Original

Speech Disorders and Articulation Training in Patients after Cleft Palate Surgery

口蓋裂術後患者の言語障害と構音訓練

Hisako KOBAYASHI*, Nobuhiro HANADA**, Keiko GOTO**,
Kiyoko OGOH*, Yoshihisa YAMASHITA**, Hideo MIYAZAKI**
and Tadamichi TAKEHARA**

小林久子* 花田信弘** 五島恵子**
淡河紀代子* 山下喜久** 宮崎秀夫**
竹原直道**

Received April 14, 1987; accepted April 30, 1987

概要: 福岡市立心身障害福祉センターを訪れた器質的構音障害例58例のうち、口蓋裂の一次手術の術後例42例を調査した結果、十分な鼻咽腔閉鎖機能を得ていたものが21例(50%)認められた。また、42例中一次手術を行った病院に専門の言語治療士がいたのは15例(36%)であった。42例中、系統的構音訓練を行った13例について、正しく構音できる段階に達した症例は3例(23%)にすぎなかった。なお、異常構音では口蓋化構音が最も多かった。鼻咽腔閉鎖機能の良否と構音訓練成績の関係を調べた結果、鼻咽腔閉鎖機能が良好であれば構音訓練の成績が良い傾向はあったが、統計学的には有意な差がなく、複雑な要因の存在が示唆された。以上の所見は、当福祉センターで行った構音訓練の成果が満足できるものではなかったことを示していた。この原因の一つには、言語治療士と手術側との連携がよくとれていなかったことが挙げられ、口蓋裂手術を行なう病院のスタッフに言語治療士が加わる必要性が示唆された。

Key words: Cleft palate, Articulation training, Velopharyngeal closure, Palatalized articulation

索引用語: 口蓋裂, 構音訓練, 鼻咽腔閉鎖機能, 口蓋化構音

Introduction

After cleft palate surgery one of the most important things is to help patients learn normal articulation. Recently, oral and plastic surgical techniques for palatoplasty, orthodontic diagnosis of and treatment for growth disturbance or malocclusion of the jaw or palate, and diagnosis of and rehabilitation for speech disorders by speech therapists have all developed dramatically as isolated fields. However, very few medical institutions are integrating these diversified treatments¹⁾.

* Speech Therapist; Fukuoka City Rehabilitation Center for Physically and Mentally Handicapped

* 福岡市立心身障害福祉センター, 言語治療士

** Department of Preventive Dentistry, Kyushu Dental College (Director: Prof. Tadamichi TAKEHARA)

** 九州歯科大学口腔衛生学教室 (主任: 竹原直道教授)

Consequently occasional patients are encountered who undergo surgery in hospitals where there are no speech therapists, and other patients desire articulation training by speech therapists in the City Rehabilitation Center where there is inadequate medical equipment.

We report our findings on articulation training in Fukuoka City Rehabilitation Center ; these findings differ from those reported by the University Hospital^{2,3)}.

Subjects and Methods of Articulation Training

The Pediatric Department of the Fukuoka City Rehabilitation Center for The Physically and Mentally Handicapped is divided into four departments: the first for physically-handicapped infants, the second for speech- and hearing-disordered infants, the third for visually handicapped infants, and the fourth for mentally-retarded (disordered) infants. Articulation training in patients after cleft palate surgery was performed at the department of speech- and hearing-disordered infants. One otorhinolaryngologist and 7 speech therapists served in this department, but no dentist was present there.

The subjects of this study were patients who had visited this department from April, 1979 to March, 1984. These included 58 patients with organic articulation disorders. By eliminating 8 preoperative patients awaiting primary cleft palate surgery and 8 patients with malformed soft palates or suspected submucous cleft palates, 42 postoperative patients who had undergone cleft palate surgery were selected as the subjects.

The subjects for articulation training were chosen after an evaluation of their velopharyngeal closure, consistent articulation errors, stimulability of articulation, and other appropriate variables. The age criterion for starting articulation training was set at 4 years⁴⁾. Patients of this age are able to understand syllabic segmentation and identification and to practice intensively definite training tasks. Additionally, for patients who reached school age during the training, subsequent training was provided in a special education class for hearing and speech disorders instituted at a primary school or in hospitals where speech therapists were present.

The articulation training was conducted individually once a week for about 30 minutes per session. When the patient's progress was uneventful, the frequency of the sessions was changed to once per two weeks or once a month.

Two to three sounds were taught at each session, with consideration given to stimuable sounds, sounds which are said to be learned at an early age ([t, d, p, b, m]), and sounds in which the articulation point or articulation movements are correctly accomplished.

The training was started from the stage at which the patient exhibited poor articulation at the phoneme level and the results of articulation training were evaluated by dividing them into four stages: single syllables, words, sentences and conversation. For statistical analysis, the Mann-Whitney U-tests and Kolmogorov-Smirnov's tests were employed.

Results of the Investigation and Articulation Training

1. Clinical characteristics of the 42 patients who had undergone cleft palate surgery

Table 1 shows the numbers of patients separated according to their initial examination age and sex. Patients aged 2 to 4 years accounted for 74% of the total group.

Table 2 categorizes the patients by type of cleft. In unilateral cleft lip-cleft palate, there were more than twice as many patients with left-sided clefts as with right-sided clefts.

Of the 42 patients, 21 (50%) were found to have adequate velopharyngeal closure at the initial examination, 17 (40%) were found to have velopharyngeal insufficiency, and 4 (10%) could not be assessed at the initial examination.

Table 1 Initial examination ages and sexes of the 42 postoperative patients

age(years)	1	2	3	4	5	6	7	total
male	1	5	8	4	1	1	1	21
female	1	5	5	4	2	2	2	21
total	2	10	13	8	3	3	3	42

Table 3 The number of patients achieving different stages of improvement in the 13 systematic articulation-trained patients

results of articulation training	number of patients	%
stage I	2	15
stage II	2	15
stage III	6	46
stage IV	3	23
total	13	100
stage I : articulation of single syllables		
stage II : articulation of words		
stage III : articulation of a sentence		
stage IV : articulation adequate for conversation		

Table 2 Types of cleft in 42 postoperative patients

type of cleft	number of patients
cleft palate only	18
cleft lip and palate	
unilateral (right)	5
(left)	12
bilateral	5
submucous cleft palate	2
total	42

Table 4 Relationship between quality of velopharyngeal closure and the results of articulation training in the 13 systematic articulation-trained patients

results of articulation training	velopharyngeal closure	
	adequate	inadequate
stage I	1	1
stage II	0	2
stage III	4	2
stage IV	2	1
total	7	6

For an explanation of the stages, refer to Table 3.

Three patients had been equipped with a speech-aid prior to our evaluation, or were equipped with one during the training.

Fifteen patients (36%) underwent cleft palate surgery at hospitals where special speech therapists were present; 24 patients (57%) had the surgery at hospitals where speech therapists were absent; and the availability of speech therapists was unknown for 3 patients (7%).

As to additional disorders other than cleft palate, conductive deafness was noted in 17 patients, other deafness in 5, and mental retardation in 9. More than one additional disability including some of the above, were noted in 3 patients.

2. Systematic articulation training

1) Results of articulation training

Table 3 shows the results of articulation training in the 13 patients who received systematic articulation training. Three patients reached the stage at which they could articulate correctly during conversation.

2) Quality of velopharyngeal closure

Table 4 shows the relationship between the quality of velopharyngeal closure and the results of articulation training. Of the 13 patients, 7 (54%) obtained adequate velopharyngeal closure. In general, the results of articulation training have been said to be associated with velopharyngeal closure^{3,5}. Our patients also showed a trend toward favorable results of articulation training when velopharyngeal closure was adequate, but statistically, no significant difference was noted in the stages achieved by the two groups

Table 5 Results of articulation training in 6 patients with velopharyngeal insufficiency

course of patients with velopharyngeal insufficiency	results of articulation training
secondary surgery	stage II
speech-aids	stage II
spontaneous healing	stages I and IV
no treatment concerning velopharyngeal insufficiency	stages III and III

For an explanation of the stages, refer to Table 3.

with adequate or inadequate velopharyngeal closure.

3) Course of velopharyngeal insufficiency

A study was made in the patients who underwent articulation training with velopharyngeal insufficiency (Table 5).

When articulation training is performed, it is preferable to have adequate velopharyngeal closure. Therefore, the roles of speech-aids or secondary surgery were examined in the patients in whom obvious velopharyngeal insufficiency was noted despite previous cleft palate surgery. However, some patients were trained only in articulation movements using the technique of closed nostrils. This is practical in the following cases: (1) cases in which the patients are unable to undergo such treatments as speech-aids or secondary surgery, (2) cases in which about one year has passed since cleft palate surgery and the patients show signs of possible spontaneous improvement in velopharyngeal closure, (3) cases in which the patients are trained with the intention of obtaining earlier correct articulation movements, thereby preventing habituation of articulation errors, although the patients are eventually going to undergo such treatments as speech-aids or secondary surgery.

4) Articulation errors

When the 13 systematic articulation-trained patients were evaluated for the specific types of articulation errors made, palatalized articulation occurred most frequently (in 12 patients).

The second most common error was nasal distortion, noted in 7 patients. This articulation error was accompanied by velopharyngeal insufficiency in all but one of the 7 patients.

Glottal stop was noted in 6 patients. Of these 6 patients, 4 exhibited velopharyngeal insufficiency. A study of the relationship between the presence or absence of glottal stop and the results of articulation training showed no statistically significant difference.

As to other articulation errors, lateral articulation, nasal articulation, and pharyngeal fricative were each noted in one patient.

5) Duplicated articulation errors

Most of the 13 patients who underwent systematic articulation training exhibited more than one articulation error (Table 6). Only 2 patients in whom palatalized articulation alone was noted were free from additional articulation errors.

Table 6 The number of patients with each type or types of articulation errors in the 13 systematic articulation-trained patients

types of articulation errors	number of patients
C	2
B+C	2
A+B+C	3
A+C	2
C+E	1
C+D	1
A+C+F	1
A+B	1
total	13

A : nasal distortion

B : glottal stop

C : palatalized articulation

D : lateral articulation

E : nasal articulation

F : pharyngeal fricative

Discussion

For patients with cleft palate to obtain normal articulation, theoretically they should first acquire adequate velopharyngeal closure. According to a report⁶⁾ from a University Hospital where patients had undergone cleft palate surgery, the rate of acquiring velopharyngeal closure by the age of 4 was high (87%). Even in this case, however, 41% of the patients required intensive subsequent articulation training. This fact demonstrates that articulation training is required even after adequate velopharyngeal closure is obtained. A report³⁾ concerning articulation training showed that a year and a half of systematic articulation training by special speech therapists, beginning when the patients were 4 years old, enabled 80% of these patients, even though they had many articulation errors, to acquire correct articulation by the time of school attendance at age 6.

The problems in our patients were: first, only 21 (50%) of the patients obtained adequate velopharyngeal closure and only 7 (54%) (Table 4) of the 13 patients who underwent systematic articulation training had adequate closure; second, the starting periods for systematic articulation training were at the age of 4 years in all but 2 of the 13 patients, but despite this training, as shown in Table 3, only 3 (23%) of the patients achieved the stage (stage IV) where correct articulation is possible even during conversation.

In considering the causes of these poor results, a question concerning cooperation with hospitals arises, as well as questions raised previously such as the level of experience of the speech therapists, parents' cooperation, and patients' characters. That is, preparation of speech-aids or secondary surgery for velopharyngeal insufficiency may not have been smoothly performed at hospitals where there were no speech therapists because of lack of interdisciplinary cooperation.

However, the results of articulation training are not necessarily associated only with velopharyngeal insufficiency. For instance, although palatalized articulation errors were the most frequent, this articulation error is not directly related to velopharyngeal closure. Palatalized articulation has been reported⁷⁾ to have the lowest rate of spontaneous healing and is an important articulation error for training. With regard to the occurrence of palatalized articulation, an association with the organic function of the hard palate has been postulated⁷⁻⁹⁾. The study of this point will require preparation of plaster models based on intraoral impressions and measurement of the shapes of the teeth and palate as an essential condition. To elucidate the relationship between palatalized articulation and the organic function of the hard palate is our next task.

As mentioned above, many different articulation errors are present with very complicated causes. However, the most important articulation errors could be categorized as follows: (1) nasal distortion and glottal stop caused by inadequate velopharyngeal closure, and (2) palatalized articulation caused by organic dysfunction of the hard palate.

When separated according to the examining department, the former is likely to be evaluated in the oral surgery department or plastic surgery department, and speech-aids are made in the prosthetics department. The latter is usually evaluated in the preventive dentistry department or pedodontics department and therapy is usually accomplished in the orthodontics department.

However, in the City Rehabilitation Center, since there was no consistent team-approach, cooperation between the departments of the hospital was difficult to obtain.

References

- 1) Mimura, T.: Current treatment for cleft lip and palate—the integrated management in the second department of oral and maxillofacial surgery, Kagoshima University Dental School—, Bull. Kagoshima Univ. Dent. School, 4; 27, 1984.
- 2) Abe, M., Fukusako, Y. and Sawashima, M.: Results of articulation training on 60 cleft

- palate patients, *Jpn. J. Logoped. Phoniatr.*, 18 ; 67, 1977.
- 3) Kato, M., Okazaki, K., Onizuka, T., Sumiya, N. and Abe, M. : Results of articulation training on 80 children with cleft palate, *J. Jpn. Cleft Palate Assoc.*, 9 ; 109, 1984.
 - 4) Amano, K. : Formation of the act of analyzing phonemic structure of words and its relation to learning Japanese syllabic characters (kanamoji), *Jpn. J. educational psychol.*, 18 ; 76, 1970.
 - 5) Tsuji, T., Mimura, T., Matsuya, T., Nishimura, T., Yamaguchi, K. and Miyazaki, T. : Speech rehabilitation of cleft palate patients, *Jpn. J. Oral Surgery*, 18 ; 560, 1972.
 - 6) Fukuda, T. : Speech therapy, In : Cleft of palate (ed. by Miyazaki, T.), Ishiyaku shuppan Co., Tokyo, 1982, p. 367.
 - 7) Fukusako, Y., Sawashima, M. and Abe, M. : Postoperative speech in cleft palate children — a follow-up study on cases repaired at ages one to three years—, *Jpn. J. Logoped. Phoniatr.*, 15 ; 37, 1974.
 - 8) Okazaki, K. : Palatalized articulation as a type of speech associated with cleft palate, *Jpn. J. Plastic Reconstruct. Surgery*, 2 ; 164, 1982.
 - 9) Okazaki, K., Kato, M., Onizuka, T., Sumiya, N. and Haraguchi, K. : Morphology of the palate in cleft palate children with palatalized articulation, *Jpn. J. Plastic Reconstruct. Surgery*, 4 ; 304, 1984.