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Notice

The Asian Medical Journal (AMJ) has changed its name to the Japan Medical Association Journal (JMAJ) from the April 2001 issue. The AMJ has been in publication for more than 40 years since its first issue. Its goal has been to promote medicine and health care mainly in Asia. Relevant articles were selected mainly from the Journal of the JMA and translated into English. It has been an academic journal containing the latest information in the field of medicine.

In conjunction with the change in the name, the journal's cover has been revised. The content of the JMAJ will continue to contain the latest information in medicine and health care in Japan, but it will be disseminated to medical-related organizations throughout the world, in addition to Asia. It will also contain information on JMA's activities and its stance on health care policies in Japan. Please note that the first issue of the JMAJ is volume number Vol. 44, No. 4 and the numbering continues consecutively from the previous AMJ issue. The ISSN 0004-461X will also continue to be the same. In addition, we are no longer accepting contributions to the AMJ or the JMAJ.

JMAJ Editorial Office

Basic Policies of the Japan Medical Association

Eitaka TSUBOI, M.D.

President, Japan Medical Association

The following is a main part of the address of Dr. Eitaka Tsuboi, President of the Japan Medical Association which was presented at the 104th General Assembly of the JMA House of Delegates that was held in Tokyo on April 1, 2001.

Social Security Reforms

The overall public impression about social security in Japan is one of extreme political confusion. However, it should be noted that the future structure of national health care has been obscured by bureaucratic politics, that have been the expedient outcome of the government's move to restructure the ministries and agencies. I am greatly concerned that this situation is a serious problem that will distort the course of social security in our country over the long-term.

I view the restructure of the ministries and agencies as a means by which the administrative branch of the government is trying to take control of the legislative branch through bureaucratic politics.

The credibility of the politicians who state that national policies are prepared and implemented under their political leadership is questionable, in view of the fact that national policies are based on bureaucratic policies. This reality is inexcusable and such national policies are justifiably seen as an extension of bureaucratic authority and the finance-oriented policies of bureaucratic politics. In this respect, the situation is indeed one of extreme political confusion.

However, in the face of such circumstances, the JMA must continue to strive towards the development and implementation of a sound social security system through public expression of its opinions. We must work towards building adequate consensus and the realization of a national policy that will achieve a sound social security system.

Recently, the Japanese government announced its package of social security reforms and its future policies. However, the government's outlook on health care reforms remains vague.

JMA's health care structural reform plan proposes short, medium, and long-term countermeasures that will be implemented within a flexible time schedule. In order to galvanize and realize these reforms, policy dynamics must be applied by designating the newly created health care system for the elderly as the focal center of the reforms.

In order for these reforms to effectively contribute to national prosperity and to earn the support of the populace for the long-term future, the basic principles must be based on reforming public awareness and the information structure.

For example, fostering the public's awareness of the individual, appropriate choices available in health care, while providing health care information that meets the needs of a self-reliant populace, will produce a mutually harmonious relationship that will strengthen physician-patient trust and comprehensively raise public trust in our health care system. In addition, physicians striving to maintain quality management in order to enhance the public trust will ensure the propagation of safe health care.

Presently, an active ethics network of physicians endeavors to provide open access to health care information; and activities that promote safe health care have been carried out with the cooperation of the regional medical associations. The noble sense of mission with which our physician members have pursued these tasks is to be highly commended.

If reforms that are based on these two principles come to fruition, the many diverse, narrow viewpoints on the legislation of public disclosure of medical care information, the problem of corporate encroachments in the health care sector, the debate on mixed practice, and other issues will vanish like the clouds and mist.

This is the nucleus of the JMA's structural reform plan and following further debate, I would like to develop it into more strengthened policy of the JMA.

International Organizations

Six months ago I was inaugurated as the president of the World Medical Association in October 2000 in Edinburgh, Scotland. As I stated in my inaugural address, my major concern or theme is "the expansion and control of advanced medical technology". During these past six months the WMA officers, AMA executive members, and medical association representatives from three countries participated in the Tokyo meeting and reached a consensus on a proposed resolution on medical ethics and advanced medical technology.

This resolution was introduced to the WMA Council meeting held in May and it will be submitted for adoption as a WMA declaration to the WMA General Assembly, which

will be held in New Delhi in October of this year. As I also stated at the Symposium of the World Economic Forum in Davos, it is important to promote an environment where both the advanced and developing nations may reap the benefits that stem from the medical profits generated from genetic manipulation, but it is vital that we have the courage and the elevated foresight to advocate the control of such technology, in view of the risks that it imposes on mankind in today's global community.

Further, the responsibility of the JMA in the health care sector goes beyond the boundaries of the medical profession, as attested to by the great anticipation which has been directed toward our association by the international community. I would like to report that JMA's resolute stance advocating the love of humanity as the cornerstone of health care has garnered the universal support of the international health care community. Each country recognizes that rationality, which is the nucleus of health care in America and experimental medicine, which is the foundation of health care in Europe, in combination with the healing and mind-oriented health care of Asia, are essential to creating balanced health care throughout the world.

The cornerstone policy of the JMA is based on the creation of balanced health care and it will require further refining.

JMA's health care assistance to Nepal has produced astonishing achievements. Recently, I was granted an audience with the King of Nepal and I was able to report directly the achievements of JMA's assistance project. In a subsequent meeting with the Prime Minister of Nepal, the JMA was formally thanked for its work in the country.

Recently, I attended the official ceremony to transfer to Nepal the newly constructed school that was built utilizing the funds donated by the Ibaraki Medical Association. During the ceremony, I was presented with a bouquet of flowers from two first-graders and was greatly impressed by the beneficial impact of the project. Although a formal report will be submitted later, I have taken this opportunity to report on the project undertaken by the Ibaraki Medical Association.

The Takemi Program at the Harvard School of Public Health is growing steadily and recently, a reunion or forum of former Takemi fellows was held in Tokyo. The debates that took place among the former fellows, who hold prominent positions in their respective countries, was of enormous benefit, but I also believed that it was also greatly significant as a "progress report" for the individuals and organizations who have provided extensive cooperation to the program.

The JMA has implemented an assistance project to provide medical equipment to the Thai National Cancer Center under the auspices of the Japan International Cooperation Agency (JICA); and a new facility for gastrointestinal cancer was recently constructed at the Thai National Cancer Center. Additionally, there was a formal request to train Thai specialists from the Thai Medical Association. Subsequent negotiations with the National

Cancer Center has progressed to a stage where this request will be implemented. JMA's assistance projects in Asia have been highly assessed and we will continue to pursue similar academic cooperation projects.

Medical Accident Preventive Countermeasures

The Japanese government has created a committee on preventive countermeasures to address the issue of medical accidents that have occurred with increasing frequency. However, specific action has not been forthcoming and as a result, public apprehension and distrust has not been alleviated.

In view of these circumstances, the JMA is in the process of dealing directly with the medical equipment manufacturing industry and we anticipate the introduction of newly developed medical equipment to relevant facilities in the near future.

However, as I have mentioned before, medical accidents underscore the lack of morals and the absence of a sense of mission on the part of the health care professional. I feel that there is a need to promote and disseminate the study of medical ethics comprehensively by the JMA through educational curriculums at medical schools and in medical training programs.

In conclusion, although I have discussed JMA's policies based on current issues and events, health care in Japan is in the midst of a major transition period. As an organization of health care professionals, the JMA must be aware of its responsibility to ensure that health care in Japan does not progress in an erroneous direction. To that end, as the president of the association, I will act resolutely and with courage in pursuing the reforms that must be implemented.

Cochlear Implant—Update

JMAJ 44(5): 203–207, 2001

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Abstract: In recent year, cochlear implant (CI), which allows the deaf to acquire hearing, is being increasingly adopted as a new medicine in Japan as well. Cochlear implant is indicated for sensorineural hearing loss due to cochlear disorder. Information by speech is converted to electric signals to stimulate the auditory nerve with electrode array in the cochlea. On an average, 70–80% of speech has been recognized by the deaf who lose hearing after the period of speech acquisition postoperatively, and favorable results have been obtained among children, who have been implanted in early age of life. The advances in cochlear implant include miniaturization of the implantable part and improvement in a speech processor to the wearable type behind his/her ear(s). The coding strategy of speech signals also diversifies. In addition, the lowering of age for indication was also conducted in 1998 in Japan: children more than 2 years of age were included as candidates for the implantation. In Japan as well, auditory brainstem implant (ABI) was initiated for the treatment of hearing loss due to surgery for bilateral acoustic neurinoma. In the future, indications of CI will increase considerably by improvement in the device and contribution of speech auditory therapist to the medical care of CI users.

Key words: Cochlear implant; Indication; Advance in device; Postoperative result; Brainstem implant

Introduction

Multi-channel cochlear implant is being increasingly adopted in recent years, as a therapeutic method for patients with severe sensorineural hearing loss. Even the deaf become to understand speech via CI. At present the new medical treatment is globally being adopted, and it has been introduced to Japan for more than 10 years, and at least 1,400 cases at more than 50 approved institutes have been conducted.

In this article, general concept of the new medicine is briefly introduced, with reference to the recent advances in CI device, change of criteria for indications and future of CI.

The Principles of Cochlear Implant

Most cases of sensorineural hearing loss may be caused by a disorder of Corti's organ in the cochlear where sounds are converted

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The Japanese text is a transcript of a lecture originally aired on November 19, 1999, by the Nihon Shortwave Broadcasting Co., Ltd., in its regular program "Special Course in Medicine".

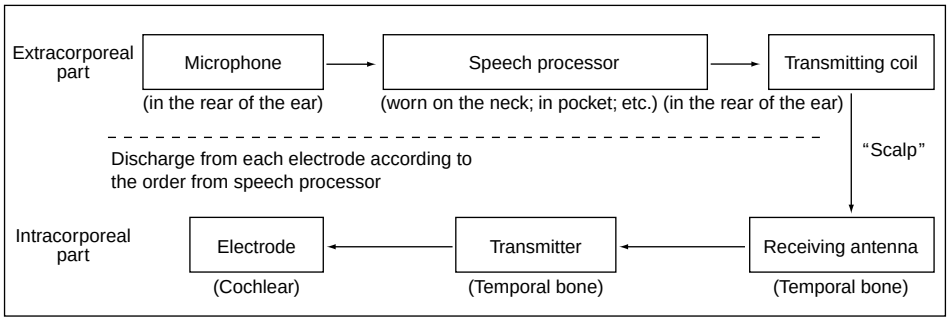

Fig. 1 A flowchart of speech signals in cochlear implant

to nervous impulses. Therefore the spiral ganglion of cochlear is directly stimulated with the electrode of CI to produce auditory sensations at the auditory cortex. Several devices developed in Australia, United States, France, and Austria have common principles as follows.

Cochlear implant is composed of extracorporeal and intracorporeal parts. The intracorporeal part includes an antenna for receipt of extracorporeally processed information, the transmitter linked with the antenna, and the electrode to be placed in the cochlear at the end of the transmitter. On the other hand, the extracorporeal part to convert speech sound into electric signals and transmit it to the intracorporeal part is composed of a microphone for signal receipt, a speech processor and a coil to transmit signals to the intracorporeal antenna (Fig. 1). The speech processor which is regarded as "the heart" of CI decides the way how and which electrode is turned on electrically. There are systems of coding strategies, as will be described later.

Postoperative Results

The outcome in speech understanding after the surgery depends on the age of hearing loss. The postoperative results in the people who lost hearing before speech acquisition (prelingual deaf) are much different from those in the people who lost hearing after speech acquisition (postlingual deaf). In case of prelingual deaf, the results vary with the time when the implantation is conducted; the people treated before school age, which is believed to be the critical period of neural plasticity, show much better speech understanding than those treated after adolescence. In general, postlingual deaf people can understand approximately 80–100% of vowel and approximately 40–60% of consonant syllables after the operation, and overall understanding of speech reaches 70–80%. The prelingual deaf people treated after adolescence, however, show poor discrimination of consonant syllables and speech understanding is generally poor, although they can understand vowel relatively well. On the other hand, the prelingual deaf people treated in their childhood, show improvement in understanding of speech with time. The postoperative speech understanding in children aged 2–3 years may be favorable, although they develop speech slightly retarded than that in normal children.

Advances in Cochlear Implant Device

Representative CI which are currently used over the world include Nucleus CI (Cochlea Inc., Australia), Clarion CI (Advanced Bionic Inc., USA), Combi 40 CI (Medel Inc., Austria), and so on. In Japan, only the CI with 22 channels (Cochlea Inc.) has been conventionally used. Its improved type, Nucleus 24 and Clarion (Advanced Bionic Inc.) are going to be used in Japan as well in the near future.

Advances in CI include improvement in the device and the widening in the indications for implantation. Cochlear implant device has also advanced both in terms of hardware and of software as follows.

1. Advances in hardware of cochlear implant

The implantable part of CI is needed to be miniaturized, because the device must be kept in the thin temporal bone of child without compression to the dura. In several types of CI, as well as Nucleus 24, the part has already been miniaturized to 1/3 or 1/2 in size of the conventional one. Electrode has also been improved; it is divided into two, and one of them can be placed in the second turn of cochlear. In Clarion device self curling electrode array in the scala tympani will become closer to the spiral ganglion, with a silicone positioner, placed outside the electrode. These improvements in CI are believed to lead to improvement of speech understanding via CI. Miniaturization of speech processor to the wearable type behind his/her ear(s), have already become to practical use. In the future, CI is to be improved to the ear-insertion type or the type in which all parts of device are implanted (whole implantable type).

2. Advances in the software of cochlear implant

Audio signals input into CI are encoded by speech processor as follows. At present, however, there have been no marked differences in the outcome of speech understanding among them.

(1) **SPEAK method**

The 22-channel CI (Cochlea Inc.) was improved to SPEAK in 1995; on an average, 6 signal components with high energy are extracted from the speech sound. The CI is being changed to CI 24 system that can be operated by the continuous interleaved sampling (CIS), which will be described in the following. In the future, the CI is to take a coding strategy called advanced combination encoders (ACE), which has both characteristics of SPEAK and CIS method.

(2) **CIS**

In this method, any characteristic of speech sound is not extracted, but audio waveforms are reproduced and input by click processions. Speech signals are separated with a filter of about 8 bands and converted to square waves. Thus, audio waveforms become biphasic click processions, to be transmitted without interference among electrodes. In this method frequent stimulation more than 1,000 times/sec is possible. The method is being adopted to Combi 40 and Clarion.

(3) **Analogue stimulation method**

In the Clarion system, the analogue stimulation method as well as CIS, can also be selected. In this method, signals input are divided into several frequency bands through the filter, and stimulated by compressing the dynamic range, so that the auditory nerve will be able to react. Interference between the electrodes has been minimized, allowing the simultaneous input of analogue waveforms.

Increase in the Indications for Cochlear Implant

1. Pediatric cases

The indications for CI in Japan were restricted to postlingual adults more than 18 years of age. In April 1998, however, the new criteria for indication including pediatric cases, were established; children more than 2 years of age were included as candidate for the implantation (Table 1). In the pediatric case, however, the hearing threshold is more restricted than in adults; severe hearing loss more than 100 dB, and non-effectiveness of hearing aid observed for a certain period. Contraindications for the implantation include no space for the electrode in the cochlear on any CT or MRI image, and severe mental retardation. The number of operation in the world using the Nucleus CI has been reached

Table 1 Criteria for the Indications for Cochlear Implant (Established by the Japanese Society of Otorhinolaryngology in April 1998)

I. Infantile cases
1. Age: More than 2 years of age and less than 18 years of age. The operation before school age in congenital deafness (prelingual deafness) is recommended.
2. Hearing level and the effectiveness of hearing aid: Bilateral severe hearing loss more than 100 dB and slight effectiveness of hearing aid. When hearing aid is little or hardly effective either in speech understanding or speech expression during the sufficient observation period, CI is indicated.
3. Contraindications: The case, which has no space for CI in the cochlear on images (CT, MRI). Cochlear malformation or ossification is not necessarily included in the contraindication. Other contraindication include active otitis media, severe mental retardation, auditory central disorder, and other severe physical complications.
4. Rehabilitation and educational supports: Understanding and agreement of CI by patient's and family members are essential. Rehabilitation, special staff for education (speech auditory therapist), and facilities are also required. It is also desirable that understanding and cooperation by ambulatory facilities and facilities for auditory education are obtained.

II. Adult cases
1. Age: More than 18 years of age.
2. Hearing level and the effectiveness of hearing aid: Bilateral severe hearing loss more than 90 dB, and slight effectiveness of hearing aid. The effectiveness of hearing aid should be evaluated with reference to the averaged results of speech discrimination by CI users (consonant syllable discrimination test, monosyllable test on the 57-word list, test for repetition of words and sentences, etc.).
3. Contraindications: No space for CI in the cochlear on images (CT, MRI). Cochlear malformation or ossification is not necessarily included in the contraindications. Other contraindications include active otitis media, severe mental disorder, auditory central disorder, and other severe physical complications.
4. The patient's will and the circumstance's support: The patient's and the family members' will and understanding of CI are required.

Additional remarks
1. The results of promontory test is used just for reference.
2. In adult patients with congenital hearing loss, it must be necessary to make them to understand the poor effectiveness of the implantation in terms of speech understanding and the possibility to become non-user of the device. It is also necessary for the patient to have much will to use CI.

to 21,067 cases as of February 1999, and 9,925 (ca. 47%) of them were pediatric case (Fig. 2). The proportion of pediatric cases in Japan, however, still remains low, ca. 14%.

The lower limit of age for the indications is 12 months in the U.S., while 6 months in Germany. As a result, it has been confirmed that the case, which receives the CI at low ages, showed significant development of normal speech as compared with other cases. In Japan as well, the age for the operation may tend to be younger in the future. On this occasion, it is important to establish the system of early hearing screening and evaluation of the accurate threshold of hearing loss. The project of mass screening for deafness in neonates has started in Japan as well. In the near future, selection of an appropriate method to acquire hearing including CI will be conducted. In Germany, along with the project of younger implantation, bilateral implantation has been confirmed to improve understanding of speech considerably.

2. Adult cases

In the present criteria for the indications, a special note that prelingual adults have a handicap in hearing of speech, and the CI before school age was recommended. In adult cases, CI becomes a so-called boon for people who have hearing loss after acquisition of speech. In the prelingual deaf people, however, the neuron networks in the brain for recognition of speech remains undeveloped, and they can not understand speech although they feel sounds with CI. Consequently, future important tasks would be criteria for indications, including age factor, from the view point of critical period of neural plasticity, and innovations in rehabilitation for

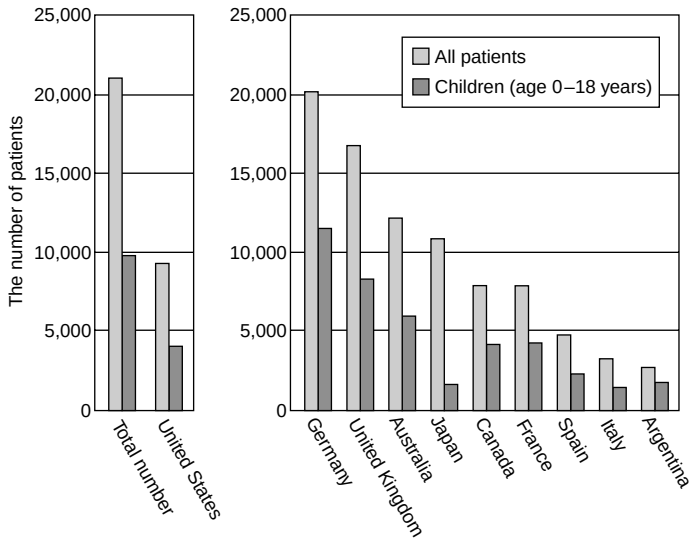

Fig. 2 Present number of nucleus cochlear implant (as of February 1999)

speech development.

In the aged person, indications for CI as a substitute for a hearing aid will increase. Severe sensorineural hearing loss including senile hearing loss are characterizes by the lower intelligibility of speech sounds than pure tone. When hearing aid becomes useless due to progression of deafness, CI becomes a new means to improve hearing. On this occasion, there is no upper limit of age for indications, if mental faculties are within the normal range and the patient has the will to improve hearing.

3. Retrocochlear hearing loss cases

Cochlear implant is useless if the auditory nerve is not preserved in the bilateral acoustic neurinoma surgery. In such a case, auditory brainstem implant (ABI) to apply the device to the cochlear nuclei, which are located superior to the cochlear is developed. Since the cochlear nuclei have the distinct tonotopicity like the cochlear, it is highly probable for speech information to be transmitted to the central nervous system. Many cases of retrocochlear hearing loss have been treated in the U.S. and Europe using ABI, and understanding of speech as well as recognition of environmental sounds are acquired. The first case of ABI in Japan has already been conducted, and the indications for the operation will increase in the future.

Conclusion

It is only a short time since CI was adopted as a medical treatment for the deaf. The degree of speech understanding will be increased by improvement in the device, and the indications for the operation will also be increased in the future. However, careful and accurate judgment of hearing level is particularly needed in deciding infantile indications. For this purpose as well, screening of hearing loss and the role of speech auditory therapist as a coordinator in implementing the medical care is important. It is also important for the people who are engaged in education, as well as those of medical side to tackle post-operative rehabilitation.

The Cause and Examination of Hearing Loss

JMAJ 44(5): 208–213, 2001

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Abstract: Information obtained through auditory sense has become increasingly important in the information-oriented society where information technology revolution is being advocated. It is important for increasing quality of life of man as well. Hearing loss is considerably involved with the density of communication. The severity and cause of hearing loss are variable; differences between reversible and irreversible conditions and between congenital and acquired types have much influence on the treatment policy. The influence of systemic diseases is hidden within the background of a certain type of hearing loss. This type of hearing loss and another type of hearing loss due to the influence of socially environmental factors (e.g., social noise, stress, etc.) can be prevented to some extent by the spread of knowledge. Various kinds of early audiometry are essential. Precise data on examination leads to the prevention of reversible hearing loss from becoming irreversible and to appropriate treatment and rehabilitation. With regard to the matters necessary as fundamental knowledge for the comprehension of the actual entity of hearing loss, the cause and methods of examination of hearing loss are mainly outlined.

Key words: Conductive hearing loss; Sensory-neural hearing loss; Puretone audiometry; Speech audiometry; Auditory evoked response

Introduction

Hearing loss is manifested by disorders developing at either site of the organ of hearing, which originates from the external ear to the auditory center, or the auditory pathway. In general, hearing loss cases are classified roughly into “conduction hearing loss” and “sensorineural hearing loss”.

Sounds enter the external auditory meatus as air vibration to vibrate the tympanic membrane and to induce vibration of three chains of the auditory ossicles inside the tympanic membrane, i.e., in tympanic cavity. The membrane of a small window (oval window) in the boundary between the tympanic cavity and

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the internal ear is also vibrated. Vibration of the small membrane surface is transmitted to the endolymphatic fluid filling the cochlea of internal ear, and stimulates hairy cells of the Corti's organ in part of the cochlea.

The process of movement of the membrane, auditory ossicles, and the endolymphatic fluid by air vibration is called conduction mechanism, and hearing loss due to a disorder at the site is called "conduction hearing loss".

Then, movement of the endolymphatic fluid stimulates hairy cells to be caught in the peripheral minute structures, and electrobiological biophenomena occur. The biophenomena ascend the central auditory tract from the cochlear nerve, and reach the primary auditory cortex of the temporal lobe. Hearing loss due to a disorder at the site ranging from the hairy cell level of the cochlea to the central auditory pathway is called "sensorineural hearing loss". Hearing loss due to a disorder of both the conductive system and the sensorineural system is called mixed hearing loss.

Main Causes of Hearing loss

1. Etiological classification

(1) **Hearing loss cases due to inflammatory diseases**

The cases include acute otitis media, chronic otitis media, exudative otitis media, internal otitis, etc. The tympanic cavity and the nasopharynx are connected with each other through the auditory tube. When upper respiratory inflammation is manifested by cold, etc., the tubal function is impaired to cause hearing loss. Infection of mothers with rubella because of viral infection, epidemic parotitis, auricular shingles, and so on also cause sensorineural hearing loss.

(2) **Hearing loss cases due to systemic diseases and medications**

The majority of living habitats-induced diseases may be related to disorders in the inner ear because of circulatory disorders and the feature to be easily infectious. They include diabetes mellitus, renal diseases, arteriosclerosis, hypertension, etc. Some of the drugs administered for a long term for the treatment of these living habitats-induced diseases are associated with hearing impairment. (drug induced)

(3) **Hereditary deafness**

The cases will be discussed in other sections.

(4) **Hearing loss cases accompanying trauma and tumors**

Typical examples of such cases are temporal bone fractures due to traffic accidents, temporal bone tumor, and acoustic nerve tumor.

(5) **Psychogenic hearing loss cases**

Hearing loss is observed in the absence of abnormality in the auditory tract. This type of hearing loss frequently develops in children and occurs due to various psychogenic factors including various problems at school and home, friendships, etc.

(6) **Hearing loss cases of unknown cause**

Sudden deafness is included in the cases; it suddenly shows lateral severe hearing loss.

2. Morbid conditions (according to sites of disorders)

The causes of and inducements to main cases of hearing loss were enumerated above. Typical morbid conditions developing hearing loss are described below according to disturbed sites.

(1) **Conductive hearing loss**

1) Foreign bodies in the external auditory canal and ceruminal plug embolism: Mild to moderate conductive hearing loss develops.
2) Congenital atresia auris: Moderate to severe hearing loss develops.
3) Damage to (perforation of) the tympanic membrane: It includes direct injuries by the use of an earpick and indirect injuries due to a slap, a bomb blast, etc. There are a variety of hearing loss cases due to the damage, which range from mild conductive hearing loss to severe sensorineural hearing loss.

4) Diseases of the tympanic cavity: Acute otitis media and chronic otitis media (including cholesteatoma) develop various cases of hearing loss. The initial stage of chronic otitis media shows conductive hearing loss, which gradually shows features of sensorineural hearing loss via mixed hearing loss in some cases. A considerably large number of the cases become severe. Exudative otitis media manifested by retention of the exudate in the middle ear cavity also shows hearing loss. Mild to moderate hearing loss is commonly observed.

As described above, conductive hearing loss develops when the auditory tube connecting the middle ear cavity with the nasopharynx becomes stenotic. It frequently accompanies a sense of aural fullness. The chain of auditory ossicles in the middle ear cavity may also be transected by a blow to the head and the direct external force. Moderate to severe hearing loss is observed.

In recent years, otosclerosis has become considerably common in Japan. In the morbid condition, the stapes, one of chains of the auditory ossicles, shows fusion with the peripheral bone tissues to restrict the mobility. The incidence of the morbid condition is believed to be high in Caucasoids and low in colored races, but changes in dietary life may be related to the incidence. It frequently occurs in young women, and generally, hearing loss gradually progresses in them. Much attention should also be paid to the morbid condition, because hearing loss may worsen in association with pregnancy and labor.

(2) **Sensorineural hearing loss**

A. **Cochlear hearing loss**

The majority of sensorineural hearing loss cases are included in the type.

1) Senile hearing loss: It is manifested by physiological phenomena of aging; at first, it becomes difficult to hear high-tone sounds of 8,000 and 4,000 Hz; "articulation of words" starts to decline; and the frequency of the so-called "asking back" increases. The physiological phenomena of aging start at the former half of the 50s. Many people are aware of the phenomena at the latter half of the 60s.
2) Noise induced deafness: There are two types of the condition; i.e., noise induced deafness due to acute acoustic trauma and the gradually developing type, chronic noise induced deafness. These cases are caused by exposure to big sounds, a sound of an explosion, big sounds at live spots, and persistent noise at occupation. The morbid condition is called headphone hearing loss as well; it develops by listening to music characterized by a strong beat with headphones for a long time, and the people must be guided to pay attention to the method how to use headphones. The condition, in which hearing of only 4,000 Hz declines, is called "C^5 dip" that is characteristic as the initial symptom of noise induced deafness.
3) Sudden deafness: Sudden deafness that shows suddenly severe sensorineural hearing loss is also believed to be cochlear disfunction. Tinnitus may be associated with sudden deafness, and vertigo occasionally occurs simultaneously with or before / after the occurrence of hearing loss. Unlike Ménière disease that will be described later, the vertigo is not repeated. The condition may be cochlear disfunction, but the cause has not been adequately elucidated. There are various theories discussing the cause; e.g., viral infection theory, blood circulation disorder theory, immunological disorder theory, allergy theory, etc.
4) Viral infection: Infections with herpes virus, Paramyxoviridae, rubellavirus, adenovirus, influenza virus, and so on induce cochlear hearing loss. Many cases of viral infection develop via blood circulation. Typical examples of viral infections are auricular shingles, epidemic parotitis, affection of mothers with rubella, and others.

5) Drug-induced hearing loss: The cases of hearing loss induced by administration of drugs with toxicity to the acoustic organs are also cochlear. The drugs that are problematic include aminoglycoside antibiotics, some loop diuretics, some antitumor agents, drugs belonging to nitrogen mustard, cisplatin as a platinum compound, and others. It has long been known that quinines, arsenic compounds, and salicylate compounds are also associated with the occurrence of the condition.
6) Ménière disease: Paroxysmal rotary vertigo, transient hearing loss, and tinnitus are associated with the disease. As it is repeated, the disease shows hearing loss, which becomes increasingly severe and irreversible.

B. **Retrocochlear deafness**

Of sensorineural hearing loss cases, those whose causes are located in the area ranging from the inner ear to the center, i.e., the central auditory tract originating from the cochlear nerve to the acoustic center, are called retrocochlear deafness. Typical examples of the cases include tumorous lesions such as acoustic nerve tumor, cerebellopontine angle tumor, etc., cerebrovascular accidents, head injury, demyelinating disease, hereditary diseases, and others. Various disorders in the center directly and indirectly influence the central auditory tract to manifest hearing loss.

Tests for Hearing Loss

There are at least 20 types of tests; they are typical tests regarding the identification of the severity, type, and responsible site of hearing loss.

The complaints of hearing loss are roughly divided into two groups: one group consisted mainly of complaints, "hardly heard" and "poorly heard", and the other group consisted of a complaint, "it's not hardly heard, but impossible to catch the contents of the talk".

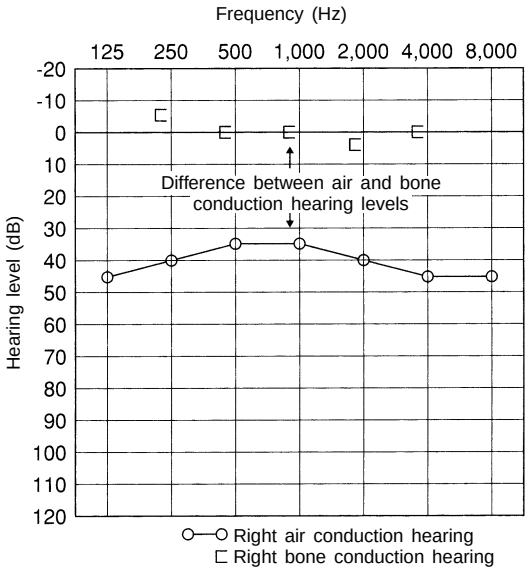

Fig. 1 A case of conductive hearing loss (of the right ear) (Cited from: The Japanese Society for Aural Medicine (Ed.): *Practical Application of Audiometry*, 1999)

In other words, the former group has problems with decrease in the hearing level, and the latter group has those with decrease in the speech discrimination.

Four of the typical tests for these cases of hearing loss are roughly described below.

1. Standard pure tone audiometry

The levels, at which pure tone sounds ranging from low-tone sounds (125 Hz) to high-tone sounds (8,000 Hz) can be heard, i.e., "hearing levels", are determined by the test. "Air conduction hearing" and "bone conduction hearing" are determined by the test. In the air conduction audiometry, a receiver is attached to the auricle. In the bone conduction audiometry, a vibrator is attached to the site of the mastoid process in the rear of the ear. In conductive hearing loss, air conduction hearing decreases but bone conduction hearing is normal; that is, difference between air conduction hearing and bone conduction hearing appears. The difference is called an Air-Bone gap. On the other hand, both air conduction and bone conduction hearing decrease in sensorineural hearing loss. That is,

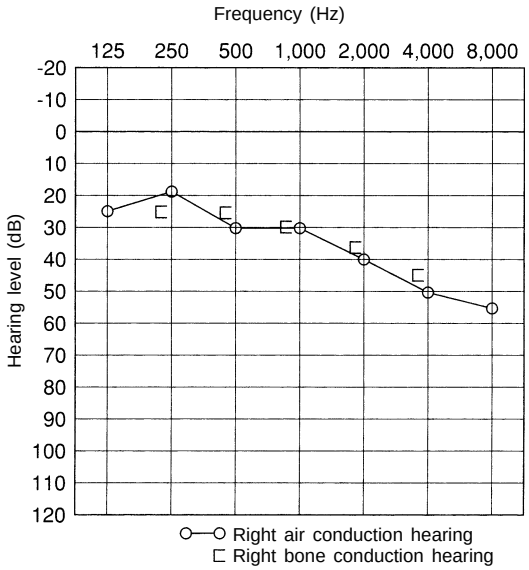

Fig. 2 A case of sensorineural hearing loss (of the right ear) (Cited from: The Japanese Society for Aural Medicine (Ed.): *Practical Application of Audiometry*, 1999)

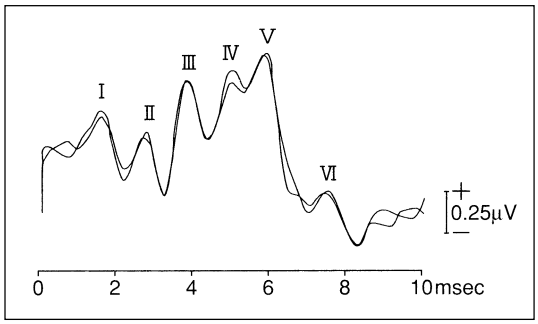

Fig. 3 Responsive components of ABR and names (Cited from: The Japanese Society for Aural Medicine (Ed.): *Practical Application of Audiometry*, 1999)

no Air-Bone gap appears (Figs. 1 and 2).

Examinations of "recruitment phenomena" and "a temporal increase in threshold" are also conducted with pure tone sounds. Recruitment phenomena are observed in the elderly; for instance, it indicates the condition, in which small sounds are hardly heard but big sounds are so noisy that they are hardly heard. Such a condition is tested on the examination of recruitment phenomena. In other words, the range of the sounds heard regarding loudness is determined. Normal people can hear both small sounds and considerably big sounds, while the range of the sounds heard decreases in cochlear hearing loss cases represented by senile hearing loss. This case is positive for recruitment phenomena, and the positivity is one of the criteria for the methods of diagnosing cochlear hearing loss.

When we are listening to sounds of a constant tone, it becomes impossible to hear them, because we get used to hearing them. When the tone is increased, the sounds are heard, but it becomes gradually impossible to hear them. Thus, the degree of inaudibility for the sounds, which are heard in the beginning, because of practice or fatigue, is determined on the examination of "a temporal threshold shift". In retrocochlear deafness, the patients feel fatigue soon on hearing. This phenomenon is called a temporal threshold shift.

Cochlear cases of sensorineural hearing loss are differentiated from the retrocochlear cases by examinations of recruitment phenomena and a temporal threshold shift.

2. Speech audiometry

In this test, examinees are subjected to hear words and speech sounds and examined for the degree at which they can hear the contents of a talk precisely (speech discrimination). The decrease in "articulation of words", i.e., the condition in which "the sounds are audible, but the contents cannot be comprehended", is examined by the test. In general, speech discrimination decreases when the site of disorder is located in the center; e.g., when a disorder is present in the auditory cortex, articulation of speech sounds shows the extreme decline, despite the fact that pure tone audiometry does not reveal so severe hearing loss.

3. Objective audiometry

In this test, electrophysiological evoked responses to sound stimuli involving the area ranging from the inner ear to the center are recorded non-invasively from the site on the

scalp. The development of medical electronics allowed the recording of microscopic electric phenomena in the brain with a simple instrument. Responses to sound stimuli, which have various characteristics, are obtained from each site of the auditory tract. A typical example of the responses is auditory brainstem response (ABR) (Fig. 3). With these tests, objective data can be obtained without declaration of intention of examinees to have heard by themselves. Therefore, the test has a wide range of application; i.e., it is applied to tests in neonates to infants, the case in which feigning illness is suspected, and the case in which psychogenic hearing loss is suspected.

4. Other tests

There are tympanometry as a test for function of the middle ear and otoacoustic emission as a new test for function of the inner ear, which has recently been developed. The accuracy of these tests for determining the severity of hearing loss and diagnosing the site is increasingly being improved.

Curable Sensorineural Hearing Loss and Critical Hearing Loss

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Abstract: Sensorineural hearing loss has generally been believed to be incurable, but it has become known in recent years that some cases of sensorineural hearing loss are curable. A typical example of such cases is sudden deafness. However, the diagnosis of sudden deafness should not easily be used; when a case was finally evaluated to be of unknown cause on subdivision diagnosis, it should be diagnosed as sudden deafness, because there seem to be variable causes of sudden deafness. Therefore, the diagnosis of sudden deafness made on initial examination may often be corrected thereafter. The cases, which should be differentiated from sudden deafness, include perilymphatic fistula, steroid responsive sensorineural hearing loss, and so on, and they are curable. On the other hand, the cases, which are diagnosed as sudden deafness from the past history on initial examination as critical hearing loss, include acoustic neuroma and brainstem infarction. Only the case, in which these diseases are ruled out, can be regarded as being of unknown cause.

Key words: Curable hearing loss; Critical hearing loss; Sudden deafness; Perilymphatic fistula; Steroid responsive hearing loss

Introduction

Sensorineural hearing loss is a general term of hearing loss cases due to the disturbance of the auditory pathway involving the area ranging from the cochlea to the auditory cortex of the cerebrum. The incidence of cochlear hearing loss attributed to the disturbance of the cochlea, which is one of such sensorineural hearing loss cases. Sensorineural hearing loss hardly becomes curable long after the occurrence of the disturbance, because sensory cells of the cochlea are hardly regenerated once they have been impaired. A typical example of the sensorineural hearing loss cases is deafness due to aging (senile hearing loss).

Curable Cases of Sensorineural Hearing Loss

Since about the middle of the 20th century, it has become known that some acute cases of

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sensorineural hearing loss are curable.[1,2] These diseases were named as sudden deafness, which is currently a common name, by Rasmussen (1949).[3] In Japan, the term, sudden deafness, was used by Tsuiki (1955).[4] It has also become known that the disease must be dealt with as medical emergency because it shows a good prognosis by early treatment.

It has subsequently become known that some sensorineural hearing loss cases other than sudden deafness are also curable. One of them is hearing loss with which immunological abnormalities are involved, and McCabe[5] used the term, autoimmune sensorineural hearing loss, for calling such a case of hearing loss in 1979.

In Japan, the authors[6] reported in 1975 that sensorineural hearing loss accompanying Takayasu disease or aortitis syndrome is steroid responsive sensorineural hearing loss. In 1981, the authors[7] reported that some cases of this type of sensorineural hearing loss show high levels of immune complex. With regard to these cases, no reliable diagnostic method has been found. Although it is one diagnostic method to clinically demonstrate the response to steroids, there are no methods of demonstrating in any case without response to steroids. Even if hearing is improved by administration of steroids, it cannot be immediately concluded that these cases show hearing loss related to immunological abnormalities, because it is difficult to differentiate the improvement in response to steroid administration from spontaneous recovery. It has therefore been estimated from animal experiments that immunological abnormalities are involved with the occurrence of some deafness cases, but there has been no diagnostic methods in the actual setting of clinical examinations under the present situation. In the possibility of such a deafness case (that will be described later), however, it is a realistic method to administer steroids from the early stage of the treatment.

Among sensorineural hearing loss cases, perilymphatic fistula has been clarified as being curable. There is a bottleneck in the diagnosis of the disease; i.e., the definite diagnosis of this disease cannot be made, unless perilymphatic leakage from either the round window or oval window or both of them is confirmed by exploratory tympanotomy. In some cases of perilymphatic fistula, hearing loss has been improved by covering the two windows using a piece of perichondrium. Therefore, there has been much argument about the diagnosis and timing of surgery. Deafness in perilymphatic fistula, which occurs suddenly, is required to be differentiated from sudden deafness.

Thus, some diseases have become excluded from the category of sudden deafness in recent years. At present, the diagnosis of sudden deafness is restricted to the cases of unknown cause. The diseases, which have become excluded from the category of sudden deafness, include the above-described deafness cases due to immunological abnormalities, perilymphatic fistula, mumps hearing loss without swelling of the parotid gland, acoustic neuroma (AN), other cerebellopontine angle tumors, brainstem infarction or cerebral hemorrhage, Ménière disease, and so on.

As “sensorineural hearing loss cases that heal up”, sudden deafness, deafness related to immunological abnormalities, and perilymphatic fistula are described below. However, “cases that heal up” should be “curable cases”, correcly describing. All these deafness cases do not necessarily “heal” or “improve”.

1. Sudden deafness

(1) Diagnostic criteria

The diagnostic criteria established by the research group for the disease sponsored by the Japanese Ministry of Health and Welfare are commonly used. They define three key points for the disease: ① It occurs suddenly; ② it shows moderate or severe sensorineural hearing loss; and ③ the cause is unknown. Dizziness or vertigo may be associated with the

Table 1 Diagnostic Criteria for Steroid Responsive Hearing Loss (Established by the author in 1984)

1) Hearing loss is improved by administration of steroids, and hearing loss worsens again by discontinuation of the administration. When hearing level also worsens, hearing level is improved by re-administration of steroids.
2) While a steroid is administered at a reduced dose or at the maintenance dose, hearing level worsens again. Hearing level is improved by the increase in dose.

The cases, which meet either of the above-described conditions 1) and 2) or both of them, are diagnosed as steroid responsive hearing loss.

disease at the time of occurrence of hearing loss, and sudden deafness should also exclude central nervous diseases (brain tumor, cerebral infarction, etc.). Mild cases of deafness including the low-tone disturbance type should be separately dealt with from the usual cases of sudden deafness, because such a case is not necessarily perceived subjectively as hearing loss.

(2) Etiology

The theory of viruses (including the viral reactivation theory), the theory of disturbed microcirculation, etc. have been considered. In recent years, a report has shown that mumps hearing loss, which manifests sensorineural hearing loss alone without parotid swelling as a symptom, is observed by the determination of mumps IgM in 5–6% of sudden deafness cases. These mumps hearing loss cases will be excluded from sudden deafness cases, if the diagnosis is made. Similarly, the deafness cases, which will be clarified to have been caused by viruses owing to the advances in testing methods, are to be excluded from sudden deafness cases in the future. Unfortunately, no certain diagnostic method for cochlear circulatory disturbance has been developed.

(3) Treatment

It is difficult to evaluate the efficacy of remedies, because sudden deafness may show spontaneous recovery. Thus, it can be said that there have been no specific remedies for sudden deafness, which are based on adequate evidence. In the present situation, some drugs are used at rest on the basis of theoretical and empirical evidence. In general, steroids are frequently used, unless the cases are regarded as contraindications for steroids. In addition to steroids, drugs for improving circulation are used, but it remains unclear whether the combined use is more effective than the single use. As a consequence, about a third each of the cases appear to heal, to be improved (to markedly recover and recover), and to be unchanged, respectively.

However, many factors are related to the prognosis: ① hearing level, ② the period (day) from the occurrence to the start of treatment, ③ the presence/absence of dizziness, ④ the rate of improvement 1 week after the start of treatment, ⑤ age, etc. When dizziness or vertigo is severe, hearing impairment is also severe, indicating that the relationship between dizziness and hearing impairment is the same as that between hearing impairment and hearing level; when the rate of improvement in hearing is high ($>50\%$) after the treatment or within 1 week after the occurrence, the prognosis is favorable as a matter of course, whereas the prognosis is poor when the rate of improvement is low ($<50\%$) within 2 weeks after the occurrence.

2. Hearing loss related to immunological abnormalities

(1) Diagnostic criteria

A research group for hearing loss due to immunological abnormalities sponsored by the Japanese Ministry of Health and Welfare established the diagnostic criteria for the research to collect and assess cases of the con-

Table 2 Diagnostic Criteria for Perilymphatic Fistula (Established by the research group by the Japanese Ministry of Health and Welfare in 1990)

Certain cases
Perilymphatic transudation or liquorrhea from either of the vestibular or cochlear window or both of them is confirmed or a fistula is confirmed by surgery (exploratory tympanotomy), endoscopy, etc.
Suspected cases
Some factors predisposing to rapid changes in cerebrospinal fluid pressure and tympanic pressure are followed by the occurrence of a sense of ear fullness, hearing loss, dizziness, and disequilibrium.
Notes 1 through 8
Note 1. The factors predisposing to the changes include the strain, lifting of a heavy thing, nose blowing, anger, diving, traveling by plane, etc.
Note 2. All the symptoms are not necessarily present; either one of them may be present.
Note 3. A sound, pop, may be associated with the condition.
Note 4. It may recur.
Note 5. Sensorineural hearing loss occurs for several hours or days. It may occasionally vary.
Note 6. Hearing loss acutely develops, with which the following condition is associated: "ringing of the ears like water-run" or "a sense of water-run".
Note 7. Dizziness is complained of with compression and decompression to the external and middle ears.
Note 8. A sense of trembling persists, and positional nystagmus is observed on the affected side.

dition. The key points of the criteria are as follows: ① The disease is dependent on steroids (Table 1); ② existing autoimmune diseases are associated with the disease; and ③ abnormalities are revealed by immunological examination. The authors include ①+②+③ in the category of the systemic type (hearing loss associated with Takayasu disease), and ①+③ in the local type. It is necessary to assess whether the local type will be transferred to the systemic type if the local type is left untreated. The authors have experienced no cases of such transfer from the local type to the systemic type, probably because the local type has been treated.

(2) Etiology

The site of the inner ear, which is involved in the occurrence of hearing loss, or the immunological mechanism underlying the occurrence of hearing loss is quite unclear. As the site of impairment, the stria vascularis and the endolymphatic sac have been estimated from animal experiments.

(3) Clinical symptoms

Cases of steroid responsive sensorineural hearing loss are divided into the type of deafness accompanying Takayasu disease and the local type without known autoimmune disease or any disturbance other than deafness.[8] Both types are frequently observed in women in their 30s and 40s. Most cases are bilateral. In many cases, the unilateral side is revealed on the initial examination to have already had severe deafness or total deafness. Some cases show mixed deafness, suggesting that some morbid conditions of the eustachian tube are suspected. However, exudative otitis media is not observed. No specific findings have been revealed by any immunological examination conducted in clinical routine tests. Many cases show increased sedimentation rate and high total gamma-globulin and IgM levels in serum. Sedimentation rate is increased at the time of the exacerbation of hearing in some cases.

(4) Treatment

Prednisolone (PSL) as the steroid and Sairei-to (Chai-Ling-Tang) are used together.[8] The combined use of Sairei-to has facilitated to reduce the dose of PSL, as compared to the single use of PSL, probably because the herb medicine can enhance the effect of steroid. Severe deafness cases do not respond to PSL. The criterion for reduction in dose of PSL is that the dose ($\leq$10 mg) is decreased by 1 mg over the 4-month period. If hearing worsens during the reduction, the dose may be increased by 50% of the maintenance dose,

then be gradually decreased again.

3. Perilymphatic fistula

(1) Diagnostic criteria

The key points were described earlier. When perilymphatic fistula is suspected on interview, the item as shown in Table 2 are used for reference.

(2) Etiology

According to the hypothesis of Goodhill,[9] there are an explosive route and an implosive route for the cause of the condition. With the former route, either one of the cochlear windows or both are broken in the direction from the cochlear side to the middle ear side in response to increased intracranial pressure. With the latter route, the cochlear window is broken in the direction from the middle ear side to the cochlear side in response to increased middle ear pressure. Changes in intracranial pressure and middle ear pressure due to barotrauma, head injury, and middle ear injury are responsible for perilymphatic fistula. There are also some cases of unknown cause.

(3) Clinical symptoms

Hearing loss shows various symptoms as follows: some cases occur suddenly; some cases show rapid progression and exacerbation within several days after the onset; deafness itself is mild, and dizziness and tinnitus (ringing of the ears) are the main symptoms in some cases; and disequilibrium is remarkable in some cases. Anamnesis is important for the diagnosis, while fistula test is important for examination. The fistula test is a method of observing nystagmus under compression and decompression by closing up tightly the external auditory meatus. Observation of nystagmus is facilitated by the use of infrared photography. It is secure to record findings of nystagmus on videotape or with a nystagmograph (ENG).

(4) Treatment

Before long (within 2 weeks) after the onset of hearing loss, spontaneous closure of fistula is expected by resting with drug therapy, as in the case of sudden deafness. Exploratory tympanotomy is conducted on the following cases: vertigo or deafness do not improve even 2 weeks after the onset; and vertigo is severe or hearing deteriorates. In surgical cases, the cochlear window is closed with the tragal perichondrium and fibrin sealant is used for the attachment, regardless of the presence or absence of perilymphatic transudation.

Critical Hearing Loss

Critical hearing loss indicates the deafness case with an underlying disease that will become life-threatening if it is left untreated. There is another case of bilateral progression of deafness, although it does not accompany any fatal disease. According to the severity of disturbance, some cases may be regarded as semi-critical deafness, because they become disturbance of communication in social life. The disease described as critical hearing loss herein is restricted to sensorineural hearing loss.

Typical examples of the causative diseases underlying critical hearing loss are AN [including bilateral AN (NF 2)], other cerebellopontine angle tumors (meningioma, epidermoid, etc.), brainstem infarction, cerebral hemorrhage, multiple sclerosis, and autoimmune diseases (Takayasu disease, systemic lupus erythematosus, recurrent polychondritis, etc.).

Typical examples of the diseases causing a disturbance of communication as a consequence of bilateral progression of sensorineural deafness are NF 2, perilymphatic fistula, dilated aqueduct of the vestibule, Takayasu disease, labyrinth syphilis, and Cogan syndrome. NF 2, Takayasu disease, and Cogan syndrome are regarded as “critical hearing loss” as well.

AN and brainstem infarction are described herein.

1. AN

(1) Etiology

Bilateral AN, which is called neurofibromatosis 2 (NF 2), is believed to be a hereditary abnormality. The causative gene for unilateral AN still remains unknown. Unilateral AN is described herein.

(2) Clinical symptoms

The main symptoms of the disease are hearing loss and tinnitus in almost 90% of the patients when they visited hospitals for examination. To be important, AN is hardly differentiated from sudden deafness in 10–20% of AN cases, because hearing loss suddenly occurs. It also escapes an examiner's attention, because hearing level is improved in some AN cases. If AN is left untreated without assessment because it is regarded as an example of incurable sudden deafness, "late diagnosis" or "erroneous diagnosis" may occur. Therefore, all cases, which are considered to be sudden deafness, should be suspected to show the condition as the initial symptom of AN. Such an attitude is needed.

(3) Diagnosis

It has conventionally been believed that there is no audiometric configuration characteristic of AN, but it became increasingly known that some cases of small tumors, which manifest as sudden deafness, show the trough type of audiometric configuration. The trough type was indicated first by the authors.[10] Then, transorbital technique and Stenvers projection are conducted as a method for plain roentgenography of the internal auditory meatus. However, no abnormalities are observed in approximately 20% of small tumor cases. With regard to auditory brainstem response (ABR) test, the indication for the test is restricted to the cases in which the mean level for frequencies 4 kHz and 8 kHz is 70 dB or lower. Approximately 15% of small tumor cases (<10 mm in size) show no abnormalities. On the basis of the situation, ABR and magnetic resonance imaging (MRI) are conducted on suspected cases, especially suspected young patients with good hearing, while MRI is conducted on the cases with 70 dB or higher of hearing level, because they are excluded from the indication for ABR. From the aspect of cost, several new methods for screening are also being assessed; with these methods, 3-dimensional Fourier transform fast recovery fast spin echo are used or the amount of contrast medium are reduced to half, and the number of the images taken is also limited.

(4) Treatment

Unless there are problems with general condition in patients aged 60 years or under, surgery may be recommended as the first choice. If the tumor tends to increase in the elderly patients, patients with risk factors, and patients refusing surgery, stereotaxic radiotherapy may be selected. In cases of small tumors localized in the internal auditory meatus, which accompany the favorable preoperative hearing level, hearing level is postoperatively to be sustained to 70–80% by the middle cranial fossa method. The operation is highly safe, and the mortality with the operation is 1% or lower. The rate of preservation of the facial nerves, which becomes the most issue among the sequelae, is being increased in recent years. The incidence of postoperative sequelae is high among the recurrent cases after stereotaxic radiotherapy, and the postoperative function of the facial nerves is extremely poor.

2. Brainstem infarction

Some cases of small brainstem infarction show sudden deafness and dizziness or vertigo alone, which accompany no other cerebral nervous symptoms. Since dizziness or vertigo may be associated with sudden deafness of unknown cause, it is necessary for brainstem infarction to be ruled out, in addition to differentiation of brainstem infarction from sudden deafness and Ménière disease. In the elderly patients and patients with a past history of hypertension particularly, MRI is an essential means for test.

The treatment of deafness in patients with brainstem infarction follows that for sudden deafness. In the cases with past histories of hypertension, diabetes mellitus, and hypercholesterolemia, as well as those with risk factors, the control of these conditions is required.

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Depression in the Prime of Life —Its Characteristics and Precautions Required in Treatment—

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Abstract: Depression may occur at any age, but that occurring in the prime of life (maturity) is considered most typical, given its symptoms, course, and other aspects of serving as a prototypic model. The 3 major depressive symptoms of depressive mood, retardation, and anxiety are often observed to the same extent, demonstrating a stable cycle in mature depression. Attention should be paid, however, to the onset of hypomania because some patients end up as rapid cyclers alternately repeating manic and depressive episodes. This disease often occurs in those with melancholic personality who are scrupulous and have a strong sense of obligation and responsibility when encountering change such as career changes, or may often occur in postpartum depression. Even though endocrine changes should be considered in the latter, it is helpful to handle these cases as attributable to the entanglement of character and circumstance. Pharmacotherapy is most effective against depression in this generation. Unlike elderly patients, serious adverse reactions rarely occur, but, it is essential to administer sufficient tricyclic antidepressants, etc., for a long enough time. Mood stabilizers are also required in the treatment of bipolar II disorder.

Key words: Mature depression; Typical symptoms; Melancholic personality; Antidepressants; Hypomanic state

Introduction

While schizophrenia is regarded as a disease of adolescence, depression is characterized by initial onset and recurrence at any age. While manic depressive illness or bipolar disorder onset ranges from the second half of the teens to the first half of the 20s, unipolar depression often occurs for the first time in those in their late 20s to 30s. Depression is thus considered as a disease typically occurring in the prime of life. While childhood, adolescent, and geriatric depression mostly demonstrates specific types, depression in the prime of life occurs as a "prototype", meaning that basic symptoms of depression are all present.

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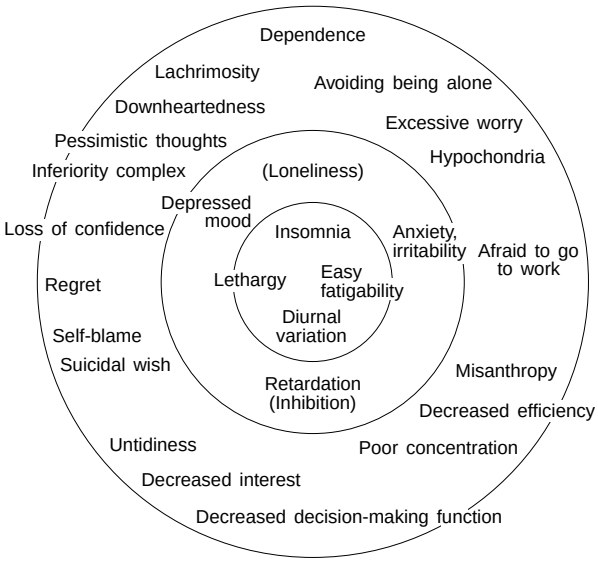

Fig. 1 Symptomatic spectrum of depression

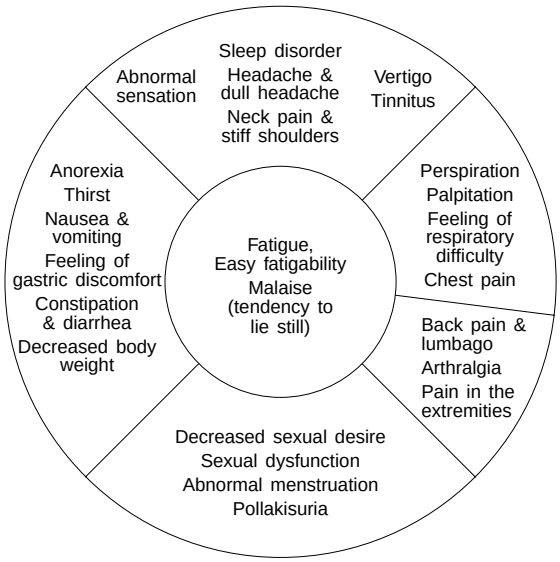

Fig. 2 Physical symptoms of depression

Characteristics of Depression in the Prime of Life

1. Symptomatology

Retardation is often conspicuous in depressive patients in their 20s, whereas elderly patients tend to show anxiety and agitation. Mature depression (depression in the prime of life) is positioned in between and characterized by 3 major psychic symptoms—depressive mood, retardation, and anxiety (Fig. 1). Mood is a subjective matter and not always expressed accurately. In women, mood is expressed in objective symptoms such as lachrimosity. The onset of depression may often be detected when the patient hangs around and follows someone close to the patient due to loneliness and anxiety. Strong anxiety leads to agitation or panic attacks, but the disease is an abnormality in thought such as excessive concern or worry in less serious cases. Added to a depressive mood, pessimistic thoughts and loss of confidence occur.

Retardation tires the patient, causing a loss of interest and decreased communication. These symptoms all impact on a person normally sociable, consequently causing misanthropy. Such a tendency is observed in initial depression, so it is possible for friends and colleagues to suspect depression if a person becomes aloof.

Unlike geriatric depression, delusion is observed less in mature depression but self-blame occurs frequently and a small failure at work or slight scolding by a superior may have an excessive impact on the patient, even triggering suicidal tendencies. Many suicide cases associated with corporate restructuring are assumed attributable to self-blame and despair related to depression.

In addition to psychic symptoms, physical symptoms are associated with depression. Masked depression in which psychic symptoms are inconspicuous while physical symptoms are noted in the foreground is a well-known case. Typical masked depression is most frequently observed in mature depression. Extensive physical symptoms are noted but central symptoms classified as systemic are general malaise and fatigue resulting in attempts to lie down whenever possible. The influence of retardation, a psychic symptom, should be considered (Fig. 2).

Considering physical symptoms accompanying general malaise and fatigue, a physical disease is first suspected by a physician, but the

presence of insomnia, which persists from the initial stage of disease and even after other symptoms have been resolved and diurnal variation may give a clue to the diagnosis of depression rather than physical disease.

Psychosomatic disease such as peptic ulcer may occurs prior to the onset of depression. The syndrome shift is acknowledged between depression and psychosomatic disease, especially in mature depression. In other words, a psychosomatic disease should be regarded as a warning sign of depression in mature depression.

2. Course

Depression is likely to recur. And has clinical importance in treatment. Compared to other ages, intervals between episodes are relatively long in mature depression in general, indicating a stable cycle. Attention should be paid, however, to patients demonstrating unstable elements because those long assumed to have unipolar depression may suddenly demonstrate a hypomanic episode after several repetitions of depressive episodes. Some shift to rapid cycling, turning into frequent manic-depression episodes, while others demonstrate so-called bipolar II type in which depressive episodes and hypomanic episodes are alternated.

Seasonal depression is another depression related to maturity. Occurring from autumn to winter and showing sign of remission or hypomania in spring. This is frequently observed in women and is dealt with specifically treatments as described below.

3. Premorbid personality and precipitating factors

Completion of a melancholic type characterized by scrupulosity, perfectionism, a strong sense of obligation, responsibility, and excessive consideration for others is observed in this period, and typical depression in this period of life occurs, triggered through entanglement of this personality and environmental factors. In men, mostly salaried men, increased responsibility due to transfer or promotion may be a precipitating factor. Those with the above personality adapt to an environment in which they set their pace of work as in the case of crafts people but are vulnerable to stress in an environment of change, increased workload, requiring resources in an emergency, often resulting in the onset of depression. Women, also susceptible to changes, may develop so-called house-moving depression. Postpartum depression can occur in this period and in the 20s. Although physical factors including change in the endocrine system due to pregnancy and delivery may play a role in onset in most cases, the illness is associated with the character of a person who cannot withstand change or cope with mother role and environmental factors.

4. Comorbidity

Unlike geriatric depression, comorbidity with physical disease are characteristically less common in mature depression. Attention should be paid, however, to panic disorder and alcohol dependence as psychiatric comorbidity. Panic is frequently noted in women in their 30s and alcohol dependence observed more in men in their 40s and 50s, but it should be remembered that these disorders occur in both men and women. If treatment focuses on panic disorder and anxiety neurosis just because panic attacks are conspicuous, coexisting depression may be overlooked. Alcoholism is primary in some cases and secondary in others, and it is possible to dissipate alcohol dependence by appropriately treating depression. The risk of suicide is higher than in those with depression alone, so care should be taken.

Precautions in Treatment

1. Pharmacotherapy

Many with such mature depression are classified into endogenous depression and

respond favorably to pharmacotherapy. In comparison to elderly patients, adverse reactions are not so serious and the need to pay attention to comorbid physical diseases is less. In principle, tricyclic antidepressants, considered effective against moderate or severe depression, should be administered at sufficient doses and for several months after improvement is noted. Imipramine, clomipramine, nortriptyline, and amoxapine are the drugs of choice. Tetracyclic antidepressants, which are somewhat less effective than tricyclic ones but which cause less adverse reactions, are administered to outpatients with mild symptoms. Drugs other than tricyclic ones frequently prescribed are maprotiline, mianserin, setiptiline, trazodone, sulpiride, and fluvoxamine.

Since treatment with an antidepressant makes course more unstable in bipolar II patients who demonstrates hypomania, mood stabilizers including lithium, carbamazepine, and sodium valproate constitute mainstream treatment, and antidepressants are used as needed. The efficacy of phototherapy exposing the patient to full spectrum light is known to be effective against seasonal affective disorder.

2. Psychotherapy

Although treatment centers on pharmacotherapy, psychotherapy is also indispensable. The principle that encouragement for depressive patients is a taboo is well known to the public. The supportive psychotherapy for depressive patients who suffer from loss of confidence, anxiety, and pessimistic thoughts literally supports and prevents them from going into a vicious circle of depression, and gives them a chance to rise to the baseline. Positive family support is also needed, especially by the spouse of the patient, because they are easily ravaged. Psychological education explaining the nature of disease is indispensable both for the patient and family. It is especially important to obtain full understanding of the spouse because any harsh words from the spouse may have fatal consequences in the patient. In remission, cognitive therapy correcting the scrupulous and perfectionistic personality or extreme thoughts is conducted to prevent recurrence.

Conclusion

Depression in the prime of life is characterized by a stable cycle. Symptomatically, depressive mood, retardation, and anxiety are typical. As patients respond more favorably to antidepressants without serious adverse reactions, treatment at a sufficient dose for a sufficient period leads to a favorable outcome. It is necessary to use mood stabilizers in hypomania. Along with supportive psychotherapy, psychological education and family support are indispensable to successful treatment.

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Comorbidity of Depression and Other Diseases

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Abstract: This paper outlines the comorbidity of depression and other diseases that are frequently seen in the primary care of depression. Since the operational diagnostic criteria of the DSM-III-R (Diagnostic and Statistical Manual of Mental Disorders, revised 3rd edition) and the current DSM-IV (4th edition) were introduced to Japan from the U.S., Japanese psychiatrists have become active in assigning a single patient parallel or overlapping diagnoses of mental disorders. In patients with depression, the comorbidity of anxiety disorder (panic disorder, generalized anxiety disorder), obsessive-compulsive disorder, drug dependence, alcohol dependence, post-traumatic stress disorder, or personality disorder is an issue. When depression is comorbid with another mental disorder, both disorders are reported to be severer, more likely to be refractory, and more likely to be associated with a poor prognosis. Although the concept of comorbidity in the field of mental disorders is useful in understanding patients' symptoms and determining prognosis, it is also possible that the patient's pathological structure is too greatly simplified. The concept of comorbidity should be employed within the limits of its clinical usefulness, while maintaining full recognition of this possible simplification.

Key words: Comorbidity; Depression; Mental disorders; DSM-IV

Introduction

Comorbidity is a term that has become increasingly common during the past 10 years or so, particularly in the field of psychiatry as practiced in Europe and North America. This concept now represents a major theme in clinical psychiatry. Comorbidity means the state of being jointly (co-) morbid, and it is defined as "the presence of more than one disease in a single person during a certain period of time". In Japanese, "comorbidity" is translated as "*heison*," "*heibyo*," or "*kyoson*," but the original, untranslated English word is often used in practice.

The assumption that a patient has comorbid mental disorders is often helpful in understanding his or her pathological condition and in formulating treatment policy and determining prognosis. General information on psychiatric comorbidity, including depression, has been the topic of several review articles that

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have been published in Japanese psychiatric journals.[1–3] This paper outlines the comorbidity of depression and other diseases, focusing on those cases that frequently may be seen in the general clinical setting.

Historical Development

Although the concept of the coexistence of two or more diseases is not at all new, conventional clinical psychiatry has tended to avoid it. Traditional psychiatric diagnostic criteria have been presented as a stratified structure of independent disease classifications, and various symptoms have been subsumed under a single psychiatric disease. For example, if a patient had both depressive and compulsive symptoms, depression and obsessive-compulsive disorder were considered in the differential diagnosis, and the patient's condition was generally diagnosed as depression, a diagnosis that superseded obsessive-compulsive disorder. Until recently there had been no tendency to label a single patient with both of these diagnoses.

However, since the operational diagnostic criteria of the DSM-III-R (Diagnostic and Statistical Manual of Mental Disorders, revised 3rd edition) and the current DSM-IV (4th edition), which are based on multiaxial evaluation involving five axes,[4] were introduced from the U.S., the concept of psychiatric comorbidity has spread throughout clinical practice in Japan, allowing Japanese psychiatrists to give a single patient two or more diagnoses at the same time. Thus, a patient such as the one mentioned above would be regarded as having both depression and obsessive-compulsive disorder. The development of such parallel, overlapping diagnostic criteria in the U.S. seems to be grounded not only on progress in the area of operational diagnostic criteria but also on the finding that drug dependence is associated with various mental disorders.

Comorbidity of Depression

A large-scale national survey on the comorbidity of depression was carried out in the U.S. principally by the University of Michigan.[5] The results indicated that more than half of all patients with a DSM-III-R diagnosis of major depressive disorder were associated with a comorbid anxiety disorder, and that more than one-third of patients showed the comorbidity of drug or alcohol dependence. Thus it is safe to say that depression is often present together with other mental disorders. According to Kessler *et al.*,[5] patients with pure depression, i.e., without comorbidity, accounted for only one-fourth of all patients with that diagnosis. However, as approximately 20% of patients with depression have comorbid post-traumatic stress disorder (PTSD), diagnoses of these coexisting disorders are based simply on the fact the patient has met the requirements for more than one disease in the current operational diagnostic criteria. This is because the previous system of diagnosis was likely to adopt one diagnosis while deliberately or inadvertently excluding others; it does not mean that the comorbidity of mental disorders has increased particularly in recent years.

The presence of comorbidity brings several important issues to the surface. First, when depression coexists with another mental disorder, these disorders are reported to be severer than when either is present alone. The frequencies of admissions and suicide attempts are higher, and the prognosis worse, in patients with comorbid depression.[5] This trend is particularly prominent among young patients with depression. A second issue is the temporal relationship between depression and other comorbid mental disorders. There are three ways of considering the order of onset[6]: 1) When depression precedes the other disorder, depression may serve as a causative factor for the subsequent disorder; 2) when the other disorder precedes depression, that disorder

may serve as a causative factor for depression; and 3) when depression and the other disorder occur simultaneously, the symptoms of these two diseases may be considered attributable to a different cause(s). In general, in patients with comorbid depression, the other mental disorder often precedes the initial episode of depression (secondary depression), and this is particularly so when the patient is male.[5)]

The comorbidity of depression and other mental disorders is outlined below in relation to individual common disorders.

1. Depression and anxiety disorder

Comorbid anxiety disorder is the disorder most frequently found in patients with depression. Many researchers have reported that more than 50% of patients with panic disorder, characterized by sudden episodes of strong anxiety, or generalized anxiety disorder, characterized by continuous anxiety, experience at least one episode of depression in their lifetimes.[5)] Based on this high rate of comorbidity, some researchers consider anxiety disorder and depression to have a common hereditary predisposition and differences in clinical picture to result from differences in phenotype influenced by environmental factors.[7)] Without going that far, it is clear that many patients, at least clinically, have symptoms of both depression and anxiety, and that the close relationship between the two disorders has been pointed out. In addition, the actions of anxiolytics and antidepressants are considered to affect both conditions. Further research on the comorbidity of these conditions, not only from the aspect of etiological studies and clinical evaluation, but also from the viewpoint of psychopharmacology, is awaited.

As mentioned in the previous section, both depression and anxiety are severe in patients with comorbid depression and anxiety disorder. Moreover, these patients are more likely to be resistant to tricyclic antidepressant drug therapy, to have markedly decreased social function including occupational and marital problems, and to have a high incidence of attempted suicide, resulting in a poor prognosis.[6)]

2. Depression and obsessive-compulsive disorder

Obsessions (such as irrational adherence to certain ideas or repetitive thinking) or compulsions (such as compulsive rituals or ascertainment behavior) are known often to be concomitant with various mental disorders including schizophrenia, depression, and organic brain disease. As in cases of anxiety disorder, secondary depression is also common in cases of comorbid obsessive-compulsive disorder and depression, with depression developing during the course of preceding obsessive-compulsive symptoms. A survey of a large number of patients with obsessive-compulsive disorder showed that about one-third of them had comorbid depression at the time of the survey and inferred that about two-thirds of them would develop depression sometime in their lives.[8)]

There are biological markers common to depression and obsessive-compulsive disorder, and serotonin-related drugs, particularly selective serotonin reuptake inhibitors (SSRIs), are effective for both depression and obsession. These findings suggest a biological relationship between the two conditions. However, the responses of depression and obsession to antidepressants are not necessarily the same in patients with comorbidity. This is an issue that requires further investigation.

3. Depression and alcoholism

The association of depression and alcoholism has long been discussed. In a review of previous reports, Davidson *et al.*[9)] found comorbidity between depression and alcoholism in 16–88% of patients. According to the previously mentioned report by Kessler *et al.*, comorbid alcohol dependence or abuse is

present in nearly 30% of patients with depression.[5] When depression precedes alcoholism, alcoholism may be a symptom of depression, or the patient's attempt to reduce depressive symptoms may result in alcoholism. It is understandable that a patient may succumb to alcoholism in trying to relieve depression or hostility. On the other hand, when alcoholism is present initially, the risk of developing depression is considered to be 2–3 times higher than that in the general population. Patients with alcoholism often fall into a depressive state when they lose control of drinking or are in a period of withdrawal. Therefore, caution is necessary when considering the nature of the comorbidity of depression and alcoholism. It is also possible in some cases that common risk factors and heredity are involved in the development of the two conditions.

4. Depression and personality disorder

It has been a firmly rooted belief that mood disorder is related to premorbid personality disorder, and, specifically among psychiatrists in this country, it is generally accepted that unipolar depression and melancholic personality are related. However, recent etiological studies of a large number of patients have resulted in negative findings, indicating the need for caution with regard to this issue.[10] There is an interesting finding from the aspect of comorbidity between depression and personality disorder. According to DSM-IV,[4] the original mental disorder is diagnosed on the first axis, and the accompanying personality disorder, if any, is coded on the second axis. In this sense, the multiaxial diagnosis of DSM-IV is based on the premise that comorbidity of personality disorder and other mental disorders exists. A recent review of patients with depression indicated that some type of personality disorder was present in 20–50% of inpatients and 50–85% of outpatients with depression.[11] Among these patients, relatively frequent types of personality disorders were borderline (10–30%), histrionic (2–20%), antisocial (0–10%), and obsessional (0–20%), showing a great deal of diversity. Although the comorbidity of depression and personality disorder is of clinical importance, it is not an uncomplicated problem. It needs to be borne in mind that the prognosis and treatment policy will vary according to the type of comorbid personality disorder.

5. Depression and physical or neurologic diseases

When depressive symptoms are present in association with organic brain disease or general physical diseases, as coded on axis III of DSM-IV, it is not particularly helpful to regard this as comorbidity of depression, as pointed out by Yoshimatsu.[12] It would be preferable to consider it a unified combination of the partial manifestations of underlying physical and organic disease or as a secondary response, if possible. For example, in clinics we often encounter patients with dementia in whom a depressive state has preceded dementia. However, it seems to be of greater significance from the aspects of both early diagnosis and integrated understanding of the pathological condition to regard the depressive state as the initial symptom of dementia rather than consider it to be a case of comorbidity of depression and dementia.

Conclusion

Comorbid conditions that are likely to be seen frequently in the clinical setting for primary care of depression have been outlined. The concept of comorbidity expressed through the names of multiple diseases that satisfy diagnostic criteria is rational from one point of view, conforming as it does to certain operational diagnostic criteria, and is helpful in understanding a patient's symptoms as well as in clarifying treatment and prognosis. However, there is also the possibility that the patient's pathological structure is too greatly

simplified into "a mosaic aggregate of a number of diseases" (Yoshimatsu[12]). The concept of comorbidity should be employed within the limits of its clinical usefulness, while maintaining full recognition of this possible simplification.

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Psychotherapy and Psycho-education of Depression

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Abstract: Progress of anti-depressants has reduced the number of depressive patients requiring hospitalization and increased those cases that may be treated at outpatient clinic. However, the drug therapy is not necessarily effective for all cases. The importance of psychotherapy is being re-evaluated for the patients, including particularly those for whom drug therapy is not indicated. Among psychotherapies are the psychoanalytic therapy, cognitive therapy, behavior therapy, interpersonal therapy, etc., and in recent years therapies that can achieve the effects in short-term are prevalent. Interests in psycho-education are mounting because of studies that family relations influence the prognosis and of the increased importance attached to informed consent. This means that the physicians and therapists work with the patient and family to deepen understanding of the disease and to prevent its aggravation as well as recurrences. A depressive person visiting a primary care physician for the first time should be seen with a flexible attitude depending on his/her signs and symptoms without adhering to therapies of different kind. In other word, there is no need to adhere to one therapy throughout the prodromal, acute and recovery stages.

Key words: Mood disorder (depression); Psycho-education; Psychotherapy

Introduction

Drug therapies are the main stream of treatments for depression and their efficacy is irrefutable as discussed in many articles. In the clinical scene, it is said that drug therapy is effective for about 80% of the patients for removing themselves from the depressive phase and it becomes more effective when combined with psychotherapy. There are, however, light and dark sides to the drug therapy, and in cases where the drug compliance is inadequate and drug therapy is not suitable, psychotherapy should mainly be pursued.

More concretely, there may be a young patient whose parent declines the drug therapy because of uncertainty about side effects, a patient may be pregnant or planning pregnancy, a patient may easily develop side effects of an anti-depressant because he/she is elderly or because of somatic complications,

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or a patient may be extremely uneasy about the drug therapy because of the past history of allergic reaction, or a patient is resistant to the drug therapy. One should be aware that the drug therapy is not omnipotent for treatment of depression.

When suicidal ideation for death such as "I wish to disappear", "there is no use for living any longer" or "I want to die" is observed, drug therapy or an emergency hospitalization should be considered.

This paper discusses the outline and the current state of psychotherapy and psycho-education focusing on mild and masked depression seeking primary care.

Kinds of Psychotherapy

Psychoanalytical therapy has long been relied on for treating depressive mental disorders, but its time-consuming and expensive nature have limited the number of patients. In order to overcome these difficulties, the short-term psychotherapies such as cognitive therapy, behavioral therapy, and interpersonal therapy came to be widely practiced for achieving therapeutic effects in a short period of time. These therapies differ from psychoanalytical therapy in that the therapist gives positive and definite guidance and completes the therapy on a short-term basis by setting a clear-cut objective based on discussion and consultation.

Cognitive therapy was developed by Beck *et al.*[1] and hypothesizes that although depression is a mood disorder, depressive patients have peculiar distorted cognition, which deteriorates their mood. This distorted cognition is what is lately described as negative thinking. By correcting the distorted cognition, the therapy aims at improving the mood.

The behavioral therapy reinforces a person's manner of addressing things by advice, feedback, and compensation based on a hypothesis that the mood can be changed by changing behavior. According to this theory, the reason why there are so many depressive elderly persons is because the elderly finds little pleasure in daily life. They are recommended to engage in activities that they can enjoy as much as possible (Lewinsohn *et al.*, 1974).[2]

Interpersonal therapy was developed by Klerman[3] and Weissman *et al.*[4] from the interviews by Sullivan *et al.* focusing on the interpersonal relationship in 1930s. The therapy is characterized in that the treatment period is as short as 12 to 16 weeks and that the problem is defined by focusing on the current interpersonal relationship, not on cognition or behavior.

The problem area is grief after the loss of an object; discord involving the interpersonal roles, which is the friction in personal relationship, change in roles, and lack of interpersonal capacity. By clarifying the problem and capturing the positive and the negative emotions that generate, the interpersonal relationship of the past is understood and the alternatives are sought.

When handling grief, the patient is encouraged to express emotions at the time of the loss of an object, to reconstruct the relationship that has been lost, and to start attachments and activities anew. Discord among roles often arises out of differences in expectations toward respective roles. It should be determined whether or not to re-negotiate, whether the situation is at a standstill, or parting is unavoidable, and then solutions to the problem are prompted, gaps are clarified and grief work is performed. As for changes in the role, the patient is made to give up the role he/she has been enacting, to express anger or sense of loss, to acquire techniques required by the new role toward the society and to support building a new social network.

Psycho-education

Psycho-education is a general term for an educational approach of assistance to offer

accurate knowledge and information about the nature and methods of treatment and addressing the disease needed for cure added with consideration for psychotherapy.[5)]

In the background of why psycho-education is now regarded important is that litigations against the unilateral treatment provided by medical profession have increased. As abundance of medical information passes to the patients' side, it is difficult and often chaotic to understand and deal with them adequately. A study on how the family expresses emotion influences prognosis of mental disorder suggests the importance of understanding of the disease by the family and closed. This means not only the unilateral offering of information from the medical service provider but also removing misunderstandings of the disease, improving cognition, and evaluating the manner of addressing problems surrounding the disease. Thus, it is called psycho-education, not mere education. The objects are not limited to psychiatry patients but include those suffering from cancer, AIDS, and the sequel of strokes. The important thing is that the treatment is performed not by the top-down method of doctor to patient, but by cooperation with the patient and the family.

Current State in Clinical Medicine

Although psychotherapy and psycho-education were discussed by distinguishing them as in textbooks, it is quite difficult to differentiate the cognitive therapy, the behavioral therapy, and the interpersonal therapy in clinical medicine.

A therapy mainly focusing on thoughts such as cognition may utilize the aspect of behavioral theory and the reverse is also possible. When an interpersonal issue is taken up, an interpersonal therapeutic approach is naturally applied. According to Elkin *et al.*[6)], the difference in their efficacy as evaluated by the psychological evaluation scale is not so clear. Even though they do have their own unique features, the issue is not about which one is superior to others. Treatment should be provided by utilizing the features of respective therapies adroitly. It is not necessary to adhere to the therapy chosen at the start. It is necessary to cope with the patient's conditions by observing the phases of depression.

As the phases of depression, there are the prodromal stage, the depressive stage, and the recovery stage. In the prodromal stage, it is difficult to detect and intervene for a patient who has developed the disease for the first time. For a recurrent patient, the same signs as those at the time of the first onset appear often, enabling intervention at an early stage. These are called the warning signs. Once a warning sign is recognized, attempts should be made as soon as possible to remove stresses by encouraging the patient to share the work load with others, decrease the overtime work, and take the paid leave.

In the depressive stage, psychotherapy and psycho-education are effective for mild to medium degree morbidity. For the grave cases, drug therapy and electro-shock therapy must be considered. At the first examination of a depressive patient, Kasahara's minor psychotherapy[8)] is often relied; the author learned the technique while still an intern. According to Kasahara, it is important to explain that (1) this is a illness, not laziness, (2) respite is the best remedy, (3) the illness is bound to be cured, (4) the patient should promise not to commit suicide, (5) the patient should not make an important decision of life during this period, (6) the patient's conditions fluctuate during treatment, and (7) side effects should be explained and the importance of medication should be emphasized.

When suspecting depression at the time of primary care examination, the physician should sympathize with the patient on painfulness of the current situation and explain the causative disease. If the patient is feeling uneasy because the cause was not uncovered by examinations at the departments of ortho-

pedics, internal medicine, and otolaryngology, he/she will feel secure if the cause is precisely explained. On the other hand, the term "depression" does sound as if it is incurable and the patient may show rejection when informed. After the patient is told of the name of the disease, he/she should be explained fully about its general course and high probability of successful cure. The patient should also be explained that depression is rather a common disease that anybody may catch.

In the acute phase, physical respite is naturally called for. But after a while, the patient calms down. Lying down at home is not necessarily restful for all, and he/she should be told to do what he/she like such as listening to music or reading and take mental respite. These would be approaches of behavioral therapy. However, depression has long been considered to be a state where one has exhausted energy, and recovery may be delayed by consuming energy for such activities. The patient should be recommended to save energy for the following day.

How much he/she should save energy is proportional to his/her degree of recovery. The patient is asked to measure to what percentage he/she has recovered by deeming his/her usual state as 100%. When he/she has recovered by 60%, he/she is asked to conduct only 60% of his/her usual activities and save 40% for the following day.

The patient may be anxious to return to work and may be preparing for work without the physician's awareness. Preparing for work is not what the patient wants to do but is something he/she feels must do, and therefore does not remove stresses. Preparation for work may prolong the leave of absence when the patient is feeling strongly uneasy about returning to work.

Since people around him/her cannot easily see abnormality or injury as in the case of bone fracture and there is no apparently valid excuse for leave-taking, the patient is often found blaming himself/herself for being lazy. He/she cannot persist even if he/she wants to or his/her problems are not resolved by perseverance. One should be careful because encouraging the patient to persevere may aggravate the conditions.

Giving such information will considerably relieve the patient and will be enough as intervention in the first stage. Except where the case is mild, cognitive or behavioral therapy may induce confusion if attempted in the very early stage. It is the same for psychoeducation. Information should be given to the family first while the patient is still unsettled and discussion of how to deal with the patient within the family should be held.

In the recovery phase, the patient has somewhat recovered energy and may be able to conduct some complex work in terms of behavioral therapy. At this point, psychoeducation is most useful because of few side effects and low rate of dropouts. The focus should be placed on preventing recurrences. It is a good opportunity to consider with the physician and the family how to best address the problem that has been causing stresses.[9)]

Conclusion

Psychotherapy and psycho-education for depression were discussed. Very few patients visit the psychiatrist at the onset as they visit clinics of other somatic medicine. In this context, the role of a primary care physician is quite important.

There are two types of primary care administered to depressive patients. One is that the physician does not realize there is depression because the patient complains mainly of physical discomforts. Another is that the primary care physician readily refers the patient to the psychiatrist. In the former case, depression should be diagnosed first to find out why symptoms do not alleviate after many tests and drug therapies and then an antidepressant, etc. as well as psychotherapy should be administered. Listening to the

patient alone may lead to cure. In the latter case, the psychiatry department is not so easily accessible and referral without preliminaries may shock the patient and the family. To facilitate treatment by a specialist, sufficient time should be spent on explanation.

Even psychiatrists may not be well versed in cognitive therapy, behavioral therapy or interpersonal therapy. If the physician takes the position of viewing things at the same eye level as the patient and try to work out countermeasures with the patient and the family, this may lead to successful psycho-education. In the old days, general practitioners must have been good psychiatrists.

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Complications of Total Knee Arthroplasty

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Abstract: Total knee arthroplasty (TKA) is an excellent surgical procedure that can make severely damaged knees painless and stable, but it can be associated with many complications. Once complications develop, their management is not necessarily easy. The major complications include loosening, wear and breakage of the prosthetic components, patellar problems, fracture in the vicinity of the prosthesis, disruption of the extensor mechanism of the knee, and infection. Complications can often be prevented if TKA is performed after adequate preparation, such as thorough evaluation of the appropriateness of surgery, and if the technique used for TKA is meticulous. Great care must be taken both before and during the operation. When complications occur despite such precautions, early detection, accurate evaluation, and appropriate treatment are important.

Key words: Total knee arthroplasty; Complications; Infection; Revision surgery

Introduction

Total knee arthroplasty (TKA) is a surgical procedure used to relieve the pain and functional limitations associated with severe knee joint damage caused by osteoarthritis, rheumatoid arthritis, and other diseases. TKA has already been performed for more than 30 years. Recent progress in prosthetic materials, the design of prosthetic components, and surgical techniques has made it possible to routinely achieve excellent results.[1)] When joint destruction is severe, however, successful TKA still owes a great deal to the surgeon's skill and experience.

Uncemented fixation was originally developed to overcome the various complications arising from the use of bone cement in total hip arthroplasty (THA). To employ this technique for TKA, implants for uncemented fixation were designed and have been used, but are not reliable enough yet. Consequently, cemented knee prostheses are more widely used. This also reflects the fact that the incidence of complications of cemented TKA is lower than that of cemented THA, a difference that can be explained by the difference in the weight-bearing mechanisms of the hip and knee joints. In other words, the load distribution is more even in the knee joint than in the hip joint

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and the force exerted on the knee is mainly compressive.

It is no exaggeration to say that the most important factors determining the outcome of TKA arise in the course of the operation. In other words, if the indications and surgical technique are appropriate, most complications can be prevented, but some complications of TKA will still occur. In this article, the main complications are explained along with their management and preventive measures.

Problems with the Prosthetic Components

Among the various complications, loosening of the prosthetic components is one of the most common causes of failure. Use of the correct surgical technique is very important to prevent loosening of prosthetic components, as well as for preventing other complications after TKA. Loosening can be prevented in most of the cases if the anatomical alignment of the lower extremity can be properly restored with perfect ligamentous balance at the time of surgery.

In general, the femoral component loosening and damage are rare and most problems involve the tibial component. If the alignment of the lower extremity cannot be completely restored, the stability of the tibial component can be considerably affected depending on the strength of the tibia and the severity of osteoporosis. In addition, to fix the tibial component firmly, implants that are large enough to cover the cortical margin of the tibia should be chosen. A tibial component with a stem in the centre has been used to increase stability.[2)]

Bone cement should be spread evenly over the cut surface of the tibia to create a thin layer of about 3–5 mm. To form such a thin layer, the bone cement must be compressed between the bone and the component with adequate force. Once the component has become loose, bone deformity and defects will progress. When deformity and bone loss are marked, the prosthesis designed for revision arthroplasty is required. At the time of revision arthroplasty, care must be taken to restore the bony support and to preserve the extensor mechanism of the knee joint. As a rule, it is important to obtain the same alignment of the lower extremity as that achieved after the initial arthroplasty together with adequate ligamentous balance.

Damage to prosthetic components is another problem. If the alignment of the lower extremity is unsatisfactory after TKA, stress will be concentrated on particular parts of the ultra-high-molecular weight polyethylene (UHMWPE) tibial component, resulting in wear and deformation. If this damage progresses too far, the metal parts of the femoral and tibial components may come into contact with each other, resulting in wear and breakage of the metallic components. It was previously considered desirable for as little of the tibia to be removed as possible. If the UHMWPE layer is not thick enough, however, the stress is increased in magnitude, predisposing to wear and damage. Consequently, the tibia should be so cut that a tibial component of at least 8 mm in thickness can be inserted into the space created by bony resection.

Dislocation and Subluxation of the Patella

Frequent complications after TKA include dislocation and subluxation of the patella, as well as component loosening. These two complications occur usually from early to about 6 months after TKA. According to previous reports, the occurrence of such complications was recognised in 2% to 20% of patients. The risk of patellar dislocation depends on the balance of the supporting structures (retinaculum and collateral ligament), valgus deformity of the knee, the placement of the components, and the shape of the components used. The risk is particularly high with implants of a certain design in which the patellar groove of the femoral components is shallow such as the MG I model. When patellar replacement is per-

formed, excessive resection of the lateral aspect of the patellar should be avoided and the patella implant should be positioned slightly in the medial direction.[3] These points should be kept in mind during the operation.

If the tibial component is inserted with internal rotation, the tibial attachment of the patellar tendon will deviate laterally, rendering the patella liable to malalignment. Positioning of the femoral component with internal rotation may also cause similar problems. These problems can be avoided if accurate positioning of the components is confirmed by trial at the time of operation. After insertion of trial components, flexion and extension of the knee should be repeated to confirm patellar tracking. If the patella seems likely to undergo dislocation or subluxation, lateral retinacular release should be added. To preserve the superior lateral geniculate artery supplying blood to the patella, the release should be done at least 1 cm from the lateral margin of the patella.[4]

If patellar dislocation or subluxation occurs during postoperative follow-up, bracing or other conservative management can be attempted. If such treatment fails, open reduction will be necessary. When the patellar or femoral component is severely damaged, the whole prosthesis must be replaced in some instances. In the absence of substantial damage, only the patellar component is replaced, while reefing the medial patellar retinaculum and releasing the lateral retinaculum. If these procedures fail to achieve realignment of the patella, correction of the component position by revision or medial transfer of the tibial tuberosity is required in some cases.

Fracture

In patients suffering from severe osteoporosis or with intraoperative damage to femoral cortex during resection of the anterior aspect of the femoral condyles, even slight trauma after TKA may cause fracture of the femur and/or tibia around the prosthetic components. Such fractures have been reported in about 1–2% of patients undergoing TKA. The fracture commonly occurs in the supracondylar area, and is incomplete in many cases. Some of the fractures can be reduced and fixed in a cast under fluoroscopic observation. Usually the joint should be immobilized until bony healing is achieved, but load bearing can be resumed at a relatively early stage. Almost the same range of motion as before the operation can be restored in many cases.

Open reduction should be considered for fractures with substantial displacement, but surgical treatment is associated with a high risk of infection. In patients sustaining a fracture after TKA, the bone is also severely atrophic in the vicinity of the prosthesis, so fixation with ordinary instruments and materials is not necessarily easy. The incidence of postoperative nonunion is also high in such cases. Consequently, extreme care must be exercised when a fracture is treated surgically after TKA.

Furthermore, fracture is associated with loosening of the prosthetic components in some cases, and revision arthroplasty should be considered when this occurs. The femoral component with a long stem has been designed for such revision arthroplasties.

Complications Involving the Extensor Mechanism of the Knee Joint

Disruption of the extensor mechanism of the knee after TKA diminishes muscle strength, resulting in instability and weakening of the knee joint, with inability to stand up or sit down and "giving way" of the knee. Contributory events include intraoperative injury to the extensor mechanism, patellar fracture, detachment of the patellar tendon insertion, and rupture of the quadriceps and patellar tendon. Patellar fractures that occur after TKA are usually stress fractures, and several causative factors may be involved. Excessive osteotomy of the patella, ischemia secondary to lateral release, and bone resorption due to loosening

of the patellar component can predispose to a patellar fracture.

Patellar fracture can be treated relatively well by immobilization in a cast for 6 weeks if the fragments show minimal displacement. Surgery is required if the patellar component has been loosened. Open reduction is followed by internal fixation of the bone fragments, and then the loosened patellar component is replaced. However, the use of bone cement in the preceding arthroplasty may make the revision arthroplasty impossible because of large bone loss. If so, the fracture is often difficult to treat, but the patient can recover extension of the knee joint partially even in the presence of small gaps between the fragments unless there is a transverse fracture associated with remarkable displacement.

Detachment of the patellar tendon and rupture of the quadriceps femoris muscle occur infrequently but are extremely difficult to treat, and thus are considered to be serious complications. In many of the patients who have undergone previous surgical treatments on the knee such as high tibial osteotomy or knee arthroplasty, the patella is difficult to evert because of scarring or shortening of the patellar tendon. Consequently, the patellar tendon may become detached when the knee is flexed during surgery after eversion of the patella. Care must be taken to avoid such detachment. During postoperative passive range of motion exercises, the quadriceps femoris muscle and patellar tendon may be torn completely if the manipulation is performed violently beyond the range of motion achieved during the operation. Manipulation is effective for releasing adhesions of the extensor mechanism. It should be understood, however, that manipulation cannot stretch contractures of the quadriceps femoris muscle. There have been reports on several methods of surgical therapy, including primary repair of the soft tissues and repair of the patellar tendon augmented with the hamstring tendon graft.[5] The outcome is often unsatisfactory because of limited motion, decreased quadriceps strength, and recurrence of rupture.

Infection

The most severe complication that can occur after TKA is infection, so its prevention is very important. The extremity must be fully cleansed before the operation. The operating room used for TKA should be clean, being furnished with facilities such as laminar air flow. Before operation, prophylactic antibiotics should be administered intravenously, and the operative site should be thoroughly irrigated with more than 6 L of physiological saline after bone cut and insertion of the prosthetic components. An intraarticular drain should be placed to remove blood postoperatively. These prophylactic measures make early infection after TKA an uncommon complication. The incidence of late infection has been reported as 1–10%, depending on the series.[6] Local heat and pain, an increased erythrocyte sedimentation rate, leukocytosis, and elevation of the C reactive protein (CRP) level suggest infection. If any of these signs is noticed, synovial fluid should be aspirated and examined microbiologically to identify the causative organism. In case no causative organism is identified in the patients with clinical signs of infection, the diagnosis should be established by open biopsy.

When a wide radiolucent zone is demonstrated around the components during postoperative follow-up, infection should be considered. Even when infection is suggested by radiographic findings, no organism is identified in some instances. In such cases, the presence of infection should be identified from both clinical findings and the results of radiological and laboratory studies.

For mild infection after TKA, systemic administration of antibiotics and local irrigation have been reported to be effective with the prosthesis retained. In the case of late infection, however, cure is rarely achieved without removal of the prosthesis. In general, the whole prosthesis should be removed together with

any cement and granulation tissue, followed by complete debridement of the infected area and systemic administration of antibiotics. Bone defects should be filled with cement beads containing antibiotics. In general, after complete resolution of the infection, revision arthroplasty or arthrodesis is done. In the United States and Europe, revision arthroplasty has been performed primarily after complete debridement,[7] but this method requires further evaluation.

Restricted Motion

The range of motion that is achieved after TKA depends on several factors, such as the patient's motivation, the success of rehabilitation, and the design of the prosthesis. The preoperative range of motion is considered to be the greatest determinant. One of the indications for TKA is extension contracture of the knee, which causes substantial limitation of flexion. In general, contracture of the quadriceps femoris or the joint capsule is the cause of extension contracture of the knee. Even if an adequate range of motion can be recovered at surgery, contracture frequently recurs and flexion is eventually limited to 45–60 degrees in such cases. Consequently, if the affected knee joint has a contracture, extreme care should be exercised intraoperatively in selecting a method to release the soft tissues and rebalance the ligaments. Usually, approach to the joint can be performed through medial parapatellar arthrotomy. If the patella cannot be everted after this is done, proximal release of the rectus femoris muscle is recommended,[9] although osteotomy of the tibial tubercle has also been reported.[8] If osteotomy of the tibial tubercle is performed, its fixation will pose another problem. In contrast, it is an advantage of proximal release of the rectus femoris that the tension of quadriceps can be adjusted at the end of the operation. In addition, the range of motion can be increased by manipulation under lumbar anesthesia with careful assessment of the tone of quadriceps.[10]

In patients with severe flexion contracture of the knee, inappropriate bony resection and inadequate posterior release may result in limitation of the range of motion after TKA. When the distal femoral bone cut is added to provide extension gap, and a polyethylene component that is thick enough to achieve stability in extension is inserted without releasing the contracted posterior capsule, the collateral ligaments become excessively tight during flexion causing loss of flexion. Consequently, the distal femoral bone cut should not be done merely to gain space for extension. As a rule, femoral bony resection should only create a space that is as wide as the implant to be inserted. In addition to this bone cut, the posterior tissues, which are the main cause of flexion contracture of the knee, should be thoroughly released, including the posterior capsule, posterior cruciate ligament (PCL), and the popliteal tendon. After all of these are released, arthroplasty should be carried out routinely, including determination of the level of the tibial bone cut, which determines the range of both extension and flexion after TKA. A posterior stabilised prosthesis that requires resection of the PCL can improve flexion more easily than a cruciate-retaining prosthesis which allows the preservation of the PCL.

Conclusion

TKA is an operation about which there are high expectations. Once complications develop, however, the outcome of TKA becomes extremely poor and is often devastating. It must be recognised anew that thorough preoperative evaluation of the indications and meticulous surgical technique can prevent complications. When complications occur anyway, it is very important to diagnose them early and treat them appropriately.

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Music Therapy in Pediatrics

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Abstract: Music has been utilized as a form of therapy due to ten factors; it has been particularly effective in treating children who are not adept at adaptively releasing their emotions, motivating children with little volition, in stimulating communication among children with undeveloped language skills, in helping to develop cognitive skills, and in overcoming abnormal habits or unadaptive behavior. Specific forms of therapy and techniques have been summarized and the focal points have been explained. There are mainly three categories of patients and music therapy has been applied in the treatment of children suffering from retardation and some form of emotional and behavioral polarization or abnormality, difficulty adapting due to physical functional disorders, and psychosomatic disorders stemming from psychological causes.

Key words: Music; Communication; Developmental disorders; Psychotherapy

Introduction

Music therapy is an ideal method of treatment due to the following factors.

1. Music bypasses the intellectual process and directly affects the emotions.
2. Music produces a sense of self-satisfaction or self-love.
3. Music fulfills an aesthetic sense of beauty.
4. Music is liberating and provides a direct means of emotional release.
5. Music induces physical movement.
6. Music is a form of communication.
7. Music is structured according to set rules.
8. Music is diverse and has wide-ranging applications.
9. An integration of mental functions is needed to participate in music activities.
10. Collective music activities meet a social demand.

Additionally, in the field of pediatrics, music therapy is greatly beneficial as an enjoyable diversion and successfully provides distress-free treatment for children who feel threatened by the treatment.

In addition to the ten factors listed above, music therapy has produced significant results in treating children who are not adept at adaptively releasing their emotions, in motivating children with little volition, in stimulating communication among children with poor or undeveloped language skills, in helping to develop cognitive skills by utilizing the fixed parameters in music, and in overcoming

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abnormal habits or unadaptive behavior.

Music, as is referred to in this paper, refers to all kinds of organized music and it is not restricted to the artistic or established forms of music.

Adaptation and Treatment Methods

Music therapy was initially used to treat adult patients suffering from mental illnesses, but its use was rapidly adopted in the field of pediatrics from the middle of the 20th century, principally, as a means of treating developmental disorders in children. As the pioneering nation in music therapy, the behavioral treatment approach (applied behavioristics method) was developed in the United States. Nordoff Robbins, who developed creative music therapy, adapted play therapy that emphasized improvisation and effectively utilized the characteristics of the music. His approach has greatly influenced music therapy in Japan.

Others such as the renown Montessori in the field of education for mentally retarded children, Carl Olaf in music education, and Darkrose, famous for rythmique, and other experts in educational therapy have established various schools of thought in music therapy, that has also influenced music therapy in Japan.

Music therapy has been widely applied in the treatment of children suffering from retardation and some form of emotional and behavioral polarization or abnormality, difficulty adapting due to physical functional disorders, and psychosomatic disorders stemming from psychological causes.

1. Retardation and emotional abnormalities impeding mental and physical development

Music therapy has been utilized to treat mental retardation, learning disabilities, developmental coordination disturbance, communication disorders, extensive developmental disorder, and others. Music activities that meet the needs and the development level of the patient are prepared and the aim is to help adjust the emotions and behavior by having the child listen to the music. The objective is to enable the autonomic nervous system to adjust and relax. Music activities are used at various stages to stimulate the development of movement, cognitive functions, communication skills, and others.

The skill to create as well as select music, that is in correlation with the level of physical and mental development and characteristics of the child, is vitally important, in addition to understanding the nature of the disorder and accurately assessing its progress. It is impossible for solely one therapist to develop and implement this type of therapy for a patient and a team approach or treatment which incorporates consultation is required.

The use of musical instruments is also an important means of therapy, but the approach differs from the concerns of music education, which addresses the issue of how to skillfully play existing musical instruments. In music therapy, the major objective is to select or create a musical instrument that is most suited to the physical and mental functions of the patient. The teaching aids created by Montessori or the musical instruments used by Carl Olaf have been traditionally exploited, but recently, musical instrument stores have begun to carry instruments or teaching aids that have been specifically developed for use in music therapy.

In either case, the key factors that produce successful results are the appropriate participation of the therapist and achieving goals such as stimulating the natural pace of physical and mental development by taking advantage of the patient's interest, improving problematic behavior, and teaching daily living and communication skills.

When the disorder is relatively moderate and the possibility of a correlative relationship exists, music therapy has been used in small

groups (3 to 5 patients). In addition to music therapy targeting individuals, techniques based on group dynamics are incorporated in such cases, i.e., techniques that will apply the various phenomena produced by group therapy to the benefit of the individual patient.

The author has proposed the following BED music skills as a therapeutic technique for helping development impaired children.

B: BGM
E: Echo T (T = technique)
D: Dialogue
M: Modeling
U: Unaccomplished T
S: Stimulative T
I: Iso-T
C: Call T

The above is a list of improvised communication techniques. These techniques have been published in other reports; therefore, a detailed explanation has been omitted.

In the case of severe, extensive developmental disorders such as autism, many aspects of the disorder are unknown. However, significant progress has been made in the area of semiology and therapeutics in the past 20 years. Autism, at least, has been recognized as a specific brain disorder and play therapy and other related approaches that were hitherto employed, have been largely replaced by behavioral therapy or a cognitive learning approach. The therapeutic educational approach has produced consistent results.

Although a systematic approach has not prevailed in Japan, some areas of the approach have been enthusiastically adopted. Music therapy within the field of educational therapy in the treatment of autism is as yet inadequate in Japan, but the author has actively adopted music therapy as one form of treatment for autism and as a means of motivating patients.

Based on the author's clinical experience, the treatment of autistic patients is comprised of two stages—a stage where free expression of the patient is encouraged and a stage where repetition is used as part of the learning process to address a clearly defined problem. Incorporating music in both stages creates a calming effect which in turn, encourages the patient's participation in the activity that is being introduced. Additionally, the use of music makes it easier to structure the treatment and promotes the understanding of the autistic patient.

2. Behavioral polarization and abnormalities that impede adaptation

Repetitive behavioral disorders such as Attention Deficit Hyperactivity Disorder (ADHD) or antisocial behavior, Tourette disorder, silence and eating disorders, and other repetitive abnormal habits are some of the disorders that fall into this category. Although the approach that is taken to treat these disorders differs slightly and the causes and psychological complications that stem from brain disorders are varied, music therapy is a commonly utilized approach, where a variety of music-related activities are selected to channel and adaptively release inherent aggression. The music activities are adjusted until adaptive behavior is attained.

The approach also differs according to the disorder and the personality of the patient. Music therapy has been successful in achieving relatively short-term behavioral changes in cases where psychological complications are a major factor.

3. Psychological factors as a primary cause of diverse psychosomatic disorders

A major goal of the treatment for psychosomatic disorders is to release psychological complications that stem from the disorder. Music therapy has been incorporated into play therapy and its related forms which are vitally important to help release the patient's pent up emotions and frustrations. Adaptive behavior is then taught through music activities, followed by attempts to verbalize the patient's inner self. Music therapy follows the same

process as the commonly utilized forms of psychological therapy.

Conclusion

The significance and effectiveness of music therapy in pediatrics have been explained in this paper. Music therapy takes advantage of the physical, psychological, and social impacts of music by using selected music-related activities in the treatment of children suffering from various disorders. Further, a summary of the major techniques and points, that is used to treat the three major areas of developmental and behavioral disorders and psychological complications, has been presented.

Due to the restricted length of the paper, evaluations were not discussed. But, the results that are achieved through therapy are closely examined using a behavioral evaluation scale and numerical values that are based on the direct observations and introspection of the therapist. It is hoped that music therapy will be utilized as an enjoyable form of therapy that provides gradual results, without inflicting fear or pain on the patient.

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