

A Comparative Study of Results of the Von Langenbeck and the V-Y Pushback Palatoplasties

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Introduction

The primary goals of cleft palate management are that the patient achieve normally oral speech and normal maxillofacial growth. The element of speech in cleft palate patients most directly attributable to surgery is velopharyngeal competence. The degree to which a patient is able to achieve velopharyngeal closure following palatoplasty is, therefore, one measure of the success or failure of that surgical procedure.

Unfortunately, very few reports of palatoplasty results have utilized measures which are clearly based on velopharyngeal competence as the primary criteria of success (5, 12). In other studies, lack of homogeneity in the patient population has been a problem. (15)

The longitudinal cleft palate study at the University of Iowa is an attempt to evaluate the long-term results of cleft palate management. Many factors related to cleft patients and their management are being studied in an attempt to understand the causal relationships which exist. Because there are so few sets of data, it seems important to report findings even in preliminary format as soon as they are available. This is a preliminary report of data gathered thus far with some information about the effects of both cleft type and method of palatoplasty upon the speech results as assessed by velopharyngeal competence. More detailed reports and information about relationships of other factors will be reported in later papers.

Description of Subjects

The 267 patients reported upon were enrolled in the longitudinal cleft palate project from 1961 to 1971. Before 1964, all subjects were enrolled in the study just before palatal surgery and were then followed at specified intervals with specific observations made at each visit. Beginning in January, 1964, the protocol was changed. To be included in the study, infants must have been

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enrolled prior to any surgical or orthodontic management (with the exception of life-saving techniques)—that is, by six months of age if a cleft lip were present or by two years of age if a cleft palate only were present.

An effort has been made to enroll patients as soon as possible after birth and in the order in which they are presented for care at this hospital in order to avoid a selection bias. All potential subjects have been enrolled in the study if the parents considered it possible to return as often as study protocol specifies. Distance of residence from the hospital or job requirements of the parents have occasionally prevented some patients from participating. This is not viewed as having had an effect on the randomness of the population.

Subjects are examined by the cleft palate team at six-month intervals until age five and then yearly until age 18. Specific observations are made at each visit.

The von Langenbeck palatoplasty (8) was the procedure of choice in this department until October, 1968, and 149 of the patients in this study had this type of palatoplasty. During that time period, an additional 10 cleft palate patients were managed with a prosthetic obturator rather than surgery. Eight of these were considered poor candidates for palatoplasty because the cleft was judged to be too wide for surgical closure, and two were obturated because their parents refused surgery. This has obviously had an effect on the randomness of the von Langenbeck group since eight of those who were obturated had very extensive palatal clefts.

Since October, 1968, the V-Y elongation technique as described by Wardill (19), Kilner (7), and Demjen and Krause (4) has been used. All 118 available subjects have been treated surgically. This group is at present very much younger than the von Langenbeck group (Table I), and there has been less time to evaluate the results. Consequently, assessments of velopharyngeal competence for these very young children must be regarded as tentative.

All surgical procedures were performed in the department. Approximately 60 per cent were performed by residents and 40 per cent by senior staff. No attempt was made in this study to evaluate the differences between the conventional V-Y and the bundle ligation groups (see later discussion).

The patients in this study were classified only with regard to the extent of the palatal cleft without consideration of the lip cleft. In other words, if a subject had an incomplete cleft lip and a cleft of the soft palate only, in this study, he was considered to have only a cleft of the soft palate. Nine subjects were reclassified from lip and palate to palate only in the von Langenbeck surgical group and eight in the V-Y group.

Velopharyngeal Evaluation

Judgments of velopharyngeal competence were made by speech pathologists who specialize in cleft palate. The judgments were based on a number of observations, including several types of speech articulation tests, breath pressure ratios, and physical examination. The observations have been described in detail elsewhere (13, 18).

The following criteria were used in making the clinical judgments:

- a. *Velopharyngeal competence*: The patient had to meet *all* of the following criteria:
 1. Consonant articulation that was oral or that could be stimulated to be oral (rather than nasal).
 2. Normal (not hypernasal) voice quality.
 3. No nares constriction during articulation of pressure consonants.
 4. Manometer ratio, with bleed, of .90 or higher.
- b. *Marginal velopharyngeal competence*: The patient exhibited such slight degrees of incompetence that no further surgical or prosthodontic treatment was indicated but demonstrated the following characteristics:
 1. Occasional slight nasal emission during connected speech.
 2. Nares constriction (not required).
 3. Manometer ratio below .90.
- c. *Velopharyngeal incompetence*: The patient was judged to demonstrate incompetence when the following observations were made:
 1. Consonant articulation that was characterized by consistent nasal emission and that was not stimuable under any condition.
 2. Hypernasal voice quality.
 3. Nares constriction (not required).
 4. Manometer ratio of .89 or lower.

Note that the above criteria were used in evaluating all children older than five years. Children younger than that, however, frequently could not perform the manometer task, so judgments of competence were made on the basis of speech tasks alone or in combination with observations made during the performance of informal blowing tasks.

Finally, a requisite to all judgments was an examination of the oral mechanism to determine whether there was a palatal fistula. If a fistula was present and the subject was judged to show velopharyngeal incompetence, he was excluded from the study (since it is difficult in such cases to determine whether the nasal air flow is from the fistula or a valve deficiency). More detailed information about the incidence of fistulae in these surgical groups will be reported in subsequent papers.

For the purpose of this report, those patients in the velopharyngeal competence and marginal competence categories were combined to represent a single group for whom secondary palatal management was not indicated at the time of examination. These combined groups will hereafter be referred to as competent. Only those patients in the velopharyngeal incompetence category were considered for subsequent surgical or prosthodontic management.

Data about the reliability of clinical judgments of velopharyngeal competence by experienced speech pathologists are available. (13, 16, 18) In those studies, indications were that, in about 80 per cent of the sample being studied, there was inter- and intra-judge agreement among clinical speech pathologists who were specialists in cleft palate. When differences occurred, they pertained to confusion between the competence and the marginal competence groups.

Surgical Technique

MODIFIED VON LANGENBECK METHOD. A modified von Langenbeck palatoplasty was used in 149 patients. This technique involved the development of two bipedicle mucoperiosteal palatal flaps which were advanced to the midline for closure.

The palatal aponeurosis was detached from the posterior edge of the hard palate and the nasal mucosa incised. The tensor veli palatini tendon was slipped off the hamular process or the process itself was fractured.

When the flaps were sufficiently mobilized so that closure in the midline was possible with minimal tension, the nasal mucosa was closed with interrupted sutures of 4-0 chromic catgut, and the oral mucosa and palatal muscle were closed with vertical mattress sutures of 3-0 chromic catgut.

V-Y ELONGATION METHOD. This general method was utilized in 118 patients. Though the principles of repair were constant in all, some differences in technique occurred. In 80 of the patients, the neurovascular bundles were ligated and transected bilaterally, whereas, in the others, the bundles were left in tact. In one-third of the patients, a suture was placed simultaneously through the oral and nasal layers at the posterior border of the hard palate in an attempt to retain the palate in retroposition. Preliminary evaluation indicated that these slight differences in technique did not result in any discernable difference in results within the V-Y group.

All posterior flaps were designed in like manner. A medial incision was made along the entire edge of the cleft. The lateral incisions began 5 mm behind the maxillary tuberosity and extended around the tuberosity to the canine tooth on either side. The oblique incisions began 2 mm in front of the palatal margin posteriorly and extended forward to join the lateral incisions at the canine teeth. The oblique incisions were made in the same location each time with the extent of the cleft determining whether it would be a three-flap or a four-flap procedure. This allowed maximum lengthening of the palate in each patient.

The paired anterior and posterior flaps were elevated from the underlying bone. The neurovascular bundles were dissected and either ligated and transected or elongated. Elongation was accomplished by making parallel incisions on either side of the pedicle and then dissecting the pedicle from the base of the flap a distance of from 10 to 15 mm's.

The palatal aponeurosis was dissected from the posterior edge of hard palate and the nasal mucosa elevated along the nasal floor as extensively as possible but retained in tact. The tensor veli palatini tendon was slipped from the hamular process to allow adequate relaxation during closure.

A flap from the septum was sutured to the nasal mucosa to provide closure of the nasal floor beginning at the anterior margin of the cleft and extending back along the vomer. The nasal layer of soft palate and uvula were likewise sutured with interrupted sutures of 4-0 chromic catgut. The oral layers of mucosa and muscle were closed with interrupted vertical mattress sutures of 3-0 chromic catgut, using care to approximate the levator sling. A suture was placed through oral and nasal surfaces at the posterior end of hard palate to retain the palate in retroposition.

The two anterior flaps were sutured in the midline beginning at the anterior margin of the cleft. The points of the anterior flaps were sutured within the two points of the posterior flaps. Thus a V-Y advancement of the two posterior flaps resulted in an elongation of from 15 to 20 mm's. It should be recognized, however, that this elongation was not entirely translated into permanent retropositioning of the soft palate.

Age at Palatoplasty

Palatoplasties were performed at a later age during the time the von Langenbeck procedure was used than is currently the practice. The mean age at palatoplasty for the von Langenbeck group was 41.36 months with a range of 15 to 145 months and a standard deviation of 20.52 (Table 1). The mean age for the V-Y technique was 27.96 months with a range of 15 to 92 months and a standard deviation of 9.38 months. This difference in age at time of palatoplasty reflects changing departmental philosophy rather than a difference in the surgical technique itself.

Results

BY CLEFT TYPE. Table 2 lists the results of primary palatoplasty. As one might expect, there is a general trend toward progressively poorer results as the extent of the cleft becomes greater. That is, 87 per cent (38 of 44) of patients with clefts of the soft palate only attained acceptable competence, whereas only 67 per cent (40 of 60) of those with hard and soft palate clefts did so. This difference is statistically significant at the 5 per cent level ($\chi^2 = 4.25$).

The difference in percentage of competence between the unilateral lip and palate (59 per cent) and bilateral lip and palate (52 per cent) was not statistically significant. However, the difference between competence in the group with total palate only (75 per cent) and that in subjects with total lip and palate (57 per cent) was significant at the 1 per cent level ($\chi^2 = 8.12$).

BY TYPE OF SURGICAL PROCEDURE. Table 3 shows a comparison of competence results related to the type of surgical procedure which was used. A somewhat higher percentage of those in the von Langenbeck group had extensive clefts than did those in the V-Y group. This probably caused a reduction in success rate in the von Langenbeck group but does not, of course, affect the results when individual cleft types are compared.

Another factor which further complicates this comparison is that ten of the

TABLE 1. Age at palatoplasty

<i>cleft type</i>	<i>N</i>	<i>von Langenbeck</i>		<i>N</i>	<i>V-Y pushback</i>	
		<i>age range (months)</i>	<i>mean age (months)</i>		<i>age range (months)</i>	<i>mean age (months)</i>
Soft palate only	(23)	18-64	32	(21)	15-35	24
Hard & soft palate	(27)	15-122	42	(33)	16-54	27
Unilateral lip & palate	(67)	18-145	42	(44)	16-92	28
Bilateral lip & palate	(32)	30-128	46	(20)	20-71	32
Totals	(149)	15-145	42	(118)	15-92	28

TABLE 2. Results of primary surgical procedures by cleft type

<i>cleft type</i>	<i>N</i>	<i>VP competence</i>	<i>marginal VP competence</i>	<i>total</i>
* Soft palate only	44	73% 32/44	14% 6/44	87% 38/44
* Hard & soft palate	60	57% 34/60	10% 6/60	67% 40/60
** Total: palate only	104	63% 66/104	12% 12/104	75% 78/104
Unilateral lip & palate	111	44% 49/111	15% 17/111	59% 66/111
Bilateral lip & palate	52	37% 19/52	15% 8/52	52% 27/52
Total: lip & palate	163	42% 68/163	15% 25/163	57% 93/163
Totals	267	50% 134/267	14% 37/267	64% 171/267

* Significant at the .01 level

** Significant at the .05 level

TABLE 3. Results of primary surgical procedures

<i>cleft type</i>	<i>N</i>	<i>von Langenbeck</i>			<i>N</i>	<i>V-Y pushback</i>		
		<i>VP compe- tence</i>	<i>marginal VP compe- tence</i>	<i>total</i>		<i>VP compe- tence</i>	<i>marginal VP compe- tence</i>	<i>total</i>
Soft palate only	23	74% 17/23	17% 4/23	91% 21/23	21	71% 15/21	10% 2/21	81% 17/21
** Hard & soft palate	27	41% 11/27	7% 2/27	48% 13/27	33	70% 23/33	12% 4/33	82% 27/33
Total: palate only	50	56% 28/50	12% 6/50	68% 34/50	54	70% 38/54	11% 6/54	81% 44/54
Unilateral lip & palate	67	43% 29/67	9% 6/67	52% 35/67	44	45% 20/44	25% 11/44	70% 31/44
Bilateral lip & palate	32	28% 9/32	19% 6/32	47% 15/32	20	50% 10/20	10% 2/20	60% 12/20
Total: lip & palate	99	38% 38/99	12% 12/99	51% 50/99	64	47% 30/64	20% 13/64	67% 43/64
* Totals	149	44% 66/149	12% 18/149	56% 84/149	118	58% 68/118	16% 19/118	74% 87/118

* Significant difference .01 level.

** Significant difference .05 level.

patients with extensive clefts managed before 1968 were obturated and so were not included in the von Langenbeck surgery group. (Four had clefts of the hard and soft palate only and 3 had bilateral lip and palate clefts). In contrast, none of the patients in the later management series had obturation, so the full range of cleft severity is probably represented in that group.

The V-Y elongation method produced a higher percentage of competence (74 per cent) than did the von Langenbeck procedure (56 per cent) when all cleft types were combined. This difference is statistically significant at the 1 per cent level ($\chi^2 = 7.87$).

In the soft palate only category, the results were somewhat better in the von Langenbeck group (91 per cent) than in the V-Y group (81 per cent). This difference was not found to be statistically significant.

In all other cleft types, the results were better in the V-Y group. The differences in success between surgical procedure groups were not statistically significant in individual categories. However, when the individual categories are combined into total palate only and total lip and palate categories, the results in the V-Y groups are better (5 per cent level of significance) than those in the von Langenbeck groups. A comparison of success in the total palate only category again favored the V-Y group with 81 per cent success as opposed to 68 per cent for the von Langenbeck. This difference is statistically significant at the 5 per cent level ($\chi^2 = 4.86$). Likewise, a comparison of results in the total lip and palate categories favored the V-Y group 67 per cent to 51 per cent. This difference is also statistically significant at the 5% level ($\chi^2 = 4.25$).

BY LEVEL OF INTELLIGENCE. The two management groups were virtually identical in intellectual function: von Langenbeck lip and palate, mean IQ 101.2, range 50-141; von Langenbeck palate only, mean IQ 100.6, range 50-132; V-Y lip and palate, mean IQ 101.6, range 62-125; V-Y palate only mean IQ 98.1, range 51-122. In interpreting these data, however, we must consider the fact that test results for the very young children (the V-Y group) may be more unreliable than for the older children. Nevertheless, it seems unlikely that there are substantial differences in IQ between the two management groups.

Discussion

In order to make this preliminary report, it was necessary to look at the two surgical groups at widely differing ages. The mean age at last examination of the von Langenbeck group was 141 months with an age range from 47 to 304 months and a median age of 137 months. The V-Y group was much younger with a mean age at last examination of 64 months. The age range for this group was 24 to 120 months with a median age of 60 months.

This difference in age at last examination clearly raises questions about the reliability of assessment of velopharyngeal competence in the younger (V-Y) group. In general, assessment of velopharyngeal competence is easier in older children and occasional shifting from one classification to another may occur with advancing age. Even considering that possibility, however, it appears that the overall velopharyngeal competence results are significantly better with the V-Y palatoplasty (74 per cent) than with the von Langenbeck procedure (56 per cent). McEvitt (10) reported a similar improvement in results when utilizing the V-Y palatoplasty, but Lindsay (9) found a greater incidence of "acceptable speech" utilizing the von Langenbeck than the Dorrance pushback. Musgrave, McWilliams, and Matthews (14), on the other hand, in their study of children with clefts of the soft palate only, reported that all subjects in both the von Lan-

genbeck and V-Y retroposition groups had adequate or borderline-adequate mechanisms at age ten but that the V-Y group had required less secondary intervention. Though the criteria for success vary somewhat from study to study, our overall velopharyngeal competence rate of 74 per cent in the V-Y group is slightly better than that reported by Green (6) (66 per cent) and Calnan (3) (64.1 per cent), though not as good as reports by Braithwaite (2) and Morley (11) (95.8 per cent), Trauner and Trauner (17) (86 per cent), Battle (1) (77 per cent), and McEvitt (10) (87 per cent), all of whom also utilized the V-Y palatoplasty.

There appears to be a general decline in the percentage of competence as the severity of the cleft increases. Battle (1) similarly reported an incidence of "good speech" in 70 per cent in bilateral lip and palate and 83 per cent in "short" post alveolar clefts. Green (5), however, reported a "normal speech" incidence of 86.7 per cent in unilateral lip and palate, 79.5 per cent in bilateral lip and palate, but only 35.5 per cent in palate only.

We have not yet studied the effect of patient age at time of palatoplasty on velopharyngeal competence. As noted earlier, there has been a trend toward performing palatoplasties at an earlier age. This trend is reflected in a mean age at palatoplasty of 42 months in the von Langenbeck group and 28 months in the V-Y group (Table 1). This difference in age at palatoplasty may have affected the results as some authors suggest. Such a comparison related to age-at-surgery within the V-Y group is now being carried out and will be reported subsequently.

The data reported here for the V-Y management are to be considered tentative for our patient population because of limitations in the evaluation procedures.

Summary

The incidence of velopharyngeal competence noted in 267 cleft palate patients following palatoplasty has been reviewed. Comparisons have been drawn with regard to the cleft type and the surgical technique performed. Since there were relatively small numbers of subjects in some categories, differences in age at last examination between the von Langenbeck and V-Y palatoplasty groups, some patients were very young at time of evaluation, and a number of different surgeons at different levels of training and experience performed the surgery, the differences in velopharyngeal competence found should be viewed as trends and this report as preliminary.

In general, there was a trend toward smaller percentages of patients attaining acceptable velopharyngeal competence as the severity of the cleft increased. Of those with clefts of the soft palate only 86 per cent achieved competence. Among those patients with clefts of the palate only, 67 per cent achieved competence, whereas only 57 per cent of those with clefts of the lip and palate were able to do so.

When comparing all cleft types, the V-Y palatoplasty resulted in a significantly higher percentage of velopharyngeal competence (74 per cent) than did the von Langenbeck method (56 per cent), although the data for the V-Y group are probably less reliable than those for the von Langenbeck group. In the

soft palate only category, the results were slightly better with the von Langenbeck technique, though not significantly so. In all other cleft types, the results with the V-Y method were better than those with the von Langenbeck.

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