REVIEW

RECENT TREND OF CLEFT PALATE OPERATION

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ABSTRACT

Since the first success to close the cleft palate with muco periosteal flap by von Langenbeck, many improvements were made not only the technique but speech therapy, orthodontic treatment and anesthesiology.

The author makes a review on the history of the cleft palate operation, and present concepts on the treatment of the cleft palate from the standpoint of the speech results and maxillary growth. Ten years ago, the surgeon made operation only to gain good speech results, but now he must think of maxillary growth at the same time.

It is now well known, that the early operation (1–2 years old) with muco periosteal flap results mal development of the maxilla. In eastern Europe, late operation (after 3–4 years old) are in common. But in western Europe, United States and Japan early operation is still prevailing. Several methods were reported which could preserve maxillary growth, yet problems remain in the speech. The author wish to introduce these methods, including his two stage method (Osada method).

INTRODUCTION

The cleft palate is one of a congenital malformation of the face and frequently seen in daily clinical work. The purpose of the treatment is not only to close the cleft, but to gain good nasopharyngeal closure to gain normal speech, normal development of maxilla and good occlusion to enjoy healthy social life.

Since the first success of hard palate closure with bipedicle mucoperiosteal flap
by Langenbeck (1861), the techniques of cleft palate closure were greatly advanced. And, those who can gain normal speech with first operation increased with the progress of the techniques. Especially the studies on the nasopharyngeal closure, articulation development and anaesthesia had a great role on the speech results.

But the adverse effect of mucoperiosteal flap still used in recent operation is being apparent which requires hazardous later surgical correction.

The author studied cleft palate and experienced various method, and since 8 years began new operation, so-called "two stage operation" (Osaka method). This time the author wish to make a review of recent progress on the treatment of the cleft palate.


In the era of Greece, Rome and Dark Ages, cleft were covered with gold plate or sponge, and its technique developed to present prosthodontia.

Successful closure of the soft palate was performed by Le Monniere (1876), and in 19th century relaxation incision were performed on the lateral wall of the soft palate to avoid tension. Ultimatily Diffenmach made long incision including muscle according to the lateral wall of the soft palate.

It was the Bernard von Langenbeck who firstly noticed the necessities to use hard palate mucosa and periosteum to close the hard palate, and used bilameller mucoperiosteal flap which could provide a satisfactory method of performing uranoplasty.

Soon the technique of soft and hard palate closure became widely common, and the aim of the surgery began to change.

Passavant (1862) noticed that the speech after Langenbeck's procedure often followed nasal speech. He emphasized the necessity of gaining naso-pharyngeal closure to gain good speech and attached the soft palate to posterior pharyngeal wall to gain good nasopharyngeal closure. Since that time efforts were focused to push back the palate.

Ganzer (1862) used single pedicle mucoperistal flap, and pushed back the palate by using V-V procedure. Victor Veau (1934) separated and sutured mucous membrane of the nasal side, and hard palate mucosa was fixed on it.

At present, most widely known method is the modified method of Wardill. The procedures are as follows:

1. Elevation of the single pedicle mucoperiosteal flap.
2. Separation of neurovascular bundle near the greater palatine foramen.
3. Sectioning the hamular process.
4. Separation of the cleft muscle from posterior spine so as enable to reconstruct muscle sling of the soft palate.
5. Sectioning the mucous membrane of nasal side near the posterior spine to push back the soft palate.
6. Sutures are done with 3 layers.
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Through these procedures, the speech results were greatly improved as compared with classical Langenbeck's procedure. And it is undeniable that the progress of anesthesiology made possible to operate early before the learning of the speech.

Recently, more radical methods were reported, such as Cronin's, Millard's and Manchester's methods which can prevent the scar contractures on nasal side, which made more apparent the maldevelopment of the maxilla being susceptible to surgical invasion.

In view of these matters, the cleft palate operation is now shifting from past push back method to the new techniques to preserve the maxillary growth.


The optimum time to cleft palate operation should be considered from the standpoint of articulation development and maxillary growth.

i) From the standpoint of the articulation development.

When a baby is born, he makes the initial cry, which is reflective movement and being made automatically through inspiration and expiration. Within 3 months the baby learns to control his crying and express his feeling of hunger, pain and joy. Then he begins of sound vowels and consonants. At first they are consists of vowel, semi-vowels and small number of consonants. At the age of 6 months, the frequency of vowels and consonants become almost equal and consonants become more frequent after 6 months. After 8 months, the baby has a developmental stage, enjoing to sound various consonants, which is called jargon.

After 1 years of age, the baby begins to repeat the sounds of the parents and begins to repeat the words.

But in case of cleft palate children. Before operation the children do not sounds the consonants which demand intraoral pressure. And the number and variety of the consonants do not increase as normal children. But after the operation, the development of the articulation differ according to the patient, Takehisa et al. studied the articulation development after the cleft palate operation among groups operated at the age of 1 year, 1 year and half and 2 years old.

Those group operated 1 year old did not show remarkable increase in the consonants sounding, but with the coming of echolalia (in this study "echolalia" is the developmental stage in which the baby actively repeat the sounds which contain 2 or more syllables) the children began to repeat the words of the mothers and others persons unconsciously. Those who operated 1.5 years old began to repeat soon after the operation. Those who operated 2 years ld began to repeat immediately after the operation. The average age of the coming the echolalia is 1 year and 11 months and in 70% of the patients the echolalia appeared between 1 year 10 months and 2 years old.

So, those who operated during or after the echolalia remain some errors in articula-
tion which they learned before gaining the nasopharyngeal closure.

Those patients operated before echolalia and remained the errors in articulation and made speech therapy were 5%. Those who were made operation during the "echolalia", and made speech therapy were 26% and those who operated after the period of echolalia and made the speech therapy were 95%.

The optimum time for cleft palate operation from the stand point of articulation development should be decided not on the age of the children, but on the development of the children which differ on every patients, yet 1 year and half is the optimum time for the majority of the patient, because on 70% of the patient echolalia come in 1 year and 11 months.

ii) Optimum time of cleft palate operation from the stand point of maxillary development.

The growth of the face are performed by separation and ossification of bony sutures. In case of the growth of the maxilla, the separation of the pterygomaxillary suture take an important role, and the role of the periostem of facial wall is very small.

The growth of the face is performed very rapidly immediately after the birth, and about 70% of the facial growth is performed within 3 years old. According to Ross,17 the cleft palate operation using mucoperiosteal flap since Langenbeck's method make scar contractures according to the defect of the tissue which is made after the closure of the cleft, especially on the pterygomaxillary suture, and make a condition so-called "maxillary ankylosis." This maxillary ankylosis disturbs the separation and ossification of the sutures. The degree of the ankylosis depends upon the age of operation, operation method, frequency of operation and techniques of the operators. The more progress of the technique, the heavier the scar tissue formation, which disturb the maxillary growth.
The new concepts to avoid maldevelopment of the maxilla due to the operation.

In order to avoid maldevelopment of the maxilla after the operation, there are two ways of concepts. One is to postpone hard palate operation after 3–4 years old, another is to perform cleft palate operation at the age of 1–1.5 years old with minimum surgical invasion.

Cleft palate operations are performed in East Germany\textsuperscript{16} at the age of 3 years old, in Czechoslovakia\textsuperscript{19} 4 years old and in Reningrad\textsuperscript{20} in USSR at the age of 7 years old.

In western Europe, Graber\textsuperscript{21,22} recommended to operate after 6 years old, through his study of maxillary development of the patients operated with mucoperiosteum flap method.

Slaughter\textsuperscript{23} recommends to reconstruct muscle sling and close the hard palate after 6 years old. Schweckendiek\textsuperscript{24,25} close the soft palate at half year old, and then cover the hard palate with obturators, and surgical closure of the hard palate is recommended at the age of 11.

Through these method, the maxillary growth are very good as compared with early push back operation generally performed 1 ½ ~ 2 years old. But problem remain in speech.

In socialistic countries, the patient are asked to attend kindergarden in early age and they are trained the blowing exercise or others which relate to speech training through kindergarden life, and ready to start the speech training immediately after the operation. Still they consume much time and energy for speech training. In order to perform this way of treatment, many speech pathologists are necessary to give enough training to the patients.

Another concept is to make the operation at 1.5–2.0 years old with less surgical invasion.

i) Langenbeck's method.

In 1964, Lewin\textsuperscript{26} send the letters to the plastic surgeons of U.S. and gained the answer that nearly half of the plastic surgeon use Langenbeck's procedure.

The evaluation of Langenbeck's procedure still divided, some reports for its superiority to push back methods not only maxillary growth\textsuperscript{27,28} but speech results. Others complains the reverse results.\textsuperscript{29,30} Recently even in Japan, some authors\textsuperscript{31} are trying this method, yet final results are not yet reported. Issiki\textsuperscript{32} use Langenbeck's bipedicle flap for small segment, and Wardill's mono pedicle flap for large segment in order to minimize scar contracture.

The author has an opinion through his experience, those who made affirmative answer to Langenbeck method have a system of good orthodontic treatment after surgery.

ii) Dunn's vomer flap method.\textsuperscript{30}

In 1959 Dunn reported a method; hard palate is closed with vomer flap, and soft
palate is closed with simple suture without relaxation incision. The fistel remained at the boundary of the hard and soft palate is closed small bibepedicle flap from both sides secondarily.

In 1974 Stenstrom made vomer flap. And he made skin graft to the raw surface both vomer and flap side, then the flap was returned to former place. After 2 weeks, hard palate was closed with the vomer flap which has skin graft. Soft palate was closed with relaxation incision without sectioning of the hamullar process. These methods are considered to be excellent in maxillary growth, but remain problems in speech results.

iii) One stage closure of the cleft palate with mucous flap.

Widmaire closed hard palate with vomer flap, and closed the soft palate with mucosal flap taken from hard palate. As neurovascular bundle of the hard palate and periosteum were preserved in this method, remarkable scar tissue were not remained on maxillary tuberosities. The maxillary growth was excellent. Kamiishi reported new designed flap to cover pterygomaxillary junction, and lengthened soft palate with two Z-planties. And reported the results of 5 years follow-up. The results were excellent.

The author closed hard palate with vomer flap, and closed the soft palate with modified Widmair's method. Push-back of the soft palate was done and the defect at nasal side was covered with Kaplan's cheek flap, and then covered all raw-surface at oral side with skin graft.

Perko reported to make mucosal flap from hard palate to close the cleft, but as it was difficult to make long random pattern flap in oral cavity, so the results of operation were not satisfactory.

iv) The author's two stage method. (Osada method)

This method is mainly for complete cleft lip and palate patients. Soft palate is closed at the age of 3 months, weighing 6 kg with cleft lip operation simultaneously.

Incision is made to soft palate, and cleft muscle is separated from posterior spine, and muscle sling is being reconstructed.

In case of the high tension due to wide cleft, mucous membrane is separated at the border of the soft and hard palate. After the soft palate closure, the patients are followed at out-patient clinic every 3 or 4 months, and being examined nasopharyngeal closure by gag reflex with posterior nasopharyngo scope and mental development is checked.

The nasopharyngeal closure are scored in three grade.

A) good → prefect closure → about 50%
B) border line → space within 1 or 2 mm is observed by gag reflex → about 30%
C) poor → space more than 3 or 4 mm is observed by gag reflex → about 20%
Hard palate is closed 1.5–2 years old, before echolalia. Those who belong to Class A, vomer flap is used to close hard palate and skin graft is performed to the oral raw surface to prevent scar contracture.

Those who belong class C, pharyngeal flap is performed simultaneously. As the pharyngeal flap is combined according to the nasopharyngeal closure, the results of speech is very excellent. And as no-surgical invasion is performed on maxillary tuberosities, the growth of the maxilla are also very good.

CONCLUSION

(1) The cleft palate operation experienced the ara only to close the cleft, the ara to think of the speech and now it is going to change to think of speech and maxillary growth.

(2) The optimum time for cleft palate operation has two way of thinking, one
Fig. 3 Before operation.

Fig. 4 After soft palate closure.
is to think of speech results (early operation), the other is to think of maxillary growth (late operation).

(3) The optimum time for early operation is before “echolalia”, which comes average 1 year and 11 months.

(4) The optimum time for late operation is after 3 or 4 years old. In this cases speech therapy is necessary after the operation.

(5) In western countries, less invasive techniques especially on maxillary tuberosities are under study. But it is difficult to fulfill both speech and maxillary growth.

The author reported a method so-called two stage operation (Osada method) which could fulfill the both. Speech and maxillary growth after the study of 8 years.
Fig. 7  Hard palate is closed with vomer flap.

Fig. 8  Skin graft with many stab hole is placed, and fixed with tie-over dressing.
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Fig. 9 4 years after hard palate closure. Skin graft is taken well.

Fig. 10 4 years after operation. Maxillary growth and occlusion is quite excellent.
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