

Clinical Analysis of Cochlear Implantation

Ailing Yang

Otolaryngology Major, Graduate School, Medical College, Qinghai University, Xining City, Qinghai Province 810016 China

Abstract: Objective: To analyze the clinical ability of cochlear (CI). Methods: 100 sensorineural deaf patients with CI implantation from January 2020 to January 2022 and 100 were included in the two groups, and then the 100 patients were divided into unilateral implantation group (n=45) and bilateral implantation group (n=55), to compare the Chinese rhyme recognition accuracy between the two groups. Results: > 80% were less than the healthy group (P 80% between 50-80% was slightly higher than the unilateral implantation group, and slightly lower at 0.05). Conclusion: The Chinese voice rhyme recognition ability has recovered after CI implantation, but there is still a gap with the recognition ability of healthy listeners, and the implantation side has little impact on the Chinese voice rhyme recognition ability.

Keywords: Cochlear implantation; Chinese; Rhyme; Recognition ability

Sensorineural deafness is a disease caused by cochlear spiral lesion, the central cortex lesion, resulting in hearing impairment, acquired, congenital factors, pathogenesis,^[1] with fluctuating deafness, seizure vertigo and other symptoms. And cochlear implant (CI) is currently used in clinical to help severe and severe sensorineural deaf patients restore hearing electronic device, it can convert the external speech and voice through the processor into electrical signal, the electrical signal has a special coding form, can be implanted electrode system to stimulate auditory nerve excitation, so as to realize the reconstruction of auditory function of.^[2] However, in a large number of clinical studies, the feedback that CI implantation is not suitable for everyone, and the effect remains to be confirmed. And the recovery of language perception and recognition ability is one of the important indicators to measure the effect of implanted CI. To understand the clinical effect of CI implantation, master the patient rhyme recognition ability, the monosyllabic recognition speech test for Chinese rhyme recognition ability, the method is easy to implement and patients to accept, can intuitive feedback after CI implantation speech recognition ability, in order to correctly judge the clinical effect of CI implantation.^[3] Detailed report is as follows:

1. Data and methods

1.1 General Information

A total of 100 sensorineural deaf patients from January 2020 to January 2022 and 100 patients were included, forming the CI implantation group and listening group. Among them, 51 men and 49 women in CI implantation, 5-74 / (25.56 ± 11.45), 55 men and 45 women, 4.5 to 78 / (25.41 ± 11.71); and general data were comparable ($P > 0.05$). Further 100 patients with CI were classified into unilateral implantation (n=45) and bilateral implantation (n=55), including 23 men and 22 women aged 7 to 74 / (26.17 ± 9.35), 28 men and 27 women aged 5 to 70 / (26.35 ± 9.88); and general data were comparable ($P > 0.05$). Among the 100 patients with CI implantation, 31 were congenital inner ear, 15 infectious, 5,8 elderly, 4,2 Meniere, 3 autoimmune sensorineural deafness, 3 sudden deafness, and 29 auditory neurosis.

Inclusion criteria: ① daily communication for Chinese patients; ② patients with no intellectual disabilities; the hearing threshold fell in the normal speech spectrum after CI implantation on the ③ side.

Exclusion criteria: patients with ①; ② with previous language dysfunction.

1.2 Methods

1.2.1 Surgical method

Giving patients general anesthesia, Preoperative transintravenous infusion of antibiotics; The electrodes were implanted first, After electrode impedance and neural response telemetry, the next step, If the case of inner ear malformation and other special cases should be passed through the facial nerve and EBAR monitoring; Select surface surface approach, Set the incision before, The incision consists of two layers, The skin and subcutaneous tissue are superficial, Temporal fascia and periosteal valves are for deep layers; Open the flap just back on it, Full exposure of the bone in the mastoid region, Bbed bed for receiver / stimulator, Location on the skull surface above the retromastoid process; Custovil short feet are fully exposed after mastoid resection, And open the surface recess, open the cochlear drum steps, Install the receiver / stimulator and insert into the electrodes, Finally, the electrodes were placed on the skull surface of the inferior temporal muscle.

1.2.2 Experimental Methods

The test is completed in the free sound field of the sound insulation room (conforming to national GB / T 16296.2-2016), control the background noise below 30dB (A); and set speakers for the Chinese Mandarin monosyllabic test list (Xi Xin), with 22 equivalent lists, each lasting about 2min. Each tester chooses 2 monosyllabic equivalent lists as the test, each table has 15 test items; explain the listening method before the test, the test rhyme restatement is correct; the test order is random.

The test process is as follows: The tester remains seated for the speaker, The incident angle between the speaker remains 0, The interval is 1m; Head integrity was maintained during the testing period, The level height of the speaker center point should be consistent with both ears, Equipment calibration shall be performed before each test, Avoid causing testing interruptions; The materials used are

in accordance with the relevant regulations of the national GB/T16296.3-2017, With sufficient numbers of listeners (each frequency threshold above 10dB), The speech recognition benchmark curve is the speech level required to achieve the 50% speech recognition rate; For the speaker playback, To ensure the auditory comfort of the tester, Therefore, the sound intensity of the speech listening level, At the same time, the 60-d B H L; Practice before officially starting the test, Familiar with the word table content, New words should be solved for young sters, Avoid affecting the accuracy; Control the interword interval within 4s, Statistical monosyllables are the accuracy.

1.3 Observation indicators

Accuracy of Chinese rhyme recognition in ① CI implantation group and healthy listening group. Identification accuracy of Chinese sound rhyme tuning in ② unilateral and bilateral implantation groups. Identification accuracy = correct number / 100% total word number.

1.4 Statistical Methods

The data was analyzed using SPSS26.0 software, Student’s test tool was used for measurement data inspection; χ^2 test tool was used for count data inspection.

2. Bear fruit

2.1 Comparison of Chinese rhyme recognition accuracy in C I implantation and listening groups

The CI implantation group had> 80% less patients than the healthy listening group (P<0.05). See table 1

Table 1 Comparison of accuracy of Chinese rhyme recognition between C I implantation and listening groups [n (%)]

group	Example number	>80%	50~80%	<50%
CI implantation group	100	43 (43.00)	39 (39.00)	18 (18.00)
Jian listen to the group	100	95 (95.00)	5 (5.00)	0 (0.00)
χ^2		63.2071	33.6830	19.7802
P		0.0000	0.0000	0.0000

2.2 Comparison of identification accuracy of Chinese rhyme tone in single and bilateral implantation groups.

The proportion of patients were> 80% and 80% between 50 to 80% than the unilateral implantation group, and slightly lower than the unilateral implantation group at (P>0.05). See Table 2.

Table 2 Comparison of Chinese sound and rhyme recognition accuracy [n (%)]

group	Example number	>80%	50~80%	<50%
One-sided implantation group	45	20 (44.44)	18 (40.00)	10 (22.22)
Bilateral implantation group	55	23 (41.82)	21 (38.18)	9 (16.36)
χ^2		0.0696	0.0344	0.5520
P		0.7919	0.8529	0.4575

3. Discuss

The tone of Chinese Putonghua has the important function of distinguishing language meaning. Different from other languages, correctly identifying Chinese rhyme tone is one of the prerequisites for understanding Chinese language. But for many sensorineural deaf patients, Transinnate or acquired factors lead to impaired hearing impairment, The auditory nerve, the cochlea, and the central function were significantly decreased, The ability to recognize language rhyme is also in decline, The main reason is that some patients of the cochlear fine institutions were destroyed; For some patients with hearing impairment caused by auditory nerve damage, The accuracy of monosyllables and tone recognition is low, It is reported that this situation is due to auditory nerve involvement or poor firing synchronization, Thus, we cannot accurately identify the Chinese sound and rhyme tone, Chronic loss of rhyme stimulation will lead to further decline in hearing and language function, Especially for younger patients, The situation is even more serious.^[4] Therefore, the recognition ability of sensorhonural deaf patients is important in the analysis of CI implantation.

From the acoustic point of view, the amplitude and phase are usually used to describe the sound waveform, so as to determine that the time domain envelope information and fine structure information are the two important acoustic signals of speech, which play an irreplaceable role in language perception. In addition, it has been found that using the “sound chimerism” technology, more than 90% of the monosyllabic tone recognition is closely related to the fine structural information. In addition, the clinical reports also points out that sensorineural deaf patients cannot speech correct recognition is mainly related to fine structure is destroyed, because not complete perception of tone frequency recognition ability gradually decline, many patients will use the domain envelope information as an auxiliary, the lack of sound rhyme perception factors to make up. All the above studies can confirm that the Chinese sonology recognition ability also decreases, which reflects a close connection between hearing and speech recognition. The evaluation of patients’ speech rhyme recognition ability can be used as an indicator to measure hearing recovery and related treatment effects.

After CI implantation, the skull surface above the posterior mastoid was treated as the receiving / stimulator bone bed. Simple

mastoidectomy was performed. After opening the open surface crypt and cochlear drum steps and the receiving / stimulator was installed, the stimulation electrode was inserted, and electrodes were set on the surface of the subtemporal muscle skull. After 3~5 weeks electrode stable can be boot, affected by the patient physiological, psychological and other factors, boot hearing recovery needs a period of time, usually within 1~4 weeks electrode parameters will have significant changes, need to be debugging, the first three months after surgery need debugging once a month, then can be changed to half a year or a year debugging. With the gradual recovery of hearing in patients with stable electrode sensorineural deafness, the sound rhyme recognition ability has also been significantly improved. At present, CI implantation is known as the best way in the process of hearing recovery, and can prevent the decline of speech ability caused by hearing impairment, and reduce the impact on patients' daily life of .^[5]

From the above content, CI implantation effect validation, rhyme recognition ability test and evaluation is crucial, therefore, the study included 100 cases of listeners and 100 cases of sensorineural deaf patients in clinical control trial, after CI implantation of Chinese rhyme recognition ability is more ideal, recognition accuracy of more than 80%, 43%, 39%, but 19%, compared with listener recognition accuracy has a big gap. The research results are basically consistent with the existing clinical, a large number of reports put forward some patients after CI rhyme recognition recovery effect is not ideal, mainly because CI can help patients more accurately identify monosyllables, namely more accurate perception tone, but many patients with impaired perception of phonemic, tone recovery to improve the positive effect of phonemic perception ability is not big, therefore, some patients Chinese rhyme recognition accuracy is less than 50% within the acceptable range. At the same time, in the analysis of this study, the effect of patients. According to the statistical results, the identification rate of patients in the bilateral implantation group was > 80% and between 50 to 80% was slightly higher than that of the unilateral implantation group, and slightly lower than that of the unilateral implantation group at ($P > 0.05$). Thus it also suggests that the rhyme perception of monosyllables is not affected by binaural hearing.

Can be seen from the results of CI implantation, in help sensorhonic deaf patients recover sound rhyme recognition ability has obvious effect, but now for many patients, especially in childhood by congenital or acquired factors caused by sensorhonic deafness, CI implantation is an early intervention, subsequent need to cooperate with rehabilitation training. However, the implantation of CI is necessary, and the brain plasticity is strong in childhood. If the sound cannot be received to stimulate the brain center for a long time, it will be difficult to distinguish speech sound, which will induce language or speech disorders, and eventually become deaf and mute. Therefore, it is recommended that the earlier the diagnosis, the better.

In conclusion, the recognition ability of Chinese rhyme in patients has recovered after cochlear implantation, but there is still a gap with the recognition ability of healthy listeners, and the implantation side has little impact on the recognition ability.

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