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Our Experience with Rehabilitation of Cochlear Implant Surgery in Jos, North Central Nigeria

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Abstract

Background: Hearing loss is estimated to have increased from 42 million to about 360 million globally within a spate of 26 years (1985-2011). The challenges of disabling hearing loss include difficulty with communication and psychosocial well-being, poor quality of life and economic dependence of the afflicted. Cochlear implant is the choice treatment but however not readily available in Nigeria coupled with the scarce resources meant for the management of severe to profound hearing loss at the Jos University Teaching Hospital. We commenced our Cochlear implant program in 2005 to rehabilitate and ameliorate the challenges these profoundly deaf were facing. However poor rehabilitation equipment and paucity of indeginous trained personnel which are pivotal for a successful programme posed serious challenges.

Aim: This communication hereby highlights the challenges and the result of post Cochlear implant rehabilitation in Jos within the last 12 years.

Results: A total of 15 patients had Cochlear implant surgeries for various etiologies from 2005-2017. Their ages ranged from 3.0-63.0 years with a median age of 34.0 years. Three of the patients were children (age 3-6 years) while 12 were adults (age 19-63 years). The male: Female gender ratio was 1:1.1. Febrile illnesses constituted 7 cases followed by meningitis in 3cases. Three were pre lingual pediatric cases with 1 prelingual adult while the rest (11) were post lingual adults. The patients were implanted with different types of Medel Cochlear implants (2 Combi 40+, 7 Pulsar, 6 Sonata). Six of the cases were activated primarily with subsequent mapping in our center and the rest of the cases were activated in United States with part mapping in United States and successive ones in our center.

Outcome: Ten out of the 11 adult cases have returned to work with good hearing.

Conclusion: The availability of rehabilitation equipment as well as trained personnel has further added to good outcome and improved quality of life of our patients; however, there are still more challenges to surmount.

Keywords: Cochlear implant; Experience; Outcome; Patients selection; Rehabilitation

Introduction

Hearing loss is estimated to have increased from 42 million to about 360 million globally within a spate of 26 years (1985-2011) [1]. Seven million five hundred (7.5 million) children less than 5 years of age were affected. Seventy-five percent reside in Sub-Saharan Africa and about 2.8% of it reside in Nigeria [2,3]. Hearing loss has varying degrees with Disabling hearing impairment having negative consequences on communication, psychosocial well-being, quality of life and economic independence [4-6]. The

resources for the management of severe to profound to severe hearing loss is scarce in my institution. Whereas Cochlear implant is the preferred treatment for profound hearing loss, it was unavailable in Nigeria before 2005. We commenced our Cochlear implant program in 2005 to overcome the challenges these profoundly deaf were facing [4], consequently; the unavailability of rehabilitation equipment and trained personnel which are pivotal to the overall quality of life of these individuals posed serious challenges [7].

Methods: This was a retrospective review of all Nigerian patients who had cochlear implant surgery from the year 2005-2017 in Jos. The age, gender, aetiology, duration of illness, pure tone averages, year of surgery and outcome of surgery were extracted. We linked our Cochlear implant studio center here in Jos, Nigeria with the Cochlear implant studio of Jacksonville Hearing and Balance Institute, Florida; United States for the purpose of activation of the cochlear implant. The data generated was analyzed using Epi-info version 7.2.1 and results presented in simple descriptive terms and tables.

Result: A total of 15 patients had Cochlear implant surgeries for various etiologies from 2005-2017. Their ages ranged from 3.0-63.0 years with a median age of 34.0 years. Three of the patients were children (age 3-6 years) while 12 were adults (age 19-63 years). The male: Female gender ratio was 1:1.1. There were 7 cases of Febrile illnesses, followed by meningitis in 3 cases (Table 1).

S/NO	AGE (YRS)	SEX M/F	AETIOLOGY	DURATION OF HEARING LOSS (YRS)	PTA (dB) bilateral
1	50.0	M	Febrile illness/ ?ototoxic injections	10.0	>95.0
2	45.0	F	Meningitis	10.0	>100.0
3	19.0	M	Meningitis	17.5	>100.0
4	28.0	M	Typhoid illness	10.0	>110.0
5	3.0	F	Ototoxicity/ febrile illness	1.8	70.0 (FFA)
6	34.0	F	Idiopathic	2.0	>100.0
7	6.0	M	Measles	9/12	>108.0
8	3.0	F	Febrile illness	1.0	75.0
9	63.0	F	Febrile illness	5.0	>100.0
10	18.0	M	Meningitis	3.0	>110.0
11	36.0	M	Post febrile illness	3.0	>103.0
12	57.0	M	Progressive hearing loss? Autoimmune	10.0	>110.0
13	26.0	F	Post Febrile Illness	0.5	>106.0
14	35.0	F	Progressive hearing loss? Cause	?	>100.0
15	54.0	F	Febrile illness	?	>100.0

Table 1: Patients' clinical characteristics.

There were 3 pre lingual pediatric cases with 1 prelingual adult while the rest 11 were post lingual adults (Table 2). The pure tone average ranged from 70 -108 Decibels in the 3 paediatric cases and greater than 95-110 Decibels for the adult patients (Table1). The post implant duration ranges from 0.1 to 12.0 years and the interval between implantation decreases from 7.0 years to binual events and finally to annual events (Table 2). The patients were implanted with different types of Medel Cochlear implants (2 Combi 40+,7 Pulsar, 6 Sonata). Five of the cases were activated primarily with subsequent mapping in our center while the rest were activated in the United States but subsequent mappings were carried out in our center. Ten out of the 11 adult cases have returned to work while the prelingual adult and the pediatric cases have stopped rehabilitations on their own volition. One of the paediatric cases lost her external processor while one of the adult post lingual broke the ear piece and could not replace them.

SNO	OCCUPATION	YEAR IMPLANTED	TYPE OF DEAFNESS	TYPES OF IMPLANTS	YEARS POST-IMPLANTATION	OUTCOME
1	ICU Nurse	2005	Post lingual	Medel	12.0	Very good
2	University Lecturer	2005	Post lingual	Medel	12.0	Very good
3	Student	2012	Prelingual	Medel	5.0	Fair
4	Medical Doctor	2012	Post lingual	Medel	5.0	Excellent
5	Child	2013	Prelingual	Medel	4.0	Unimpressive
6	Student computer	2013	Post lingual	Medel	4.0	Excellent
7	Pastor	2014	Post lingual	Medel	3.0	Very good
8	Student	2014	Post lingual	Medel	3.0	Very good
9	Lecturer/Politician	2014	Post lingual	Medel	3.0	Very good
10	Child	2016	Prelingual	Medel	2.0	Fair
11	Child	2016	Prelingual	Medel	2.0	Fair
12	Nurse(retired)	2016	Post lingual	Medel	1.0	Very good
13	University student	2017	Post lingual	Medel	0.1	Good
14	Teacher	2017	Post lingual	Medel	0.1	Good
15	Civil servant??	2017	Post lingual	Medel	0.1	Good

Table 2: Occupation, year of implantation, Implant types, duration post implantation and outcome.

Discussion

Rehabilitation is defined by World Health Organization (WHO) as the application of all useful measures to lighten the influence of disabilities and help the handicap return back to society [8]. A good surgery without corresponding good outcome of rehabilitation is a waste of time and resources. The most interesting period of the post cochlear implant candidate is prior to activation. This period is full of anxiety on the path of managing team, patient and parents in anticipation of outcome. It is usually within 2-4 weeks after edema has subsided. All our patients had activation within a week post operatively because of good healing except the first case that had extrusion following wound infection. On the contrary, Howard and co had delayed activation secondary to post cochlear implant complications [9,10].

The age range of 3-63 years in our study is similar to that of Lima Júnior and co-workers in Brazil. Their study population of 250 consisted of both adults and children comparable to the present study though with a smaller study population. Our gender ratio is similar to theirs where they had nearly equal ratio as well. Their major aetiological agents is composed of 40.1% idiopathic, followed by Congenital rubella (21.5%) and equal proportions of meningitis and ototoxicity of 6.8% respectively [11]. This is at variance with the aetiological agents in our study where febrile illness constituted 46.7%, meningitis 3 (20%) and Idiopathic 6.7% of the cases.

Cochlear Implants (CI) have positive impact on recipients' lives by improving communication in adult patients. These include ability to listen to speech and music perception, use of auditory skills such as telephone. Great variability in outcomes does occur as some may only obtain increased awareness of environmental sounds. Variation in outcomes may be due to age at implantation, duration of sensory deprivation and implant use, mode of communication, anatomy and physiology of the inner ear, technological and surgical factors, quality of rehabilitation, and availability of education and assistance [12-16]. All adult patients in this study have returned back to work as physician, lecturers, pastor and students respectively after a maximum duration of 12 years. The only prelingual adult in this present study had a prolonged auditory deprivation having become deaf at age 2; communicated using sign language and was implanted at 17 years but lacked proper quality of rehabilitation. He no longer stamps his feet noisily as he walked but now aware of his foot noise and depends on lip reading to understand communication. Unlike our adult cochlear implantees, 2 of our paediatric cases have been coming for rehabilitation while one stopped because the parent is unimpressed with their rehabilitation; one who was very restless is now beginning to listen to instructions but the 3 children are generally difficult to access.

Considering the duration of auditory deprivation, Connell and Balkany [17] recommends not implanting the deprived ear if that ear has greater than10 years of auditory deprivation. But a contrasting finding by Boisvert and colleagues [18] says this will be true if only the deprivation is bilateral and greater than 10 years but others still argue that outcome still differs even if both ears have same duration of auditory deprivation. In our study all the cases have auditory deprivation from 0.5 years to 10 years except the prelingual adult with 17 years of deprivation.

Regarding the auditory thresholds, hearing is considered severe to profound if the ear hears sounds above 70 dB (between 71-90 dB, severe and, above 91 dB profound). It is unilateral

or bilateral when one or both ears are affected. The pre-lingual indicates that hearing loss occurred prior to the acquisition of language. This is an important component for making decisions of rehabilitation in order to direct the clinical management and the indication of electronic devices for deafness, such as the cochlear implant [19-21]. In our study 2 of our paediatric patients have minimum pure tone average of 70 dB bilaterally while the minimum for the adult was greater than 100dB; this concurs with the indication of cochlear implant in severe to profound hearing loss.

The stages of rehabilitation involve setting up of studio, switch on of implant and subsequent mapping or fine tuning over time. Initial activation/mapping was in USA with subsequent ones in Nigeria. Upon return of patients to Nigeria, the challenges became evidently clear. Such problems include expenses for patient travelling for post-operative checkup, poor network services which affected our fine tuning therefore resulting in rescheduled visits by patients from distant places. The expenses associated with post-op care necessitated some drastic measures to be put in place in our center. A lack of consistency in their auditory training program can interfere with progress. We need collaboration between international and local CI team and the educational team which are critical to the progress of the Adult and Paediatric CI user. These difficulties are overcome by the use of telemedicine as opined by Ramos [22] and coworkers in Spain. Similarly, in a case, internet stimulation was also successful in activating cochlear inplant by Byaruhanga [2] and colleague in Uganda in East Africa. The solution was to set up a studio for mapping via telemedicine in our center (Figure 1).

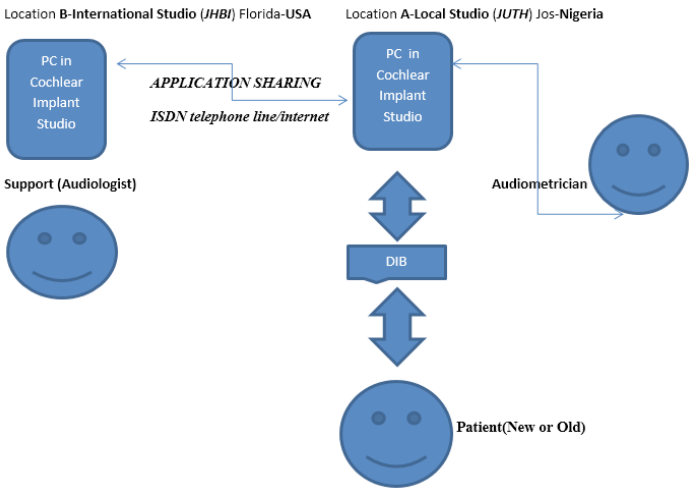

Figure 1: Remote Supporting Services (Internet Stimulation & Fine tuning).

The needs of implantee based on occupation require special attention. For the doctor in our study who is the first implanted doctor in Nigeria, a special type of stethoscope was made available to him to attach to his speech processor in 2012. He is currently offered admission to pursue his graduate study in Otolaryngology in our institution. He now auscultates the heart, breath sounds and other important medical sounds. A similar need was offered to two medical students who had cochlear implant in Greece by Kyriafinis and colleagues in 2016 [23]. There are other challenges with batteries, body parts of cochlear implant excetra as the batteries need replacement every 72 hours and pattients have to replace the body parts by themselves.

The interval between successive cochlear implantation is significant as noted in this study which revealed a wide gap of 7 years before the next implantation (Table 2); being narrowed down to bienal and eventually, annual surgical events. These are due to challenges in starting any program in a developing country. Such includes political instability, unstable economic environment and rising cost of treatment. Salamat and colleague [24] experienced similar type of difficulties in their Libyan experience.

Complications have not occurred since we learned from the first 2 experiences of the hard device failure where there was extrusion following infection and currently a soft device failure in a paediatric case. These were major complications. Eskander et al. [25] had low incidence of device failure in a large volume practice in Australia. They noted that children who had meningitis as aetiologic factor had a greater risk of device failure.

Success in Cochlear implant is directly dependent on its ability to address the patient's expectations and balance it with the outcomes [26]. This can be achieved by evaluating the quality of life after cochlear implantation with Category of Auditory Performance (CAP) scores [27] and Speech Intellegibility Rating (SIR scores). [28] All of our Adult recipients were able to reply to simple questions and react spontaneously to greetings in everyday situations except the prelingual adult. They talk on the phone with their parents, friends and relatives on wide range of topics. The medical doctor is actively practicing his medical carrier by clerking patients and performing some surgeries. His only complaint is inability to immediately localize sound direction. Most of these recipients use their device regularly and were positive regarding their decision to pursue a cochlear implant. Two out of the 3 implanted children were able to identify some environmental sounds and their awareness of auditory stimuli in their environment following long-term auditory training and were able to understand simple sentences. However, one of them never agrees to wear her external processor. The Parents were not too satisfied with the slow pace of success.

Conclusion

The availability of rehabilitation equipment as well as trained personnel has further added to the outcome of quality of life of our patients however, there are still more challenges to surmount.

Recommendation

We recommend adult type of Cochlear implantation in our institution for now. Our experiences prove that we need to train more people to have the compliment of commencing Paediatric and prelingual adult's Cochlear implantation.

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