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PHYSIOLOGICAL TREATMENT OF CLEFT PALATE.

BY

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AN IMPROVED APPLIANCE IN THE PHYSIOLOGICAL TREATMENT OF CLEFT PALATE.[1]

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IT has usually been said that lesions of the palate arise from one of two causes, that is, they are either congenital or accidental.

Congenital cleft of the palate was as commonly treated surgically as by mechanism. The former treatment has been nearly or quite abandoned in recent years for two very good reasons: First, it is a very painful one for the patient, and difficult for the operator, and a failure of closure is largely in the majority. Second, it universally fails to improve the speech even after a successful closure.

Notwithstanding the above facts, some physicians recommend staphyloraphy. They must certainly do so from want of knowledge of the anatomy and physiology of the vocal organs and their use in the mechanism of speech, which is the production of sound, and its direction through the nasal passage or the mouth at will, being controlled by certain organs whose modification and resonance enable us to form what we term articulate speech.

One of the most important aids in producing the above results is the soft palate. This organ is lifted up and comes in close contact with the pharyngeal wall, thus shutting off the nasal passage, which is absolutely essential in producing all excepting nasal sounds. After the operation of staphyloraphy such a

[1] Read by invitation before the Section for Clinical Medicine, Pathology, and Hygiene of the Suffolk District Medical Society December 12, 1883.

closure is impossible, owing to the soft palate having been made too short and tense; hence defective speech invariably follows.

Accidental lesions of the palate, as the name suggests, are caused either by accident or disease. These cases may be successfully treated with a very simple appliance, while the same amount of skill exercised on a congenital cleft would have no beneficial result. This may be accounted for by the fact that in the former case the patient had learned to articulate distinctly, and use the organs of speech efficiently and correctly, while persons who are thus deformed from birth are obliged to learn the art and methods of articulation by slow and painful processes. The organs require the training which is necessary for one who acquires a new language. Hence the appliance for relief should not only fill up the gap in the defective palate, but should also be so constructed as to work on physiological principles in harmony with the natural movements; that is to say, it should be under perfect control of the surrounding muscles. It is manifest, therefore, that the success even of the most scientifically adjusted instrument depends largely upon the coöperation of the patient who uses it.

As the above malformations are classed as congenital, and accidental, the appliances for their relief are classed as follows: obturators and artificial vela. Among the former Dr. William Suersen is the inventor of one which has created much interest. The most important and significant advance in this department of science, however, made itself manifest in attempts to form an artificial velum, and Dr. Stearns was probably the first to introduce its true principle. I speak of these two investigators, Suersen and Stearns, because I am led to think that they have brought before the profession the most scientific apparatus of each class, and it is from a consideration of both of their appliances that I have evolved the principle, in explanation of which this paper has been prepared.

Suersen says: "In order to be able to pronounce all letters distinctly it is accordingly necessary to separate the cavity of the mouth from the cavity of the nose by means of muscular motion. That separation is, under normal conditions, effected, on the one hand, by the velum palati, which strains itself (consequently by the levator and tensor palati), but, on the other hand, also by a muscle, which to my knowledge has not yet received a sufficient amount of attention in connection with these operations. I mean the constrictor pharyngeus superior. This muscle contracts itself during the utterance of every letter pronounced without a nasal sound just as the levator palati does. The constrictor muscle contracts the cavum pharyngo-palatum, the pharyngeal wall bulging out, and it is chiefly on the action of this muscle that I base the system of my artificial palates."

It will be noticed that Suersen admits that the levator palati is an important organ of speech, yet he makes no provision for utilizing it as such, and only provides for the superior constrictor muscle coming in contact with the distal surface of his appliance to shut off the nasal passage. In my opinion, for the patient afflicted with congenital cleft to acquire perfect articulation with such an appliance (even if it be possible), years of application and training of this muscle would be necessary. A little reflection will show that this muscle, besides performing its own function, must be trained to fulfill those of the velum palati, levator palati, and tensor palati. But in an *accidental* lesion this may be all that is necessary, as the patient having previously learned to articulate distinctly, and having this deformity come upon him afterwards, the superior constrictor muscle would, no doubt, be sufficiently developed to perform that function.

Sir William Fergusson, in his report of a dissection made by him of a cleft palate in 1844, states distinctly that the superior constrictor was very full, and he also claimed for that muscle very decided forward action in deglutition. It was in the year 1841 and 1842 that

Dr. Stearns made his first artificial velum. In 1860 Dr. N. W. Kingsley came into the field, and took up Dr. Stearns's appliance. Finding it too complicated for the general practitioner to construct, and too expensive when completed for those in ordinary circumstances, he was led to serious thought in regard to modifying its production, but he still adhered to the same principle of utilizing the levator muscle.

Dr. Kingsley says respecting Dr. Stearns's appliance: "Two principles were vital to Dr. Stearns's instrument, namely, first, the artificial velum should embrace the levator muscles of the palate, so that it could be lifted by them; and, second, that it should bridge the upper pharynx behind the uvula, and cut off nasal communication at will."

Dr. Kingsley's modification of Stearns's instrument consisted chiefly in leaving off the triple form, and doing away with the central slit, the flap, and the springs. The simplified form consisted of two leaves of soft vulcanized rubber, connected in the median line, the palatal portion running down to the uvula, and then bridging across at that point, and the nasal portion reaching across the pharynx. Instead of the appliance being made in sections so as to slide across each other, as in the Stearns, the bifurcated uvula slides between the two leaves, and the levator muscles of the palate lift it up to meet the pharynx, thus shutting off the nasal passage. It will be noticed that in this simplified form the Stearns principles are fully carried out, and to Dr. Kingsley that credit is due. His claims to originality are in the simplifying of the Stearns instrument.

Dr. Kingsley says: "An important principle enunciated by Dr. Stearns as essential to the success of all artificial vela for congenital cleft was that the instrument filling the fissure in the natural palate must be of the nature of a valve under the control of the muscles surrounding it, and so arranged that it could be elevated by them, thus shutting off the nasal passage, as

is absolutely essential in the production of certain sounds belonging to articulate language. This principle was carried out by him first in the character of the material chosen, being of a yielding, elastic nature, and second in the form, being made to embrace the levator muscles, and subject to their control."

Dr. Kingsley in speaking of Suersen's appliance says: "First, that of all obturators this is the best form for a congenital fissure, but while the wearer is enabled to articulate with such an instrument it is only after he has learned articulation with another apparatus. Second, that a soft, elastic, artificial velum is much better adapted to the acquirement of articulation than any unyielding, non-elastic substance, but when acquired an obturator may be substituted. Third, that in very rare cases articulation may be acquired with an obturator only, but it is the result of the extra activity of the pharyngeal muscles, while with the elastic velum the levators of the palate contribute largely."

A great many practitioners in treating a fissured palate simply separate the nasal and buccal cavities by a thin plate, thinking that the separation is all that is required. Some even make a great parade of this device, claiming it to be an improvement over any other appliance. A little reflection will show this to be impossible, as I shall endeavor to explain before closing this paper.

My own experience with soft vulcanized rubber for an artificial velum is that if it would resist the fluids of the mouth, and not go through a process of decay, and change its form, in short, if it could be made permanent, it would be all that could be desired. Since this is impossible I do not hesitate to say that it is a very objectionable material, and I have been led to long and careful meditation regarding it.

I experimented for five years to provide an artificial appliance with hard rubber, carrying out the Stearns principle, whereby I could utilize the levator muscles

to control the movement of the appliance, and with which articulation could be learned as well as with the soft rubber. My studies and experience induced me to settle upon the following device, which consists of a

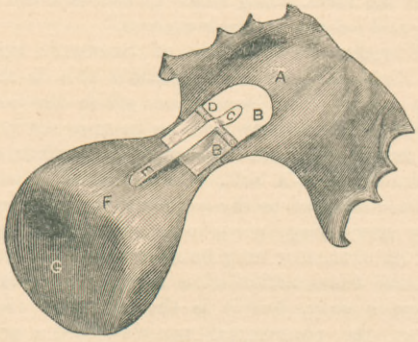

FIG. 1.[1]

gold or hard-rubber plate (A. Fig. 1), covering the roof of the mouth down to the junction of the hard and soft palates. From this point the artificial velum, F, extends back and downward, restoring the symmetry of the palatal surface by bridging across and lying upon the muscles of each side. The distal surface, G, or that portion coming in contact with the pharyngeal wall, is quite broad, and so constructed as to articulate perfectly with this surface, while the constrictor muscle contracts and closes around it on a semicircle. This is the Suersen principle, and the main ideas I take from that appliance.

The velum is of polished hard rubber, gold, or platinum, and much resembles a chestnut in form.

It is attached to the plate with a hinge joint, B, B, thus giving free movement at the junction of the hard and soft palate. At the junction of the hard and soft palate there is a stop, which prevents any downward

[1] The accompanying cuts are kindly loaned by Dr. J. W. White, the editor of the Dental Cosmos.

pressure upon the muscles when in a relaxed condition.

The bulb-like form of the velum (see D, Fig. 4) necessitated a thickness which would naturally have made it quite heavy, and, as the resultant weight would be a serious objection, I was desirous of overcoming the difficulty. A suggestion happily came to my relief in this way: While in a drug store I accidentally took up a hard rubber truss made by a Philadelphia firm. Discovering that the pad was made

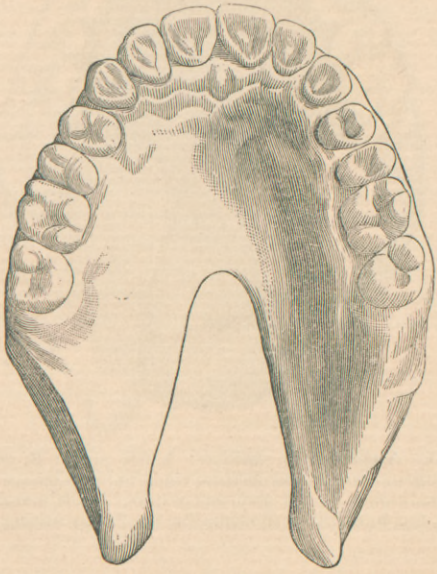

FIG. 2. The cleft, extending a little beyond the soft into the hard palate.

hollow, I thereupon wrote to the manufacturers, asking them if they would inform me how they prepared the rubber in that way. In their reply I found that the

method was quite simple. It is as follows: Take the vulcanite rubber in the soft state and cut the sheets so that when joined together the desired form is given. Then a little water is dropped into the cavity (I found it better to add a little alcohol), the edges are sealed,

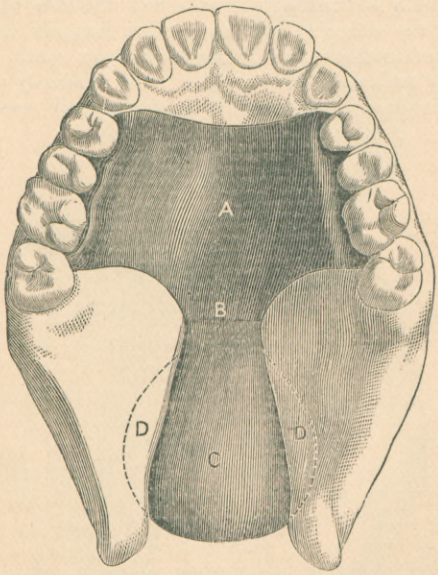

FIG. 3. Appliance in position: A, the plate; B, the stop, preventing any downward pressure when the muscles are in a relaxed condition; C, the artificial velum; D, D, muscle lying under it, the dotted lines showing the appliance resting on the muscles.

and the piece vulcanized in the usual way. The steam produced by the water and alcohol inside creates sufficient pressure to keep the walls distended. By this method the appliance that the cuts were taken from which illustrate this article was made so light that it would not sink when put in water.

In treating a case by Kingsley's method I was obliged to use a hinge-joint to bridge over a union by staphyloraphy. I found in that case that the appliance was much better controlled by the surrounding muscles, and saw a much more rapid progress in acquiring articulate speech. This led me to more fully provide for that muscular movement, and I will endeavor to give the reasons why this should be done. As we have before quoted from Suersen, in order to pronounce all letters distinctly it is necessary to separate the cavity of the mouth from that of the nose by muscular action, and to close the nasal passage in pronouncing every letter, except *m* and *n*. This can be demonstrated by holding the nose while endeavoring to pronounce all the letters as plainly as possible.

In studying the mechanism of speech we learn that more than three fourths of the sounds of articulate language depend upon the integrity of the soft palate for their perfect enunciation. This being the fact, articulation with a rigid obturator must be extremely difficult to acquire. If three fourths of the sounds depend upon the free movement of the natural palate, it seems to me a sufficient reason why we should provide for that movement in an artificial one.

Dr. Kingsley says that with a yielding appliance the levators of the palate contribute largely to correct speech. The surrounding muscles have control over my appliance in the following way: The artificial velum bridges across the opening and lies upon the muscles of either side. (See Fig. 3, D, D.) With all sounds requiring the closure of the nasal passage it is thrown up (D, Fig. 4) by the levator muscles, there being no resistance. The thickness of the velum brings its posterior surface in close apposition with the superior constrictor muscle, F, and thereby affords, in the pronunciation of the gutturals, a firmer resistance to the pressure of the tongue, G, than can be obtained with a thin obturator. By the presence of the hinge, B, the above movements are rendered so free and easy

that there is no tendency to any displacement of the plate, such as occurs with a rigid appliance. If a nasal sound immediately follows a guttural, the descent

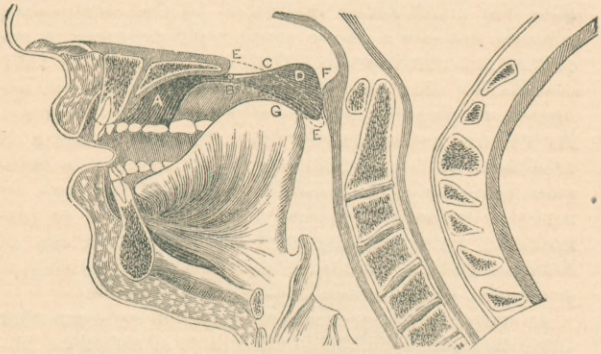

FIG. 4. The artificial palate thrown up by the muscles, E, E, as in all sounds requiring the closure of the nasal passage; F, the superior constrictor muscle, advanced to meet it; G, the tongue, raised, pressing hard against the appliance, as in pronouncing the letter *k* or *g*; A, the plate; B, the hinge joint and stop.

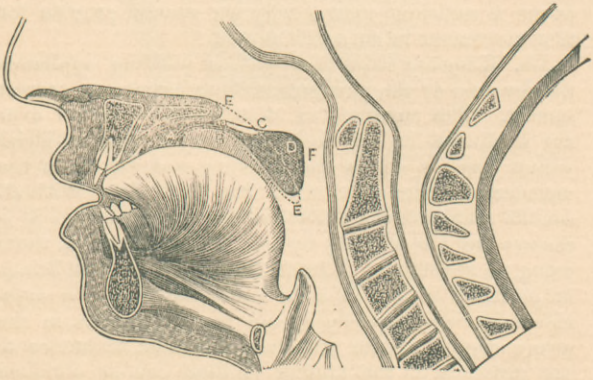

FIG. 5. The muscles relaxed, the appliance descended, thus giving a free passage for nasal sounds and respiration.

of the velum is rendered certain by its own weight. (Fig. 5, D.) My first instruments show a spring bridging over the hinge, by which I intended to accelerate the movements of the velum. This I found later to be unnecessary.

To accomplish the above with a material that would be permanent was a problem very difficult of solution. Of course it is impossible to give to a piece of mechanism muscular power, but it should be made so easily movable as to be acted upon by, and be under perfect control of, the muscles surrounding it.

I claim the following advantages for my appliance: —

First. That it is made of a permanent material.

Second. That articulation can be learned with it more readily than with any other appliance.

Third. That it is much easier to make.

Thus the unsatisfactory operation of the surgeon has been replaced by artificial organs of precision, working upon physiological principles. The ingenious appliances of our distinguished colleagues, Suersen, Stearns, and Kingsley, whose scientific attainments and researches have reflected such lustre upon the art of dental prosthesis, have excited my admiration as I have studied their complex operations; and if I have been enabled to extend their usefulness, and increase their value by substituting an imperishable material for the less excellent substances now in general use, I shall consider that the years of study I have given to this remote and rarely-considered problem of science have not been altogether without their reward.

[Reprinted from the Secretary's Report.]

After Dr. Baker had read his paper, he introduced a patient who has one of his appliances. By examination the appliance could be seen in the mouth, and, by causing him to swallow, the relation of the instrument to the wall of the pharynx and to the alæ of the velum

palati could be easily observed. It was evident that in the act of deglutition no communication between the nasal cavity and the pharynx existed, the posterior part of the obturator being raised up by the levator muscles of the palate, and pressed firmly against the posterior wall of the pharynx at the line of the naso-pharyngeal junction. The patient now removed the appliance, when an enormous fissure was disclosed, extending from a point near the incisor teeth through the entire hard palate and velum. Upon being asked to read, it was quite impossible to understand what the patient was saying. After replacing the appliance the same sentences were read, and every word was spoken with great distinctness, and could be easily understood by every person present. After this the patient was asked to read some new selection, and opening a book at random, commenced as follows: "Physicians generally agree that the moderate use of wine is beneficial." At this point the audience, pleased with the improvement in speech, and possibly desiring to express approbation of what was read, burst into applause, and appeared to be perfectly satisfied as to the usefulness of this instrument in cases of cleft palate. The patient remarked that he found the greatest comfort and solace in the fact that with the appliance in his mouth he was able to smoke, while without it he could not draw the vapor of the tobacco from the pipe into the mouth. With it, also, he can whistle, which he cannot do without it.

The paper was discussed by DRS. BIGELOW, GRANT, and others.

DR. HENRY J. BIGELOW remarked that he had been asked to say something upon this subject. It is quite exceptional that staphyloraphy alone without an obturator does much service to the speech. It is not difficult to get a union of the fissure, or of most of it, but the flaps are usually so tense afterward from the contraction of the dissected surfaces behind the palate that the play of the palate necessary to articulation is pre-

vented. I have, therefore, usually recommended patients to get one of the varieties of artificial palate or obturator, whether inflexible like Suersen's, or flexible like Kingsley's, and to submit only to so much operation as may be necessary to keep it in place. After an operation patients expect to talk at once, but they cannot do so. A long education is needed to show any considerable improvement in alternating the mute and nasal consonants. As a rule there is no improvement of speech at first. Fifteen years ago I devised a short series of exercises in articulation for a patient I operated upon. It begins with the only consonant which a patient can usually best articulate, namely, "*t*" in "*tar*," and gradually leads to the rest, constantly referring to the acquired "*t*" as a point of departure. Here it is, as it was then printed for the private use of a patient: —

"The great difficulty in pronouncing correctly with a cleft palate is in distinguishing the nasals from the mutes; thus, p and b from m; pap or bab from mam; t and d from n; tat from nan; k and g (hard) from ng.

"'Tar' is well pronounced by most beginners with an obturator. When the beginner can pronounce 'stark' and 'car' he has the key to most of what here follows. The above words should be practiced carefully; not 'start' and 'tar,' but 'stark' and 'car,' and should be spoken loudly, or, as the elocutionists say, 'exploded.'

1.	tar	artar	kar	arkar	kar
2.	kar	arkar	arkgar	kgar	gar
3.	kar	arkar	arkdar	kdar	dar
4.	kar	arkar	arkpar	kpar	par
5.	kar	arkar	arkbar	kbar	bar
6.	kar	arkar	arklar	klar	lar
7.	kar	arkar	arksar	ksar	sar

Practice all the above with the following vowels: —

8. o as in coke.

Thus, instead of kar, akar, etc., ko — oko — oklo — klo — lo

9. a (long) as in cake.
10. i as in kite.
11. e as in keep.
12. u as in suit.

13.	kar	arkar	arngar	arkar	arngar	kar	ngar
14.	tar	artar	arnar	artar	arnar	tar	nar
15.	par	arpar	armar	arpar	armar	par	mar
						bar	mar
						dar	mar
						sar	rar

(Practice reading loudly from a book.)
"*February*, 1870."

On motion of DR. MARCY it was voted that the thanks of the Section be rendered Dr. Baker for his important communication of original studies upon a most difficult subject and demonstration of ingenious mechanical appliances for the remedy of cleft palate.