

Effects of preoperative speech therapy on the speech intelligibility of patients with velopharyngeal incompetence

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Background

Improved articulatory placement through speech therapy may eliminate compensatory errors, improve velopharyngeal function, minimize perception of hypernasality, and improve speech intelligibility.

Aim

The aim of this work was to study the effect of preoperative speech therapy on the speech intelligibility in patients with residual velopharyngeal insufficiency in order to provide a better speech outcome in such patients.

Patients and methods

This study included 41 patients diagnosed with residual velopharyngeal insufficiency after cleft palate repair. Patients were divided into two groups: group I included 22 patients scheduled to undergo speech therapy 6 months preoperatively, and group II included 19 patients who did not receive preoperative speech therapy. Both groups underwent speech therapy for 6 months postoperatively. Evaluation was carried out through auditory perceptual assessment (APA) including the type and degree of open nasality, consonant precision, compensatory articulatory mechanisms (glottal articulation and pharyngealization of fricatives), audible nasal emission of air, and overall intelligibility of speech. All these elements are graded along a five-point scale in which 0 is normal and 4 is severe affection. Documentation of APA is performed by high fidelity speech and voice audio recording and endoscopy. Formal speech intelligibility testing was carried out using the Arabic Speech Intelligibility test, which is designed to provide an estimation of the overall speech intelligibility of children by providing a total score in percentage. Nasometry was performed for all patients using a Kay nasometer, which provides the 'nasalance score'.

Results

On comparing the APA assessment of group I after 6 months of speech therapy postoperatively with the preoperative data, a highly significant decrease with regard to all parameters was revealed; however, in group II, the same comparison revealed a highly significant decrease as regards the degree of open nasality and nasal emission of air and a significant difference in terms of glottal articulation, pharyngealization of fricatives, and overall speech intelligibility. On comparing the two groups postoperatively, a significant difference in glottal articulation, pharyngealization of fricatives, and overall speech intelligibility, being more improved in group I, was revealed. Nasometry showed a significant difference between the postoperative results after speech therapy compared with the preoperative results, with a nonsignificant difference between the two groups postoperatively. In group I, the results of the Arabic Speech Intelligibility test showed a highly significant decrease in the number of patients with unintelligible speech and poor speech intelligibility, a significant decrease in number of patients with fair speech intelligibility, and a highly significant increase in the number of patients with good and excellent speech intelligibility. In group II, there was a significant decrease in the number of patients with unintelligible speech and poor speech intelligibility and a significant increase in the number of patients with fair, good, and excellent speech intelligibility.

Conclusion and recommendations

Speech therapy before surgery for residual velopharyngeal insufficiency can improve the results of postoperative therapy, with a better speech intelligibility outcome. Therefore, it is recommended to schedule a speech therapy program before secondary repair of the velopharyngeal valve in order to attain better speech intelligibility.

Keywords:

speech intelligibility, speech therapy, velopharyngeal insufficiency

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Introduction

Cleft lip and palate is the most common craniofacial malformation, with an incidence of 1.0–2.21/1000 [1]. It can result in morphological and functional disorders, whereby one has to differentiate primary from secondary disorders. Primary disorders include problems in feeding and breathing. Speech, language, and voice disorders [2] and conductive hearing loss, which might also affect speech development [3], belong to the category of secondary disorders.

The speech defects of velopharyngeal incompetence (VPI) according to Kotby [4] are excessive nasalization of vowels, audible nasal air escape, consonant imprecision, and faulty compensatory articulatory mechanisms, which are the most disturbing to speech intelligibility.

Speech intelligibility was defined by Kent [5] as the degree to which an acoustical signal is understood by a listener. It is usually expressed as a percentage of words, sentences, or phonemes correctly identified by a listener or a group of listeners when spoken by a talker or a number of talkers. Intelligibility is an important measure of the effectiveness or adequacy of a communication system or of the ability of people to communicate in a noisy environment [6].

Speech disorders can persist even after adequate reconstructive surgical therapy. The characteristics of speech disorders are mainly a combination of different articulatory features, for example, enhanced nasal air emissions, a shift in localization of articulation, and modified articulatory tension [2]. Voice disorders may persist as well, especially among boys [7]. Speech disorders affect not only the intelligibility but also the social competence and emotional development of an affected child [8,9]. One major aim of therapy is to enhance or normalize communication skills.

Van Lierde *et al.* [10] assumed that the more deviant the articulation, lower is the intelligibility. Kamel [11] concluded that the degree of speech intelligibility in cases of VPI depends on the summation of the perceptual subjective degrees of hypernasality, glottal articulation, pharyngeal articulation, and audible nasal air emission.

Whitehill [12] highlighted the importance of intelligibility as an indicator of outcome in speakers with cleft palate and identified the need for measures of intelligibility that carefully specify measurement conditions, control for relevant variables, and have acceptable reliability and validity.

Speech therapy cannot change hypernasality or nasal emission due to abnormal structure. When VPI is present, surgery (or a prosthetic device if surgery is not possible) is required for correction. Therapy is effective and appropriate if the individual demonstrates the following: compensatory articulation productions secondary to VPI and misarticulations that cause nasal air emission or hypernasality that is phoneme specific. Speech therapy is more successful with articulation than with nasality problems, although attempts are made, sometimes

successfully, to help patients overcome inconsistent or minimal nasality. In general, the goals of speech therapy are to develop good speech habits and to teach how to produce sounds correctly [13].

Aim of the work

The aim of this study was to study the effect of preoperative speech therapy on the speech intelligibility in patients with residual velopharyngeal insufficiency in order to provide a better speech outcome in such patients.

Patients and methods

This study included 41 patients diagnosed with residual velopharyngeal insufficiency after cleft palate repair. The patients were recruited from the Phoniatic Outpatient Clinic, Ain Shams University, between August 2010 and September 2012 and had to fulfill the following criteria: they (i) had to have undergone a primary repair of the palate (with or without a cleft lip or alveolus), (ii) had to be between 6 and 10 years of age, (iii) had to have average intelligence, and (iv) had to have age-matched linguistic abilities. The exclusion criteria included: (i) a velopharyngeal gap greater than a grade II in the anteroposterior dimensions, which necessitates a lengthening procedure, (ii) hearing impairment, (iii) mental retardation, and (iv) delayed language development.

The patients were divided into two groups: group I included 22 patients presenting to the Phoniatic Outpatient Clinic with a nasal tone of speech, misarticulation, and poor speech intelligibility. This group was scheduled to undergo speech therapy for 6 months (two sessions per week) and was then referred to the Plastic Surgery Department for sphincter pharyngoplasty. After surgery, these patients underwent speech therapy for another 6 months. In this group, a primary assessment was carried out during their first attendance, followed by a second assessment after 6 months of speech therapy and before sphincter pharyngoplasty; a third assessment was performed after 6 months of speech therapy postoperatively.

Group II included 19 patients referred to the Phoniatic Outpatient Clinic by the Plastic Surgery Department for preoperative assessment; they were already scheduled for sphincter pharyngoplasty. This group did not undergo preoperative speech therapy but underwent only a postoperative 6-month speech therapy program. Primary assessment was carried out preoperatively, followed by a second assessment after the 6 months of postoperative speech therapy.

Evaluation was carried out using the protocol of assessment followed at the Unit of Phoniatics, Ain Shams University [14], which includes.

Preliminary diagnostic procedures

Patient and parent interviews were conducted, and auditory perceptual assessment (APA) of the patient's

voice, speech, and language by listening to every patient in free conversation and a recorded speech sample was carried out. Passive and active aspects of language were investigated. Speech evaluation included assessment of the type and degree of open nasality, consonant precision, compensatory articulatory mechanisms (glottal articulation and pharyngealization of fricatives), audible nasal emission of air, and overall intelligibility of speech. All these elements are graded along a five-point scale in which 0 is normal and 4 is severe affection.

Clinical diagnostic aids

Documentation of APA by high fidelity speech and voice audio recording and endoscopy was carried out. All patients were examined using an Olympus enf type xp (Olympus Medical Systems Corp., Ishikawa, Tokyo, Japan) fiberoptic nasopharyngolaryngoscope. This technique provides an objective real-time documentation of the velopharyngeal closure pattern. Assessment was carried out while the patients were repeating the Arabic word 'eambar' and the vowels /a/, /i/, and /u/. The main parameters of analysis were movements of the velum and lateral and posterior pharyngeal walls, which were traced on the monitor, and the movement of each component was given a score from 0 to 4, in which 0 is the resting 'breathing' position or represents no movement, 2 is half the distance to the corresponding wall, and 4 is the maximum movement reaching and touching the opposite wall. Moreover, the pattern of closure of the velopharyngeal port, whether coronal, sagittal, or circular, was specified.

Formal testing included an Arabic Language Test [15] to determine the total language age, an articulation test [16] to specify articulation errors by testing Arabic phonemes in the initial, middle, and final positions of the word, and an Arabic Speech Intelligibility test [17]. The Arabic Speech Intelligibility test is meant to be a quasi-objective measure. The test is composed of 100 cards carrying 50 pictures (each picture is repeated twice). Pictures are structurally organized into three sets as follows:

- (1) Set A includes 20 pictures of monosyllabic words that start with bilabial, nasal, epicodental, and supra-alveolar consonants.
- (2) Set B includes 20 pictures of monosyllabic words that start with dorsopalatal, uvular, velar, and pharyngeal consonants.
- (3) Set C includes 10 pictures indicating simple action verb sentences.

The pictures of each set are shuffled carefully and presented one by one to the child who is asked to name what is in the picture. After this, the clinician will write down what he heard from the child in the clinician response form. The Arabic Speech Intelligibility test is designed to provide an estimation of the overall speech intelligibility of children by yielding a total score in terms of percentage. The categorical values of the Arabic Speech Intelligibility test are as follows: 0–29%, unintelligible speech; 30–50%, poor intelligibility; 51–66%,

fair intelligibility; 67–84%, good intelligibility; and 85–100%, excellent intelligibility.

Psychometric evaluation was performed using the Stanford–Binet Intelligence Scale [18].

Additional instrumental measures

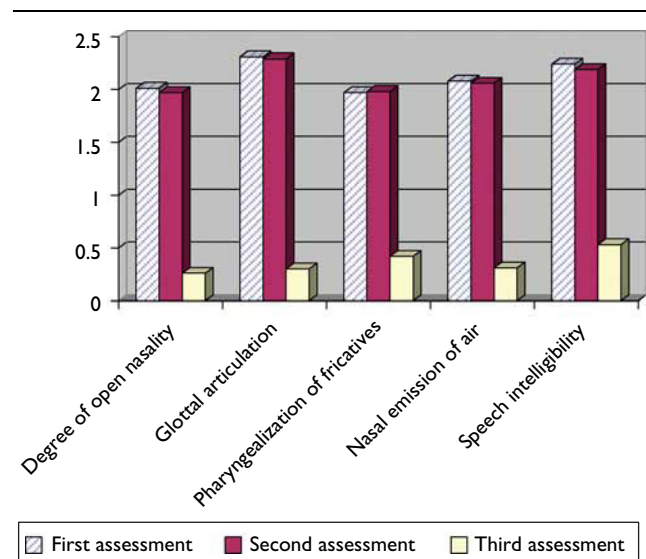
Nasometry was performed for all patients using a Kay nasometer model 6200-2, software version 1.5 (Kay Elemetrics Corp., Lincoln Park, New Jersey, USA). It provides the 'nasalance score', which is a numeric ratio that reflects the relative amount of nasal acoustic energy in the individual's speech. The patient is instructed to say, while wearing a special mask, a nasal sentence and an oral sentence; the nasal and oral signal energies are then obtained for each.

Data were analyzed statistically using the SPSS program (version 17; SPSS Inc., Chicago, Illinois, USA). Quantitative data were presented in terms of mean and SD. A paired Student *t*-test was used to assess the statistical significance of the difference between the two means of one quantitative variable measured twice for the same study group. Student's *t*-test and the Mann–Whitney test were used for quantitative variables. The significance of the results was evaluated in the light of probability (*P*), wherein a *P*-value greater than 0.05 refers to an insignificant difference and that below 0.05 refers to a significant difference. The correlation between nonparametric variables was assessed using the Spearman rank correlation coefficient.

Results

Results of APA in group I (Fig. 1) revealed that there was a nonsignificant difference as regards all parameters (degree of open nasality, glottal articulation, pharyngealization of fricatives, nasal emission of air, and overall

Figure 1



APA results in the three assessments for group I. APA, auditory perceptual assessment.

speech intelligibility) on comparing the first assessment with the second (after receiving speech therapy), whereas in the third assessment (after receiving postoperative speech therapy), there was a highly significant decrease in all parameters.

The results of APA in group II (Fig. 2) revealed that there was a highly significant decrease in the degree of open nasality and nasal emission of air, whereas there was a significant decrease in glottal articulation, pharyngealization of fricatives, and the overall speech intelligibility.

On comparing the preoperative APA results of the two groups (group I before receiving speech therapy and group II preoperatively), a nonsignificant difference as regards all parameters was revealed (Table 1). However, on comparing postoperative APA results of the two groups (after receiving speech therapy), a nonsignificant difference as regards the degree of open nasality and nasal emission of air and a significant difference as regards glottal articulation, pharyngealization of fricatives, and

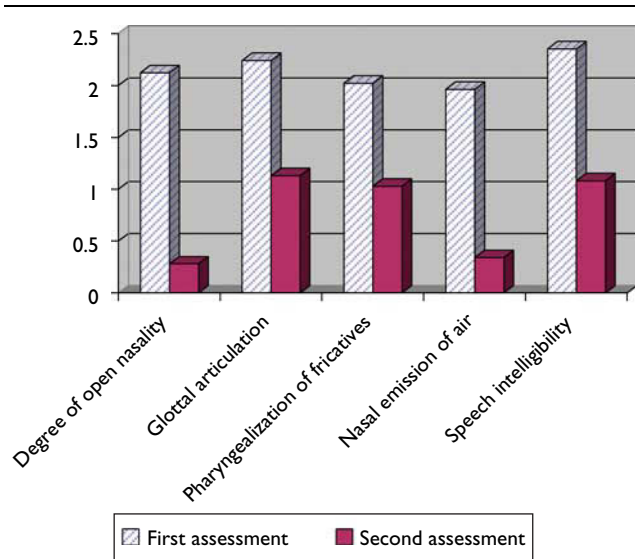
overall speech intelligibility was revealed, with more improvement in group I (Table 2).

The results of nasometry in group I (Fig. 3) revealed a nonsignificant difference between the first and second assessments; however, there was a significant decrease in the nasalance score in both oral and nasal sentences in the third assessment. In group II, the results of nasometry showed a significant decrease in the nasalance score in both oral and nasal sentences when compared with the first and second assessments (Fig. 4).

On comparing the two groups in terms of the nasalance score, a nonsignificant difference in both oral and nasal sentences both preoperatively (Table 3) and postoperatively (Table 4) was revealed.

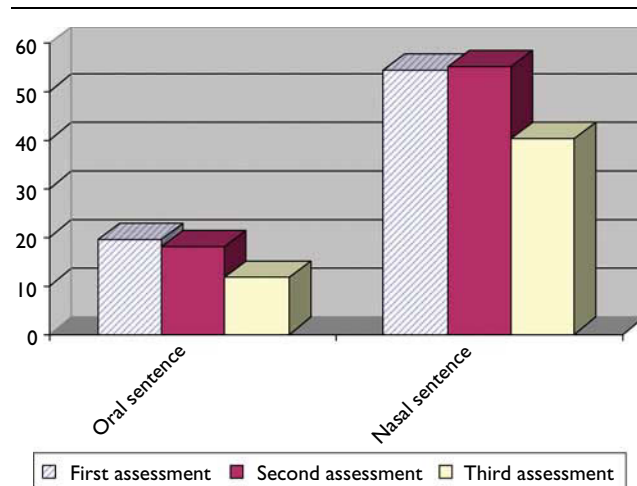
On correlating the overall speech intelligibility and other APA parameters in group I postoperatively, a significant negative correlation with the degree of open nasality and nasal emission of air and a highly significant negative correlation with glottal articulation and pharyngealization of fricatives were observed (Table 5). Moreover, there was a significant negative correlation with the nasalance

Figure 2



APA results in the two assessments for group II. APA, auditory perceptual assessment.

Figure 3



Nasometry results for the three assessments in group I.

Table 1 Comparison between the two study groups as regards APA preoperatively

	Degree of open nasality	Glottal articulation	Pharyngealization of fricatives	Nasal emission of air	Speech intelligibility
Group I (n=22)	2.01 ± 0.23	2.31 ± 0.64	1.97 ± 0.42	2.08 ± 0.69	2.24 ± 0.37
Group II (n=19)	2.12 ± 0.14	2.24 ± 0.78	2.02 ± 0.55	1.96 ± 1.1	2.35 ± 0.34
P-value	0.058 (NS)	0.062 (NS)	0.56 (NS)	0.061 (NS)	0.063 (NS)

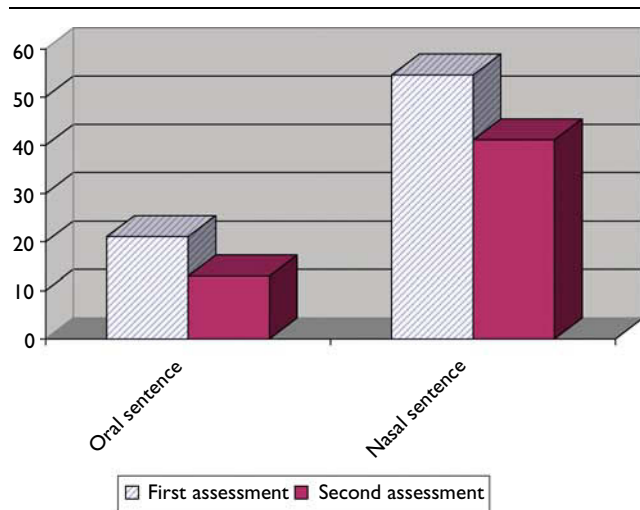
APA, auditory perceptual assessment.

Table 2 Comparison between the two study groups as regards APA postoperatively (after 6 months of speech therapy)

	Degree of open nasality	Glottal articulation	Pharyngealization of fricatives	Nasal emission of air	Speech intelligibility
Group I (n=22)	0.26 ± 0.53	0.3 ± 0.47	0.42 ± 0.6	0.31 ± 0.52	0.58 ± 0.1
Group II (n=19)	0.28 ± 0.51	1.13 ± 0.67	1.03 ± 0.07	0.34 ± 0.62	1.08 ± 1.41
P-value	0.053 (NS)	0.029 (S)	0.036 (S)	0.59 (NS)	0.042 (S)

APA, auditory perceptual assessment; S, significant.

Figure 4



Nasometry results for the two assessments in group II.

Table 3 Comparison between the two study groups as regards nasometry preoperatively

	Oral sentence	Nasal sentence
Group I (n=22)	19.32 ± 2.07	54.21 ± 3.91
Group II (n=19)	21.07 ± 3.45	54.62 ± 2.77
P-value	0.054 (NS)	0.06 (NS)

Table 4 Comparison between the two study groups as regards nasometry postoperatively (after 6 months of speech therapy)

	Oral sentence	Nasal sentence
Group I (n=22)	11.5 ± 3.01	40.08 ± 7.04
Group II (n=19)	12.92 ± 1.26	41.16 ± 6.03
P-value	0.064 (NS)	0.051 (NS)

APA, auditory perceptual assessment.

scores (Table 6). The same correlations were made in group II and revealed a significant negative correlation between the overall speech intelligibility and all the assessed parameters (Tables 7 and 8).

In group I, the results of the Arabic Speech Intelligibility test revealed a nonsignificant difference between the first and second assessments; however, in the third assessment, there was a highly significant decrease in the number of patients with unintelligible speech and poor speech intelligibility, a significant decrease in the number of patients with fair speech intelligibility, and a highly significant increase in the number of patients with good and excellent speech intelligibility (Fig. 5).

In group II, the results of the Arabic Speech Intelligibility test revealed a significant decrease in the number of patients with unintelligible speech and those with poor speech intelligibility, a significant increase in the number of patients with fair and good speech intelligibility, and a nonsignificant increase in the number of patients with excellent speech intelligibility (Fig. 6).

Table 5 Correlation between the overall speech intelligibility and other APA parameters postoperatively in group I

Parameter	Correlation coefficient
Degree of open nasality	-0.587*
Glottal articulation	-0.813***
Pharyngealization of fricatives	-0.865***
Nasal emission of air	-0.610*

APA, auditory perceptual assessment.

* $P < 0.05$ = significant.

*** $P < 0.001$ = highly significant.

Table 6 Correlation between the overall speech intelligibility and nasometry postoperatively in group I

Parameter	Correlation coefficient
Nasalance score	-0.578*

APA, auditory perceptual assessment.

* $P < 0.05$ = significant.

Table 7 Correlation between the overall speech intelligibility and other APA parameters postoperatively in group II

Parameter	Correlation coefficient
Degree of open nasality	-0.569*
Glottal articulation	-0.620*
Pharyngealization of fricatives	-0.652*
Nasal emission of air	-0.584*

APA, auditory perceptual assessment.

* $P < 0.05$ = significant.

Table 8 Correlation between the overall speech intelligibility and nasometry postoperatively in group II

Parameter	Correlation coefficient
Nasalance score	-0.535*

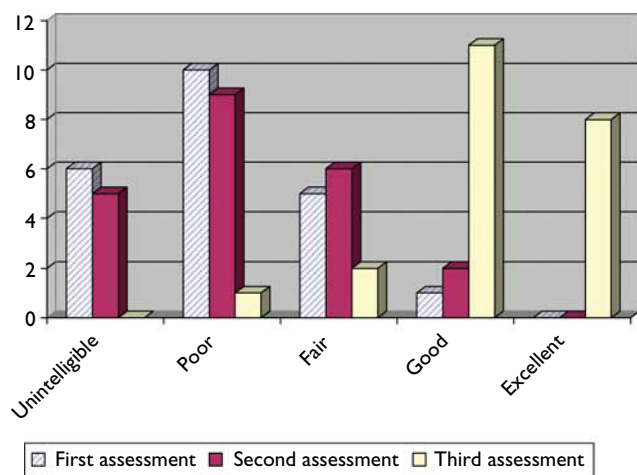
* $P < 0.05$ = significant.

Comparison between the two study groups with regard to the preoperative results of the Arabic Speech Intelligibility test revealed a nonsignificant difference in all categorical values of the test. However, on comparing the two groups postoperatively, there was a significant difference in the number of patients belonging to the categories of unintelligible speech and poor and fair speech intelligibility, and there was a highly significant difference in the number of patients belonging to the good and excellent categories (Tables 9 and 10).

Discussion

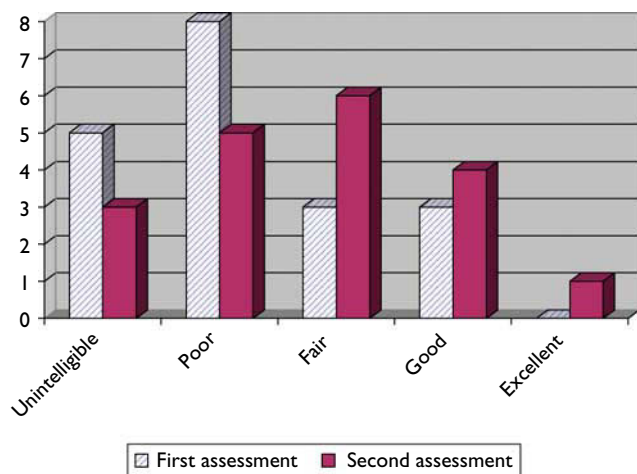
When velopharyngeal dysfunction is present, effects may be seen on one's resonance and/or articulation. For example, an individual with velopharyngeal dysfunction may show one or several of the following symptoms: resonance disorders, audible nasal air emission, weak pressure consonants, and compensatory articulation errors (glottal stops, pharyngeal stops, fricatives, and voice disorders). Just as one would not expect each child to be

Figure 5



Results of the Arabic Speech Intelligibility test for group I.

Figure 6



Results of the Arabic Speech Intelligibility test for group II.

the same, one should not expect the constellation of symptoms to be the same [19].

Often, after initial palate surgery (and sometimes after secondary palatal surgery), children will sound ‘nasal’ and/or audible puffs of air will escape from their noses while talking. Even if the child does not have articulation errors, the degree of hypernasality and/or nasal emission may cause speech to become difficult to understand and/or may lead to social problems [20].

When surgical management is indicated for restoration of velopharyngeal function, construction of a pharyngeal flap and sphincter pharyngoplasty are among the most commonly used surgical procedures. Several studies have advocated sphincter pharyngoplasty, citing its advantages such as (i) technical ease of execution, (ii) superior speech results, (iii) low complication rate, (iv) reduced anesthesia duration, and (v) nonobstruction of the nasal airway [21,22].

The impact of deviate articulation and/or excessive nasalization on communication may be best expressed through intelligibility assessment. For this reason, such assessments should be made part of clinical evaluation. It has been reported that there is a high correlation of speech intelligibility with the phonological features computed for the target phonemes [23].

Intelligibility, or how understandable one’s speech is to others, is recognized as a primary functional indicator of oral communication competence [24] and is used as an index of overall speech adequacy by researchers and clinicians. The number, type, and consistency of speech sound errors and phonological patterns are factors that may negatively affect speech intelligibility [25].

Intelligible speech is the primary goal of intervention in many children with speech disorders, one of which is open nasality. Measures of intelligibility provide a practical reference for expressing the communicative significance of how impairments in the structure and function of the speech mechanism affect one’s ability to make spoken messages understandable to listeners [26]. Children with

Table 9 Comparison between the two study groups as regards the results of the Arabic Speech Intelligibility test preoperatively

	N (%)				
	Unintelligible speech	Poor	Fair	Good	Excellent
Group I (n=22)	5 (23)	9 (41)	6 (27)	2 (9)	0 (0)
Group II (n=19)	5 (26)	8 (42)	4 (21)	2 (11)	0 (0)
P-value	0.053 (NS)	0.051 (NS)	0.059 (NS)	0.052 (NS)	-

Table 10 Comparison between the two study groups as regards the results of the Arabic Speech Intelligibility test postoperatively

	N (%)				
	Unintelligible speech	Poor	Fair	Good	Excellent
Group I (n=22)	0 (0)	1 (5)	2 (9)	11 (50)	8 (36)
Group II (n=19)	3 (16)	5 (26)	6 (32)	4 (21)	1 (5)
P-value	0.042 (S)	0.039 (S)	0.037 (S)	0.006 (HS)	0.006 (HS)

HS, highly significant; S, significant.

a cleft palate face a unique physical challenge to the acquisition of spoken language [27]; even after surgical repair of the palate, a number of factors can affect speech production, including VPI, fistulae, hearing impairment, and dental occlusal abnormalities. Articulation errors, hypernasal and/or hyponasal resonances, and nasal emissions all contribute to reduced intelligibility, with misarticulations considered to have the greatest effect [28]. Direct measures of the cumulative impact that error patterns and mechanism impairments have on the speech intelligibility of children with a cleft palate can be used to determine whether therapy is warranted; to measure functional outcomes of different types of cleft lips and palates and types and timings of surgical procedures, speech therapy, and orthodontic treatment; and to examine the relationship between intelligibility and other speech-language variables [29].

Speech therapy cannot change hypernasality or nasal emission due to abnormal structure even if there is only a small gap. When VPI is present, surgery (or a prosthetic device if surgery is not possible) is required for correction. This is manifested in the results of our study, which showed a significant difference between the preoperative and postoperative results of the perceived nasality, as judged by the APA and augmented by the results of nasometry in both groups. In addition, there was a nonsignificant difference in the results of the degree of nasality and nasalance scores between the two groups. Therapy is effective and appropriate if the individual demonstrates the following: compensatory articulation productions secondary to VPI that cause nasal emission, misarticulations that cause nasal air emission or hypernasality that is phoneme specific, and hypernasality or nasal emission after surgical correction. This is because changing the structure does not change the function. The child may need to learn to use the corrected velopharyngeal valve through auditory feedback [13].

Speech therapy cannot change an abnormal velopharyngeal structure; however, it may improve articulatory placement and oral pressure/airflow, reduce nasal emissions, and increase oral resonance. Therefore, speech therapy is effective in those who have already had successful surgical intervention and need to improve the function of revised structures and/or in those who have residual velopharyngeal dysfunction resulting from a very small velopharyngeal gap, causing a degree of open nasality and faulty articulation [30,31]. Teaching the patient the proper articulatory placement preoperatively will therefore yield better results after correction of the anatomical defect surgically because he/she will have the structural competency that will facilitate the learned functional abilities.

With regard to early intervention in infants and toddlers, the goals focus on increasing the variety of oral pressure consonants in the child's repertoire, eliminating the pervasive use of glottal stop substitutions and/or improving the phonological shape and phonetic composition of words [32].

Therefore, the aim of speech therapy is to improve articulatory placement and oral pressure/airflow, reduce nasal emissions, and increase oral resonance. Improved

articulatory placement may eliminate compensatory errors, improve velopharyngeal function, and minimize the perception of hypernasality [33].

If a child with a cleft palate develops compensatory errors before palate repair, it is likely that these errors will continue after surgery. If palatal surgery is successful, speech therapy can help correct these retained errors. Often, to get a head start on compensatory errors, it is recommended that speech therapy begin before surgery, especially for older children who are undergoing secondary surgery to correct persistent velopharyngeal inadequacy. In these cases, it is important for both the parents and the therapist to recognize that the goal of speech therapy is to correct a faulty placement of articulation and not to correct obligatory symptoms such as hypernasality [19].

Maegawa *et al.* [34] carried out a retrospective study on 40 patients with repaired cleft palates to identify factors affecting speech intelligibility. Intelligibility was rated using a four-point scale. The authors reported that the amelioration of articulation distortion correlated strongly with intelligibility.

One of the most challenging goals of speech therapy in cases of VPI is to attain intelligible speech, and hence the most important factors affecting speech intelligibility in such patients is the articulatory errors, especially the compensatory articulatory mechanisms, such as glottal articulation and pharyngealization of fricatives [35]. Therefore, it is logical that therapy for these compensatory mechanisms can improve the speech intelligibility outcome. This was observed in our results: group I, which underwent speech therapy before surgery, showed a better speech intelligibility outcome, as shown by the results of the Arabic Speech Intelligibility test and manifested as the highly significant decrease in the number of patients with unintelligible speech and poor speech intelligibility, in addition to the highly significant increase in the number of patients with good and excellent speech intelligibility.

Ysunza-Rivera [36] studied 31 patients with surgically repaired cleft palates who had velopharyngeal deficiency and compensatory articulatory defects. All patients were subjected to videonasopharyngoscopic and videofluoroscopic studies of multiple incidences before and after speech therapy in order to correct the compensatory articulation. The movement proportions of the pharyngeal velum structures increased significantly after correction of the compensatory articulation. Further, the size of the pharyngeal velum defect decreased significantly. The results of their study support the hypothesis that articulatory abnormalities associated with hypernasality should be corrected before surgery for pharyngeal velum insufficiency secondary to closure of the cleft palate.

Conclusion and recommendations

Speech therapy before surgery for residual velopharyngeal insufficiency can improve the results of postoperative therapy, with better speech intelligibility outcome.

Therefore, it is recommended to schedule a speech therapy program before secondary repair of the velopharyngeal valve in order to attain better speech intelligibility.

Acknowledgements

Conflicts of interest

There are no conflicts of interest.

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