Health on CI in Brazil. We tried to research published between 2000 and 2010, analyzing them in terms of year of publication, area of knowledge that was developed and the subject studied, obtaining an overview of national research on CI. **Results:** were organized into graphs and charts reveals that the topic CI has been the focus of research in different areas of knowledge, there is a concentration of studies in the area of Health and little researches related to Education. **Conclusion:** there is a need for greater investment in this area contributing to the education, socialization and inclusion of these people.

**KEYWORDS:** Deafness; Cochlear Implantation; Academic Dissertations

### ■ INTRODUCTION

Cochlear Implant (CI) is an auditory prosthesis inserted in the internal ear of people who have hearing impairment. The CI performs the role of sensorial cells by electrically stimulating the ganglion cells which remained in the cochlear auditory nerve and therefore improving the auditory performance<sup>1</sup>.

The CI is composed by an internal component (receptor-stimulator, magnet and internal aerial, electrode beam) and an external component (transmitter aerial, cables, microphone, speaking processor). The external component captures the sound and sends it to the speaking processor,

which selects and codifies the sound in electrical signals. The electrical signals are sent through the cable to the external aerial, which then transmits these signals to the internal aerial. The receptor-transmitter stimulates the electrodes which are introduced in the cochlea and the electrodes stimulate the nervous fibers, sending messages to the brain, which receives the signals, interprets them, thus supplying the individual with auditory feeling<sup>2</sup>.

The CI tries to ease the impact of the hearing impairment on the auditory development and oral language<sup>3</sup>.

The minimal age to receive a CI ranges from 12 to 18 months old, since it is the average time to diagnose and confirm the degree and type of the auditory loss, although nowadays there are surgeries which are carried out on children younger than the ones aforementioned.

The CI is indicated to people deep neurosensory auditory loss, i.e., a loss above 60 dB; as well as people who do not benefit from the use of a personal sound amplification device and the ones who had auditory training<sup>2</sup>.

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The indication of CI is polemic and constantly a reason of discussion, therefore, as suggested by Hyppolito e Bento(2012),<sup>4</sup> this is a decision that needs to be discussed with the team in charge of the cochlear implant program, focusing a precocious intervention and auditory benefits, which justifies the current practice of carrying out surgeries on children even before the minimal age aforementioned.

Authors highlight the fact that the CI benefits, specially, people who have hearing loss after language, or with short time impairment, i.e., the person who has a CI right after diagnosis of hearing loss<sup>2-5</sup>.

The improvement in the hearing abilities of responding to an electrical stimulus depends on the number of preserved ganglion cells, i.e., the shorter the time of hearing impairment, the bigger the number of cells, and therefore, better auditory ability<sup>6</sup>.

Authors<sup>7</sup> (2007, p. 254) also point out the importance of an early diagnosis of hearing impairment and the procedure of CI in a short time, so that:

Children younger than three years old who received the implant, after four or five years of using the CI, reached the best performance in the productions of speech and its intelligibility. This is due to the plasticity of the auditory way. The plasticity is the ability of the neuron connections to be modified through the growth of synapses, producing adequate stimuli.

However, other authors<sup>3</sup> point out that the CI is not indicated to all the people who have a hearing impairment and, therefore, it is necessary to consider the criteria to indicate its implantation.

In 1999 the Health Ministry<sup>8</sup> established:

The Cochlear implant in children below 18 years of age who have pre and post language hearing impairment must meet the following criteria of indication for the implantation:

- a) experience with auditory prosthesis for, at least, three months;
- b) inability to recognize words in a closed group;
- c) adequate and motivated family for the use of cochlear implant;
- d) adequate rehabilitation facilities in the origin city.

(BRAZIL, 1999, p.2).

Besides the criteria for the indication of the implant, the Health Ministry included the prosthesis for multichannel cochlear implant in the table of orthosis, prosthesis and special material – OPM,

i.e., the cochlear implant started to be supplied for free by the unified national health system, when performed in previously certified clinics/centers.

According to the Health Ministry<sup>8</sup> the clinics/centers which perform the surgery for the cochlear implant must carry out:

- phonoaudiological evaluation of oral, written and phono-articulatory languages;
- individual and group phonoaudiological therapy;
- test of personal sound amplification device.
- test of oro-facial reading and speech perception;
- VRA – visual reinforcement audiometry, imitancimetry, tonal threshold audiometry,
- insertion progress, BERA and test of otoacoustic emission;
- logaudiometry and auditory rehabilitation, vestibular tests.

Some authors<sup>7</sup> point out that: “determining if the patient is eligible to CI is a task that needs a multiprofessional team, considering the individual in all aspects: medical, audiological, psychological, emotional, social and cultural”.

In order to perform in cochlear implant, the Health Ministry indicates the certified clinics/centers which offer the services of:

(...)otorhinolaryngology, neurology, clinical and pediatric genetics, phonoaudiologists, clinical audiology including adaptation to personal sound amplification device and rehabilitation programs – phonoaudiological therapies which are distinct and adequate to different ages and needs of the patients, pedagogical support in school orientation and support in educational audiology; social service, nutrition and nursing (...)

(BRAZIL, 1999, p.5)

The clinics/centers which perform the surgery need to have a team of professionals to follow and lead the adaptation of the patient to the cochlear implant, for, otherwise, the patient would not benefit from the procedure.

Therefore, the implantation of the CI takes place in phases: pre-operation exams, surgery and post-surgery support, which justifies the importance of the fact that clinics/centers which perform the procedure to offer the services aforementioned so that the patients are duly accompanied and oriented.

The last phase of the post-surgery service includes, besides phonoaudiological therapies, the pedagogical and educational support.

Education is a challenge for people who have hearing impairment, because, in general, the oral language is essential to the teaching practice in regular schools, once the teachers find it difficult to dissociate the teaching from the oral/verbal explanation. Therefore, the teaching practice consists of repetitive and mechanical activities<sup>9</sup>.

The CI makes it possible and collaborates with the education of the hearing impaired children, since it allows them to develop auditory abilities and oral language<sup>6</sup>; however, it is necessary to emphasize that the CI does not restore the hearing, i.e., does not transform an impaired child in a hearing one.

It is necessary to accompany the education of these children, i.e., their inclusion in the regular school system, since, besides the surgery and medical and phonoaudiological assistance, educational support is also included as the last phase of the process post-implant by the Health Ministry.

The CI is not a common practice in the Brazilian reality yet, and many people believe that once the person has a CI, he/she does not have any difficulty, when actually they do need:

Strategies to optimize the use of hearing and oral communication at school, specific support and curricular adaptations that assist the children who have CI in the challenge of learning the academic content at the same time as they acquire and perfect the abilities of hearing and oral language, among others. (BRAZOROTTO<sup>10</sup>, 2008, p. 9)

From the information exposed, the present study is justified by the need to know more about the national research on the CI after the regulations and definitions of the Health Ministry on the topic and understand the advances and gaps on the area, contributing to the success of the inclusion and education of the patients who have a CI.

The general objective of this article is to learn the national research on CI after 1999, year of the regulations on CI in Brazil. And the specific objective is to identify among the found studies, the ones that are related to the educational area.

## ■ METHODS

The work consists in a bibliographical research which shows qualitative and quantitative data which are present in scientific and academic production. This research was developed from material which is indexed in online CAPES Theses bank in the period from 2000 to 2010.

The bibliographical research, according to Marconi e Lakatos<sup>11</sup> must present specific

procedures which permit the treatment of the bibliographical research as a source of information. In order to meet this requirement, the authors suggest the following steps:

- identification – recognition of the subject;
- location – search of the source of publication on the theme;
- compilation – systematization of the found material;
- cataloging – transcription of the data on the bibliographical cards.

The present research was carried out following the steps previously described, by Marconi e Lakatos<sup>11</sup>, due to the richness of details in the description of the steps, which simplified the data analysis.

## Procedures

In order to carry out the research on Cochlear Implant over the last years, researches, dissertations and theses – published on the online CAPES Theses Bank were consulted, once it is a recognized and reliable data base, containing publications from all over the country.

The search for the researches was done by using the term “cochlear implant” as descriptor, since it represents the object of the research, besides the terms used as selection of academic production present on CAPES website in the period between 2000 and 2010.

After finding the research on the online CAPES theses bank, the second step was the systematization of the found information, organizing them in cards where information such as author, title, year of publication/year of defense, place of publication, area of knowledge of the origin of the research and the theme of the research developed were cataloged.

The collected information was organized in graphs and a chart describing the themes developed and pointing out the number of researches developed for each theme. The chart was submitted to the appreciation of three referees with the purposed of bringing reliability and veracity to the themes and their respective descriptions.

## ■ RESULTS

The search on the online CAPES theses bank expatiating on CI in the period from 2000 to 2010 resulted in 49 researches, from which 33 were dissertations and 16 were theses.

The number of researches found in each year during the analyzed period is shown in Figure 1.

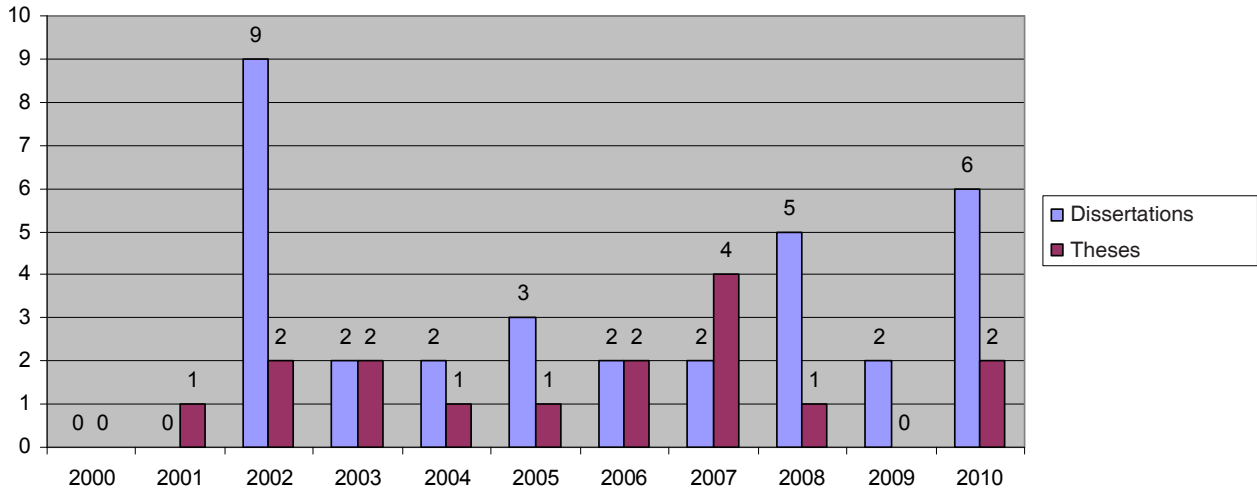


Figure 1 – Dissertations and theses per year

The theme CI appears in the online CAPES theses bank from 2001 and achieves more attention in recent years. An interesting datum is the great number of dissertations on the theme in 2002.

Besides learning the number of researches carried out over the period in question, it was possible to identify the areas of knowledge to which the researches are linked. This information is important since as it is mentioned in the indications and regulations of the Health Ministry and, as stated by the researchers in the area such as the ones mentioned as references, the implantation of a CI involves a multiprofessional team, i.e., professionals linked to different areas of knowledge.

In 2009, with the purpose of organizing the evaluation process and support for research, CAPES

altered the distribution of areas and subareas of knowledge to: Earth and Exact Sciences; Biological sciences; Engineerings; Health Sciences, Agricultural Sciences; Applied Social Sciences; Human Sciences; Linguistics, Languages and Arts; and Multidisciplinary.

Therefore, in order to carry out this research, the areas aforementioned were considered, according to CAPES indications, so that the areas of knowledge to which CI researches belong, in the considered period, were analyzed.

The dissertations and theses expatiating on CI which were found in the period were developed by researchers who belong to the 5 areas of knowledge as shown in Figure 2.

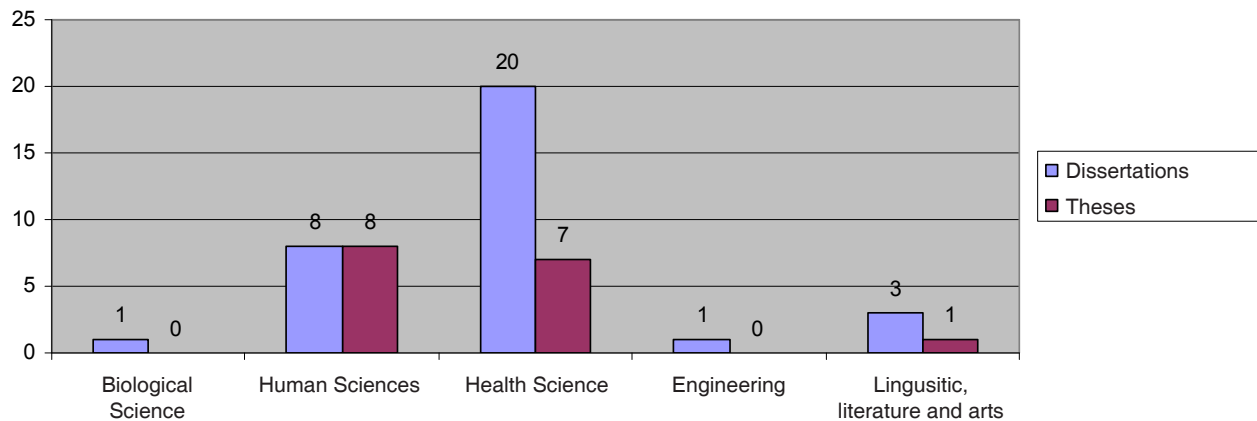


Figure 2 – Researches and area of knowledge

Although there is a relevant number of dissertations on CI, it is possible to observe that most of the researches were developed in the area of Health Sciences, area of knowledge to which the professionals directly involved in the diagnosis and evaluation of hearing impairment degree as well as performing the surgery to implant the CI and post surgery care, i.e., Medicine and Phonoaudiology belong.

## ■ DISCUSSION

From the data obtained and presented in the previous graphs, it is possible to point out the area of knowledge to which each one belong.

The eight dissertations linked to the Human Sciences, belong to Psychology (three researches), Education (two researches) and Special Education (three researches). i.e., they were developed by professionals who are responsible for the last phase of the CI, for carrying out the specialized post-surgery support and/or educational and psychological support.

The three dissertations in the areas of Linguistics, Languages and Arts represent an interesting and recent extension among the areas of knowledge, since the researches found consist of linguistic studies on the difficulties of people who have a CI in developing oral language. Besides, there is a research about music and the ability of people who have CI to listen and interpret music.

The dissertations linked to Biological Sciences and Engineerings consist in Biogenetic Studies on

hearing impairment and CI and the development of modern and functional technology to compose the CI, i.e., innovative and important themes in the areas of knowledge which collaborate to the researches realized by areas of knowledge more directly related to the CI.

Different from what is observed in the dissertations found, there are a similar number of these linked to Human Sciences and Health Sciences.

Like the dissertations found, the theses in the area of Human Sciences are also linked to Psychology (one research), Education (one research) and Special Education (six researches); developing studies on the support and evaluation post-CI, besides comparing school performance and difficulties found in formal education.

In the area of Human Sciences it is possible to highlight Special Education, with a total of six researches on CI, i.e., it is an area in Human sciences which has higher production in the area which is object of this study.

The seven theses linked to Health sciences also consisted in studies developed in Phonoaudiology and Medicine, which are about evaluation and perception of speech and surgery.

The thesis in the area of Linguistics, Language and Arts is also about the difficulties in the development of oral language.

According to the areas of knowledge which research on CI, it was also possible to organize the researches found according to the subject developed in each one, as is shown in Figure 3.

Theme	Description	# of researches
Auditory evaluation	It evaluates and measures the degree of hearing of hearing impaired people who have CI	16
Development of oral language	It describes the characteristics and steps in the acquisition of oral language after CI surgery.	8
Surgery	It reports surgical techniques, exams and instruments used in the CI surgery.	3
Auditory and speech stimuli	It describes the service and the different types of stimuli selected after surgery in order to stimulate hearing and speaking of people who have CI.	3
Genetics	It analyses the genetic causes of hearing impaired individuals who would benefit from the CI	3
Pre-surgery expectations	It describes the motives and expectations of the candidate to CI, besides the developed work in the selection of candidates to surgery.	2
Speech perception	It evaluates and measures the hearing of the human speech in relation to the time if use of the CI	2
School performance	It evaluates and compares the school performance of children after CI	2
Learning	It describes how the learning of the child who has CI happens	1
Professional Acting	It describes and analyses the support offered to people who have CI	1
Psychological Evaluations	It reports the psychological tests developed to measure the overcoming of social difficulties and communication after CI.	1
Writing	It analyses the writing development of hearing impaired children who have CI	1
CI effectiveness	It evaluates the effectiveness of surgeries realized for CI	1
CI in the constitution of the hearing impaired individual	It describes the influence of CI on the identity and life of the hearing impaired person who has a CI	1
Musical Perception	It describes and evaluates the musical perception of people who have CI	1
Quality of Life	It describes and evaluates the quality of life of the person who has a CI	1
Relations of power	It analyses the power acquired after CI when compared with hearing impaired people without CI	1
Selection of candidates to CI	It describes and evaluates the essential exams and procedures for the selection of candidates to the CI surgery	1

Subtitles

CI – Cochlear implants

PSAD – personal sound amplification device

**Figure 3 – descriptive chart of the research themes found in the period from 2000 to 2010**

From figure 3, which presents the main research themes on CI, it is possible to notice the variety of studies and possibilities, which show that CI is not the exclusive focus of the Health Sciences even though this is the area of science of knowledge that publishes more studies involving CI.

It is also important to notice that researches linked to Human Sciences also contribute with a relevant number of studies. Education and Special

Education are subareas of Human Sciences and, even though they have developed researches on CI, this subject seem to have not received the due attention of researchers in this subareas in the analyzed period, since out of the 18 topics on CI, only 4 studies developed topics linked to the referred subareas, two on school performance, one on learning and one on writing.

## ■ CONCLUSION

There are many studies on CI which discusses everything from its indication to the benefits obtained through it or not.

From the regulations realized after 1999 by the Health Ministry and the analysis of the academic-scientific national production, published in the following year, i.e., from 2000 to 2010, through bibliographical review, it was possible to map how the hearing impairment especially CI, has been treated.

The obtained data and information permitted to outline a scenery of national research on CI, which revealed that this is a well developed theme, that the

professionals involved in the diagnosis of hearing impairment, surgery and post-surgery support are engaged in understanding the procedure, divulging the obtained success, developing new techniques and instruments for the surgery and evaluating the obtained results, as can be seen from the topics of researches divulged on Chart 1.

However, the search on researches developed by the education area, reveals scarcity of studies.

Therefore, it is important to emphasize the importance of researches on CI in the area of education, because it is necessary to understand how they happen, besides contributing with the teaching and learning of these children.

## RESUMO

**Objetivo:** é conhecer a pesquisa nacional sobre Implante Coclear (IC), e tem como objetivos específicos verificar de que modo o objeto de estudo tem sido discutido nas áreas de conhecimento, destacando os estudos ligados à educação, pois é preciso compreender as dificuldades que a pessoa com IC enfrenta para aprender e se comunicar. Desse modo a natureza da pesquisa é teórica.

**Método:** de estudo bibliográfico de caráter quantitativo e qualitativo, desenvolvido a partir da produção acadêmica e científica nacional sobre IC publicadas no Banco de Teses CAPES on line após as regulamentações e indicações do Ministério da Saúde sobre IC no Brasil. Buscaram-se pesquisas publicadas entre 2000 e 2010, analisando-as quanto ao ano de publicação, área de conhecimento em que foi desenvolvida e o tema estudado, obtendo-se um panorama da pesquisa nacional sobre IC. **Resultados:** foram organizados em gráficos e quadro revelando que o tema IC tem sido foco de pesquisas de diferentes áreas do conhecimento; havendo uma concentração de pesquisas realizadas na área da Saúde e poucas pesquisas ligadas à Educação. **Conclusão:** há a necessidade de maior investimento nesta área contribuindo com a educação, socialização e inclusão dessas pessoas.

**DESCRITORES:** Deficiência auditiva; Implante Coclear; Dissertações Acadêmicas

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