

Research Article

The Speech Score: A New Concept in the Evaluation of the Functional Result in the Cleft Patient; A Multicentric Study.

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Abstract

Objective: Normal speech is an important parameter in an optimal palate repair. The Alvarez Speech Score was developed to evaluate post-repair and post-speech therapy phonation quality.

Methodology: Patients older than four years who came for consultation, regardless of their underlying pathology, severity of palatal malformation, sex, and previous surgical repair techniques were included in the study. Speech was assessed in the immediate pre-operative period and then one month postoperatively. The Score was used in 3 countries, by twenty-seven specialists who were trained in the score application. Audio recordings of the corresponding words in each level of Speech articulation were submitted for analysis. Speech was measured at the nasolabial, dental-palatine and velopharyngeal level. 5 tests were applied, with a score of 1 - 3 allotted to each test, giving a maximum total of 15. At the end of the practice the results that each specialist obtained were compared in a collective way.

Results: 27 patients were included in the study. Comparable and satisfactory scores were obtained between the specialists who scored the speech samples. Table 1, 2, 3 and 4 depict the breakup of the results obtained.

Conclusion: The Alvarez Score proved to be an easy and reproducible application instrument. It provides a useful measure of parameters for the evaluation of surgical results, and gauges the competency level and technical skills of the Cleft Surgeons. It can also serve as a quality control tool.

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Effort Test (ET)

Introduction

During the last 50 years the interest in search of new and innovative reconstructive techniques for Lip and/or Palate surgery has motivated the Cleft Surgeons to look for the "ideal surgery" that allows to obtain the closest result to normal in the visual aspect of both the lip and the palate. Techniques for lip repair evolved from Le Mesurier, Tenison-Randall, Millard and lately the Fisher technique which has excellent results, but requires a long learning curve.¹⁻⁴ In the same way palate repair has evolved with wide dissection

techniques, such as Veau-Wardill, Bardach, Von Lagenbeck and Furlow's. Currently more conservative techniques with minimal incisions are also in use. They have a long learning curve, but with encouraging results. Mixed techniques have taught us to temper surgical procedures by dissecting what is strictly necessary to achieve repair of the defect with minimal scars, we have described these as the Surgical Philosophy of the Palate, or cut as you go.⁵⁻⁷

Despite the efforts that allowed us to repair the congenital defect, we were "disappointed" when the patient did not speak well or had difficulty articulating some

words. Unfortunately their diagnosis, preoperative evaluation and postoperative improvement became elements of subjective analysis, because we did not have adequate methods to measure the quality of speech.

Without doubt diagnostic resources such as Fibronasoscopy, Pressure-flow Nasometry, voice onset time (VOT), and Nuclear Magnetic Resonance allow us to have an approximate idea of the residual defect that can lead to a speech quality problem, but many of these "residual defects" can be compensated with an adequate speech therapy established at an early age.⁸ Therefore, it becomes difficult to measure the effectiveness of the surgery, and to determine when the phonemic compensation began.

It is important to mention the "Pittsburg Scale" as an interesting instrument to measure the quality of pre and post operative speech in relation to Velopharyngeal insufficiency and Incompetence correction and repair, but this scale is incomplete.⁹

Therefore, we provide a new method to measure the known speech problems and new disorders that we are describing, that could be detected at several levels of speech articulation, among them the 1st Level or NASOLABIAL, the 2nd Level or DENTAL PALATINE and the 3rd Level or VELOPHARYNGEAL.

Methodology

With the respective knowledge and approval of the medical directors, the "Speech Score" was routinely applied in all cleft patients older than four years who came for consultation, regardless of their underlying pathology, severity of palatal malformation, sex, and previous surgical repair techniques. 27 cleft surgeons in 4 countries were invited one by one to listen to the same recording, and were asked to grade their results in the form. At the end of the exercise, the results were compared with the rest of their colleagues. 5 variables of speech were assessed on a scale of 1-3 each, to give a maximum allotted score of 15.

Surgeons in charge of the evaluation were trained individually and collectively prior to the score application. Sentences were designed to expose all sound varieties at the nasolabial, provoked nasolabial, dental palatine, velopharyngeal levels and effort test.

For nasolabial sufficiency or speech testing, the phonation of phonemes as "pa-pa" was graded 1 or mild for total escape of air with illegibility of the word, 2 or

moderate when there was hyper-nasal speech with a whistle deformity contributing to the labial leakage, and 3 if there was optimal emission of the word.

Provoked nasolabial phonation assessment is similar to the nasolabial but focuses more on the pressure build up and release of the consonant "p" and was assessed using the same scheme.

In dental palatine speech evaluation, phonemes as "sa-se-si-so-su", were graded with 1 or severe for total escape of air with illegibility of the word, 2 or moderate when hyper-nasal speech existed or air escaped through the mouth, 3 for optimal emission of the word.

For velopharyngeal speech grading, phonemes as "ca-co-cu" were graded with 1 or severe for total escape of air with illegibility of the word, 2 or moderate when hyper-nasal speech existed and finally the optimal emission of the word was graded three.

The effort test consists of inflating a balloon to check for velopharyngeal seal competency. A grade of 1 or severe for the absolute inability to inflate the balloon, a grade of 2 or moderate when there was a partial ability to inflate the balloon, finally the optimal insufflation of the balloon was graded 3.

With previous consent of the children's parents an audio and video of all the patients was taken. After that, all the surgeons evaluated the same patient's speech recording, and their final score was compared.

In this way, the above mentioned "speech score" was applied once in immediate pre-operative period and again a month after the procedure. Both results were added to the patient's records

Results

Comparable results were achieved by the specialists for all speech parameters both pre-operatively and post operatively.

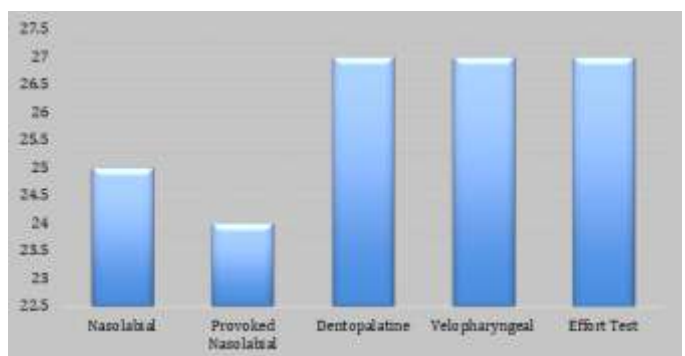


Figure 1: Pre-operative statistical analysis. Professional constant results

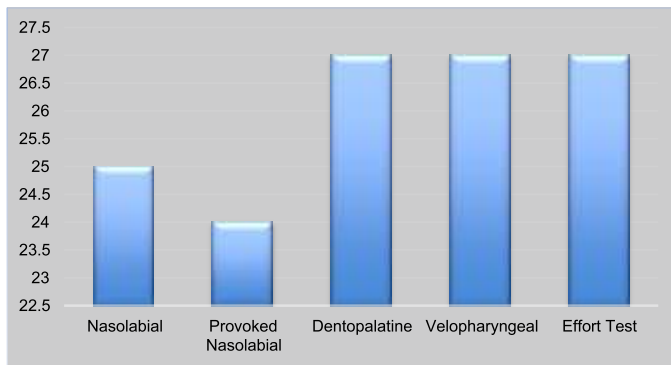


Figure 2: Postoperative statistical analysis. Professional Constant results

Discussion

Normal speech is one of the key aims in a cleft palate repair. This study held across 4 countries found consistently good results of repair at various levels. It can be inferred therefore that cleft palate repair has positive results on speech.

Normal speech is produced by an interplay of structures at various levels. At the nasolabial level, between the vestibular floor and the lips, the sounds that are modulated are the vowels a, e, i, o, u, and the consonants b, f, m, and v. With the intention to evaluate the clarity of the sounds at this level, we ask the patient to say words like "ma-ma". For the emission of this phoneme, we only need a modulation of the air flow in its path by an anatomic structure that could be contractile or not. Provoked nasolabial speech testing relies on the same level of articulation as the nasolabial, but it integrates the "p" consonant which needs different characteristics to the aforementioned. This "p" explosive sound needs an increase of intra-oral air pressure, the orbicularis oris sphincter has to be able to contain the air while the pressure inside the mouth is ascending. Hence the need for a good lip muscle capacity becomes evident, as this phoneme evaluates the "Naso Labial Competence". As we will see further on, it also evaluates the palatal integrity and the velopharyngeal sufficiency, when the soft palate ascends while intra-oral air pressure raises.

For the dento-palatine level of speech articulation, the dental integrity as well as the hard palate play an important role. The partial or total lack of them will generate abnormal sounds, in the same way a hard palate fistula will make the air escape into the nose generating hypernasal speech due to "Dental Palatine Incompetence". The Maxillo- mandibular discrepancy secondary to maxillary growth disorders known as class three dento-

facial anomaly or pseudoprognathism, prevents adequate dental or palatal sounds modulation secondary to "Dentopalatine insufficiency". This is by far the most frequent speech disorder encountered, and it is illustrated by the negative effect on maxillary development caused by the aggressive and widely dissected scarring of Cheiloplasty and Palatoplasty, in a much more noticeable way when Maxillary orthopedy was absent. The modulated sounds are the letters: c, d, h, l, n, r, s, t, z.

At the velopharyngeal level, sound modulation has likely been the most widely studied and evaluated, since most surgical efforts and postoperative diagnostic evaluation such as Naso-endoscopy, Pittsburg Scale, etc., have been focused on it. It is the one that strictly evaluates the soft palate's adequate length and the muscular competence of soft palate tensor, Palate Elevator and Uranus-estafilino muscles, as demonstrated in the third generation Veloplasty technique.¹⁰ The sounds modulated here, such as the letters g, j, k, q, w, x, y, have been the most important sounds for the Cleft Surgeons because they indicate the effectiveness of the repair of the soft palate muscle tissue.

The effort test is a simple test that consists of inflating a balloon. It tests the integrity of all levels so far described working on all of them in full coordination, so we will need; an adequate labial length; a competent orbicularis oris muscle to grasp the balloon between the lips; an adequate palatal integrity to contain air while increasing intra-oral pressure; and an adequate palatal length to completely occlude the oral cavity roof and finally get the balloon inflated. It is logical to assume that a very short or insufficient palate will not occlude the roof of the mouth and therefore will not achieve the objective of inflating the balloon making evident the diagnosis of velopharyngeal Insufficiency. On the other hand, Velo-pharyngeal Incompetence has enough veil length that allows the possibility of inflating the balloon.

With this score we finally have an integral assessment instrument of speech at different modulation levels, which has important value in pre-operative diagnosis of the cleft patient, and we also have a useful scale of measurement for postoperative improvement and language therapy evaluation applied to every patient. With this simple quick method, we can put a quantitative numerical score to something that was always qualitative, and had a very subjective appreciation.

The highest optimal value in this system is graded as 15/15 and the minimum possible score is 5/15. The minimum acceptable value that a patient should ideally reach is 13/15 considering the scarring process due to multiple surgeries to which the patient has been exposed.

Conclusions

"The Alvarez Speech Score" allows us to measure the speech quality of a cleft patient, and at the same time provides us with information about the effectiveness of surgery and speech therapy.

This tool would also allow us to evaluate the technical quality of a surgeon, and a service in general. With this evaluation we would talk about the academic preparation that makes up a Plastic Surgery Service and most importantly seek to reinforce this knowledge for the patient benefit.

This score can be easily reproduced at all levels without the application of complex technologies.

Once the score is tested by others, it could be an instrument that allows measuring and comparing the effectiveness of one technique with another.

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