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Challenges and solutions for cochlear implant rehabilitation during coronavirus disease 2019 pandemic

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Abstract

Objective

The current study was intended to detect the challenges facing cochlear implantation (CI) and rehabilitation during coronavirus disease 2019 (COVID-19) and to investigate the influence of the application of the required hygiene measures on the success of CI rehabilitation during coronavirus situations.

Patients and methods

The present research included 151 patients had CI in the Hearing and Speech Institute in the year of 2020. A total of 116 cases (22 adults and 94 children) have been implanted from August 2020 to December 2020. Of the 94 children (45 males and 49 females), 26 neonates with significant sensorineural hearing loss either due to congenital nonlethal disorders or acquired due to prematurity and prolonged incubator care were included. Intensive preoperative assessment and counseling program were done, which were then followed through the perioperative period with up to 12 months of intensive rehabilitation postoperatively.

Results

Overall, 50% of parents commented regarding the challenges faced by the parents during programming or mapping that they never had problems, 15.9% had problems to a great extent, 15.9% to a moderate extent, and 18.2% to a less extent. With respect to the use of hygienic measures, 34.1% of parents reported that they were excellently used, 29.3% commented it was very good, and 34.1% commented it was good. Overall, 43.2% of the parents agreed that they did not affect the progress of the children, whereas 27.3% of the parents agreed that the face masks were challenging for the children, 18.2% of the parents thought social distancing affected the progress, and the least percentage of parents (11.4%) thought face shields affected their progress. The quality of the therapy sessions also was noted, where 25% reported the quality of sessions was excellent, 38.6% reported the quality of sessions was very good, 31.8% was good, and 4.6% was poor.

Conclusion

This study observed that the COVID-19 pandemic had constituted a significant challenge for both CI children and their parents. They faced challenges in accessing the hearing health care services and facilities of auditory and language rehabilitation. These rehabilitation modifications must be followed until the candidate COVID-19 vaccine is made available for all the public.

Keywords: Cochlear implant, coronavirus disease 2019, rehabilitation

INTRODUCTION

Coronavirus disease 2019 (COVID-19) is a pandemic declared by the WHO. It originated in Wuhan, China, and has spread globally around the world [1]. It is caused by severe acute respiratory syndrome virus 2 (SARS-CoV-2). COVID-19 had a great effect on health care services. Many services have been

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partially or entirely disrupted in many countries, including surgeries, outpatient services, and rehabilitation programs. This was consistent with the initial WHO recommendations to minimize nonurgent facility-based care. In most countries, resources were reallocated, and the ministry of health staff was partially or fully reassigned to support COVID-19.

Postponement of elective surgeries, including cochlear implantation (CI), was recommended [2]. Rehabilitation was stopped, though rehabilitation is an integral component in CI care [3]. This had a profound effect on the lives of the CI patients seeking rehabilitation and facing technical challenges with the implant [4].

Resumption of elective surgeries was recommended after appropriate permissions were given by the authorities to start elective surgeries. In addition, general guidelines for CI were conducted for patient safety and care and the safety of the health care workers [3].

With the national neonatal hearing-screening program, infants with deafness are being identified at birth. Those who do not progress after an adequate hearing aid trial should be considered for CI. Implantation aims to provide adequate sound information to allow for speech and language development. Congenital sensorineural hearing loss is a significant infantile condition with an incidence in the order of one per thousand live births [5].

This study is intended to detect the challenges facing CI and rehabilitation during COVID-19 and to investigate the influence of the application of the required hygiene measures on the success of CI rehabilitation during coronavirus situations.

Aim

The aim was to investigate the effect of the COVID-19 pandemic on the rehabilitation of infants with CI.

PATIENTS AND METHODS

A total of 151 patients had CI in the Hearing and Speech Institute in the year of 2020. CI surgeries and postimplantation auditory and language rehabilitation have been suspended from mid-March 2020 to the beginning of August 2020. The resumption of surgeries started in August 2020. A total of 116 cases (22 adults and 94 children) have been implanted from August 2020 to December 2020. Of the 94 children (45 males and 49 females), 26 neonates with significant sensorineural hearing loss either due to congenital nonlethal disorders or acquired due to prematurity and prolonged incubator care were included.

Intensive preoperative assessment and counseling program were done, which were then followed through the perioperative period with up to 12 months of intensive rehabilitation postoperatively.

Infants with significant sensorineural hearing loss were referred for early assessment and amplification where appropriate. The infants who fail to progress with adequate amplification or

are identified with a bilateral severe to profound loss at birth are referred to the CI clinic at otolaryngology institute for assessment and management.

The FDA approved CI in infants as early as 9 months of age [6]. Early CI in prelingual infants had significant effects on the development of speech and language, performance in standard test assessments. The critical period for language learning occurs between 7 and 10 months of age, explaining the benefits of early implantation [7]. Delaying CI beyond 7 1/2 months may lead to delayed language performance.

The risk of acquiring COVID-19 within the perioperative period was balanced against the potential long-term consequences of failure to develop linguistic skills during the critical period of development.

CI guidelines during the COVID-19 pandemic by the Presidential Committee for Early Detection and Management of Hearing Impairment were constructed and focused on preventive measures that helped in the reduction of the chances of cross-infections. These involved preoperative, operative, and postoperative measures.

The preoperative preparations and assessments for each candidate were done, as well as routine preoperative investigations were done plus C-reactive protein, serum ferritin, and computed tomography chest 2 days before the operation. Only the infant and one accompanying guardian were allowed at the hospital.

Operative measures were considered. Effective protective measures and personal protective equipment were supplied for all doctors and nurses inside the operating theater. Minimal personnel were allowed inside the operation theater (two surgeons, one nurse, and one CI company engineer), with no audiologists attending during the pandemic. Two operations were done maximum per day, with a maximum of six operations per week.

Postoperative measures: postoperative discharge for the patient was within 24 h, extending maximally to 3 days. After discharge from the hospital, 2 weeks of quarantine were required for the patient and the caregiver. Follow-up by telephone call was after 1 week, and the first follow-up visit was after 2 weeks. In case of the presence of a serious complication, a visit was done after 1 week.

Audiology and programming guidelines

The first fitting and programming were done 1 month after CI with an audiologist and only one accompanying person was allowed with the child. The company engineer provided counseling on the use and maintenance of the CI device after the first fitting in a separate room. The second fitting was 1 month after the first fitting. In addition, CI videos were provided online for parental support.

Auditory and language rehabilitation guidelines

Phoniatrics assessment was done after the second fitting, and the child was referred for auditory and language rehabilitation.

A temperature check of the child and the attendee must be performed at the time of entry into the institute to prevent cross-infection. No group therapy was allowed during the pandemic period. Only individual (1: 1) sessions with only one attendee with the child were allowed, ensuring a safe distance between the therapist and the child. Adequate sanitization of the therapy rooms according to the WHO guidelines before and after each session was applied. All room surfaces should be cleaned with sodium hypochlorite after every session, and all therapy tools and toys used in therapy must be sanitized. Infected droplets can spread up to 1–2 m and deposit on the surface and remain viable but get destroyed in less than a minute with sodium hypochlorite and hydrogen peroxide [8].

The speech therapist and child wore face shields and face masks during the sessions; however, no gloves were allowed during or between therapy sessions for both the therapists as well as the child. Safe distancing between the CI child and the therapist was maintained, allowing only one accompanying attendee. The frequency of sessions was dependent on the mean length of an utterance of sentences (three or more words sentence utterance received once-weekly sessions, whereas less than three words sentence utterance received twice-weekly sessions). Parent counseling and home training programs were provided to ensure adequate progress with minimal personal contact and exposure.

The study was done in the Phoniatics Department of the Hearing and Speech Institute from March 2020 to December 2020. An online Arabic questionnaire on Google document forms was administered to 88 parents of CI children to assess the effect of the COVID-19 pandemic on the rehabilitation process. Ten questions were constructed, as summarized in Table 1, to assess the psychological effect and anxiety caused by COVID-19 on the parents, the interrupted sessions, and

its effect on the child's auditory, language, and behavioral skills. In addition, it assessed the challenges faced during programming, the effective hygienic measures done during the sessions, the effect of the protective equipment used on the session's success, the quality of the sessions, and whether there was an option of teletherapy done to the child.

Questions from 1 to 5 required responses categorized into never, to a lesser extent, to a moderate extent, and to a great extent. Questions from 6, 8, and 9 required responses that were categorized into excellent, very good, good, and poor. Question 7 required a choice of four answers (no effect, face mask, face shield, and social distancing), whereas question 10 required a 'yes/no' response.

Ethical approval was obtained for the current study from the Ethics and Research Committee of the National Hearing and Speech Institute, and the patients signed a fully written informed consent before enrollment in the study.

Demographics of the data of the questionnaire were analyzed.

RESULTS

A total of 151 patients had CI in the Hearing and Speech Institute in the year of 2020. One hundred sixteen cases (22 adults and 94 children) were implanted from August 2020 to December 2020. Auditory and language rehabilitation has been ceased for 3 months from April 2020 to June 2020. In comparison with the rehabilitation in 2019, there was a tremendous difference in the number of children receiving therapy sessions during the COVID-19 pandemic (Fig. 1).

The responses of 88 parents to the online questionnaire were collected. It was observed that 47.7% of parents felt anxious and psychologically affected during the COVID-19 pandemic. Furthermore, 34.1% of parents commented that rehabilitation was affected to a great extent, whereas 34.1% of other parents commented that it was affected to a moderate extent. The percentages of the responses to the interrupted rehabilitation's effect during the COVID-19 pandemic on the auditory, language, and behavioral skills are shown in Figs. 2 and 3.

Regarding the challenges faced by the parents during programming or mapping, 50% of parents commented that they never had problems, 15.9% had problems to a great extent, 15.9% to a moderate extent, and 18.2% to a less extent. With respect to the use of hygienic measures, 34.1% of parents reported that they were excellently used, 29.3% commented it was very good, and 34.1% commented it was good.

Overall, 43.2% of the parents agreed that they did not affect the progress of the children, whereas 27.3% of the parents agreed that the face masks were challenging for the children, 18.2% of the parents thought social distancing affected the progress, and the least percentage of parents (11.4%) thought face shields affected their progress.

Attendance during COVID-19 was variable, as 31.8% of the parents reported that their attendance was excellent, 36.4% had

Table 1: Questionnaire administered to parents of cochlear implanted children to investigate the effect of coronavirus disease 2019 on rehabilitation

1. Did you feel anxious or psychologically affected during the COVID-19 pandemic?
2. Was the auditory and language rehabilitation affected during the COVID-19 pandemic?
3. Did the cease of/ or interrupted rehabilitation affect your child's language and auditory skills?
4. Did the cease of/ or interrupted rehabilitation affect your child behaviorally?
5. Did you face any challenges in the programming or troubleshooting of the CI device with the audiologist?
6. After the resumption of auditory and language rehabilitation, how do you rate the effective hygienic measures done during the sessions?
7. From your point of view, which precaution method during rehabilitation negatively affects the progress?
8. How was the regularity of the child's attendance at therapy?
9. How did you rate the quality of sessions?
10. Did your child receive any online sessions or teletherapy during the COVID-19 pandemic?

CI, cochlear implantation; COVID-19, coronavirus disease 2019.

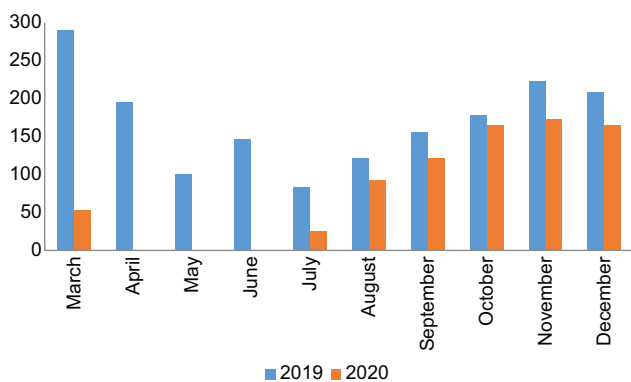


Figure 1: Number of cases of rehabilitation during 2019 and 2020.

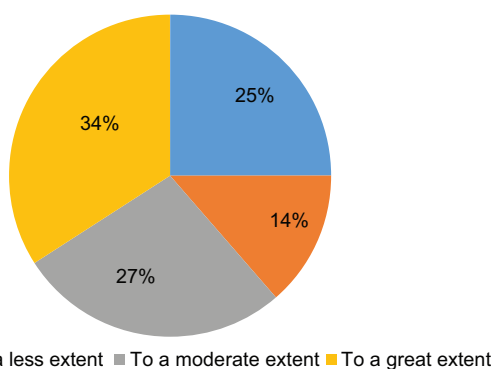


Figure 2: Effect of interrupted rehabilitation on auditory and language abilities.

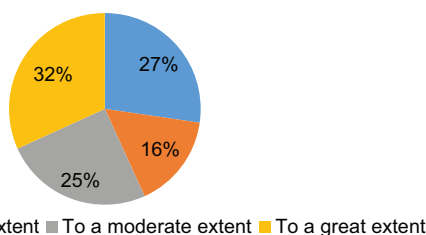


Figure 3: Effect of interrupted rehabilitation on behavior.

very good attendance, 22.7% had good attendance, whereas 9.1% showed poor attendance.

The quality of the therapy sessions also was noted. Overall, 25% reported the quality of sessions was excellent, 38.6% reported the quality of sessions was very good, 31.8% was good, and 4.6% was poor.

Regarding teletherapy and online sessions, 88.6% had no sessions, whereas 11.4% only had online sessions.

DISCUSSION

COVID-19 pandemic has psychologically affected CI patients all across the globe. During the pandemic conditions, the access to auditory rehabilitation for CI patients was difficult. This was owing to the discontinuation or interrupted rehabilitation in many hospitals and centers. Early identification of hearing

loss and provision of early access to auditory stimuli is crucial for the development of age-appropriate linguistic competence in a congenitally deaf child [4]. Therefore, a comprehensive habilitation program is needed to help utilize auditory signals and integrate components of communication that are listening, speech, language, reading, and thinking.

This study investigates the effect of the COVID-19 pandemic on the rehabilitation of children with CI. It is evident from the current study that the COVID-19 pandemic was psychologically stressing for the parents of the CI children. The study focused on the challenges faced by the parents of CI children in the health services and the possible solutions to overcome these challenges. Rehabilitation was ceased and interrupted for a period of 3 months, which had a significant effect on the auditory and language skills. The parents detected behavioral changes in CI children. The current study is in agreement with the study done by *Ayas et al.* [3] that showed that there are behavioral changes in CI children during the COVID-19 pandemic. This is attributed to the lack of access to an auditory mode of communication. These changes in behavior and emotional aspects of parents and children had severe effects on the home training programs planned by their clinicians.

After the resumption of rehabilitation, it was important to take adequate precautions and follow guidelines and protocols aiming at safeguarding the health care workers and the patients. Therefore, masks and face shields are made mandatory for everyone coming to the institute to reduce the risk of exposure.

Many of the parents reported that the hygienic measures had no effect on the children’s progress during the rehabilitation, but about 27.3% thought face masks affected their progress; meanwhile, 11.4% thought face shields affected the progress. Our results are similar to another study done by *Aschendorf et al.* [9], who reported mouth–nose mask was the most annoying factor. However, the use of mouth–nose mask, face shields, spit barriers, and social distancing had no negative effect on the rehabilitation success and achievement of goals. Therefore, the patients can effectively adapt to the situation, and the use of transparent masks with full face visibility can aid in lip reading for the CI children and could be a solution for facilitated communication.

Most of the parents in this study thought the quality of the sessions under the strict hygienic measures was not changed and felt safer during the rehabilitation sessions despite the current pandemic situation. Therefore, the task for all those involved in rehabilitation under pandemic conditions was to create a safe environment for optimal auditory rehabilitation under the best possible protection for patients and speech therapists.

The use of tele-mapping and teletherapy for rehabilitation is uncommon in Egypt in individual cases to support rehabilitation, as most of the parents (88.6%) in this study reported that they did not receive any online sessions or teletherapy. Tele-mapping and teletherapy are innovative methods that improve health care service accessibility. They

have served as tools in specialized health care, particularly aiding patients in remote locations with limited access to standardized health care services [10]. Tele-mapping in times of troubleshooting with patients who have access to smartphones is also gaining popularity in many centers [11].

In a study done by Sahoo *et al.* [12], 96% of parents reported that teletherapy had helped their children. They have started the teletherapy or tele-auditory-verbal therapy (AVT) program for their CI recipients, where the parents can engage their children with the therapist through mobiles or computers. Accessing tele-habilitation on verified digital platforms like websites and apps created by the implant companies and parent institutions is the way to go [13]. It could provide another form of therapy in the future or supplement.

Involvement of the parents as primary facilitators and therapists in AVT is essential regarding the therapy services available to families of young children with hearing loss [14,15]. Tele-AVT program is another option for parents to engage the child with therapists. This will ensure better compliance and continuity of the care plan.

CONCLUSION

This study observed that the COVID-19 pandemic has constituted a significant challenge for both CI children and their parents. They faced challenges in accessing the hearing health care services and facilities of auditory and language rehabilitation. Many hygienic measures and solutions have been proposed to face these challenges. Tele-mapping and teletherapy have a major role in providing delivery of CI rehabilitation. These rehabilitation modifications must be followed until the candidate COVID-19 vaccine is made available for everyone. Further evaluations of online rehabilitation are needed to test the efficiency and effectiveness.

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Conflicts of interest

There are no conflicts of interest.

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