SPEECH WITHOUT A LARYNX.*

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THE patient exhibited, Mr H., aged 39, suffered from cancer of one vocal cord. Three and a half years previously laryngo-fissure was performed. A rapid recurrence of the disease took place. The patient was then admitted to the University Hospital and placed in the surgical clinic of Professor Noordenbos. After preliminary gastrostomy the larynx was removed. The wall of the pharynx became necrosed, necessitating a plastic operation. A large skin flap from the neck was used for the formation of a new pharynx. A part of the external wound has been covered by a flap taken from the thigh.

The success achieved has been complete. After three years, Mr H. may be considered cured of his malignant disease, and, moreover, he has a new and fairly good voice, allowing him to carry on his business and to be a normal person in society.

It will be observed that the opening of the windpipe is situated in the neck, and that there is no communication whatever between the lungs and the pharynx or the mouth. Of the three elements necessary for voice production, namely, the lung with the windpipe as a bellows apparatus, the larynx as the organ producing the sound, and the parts concerned in articulation, the patient only possesses the last. He can, nevertheless, speak distinctly and sonorously. The voice is not altogether clear, though sometimes it is remarkably so. Mr H.'s voice is low pitched. Before operation, the pitch was of a similar character, and he sang bass. He produces all the speech sounds correctly.

The speech is not at all monotonous and the voice is well modulated; he can be heard all over a large room. He is a reporter of sporting papers and is busy throughout the day. He telephones to Berlin and Munich in order to forward reports of billiard matches with many numerical data, and his figures are never misunderstood. He delivers speeches at meetings, and, as secretary, reads the minutes.

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Mr H. can sing. Dr Kaiser has registered his singing voice. The graphs yielded the result that the vibrations were successively 120, 130, 140, 160, 180, and sometimes 190 (b, c, d, e, fis, g), which shows that the pitch of the voice is under fair control. He can produce single vowel sound and separate words. In connection with the production of the vowels, the pitch ranged between 60 and 210 vibrations; with the words, still higher values are reached, sometimes 260 vibrations. A composite graph illustrating the above shows (1) that his voice is certainly not monotonous, on the contrary, rather more varied than in normal cases; (2) that the range of voice is two octaves, as is also the case with normal persons; (3) that his singing voice is slightly lower in pitch than the bass; and (4) that the speaking voice is also a little lower than the average speaking voice of a man.

Mr H. can also whisper; he can whistle; he can smoke and blow out the smoke through the nose. He can blow out a candle at a distance of 12 inches; he can blow his nose.

Eating and drinking cause him no trouble, especially drinking. He can retain almost the whole contents of a glass of water without swallowing. After dinner, when the stomach is full, speaking is no trouble to him; it is even easier than at other times.

About once every month a bundle of hair, attached deep down in the throat, grows upwards into his mouth. These are then cut off as low down in the mouth as possible.

All things considered, Mr H. acts as a perfectly normal man; he looks healthy and cheerful. A stranger may possibly observe his somewhat harsh voice and rather peculiar manner of talking, but he will not suspect him of being deprived of his larynx.

When closely watching Mr H. while he is speaking, one observes that not more than three, five, or at most six syllables are pronounced consecutively. He then closes the mouth, and after a movement of swallowing at once continues speaking. He can speak also without preliminary swallowing, but only for a short period. Before commencing to speak, he does not repeatedly swallow as if to replenish an air-reservoir, as has been described in other cases.

Laryngoscopic examination reveals the fact that the site of the pseudo-glottis is at the mouth of the œsophagus; further, in quiet respiration this mouth is always wide open.

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By day, Mr H. wears the tracheotomy tube, as he speaks better with it than without; the voice is also better when he wears collar and neck-tie. When he speaks without a collar, he has greater difficulty. The head is held somewhat obliquely backwards so as "to get out the sound."

During speaking, a slight swelling forms in the neck above the fistula. When palpating the anterior aspect of the neck, the vibrations of the voice can be felt. Several authors, for instance Gottstein, have described similar swellings. Solis Cohen spoke of a balloon, filled with air by the patient and then used as an air-chamber. In these cases the pseudo-glottis was seated in the pharynx. In the case of Mr H. the mechanism is very different. Here the swelling is seated above the pseudo-glottis, and consequently does not represent the air-chamber used in voice production. On the contrary, the swelling is a disadvantage to him, because the air necessary for speech cannot be utilised until the abnormally wide hypo-pharynx is filled with air. This explains also why he can speak better with a collar; it gives support to the lax cervical wall at the site where the larynx has been removed.

By what force is the air from the reservoir driven through the pseudo-glottis? It is evident that the movements of swallowing, which are made immediately before and during speech, are always attended with an inspiration and that he expires while speaking. As the movements of deglutition are rather weak, and as Mr H. when about to speak never makes several such consecutive movements, the act of swallowing cannot constitute the chief moment at which the air-chamber is replenished.

While speaking, Mr H. makes at the end of each inspiration a slight movement as of deglutition, which presumably causes a little more air to pass into the œsophagus.

Conversely, it is the expiratory pressure in the thorax that expels not only air from the lungs through the windpipe, but also the air from the œsophagus through the pseudo-glottis and the mouth. In reality, the speech mechanism in Mr H. is quite similar to that of the normal man; inspiration through expansion of the thorax; expiration through contraction of the thorax.

In the case of Mr H. it is not only the œsophagus which does duty as an air-chamber, the stomach collaborates. Seemann of Prague denies the possibility of the stomach acting as an air-chamber for voice production.

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X-ray photographs of the stomach of Mr H., made by Dr Voorhoeve, demonstrate the enormous dimensions of the stomach air bubble. A picture taken directly after Mr H. has finished speaking and before the next inspiration is taken shows: (1) that the stomach bubble has been considerably reduced in size; (2) that both halves of the diaphragm have risen to a higher level; (3) that the frontal dimension of the thorax is distinctly smaller than on the photograph representing the maximum expiratory position.

The photographs show in an absolutely convincing way that the stomach plays an important rôle in the act of speaking. That it is easier for Mr H. to speak after his dinner, is readily accounted for by the familiar fact that the stomach bubble is always enlarged after a meal.

Secondly, they show conclusively that in order to force the stream of air through the new speaking apparatus, the abdomen as well as the thorax is contracted to the utmost degree. It is a remarkable thing that Mr H., when he is speaking, uses air from the stomach. In normal circumstances, the active opening of the cardia is brought about exclusively in the chain-reflexes of swallowing, vomiting, and eructation. In this case, however, the opening of the cardia does not occur altogether independently, but is related to a newly acquired intricate mechanism, namely, the œsophagus speech.

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