

Delayed Hard Palate Repair and Speech Deficiencies: A Cautionary Report

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In the management of patients with complete palatal clefts *early repair of the soft palate* (before 1 year of age) and *delayed repair of the hard palate* (after five or six years of age) has been advocated on the basis that good speech will develop following soft palate closure and that avoidance of trauma to the hard palate will obviate maxillary growth disturbance. In addition, it is said that many of the remaining hard palate fistulas will close spontaneously and that residual hard palate openings will be easy to close. Thirty-two cases treated in this way are reviewed, and a decade of experience with this technique is presented. A majority of cases failed to develop acceptable speech spontaneously. A very high percentage suffered both anterior and posterior air escape and a strikingly high proportion required pharyngeal flaps. Spontaneous complete closure of the hard palate was infrequent. The hard palate openings were not easy to close. The speech deficiencies associated with this technique are clear. The method's possible advantages in relationship to maxillofacial growth remain difficult to prove and were not specifically investigated in this study.

Introduction

It is generally conceded that early closure of cleft palates is associated with better speech results than is late repair (Jolleys, 1954; Evans, 1974). Such early reconstruction, however, may be accompanied by a higher incidence and greater severity of maxillary growth interference (Graber, 1949; Bernstein, 1968). A consensus has not yet been achieved on the best way to reconcile these aspects of cleft palate treatment. There is, however, an attractive hypothesis (Schweckendiek, 1951, 1955, 1966, 1978) that one can achieve the speech advantage of early repair by closing the soft palate alone while avoiding the maxillary deformity by delaying the hard palate

surgery until maxillary growth is essentially complete. Further, it has been suggested that, with the lip and the soft palate closed, the reconstructed ring of circumpalatal forces (Slaughter and Pruzansky, 1954) will bring about spontaneous closure of the residual hard palate opening or its reduction in size to the point where it is of little consequence for speech and of less challenge to eventual surgical closure. Unfortunately these points are imperfectly borne out in practice, and our disappointment with this approach to palatal repair prompts this cautionary report.

Materials and Methods

For the years 1964 through 1974, 32 cases of complete secondary palatal clefts operated upon at Columbia-Presbyterian Medical Center using the early soft palate closure and delayed hard palate repair technique were reviewed. Two surgeons performed approximately two-thirds of the procedures, while the remaining one-third was carried out by residents under their supervision. An early decision as to the advantage of the Schweckendiek procedure precluded the use of a control group. These cases were followed for at least five years or until age five. The average fol-

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low-up was 8.7 years. The majority of the cases had unilateral cleft lip and palates (Table 1). In three-fourths of the cases, the soft palate alone was closed following prior lip repair (Table 2). In the remainder, the lip and soft palate were closed simultaneously. Overall, the average age at soft palate repair was 11.8 months. Where possible, the soft palate was closed directly with only minimal division of nasal mucosa and palatine aponeurotic fibers (Table 3). If this could not be accomplished, small releasing incisions were made around the maxillary tuberosities and the hamulus was cut at its base to release the tensor veli palatini. Following soft palate closure, the residual hard palate fistula rapidly decreased in size. However, in only three cases (9%) did it functionally close. Symptomatic reopening of one of the apparently closed hard palates, accompanied by food and air leak, occurred during orthodontics.

Speech was evaluated at five years of age or just prior to consideration of hard palate closure. Since none of the patients had had consistent or prolonged speech therapy up to this point, speech at this time was considered to be the "spontaneous" speech result. Such late referral for speech training followed the

Schweckendiek model. Subjective listener judgments were used for judging speech, voice, and language. For the purposes of this paper, only speech and voice will be discussed. Evaluation was performed by one speech pathologist at a time over the ten-year period. A total of two speech pathologists were involved.

In the evaluation reports reviewed, a statement was usually made as to the overall intelligibility, and usually, a judgment was made on a continuum from normal to severely impaired. Whenever possible, articulation was analyzed in terms of types of misarticulations, i.e., speech sound omissions, substitutions or distortions. Additionally, whenever possible, an attempt was made to assess vocal resonance as a separate parameter, but sometimes the sample of utterances was rather limited because of the child's cooperation or inability to generate or formulate language.

Employing the standard classification of manner and place of speech sound articulation, some interesting error patterns were noted especially with regard to anterior articulation associated with anterior palatal defects. It seemed that those children with anterior palatal defects had difficulty, as one would expect, with production of those pressure consonants produced anterior to, or at the locus of the opening. In an effort to compensate for the anatomical inadequacy, with few exceptions, the children sacrificed "place" of articulation while preserving "manner" of articulation, and referred the anterior sounds to a position behind or posterior to the opening. Therefore, [+], an anterior unvoiced plosive, was typically substituted by [k], a posterior unvoiced plosive and [d], an anterior voiced plosive by [g], a posterior voiced plosive. When anterior sounds were referred to a posterior position but the resulting sound was characterized by errors symptomatic of velopharyngeal insufficiency, i.e., a weak [k] accompanied by nasal air emission, or a glottal stop, this suggested a posterior defect (a valving problem) as well as an anterior defect and these were called "combined defects". Sixty-one percent showed combined deficits of this type (Table 4). The size of the anterior palatal fistula did not bear any exact relationship to the presence or absence of an anterior air leak. Individual variability seemed important as has been reported for the posterior port in

TABLE 1. Distribution of Cases.

<i>Cleft Types</i>	<i>Number</i>
Unilateral Complete Lip and Palate	25
Bilateral Complete Lip and Palate	6
Complete Palate	1
Total Cases	32

TABLE 2. Soft Palate Operation.

<i>Operation performed</i>	<i>Average age at operation</i>
Soft palate alone	24 13 mos.
Soft palate-lip	8 6.4 mos.
Total	32 11.8 mos.

TABLE 3. Soft Palate Operative Technique.

Division Nasal Mucosa and Palatine Aponeurosis	13
Division Nasal Mucosa, Palatine Aponeurosis and Hamulus	19

velopharyngeal insufficiency (Carney 1971). For purposes of tabulation, speech was considered to be acceptable if it was slightly or mildly defective and as unacceptable if it was moderately to severely impaired as judged by the speech pathologist (O'Riain, 1972). Table 5 shows the spontaneous speech result. Only 34% achieved acceptable speech as so described. There was no relationship between the pathology and the speech result (Table 6). More unacceptable results were found in the group having combined surgery on the lip and soft palate than in the group where soft palate closure was done separately (Table 7). The division of the hamulus or the lack of it seemed unrelated to the result (Table 8).

Prostheses to obturate the hard palate opening were inserted in 12 patients, and two still have them in place. Use of these obturators was begun at an average age of 6.5 years. Actual use of the prostheses was questionable in two cases. These children were said to remove them surreptitiously. In at least one case, technical difficulty was encountered in the combined maintenance of the prosthetic and orthodontic appliances.

The hard palate was closed in 20 patients at an average age of 6.1 years. To avoid hard

TABLE 7. Operation and Spontaneous Speech Results.

<i>Operation</i>	<i>Speech</i>	<i>Number</i>	<i>Percentage</i>
Soft Palate Alone	Acceptable	9	38
	Unacceptable	15	62
Soft Palate and Lip	Acceptable	2	25
	Unacceptable	6	75

TABLE 8. Operative Technique and Spontaneous Speech Result.

<i>Technique</i>	<i>Speech</i>	<i>Number</i>	<i>Percentage</i>
Nasal Mucosa, Palatine	Acceptable	4	31
Aponeurosis	Unacceptable	9	69
Nasal Mucosa, Palatine	Acceptable	7	37
Aponeurosis, Hamulus	Unacceptable	12	63

palate trauma, a local turnover flap was used in 17 of these procedures (Figure 1). In 11, or 65%, the closure was complicated by a small fistula at the most posterior part of the closure, i.e., at the hard and soft palate junction. Only one of these openings permitted fluid to enter the nose.

Pharyngeal flaps have been performed in 37% of the cases up to this time (Table 9). Additional cases of velopharyngeal insufficiency remaining will probably require additional flaps. If all such patients receive pharyngeal flaps, the incidence in this series would rise to 66%. With hard palate closure, pharyngeal flaps, and speech therapy, present evaluation shows that 72% have acceptable speech (Table 10). Dental models were not available in enough patients for routine study. Both normal and collapsed alveolar arches were seen (Figure 2).

Discussion

Closure of the soft palate alone and delay of hard palate repair until after maxillary growth is complete is said to have been suggested by Schweckendiek in 1942 or 1944 (Herfert, 1963; Heiner, 1963). As initially presented, the soft palate was to be closed at seven or eight months, and the hard palate

TABLE 4. Spontaneous Speech Results.

<i>Type of Speech</i>	<i>Number</i>	<i>Percentage</i>
Anterior Defects	6	19
Posterior Defects	5	16
Combined Defects	20	61
No Defects	1	3

TABLE 5. Spontaneous Speech Result.

<i>Speech</i>	<i>Number</i>	<i>Percentage</i>
Acceptable	11	34
Unacceptable	21	66

TABLE 6. Pathology and Spontaneous Speech Result.

<i>Pathology</i>	<i>Speech</i>	<i>Number</i>	<i>Percentage</i>
Bilateral Cleft Lip and Palate	Acceptable	2	33
	Unacceptable	4	66
Unilateral Cleft Lip and Palate	Acceptable	9	36
	Unacceptable	16	64

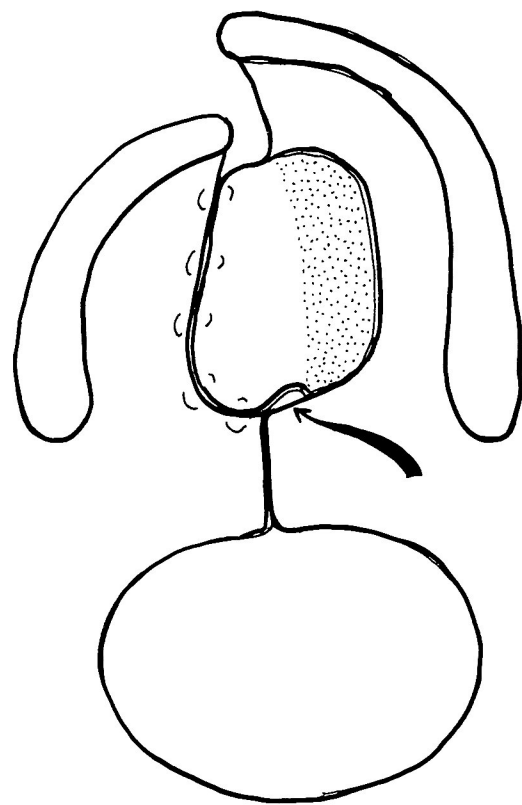


FIGURE 1. Turn-over palatal flap used to close remaining anterior hard palate opening. Arrow points to area where persistent fistula usually occurred.

TABLE 9. Pharyngeal Flaps.

Flap Alone*	Flap Combined with Hard Palate Closure	Total Flaps	Percentage
6	6	12	37

* 3 before and 3 after Hard Palate Closure

was to remain open until between 12 and 14 years (Schweckendiek, 1951, 1955, 1966). Other proponents of this approach have been willing to see the hard palate closed at five to six years in recognition of the nearly completed growth of the hard palate by that time (Herfert, 1958; Coccaro, 1962). Apparently independently, Slaughter and Pruzansky (1954) also suggested primary velar closure in multiple stages if needed in order to reestablish circumpalatal forces without interfering with palatal growth. This delayed approach to hard palate repair has had only occasional favorable references in the literature (Ding-

man, 1971; Blocksma, 1975). However, a number of recent reports seem likely to reawaken enthusiasm for primary velar closure (Schweckendiek, 1978; Coston, 1977; Jorgenson, 1977). It is in the light of this prospective interest that we present our cautionary report.

Advocates of two-stage palate repair have claimed that the early closure of the soft palate will permit good spontaneous speech development without additional intervention. This fundamental premise is not true in our experience. Only 34% of our patients had developed acceptable speech at age five prior to further procedures or intensive speech therapy. A similar paucity of good spontaneous speech results was found by Fára (1969). As compared to this, a variety of total palate

TABLE 10. Present Speech Result.

Speech	Number	Percentage
Acceptable*	23	72
Good	10	
Unacceptable**	9	28
Severe	3	

* 2 with prostheses

** 7 with open hard palate and 9 without pharyngeal flap

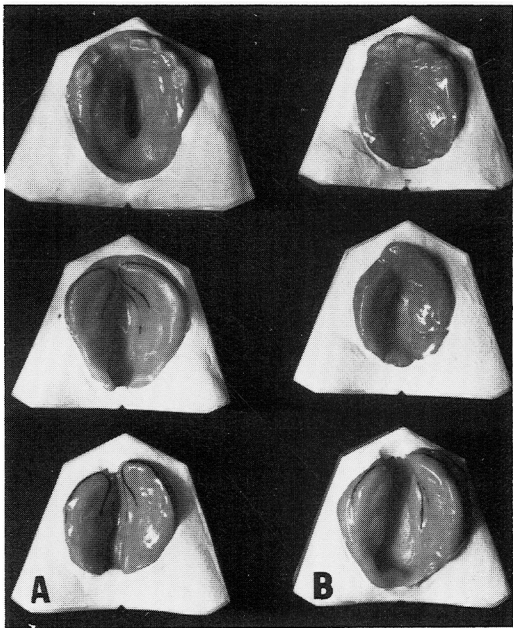


FIGURE 2. Excellent arch form in one case (A) compared to minor segment collapse in another case (B) although both had had soft palate closure and delayed hard palate repair.

repairs, including those of Veau, Von Langenbeck, the four-flap and Dorrance push-back, performed before the age of two have been reported as achieving acceptable speech in 70 to 80% of cases by the age of five (Jolleys, 1954; Lindsay, 1962; O'Riain, 1972; McEvitt, 1971). Advocates of the two-stage repair have tended to denigrate the importance to speech of the hard palate fistulas remaining after the velar repair. The residual palato-nasal fistula was not negligible, however, and was clearly significant in the failure of good speech development. In this, our experience confirms the reports of Lindsay (1962), Morley (1973), and Jackson (1976).

It might be argued that insertion of appliance, if carried out very early, might obviate this criticism of the technique. However, the good speech results of Schweckendiek (1955), Herfert (1958, 1963) and Heiner (1963) were supposedly achieved without such early obturation. Even if it is granted that early use of appliances with appropriate retaining devices (Coston, 1977; Jacobson, 1977) might fill the anterior palatal defect until it is ready for closure at age six, there is still the problem of the high incidence of velopharyngeal incompetence associated with this technique. In our experience, 37% of patients have had to have pharyngeal flaps, and the total will probably be closer to 66% by the time the series is completed. This rate of pharyngeal flap use is four to six times that reported by those doing primary total palate closures of several types (Gylling, 1964; Brozman, 1972). This unusually high degree of velopharyngeal incompetence and the consequent need for flaps is not unique to our experience with the Schweckendiek procedure. Fára (1969) reported that 68% of the 58 patients treated by this method required pharyngeal flaps. Blocksma (1975), using a primary velar closure technique of a slightly different form, reported that 50% needed subsequent pharyngeal flaps. The simplest and most apparent explanation of the frequency of velopharyngeal insufficiency is the observation that direct closure of the soft palate without hard palate undermining is a closure under tension in which, fixed to the edge of the hard palate, the soft palate is inevitably pulled forward and upward during attempts at closure. The necessity for this effect is apparent to the experienced surgeon (Figure 3).

Shortening of the soft palate in this way was noted in early criticism of the Schweckendiek method by Schröder (1966) and Rehrmann (1966). It was further substantiated by Fára (1969). In all but the narrowest clefts, the anterior few millimeters of the soft palate closure tends to separate and is the site of considerable scar tissue. This pull at the soft palate-hard palate junction is intrinsic to the technique.

Spontaneous hard palate closure is another advantage claimed for primary velar repair. Indeed, rapid decrease in the size of the palato-nasal fistula was routinely observed by us and was documented by Fára (1969). The degree to which this closure represents new tissue forming at the edge of the defect or inward movement of the palatal shelves has been argued (Andrá, 1965; McEvitt, 1969). On the other hand, functionally complete closure occurred in only three of our cases and one of these reopened during orthodontic treatment. The hard palate, therefore, usually does require closure. It may be said, however, that the narrowing of the cleft makes surgery easier. This is not actually the case. The embarrassingly high fistula rate of 65% using the turnover flap technique of Herfert (1963) demonstrates one of the problems of this form of closure. The weak point is in that region of scar that forms at the anterior edge of the velar closure (Figures 1 and 3). The residual hard palate fistula has nearly vertical walls and posteriorly is tethered to the soft palate closure. The very narrowness of the fistula diminishes the working space and makes a vomerine flap technically difficult even in those cases which have an appropriate vomer attachment. A modified Von Langenbeck approach is effective but requires a partial reopening and undermining in the area of the previous velar closure, thus adding to the scar tissue already present there.

Ultimately, despite the low rate of spontaneous development of acceptable speech, salvage methods including obturators, intensive speech therapy, and pharyngeal flaps added to hard palate closure, permitted the development of acceptable speech in a reasonable number of patients. The rationale for these extra efforts and the time and cost they represent lies in two additional premises of the delayed hard palate closure technique. First is the assumption that primary palate closure

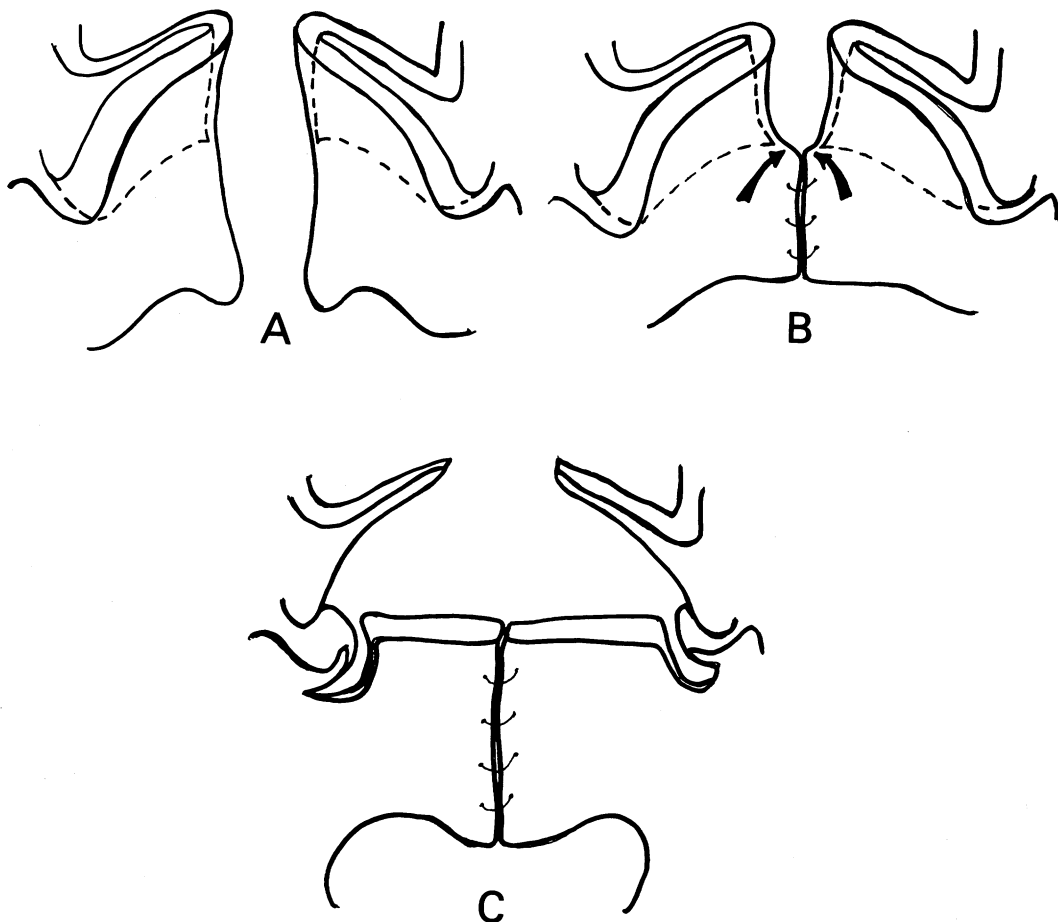


FIGURE 3. (A) Complete cleft palate in partial coronal section with dash line representing hard palate bony shelf. (B) Soft palate closure alone leads to greatest tension at anterior point of closure (arrows) and pulls soft palate anteriorly tending to shorten it. (C) Complete mucoperiosteal flap palate closure with releasing incisions converts vaulted arch to straight line across base leading to greater ease in closure and less tendency to pull soft palate anteriorly.

is necessarily associated with significant maxillary deformity, and second is the assurance that this deformity is truly avoided by the delayed hard palate closure. These assumptions are still in doubt. Careful study of cases of modern palate closure has failed to reveal a high incidence of maxillary deformity beyond that which orthodontics can effectively repair (Mazaheri et al., 1967). Other detailed comparisons of early and late hard palate closure series have failed to reveal a significant difference in cephalometric or dental deformities between the two groups (Robertson, 1974, 1977). The records taken in our patients were not sufficiently complete to add information on these points.

Summary

Early closure of the soft palate with delayed closure of the hard palate has been suggested as the way to reconcile the speech advantages of early palate closure with avoidance of the maxillary growth impairment said to be associated with early palate repair. Thirty-two cases treated in this way and followed for an average of 8.7 years are presented. A majority failed to achieve acceptable spontaneous speech by age five. The residual palate fistula narrowed rapidly, but in only three cases was spontaneous closure achieved. Closure of the residual palatal fistula at a later date was not technically simple. Defects in speech related

to the anterior palatal opening were not insignificant. A majority of the patients had velopharyngeal insufficiency requiring pharyngeal flaps. Those interested in adopting this technique should be aware of the speech deficiencies associated with it as well as of the technical surgical difficulties inherent in this method.

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References

- ANDRÁ, H., Morphologische veränderungen um bereich der gaumenspalte unter der einwirkung funktionellen kräfte, *Deutsch Zahn-Mund-Kiefer-Heilkunde*, 44, 15-22, 1965.
- BERNSTEIN, L., The effect of timing of cleft palate operations on subsequent growth of the maxilla, *Laryngoscope*, 78, 1510-1565, 1968.
- BLOCKSMA, R.; LEUZ, C. A.; and MELLERSTIG, K. E., A conservative program for managing cleft palates without the use of mucoperiosteal flaps, *Plast. Reconstr. Surg.*, 55, 160-169, 1975.
- BROZMAN, M.; SURINA, I.; DOLLEZOL, B.; and HAJDU, E., Suture of palate and secondary repair of pharyngeal flap, *Acta chir. Plast.*, 14, 218, 1972.
- CARNEY, P. J., and MORRIS, H. L., Structural correlates of nasality, *Cleft Palate J.*, 8, 307-321, 1971.
- COCCARO, P. J.; SUBTELNY, J. D.; and PRUZANSKY, S., Growth of soft palate in cleft palate children: a serial cephalometric study, *Plast. Reconstr. Surg.*, 30, 43-55, 1962.
- COSTON, G. N., Influences of early restoration of the palate on speech development, Presented, Third Int. Cong. on Cleft Palate and Related Craniofacial Anomalies, Toronto, Canada, 1977.
- DINGMAN, R. O., and GRABB, W. C., A rational program for surgical management of bilateral cleft lip and cleft palate, *Plast. Reconstr. Surg.*, 47, 239-242, 1971.
- EVANS, D., and RENFREW, C., The timing of primary cleft palate repair, *Scand. J. Plast. Reconstr. Surg.*, 8, 153-155, 1974.
- FÁRA, M., and BROUSILOVÁ, M., Experiences with early closure of velum and later closure of hard palate, *Plast. Reconstr. Surg.*, 44, 134-141, 1969.
- GRABER, T. M., Craniofacial morphology in cleft palate and cleft lip deformity, *Surg. Gynec. and Obst.*, 88, 359-369, 1949.
- GYLLING, U., and SOIVIO, A., Pharyngoplasties in the light of the follow-up of 106 operated patients, In Cong. Int. Plast. Surg. Trans. 3rd Congress; Haag: Mouton and Co., 229, 1964.
- HEINER, H., Erfahrungen mit der primären veloplastik, *Deut. Stomat.*, 13, 666-677, 1963.
- HERFERT, O., Fundamental investigations into problems related to cleft palate surgery, *Brit. J. Plast. Surg.*, 11, 97-105, 1958.
- HERFERT, O., Two-stage operation for cleft palate, *Brit. J. Plast. Surg.*, 16, 37-45, 1963.
- JACKSON, M. S.; JACKSON, I. T.; and CHRISTIE, F. B., Improvement in speech following closure of anterior palatal fistulas with bone grafts, *Brit. J. Plast. Surg.*, 29, 295-296, 1976.
- JOLLEYS, A., A review of the results of operations on cleft palates with reference to maxillary growth and speech function, *Brit. J. Plast. Surg.*, 7, 229-241, 1954.
- JORGENSEN, R. J.; SHAPIRO, S. D.; and SALINAS, C. F., Influence of delayed cleft surgery on palatal growth, Presented, Third Int. Cong. on Cleft Palate and Related Craniofacial Anomalies, Toronto, Canada, 1977.
- LINDSAY, W. K.; LEMESURIER, A. B.; and FARMER, A. W., A study of the speech results of a large series of cleft palate patients, *Plast. Reconstr. Surg.*, 29, 273-288, 1962.
- MAZAHERI, M.; HARDING, R. L.; and NANDA, S., The effect of surgery on maxillary growth and cleft width, *Plast. Reconstr. Surg.*, 40, 22-30, 1967.
- MC EVITT, W. G.; SPROULE, K. W.; HICKS, J. H.; and HAWTHORNE, E. P., Jr., Closure of anterior cleft palate by spontaneous tissue growth, *Plast. Reconstr. Surg.*, 44, 125-133, 1969.
- MORLEY, M. E., *Cleft Palate and Speech*, Seventh Ed., Edinburgh: Churchill Livingstone, 175-176, 1973.
- O'RIAIN, S., and HAMMOND, B. N., Speech results in cleft palate surgery: a survey of 249 patients, *Brit. J. Plast. Surg.*, 25, 380-387, 1972.
- REHRMANN, A., Operations of clefts of the hard and soft palate, in *Treatment of Patients with Clefts of Lips, Alveolus and Palate*. Second Hamburg Int. Symposium, 1964, Editor, K. Schuchardt, New York: Grune and Stratton, 76-79, 1966.
- ROBERTSON, N. R. E., and JOLLEYS, A., The timing of hard palate repair, *Scand. J. Plast. Reconstr. Surg.*, 8, 49-51, 1974.
- ROBERTSON, N. R. E., and JOLLEYS, A., The timing of hard palate repair, Presented, Third Int. Cong. on Cleft Palate and Related Craniofacial Anomalies, Toronto, Canada, 1977.
- SCHRÖDER, F., Operation der spalte in harten gaumen in ausschluß an velumplastik nach Schweckendiek, *Acta chir. plast.*, 8, 257-263, 1966.
- SCHWECKENDIEK, H., Zur Frage der früh-und spätoperationen der angeboren lippen-kiefer-gaumenspalten, *Z. Laryng.*, 30, 51-56, 1951.
- SCHWECKENDIEK, H., Zur zweiphasigen gaumenspaltenoperation bei primären velumerschlüssen, *Fortschr. Kiefer-u. Gesichts-Chir.*, 1, 73-76, 1955.
- SCHWECKENDIEK, W., Die technik der primären veloplastik und ihre ergebnisse, *Acta chir. plast.*, 8, 188-194, 1966.
- SCHWECKENDIEK, W., Primary veloplasty: Long-term results without maxillary deformity. A twenty-five year report, *Cleft Palate J.*, 15, 268-274, 1978.
- SLAUGHTER, W. B., and PRUZANSKY, S., The rationale for velar closure as a primary procedure in the repair of cleft palate defects, *Plast. Reconstr. Surg.*, 13, 341-357, 1954.