

may cause the valve-lesion. The evident chronicity of the cardiac condition, even assuming that it was not congenital, would seem to point to the renal disease being secondary in this case; but, when established, it would react on the heart, causing hypertrophy of its left ventricle.

W. P.'s history favours congenital malformation of the heart. He had always had cardiac symptoms. He had never had any sudden onset of severe symptoms, such as mark communications between the two sides of the heart from ulcerative perforation or the giving way of a segment of the aortic valve. The renal disease doubtless increased the cardiac embarrassment, and probably was the penultimate cause of death. The murmurs, which were very loud, and the purring tremor, which was intense, were characteristic of a communication between the aorta and pulmonary artery; they were probably due in this case, in chief part, to the to-and-fro current of blood through the aperture of communication between the aorta and pulmonary artery; the systolic murmur being heightened by the flow of blood through the septal aperture; the diastolic by regurgitation from the aorta into the left ventricle.

I have to thank Mr. Harvey Smith for assisting me in taking notes of this case.

**CASE III. Communication between the Two Ventricles of the Heart: Two Aortic Segments.**—W. S., aged 8, was brought to the hospital May 27th, 1880, in a moribund condition with enteric fever, of which he died shortly after admission. His mother said that, up to the time of the fever, he had been a strong boy, and had had no illness except an attack of bronchitis the previous winter. He had always complained of coldness of the hands and feet.

*Post mortem*, the heart weighed seven ounces. On laying open its left side, the ventricle was seen to be dilated and hypertrophied; the mitral valve was sound; the aorta free from disease. The aortic valve had but two segments; these were greatly dilated and one was a third larger than the other. The larger one showed no signs of subdivision. A small portion of both segments was thickened; the thickened portion was at their attached margin, where they formed part of the boundary of an aperture in the septum ventriculorum. The rest of the segment was sound. In the aortic sinus corresponding to the larger segment was the origin of the two coronary arteries. In the septum ventriculorum, between and below these two segments, was a smooth, round, membranous aperture, around which were some small vegetations; one, resembling a polypus, arose on the rim of the aperture, and permitted of being pushed to and fro from one ventricle to the other. On laying open the right side of the heart, the ventricle was seen to be slightly dilated and hypertrophied. The tricuspid and pulmonary valves were sound. The aperture in the septum was half an inch below the pulmonary valve. On the inner surface of the wall of the ventricle, over an area the size of a sixpenny-piece, was a cluster of vegetations; they were situated exactly opposite to the septal aperture. The ventricle elsewhere was free from vegetations. The spleen was enlarged and soft; the intestines ulcerated; the other viscera normal.

The explanation I would offer of this case is, that one aortic segment was congenitally absent; that, during foetal and infantile life, the two segments by dilatation were competent, or nearly so; but that, as the heart and large vessels increased in size, regurgitation took place, causing hypertrophy and dilatation of the left ventricle. The aperture in the septum I regard as a flaw in development, looking upon the septum as an "imperfect septum". The vegetations around the septal aperture, and the thickening of that part of the two segments which helped to form it, were, I venture to think, the result of extraordinary strain on that part, and the loitering of blood about it consequent on the lateral current through the abnormal aperture. Increased tension of the two aortic segments from the absence of one segment would explain the dilatation of these segments. The vegetations in the right ventricle being confined to a limited area, and being situated exactly opposite to the septal aperture, would make it appear that they had been caused by blood driven through that aperture, and impinging on the wall of the ventricle. This case seems to come into the category of those cases where congenital malformations of the heart are followed by morbid changes in that organ. The abnormality of the circulation probably leading to the disease, the morbid changes may take the form of dilatation, or thickening of valves, or vegetations, or aneurysmal dilatation of congenital apertures, or alterations in the walls, or capacity of the chambers of the heart—a class of cases exemplified also by Cases I and II. I would point to certain features common to this case and Case II: 1. The existence of but two segments of the aortic valve; probably the result of defective development. 2. One of the existing segments is larger than the other, and is subjacent to the sinus of the aorta giving off the two coronary arteries. 3. The existence of an aperture in the septum ventriculorum; probably congenital. 4. The

presence of morbid changes in the aortic segments and in the heart; probably secondary.

I have to thank Dr. Barling, the pathologist, for an account of the *post mortem* of this case.

## THE NEW YORK AMBULANCE SYSTEM.

By BENJAMIN HOWARD, A.M., M.D., F.R.C.S.E.

In the system for the care of emergency cases within the Metropolitan district of New York, there are observable a promptness, ease, and thoroughness not only interesting, but suggestive. This system unites municipal authority with voluntary effort, and affords an exceptional illustration of the efficiency and harmony possible to such combination.

Although not so designated, practically the Chief of the Ambulance System is the Chief of Police. The principal general hospitals which have been placed at his service, accept the regulations imposed, and thus the hospitals in question supplement the single government "House of Relief," and these together form a circle of hospitals at the centre of which is the office of the Chief of Police in telephonic communication with them all. The Chief of Police at any moment, day or night, can have an ambulance from any or every one of these hospitals, at any given spot, as certainly and as quickly as the Chief of the Fire Department can have a fire-engine from any Fire Brigade station at a designated point in a corresponding emergency. For the sake of conformity in this plan, the hospital-buildings erected since the organisation of this system, have included the most careful adaptation to it; while the older hospitals have received corresponding alterations.

On the occurrence of a surgical or medical emergency, information, whether by a policeman or a civilian, is at once given at the nearest police-station; this is telegraphed to the central head-quarter police-office. The officer receiving the telegram can see a chart before him, in which hospital district the emergency in question has occurred, and telephones the call and address to the hospital to which that district belongs.

While I was talking upon this subject in the office of the superintendent of the recently built New York Hospital, the conversation was stopped by a shrill whistle. A telephonic message having been received, and as quickly answered, the superintendent remarked that the message was an emergency call. Following him on a run down a flight of stairs, and under a covered way across an inner courtyard, a surgeon was seen to step into an ambulance, which passed almost noiselessly along the concrete way under the arch and into the street. As the superintendent had telephoned both driver and doctor, before he had explained to me the nature of the interruption in our conversation, while we were simply putting on our hats, the ready harnessed horses had been put in, the doctor had got the start of us, and I had nearly missed the performance the superintendent had asked me to witness.

The ambulance, on returning, comes in from an opposite direction, and stops under the large *porte cochère* on the opposite side of the court, at the door of the reception or accident ward. This room, is supplied with every surgical convenience: operating table, instruments, dressings, hot and cold water, and beds, while opening into it are bathrooms and small bedrooms, all at a constantly agreeable temperature. According to expediency, the patient may remain a longer or shorter time comfortably where he is, be put into a private room adjoining, or be transferred on the lift direct from the table to an ordinary ward above. If, on the other hand, the case be a trivial one, the ambulance takes him at once, or as soon as he may wish, to his own home.

The ambulance-surgeon, immediately on returning to the hospital, according as the case may be surgical or medical, notifies the house-surgeon or house-physician, who then takes entire charge of the case. Before attending to any other duty, however, the ambulance-surgeon enters in a book, kept for that purpose, time of call, start, arrival, departure, return, and such details of history and diagnosis as a coroner's jury might possibly require.

The ambulance-wagons are drawn by two good horses, with light harness; and on the street the driver, by common consent, has the right of way. The vehicle pretty uniformly adopted is in every particular as light as is consistent with its use. Its floor is very low, and the bed, which is on rollers, is by means of sliding handles used as a stretcher also. The roof and curtains are of white duck, which is so extended as to afford good shelter to the driver. Within is a comfortable seat for the doctor, where, if he wish, he can watch the patient *en route*. In the box of the ambulance are all such stores and appliances as are deemed expedient for possible use.

This system seems to have the merit of great equality of advantage.

1. To the municipality, it offers relief from all care of the cases in question, and without cost for horses, ambulance, or treatment.

2. To the hospital surgeons, it supplies the kind of cases especially desired by those who are teachers.

3. To the patients, it secures prompt help, and the most skilful attendance.

The municipal element in the system maintains in all concerned the consciousness of accountability, while the voluntary element in the system quickens between the several hospitals a lively emulation. Take it all in all, the ambulance system of New York is creditable, both to the medical and to the municipal authorities of the city, presenting an unique example of an efficient and harmonious combination of municipal and voluntary effort, which seems to yield satisfaction to all concerned.

As the city which, for the protection of property, boasts the best fire department in the world, must sooner or later follow its higher instincts and traditions in having a system correspondingly complete for the protection and care of human life also, it is possible that some of the above facts will afford memoranda which may be of service in the organisation of the future Ambulance Department of London.

## THE USE OF ELECTRICITY IN EAR-DISEASE.\*

By E. WOAKES, M.D.

IN discussing the subject of the use of electricity in diseases of the ear, I shall refer to it—first, as a means of diagnosis; and secondly, as a remedial agent.

As regards the value of electricity for the purposes of diagnosis in ear-disease, you will at once recall the experiments of Dr. Brenner at St. Petersburg, first made known about twelve years ago by the publication of his work on *Electro-Otiatrics*, a very fair *résumé* of which is given in Dr. Burnett's treatise on the *Ear*, and also in Dr. Roosa's last edition. You will remember that this work was the result of ten years of careful study, and therefore the conclusions arrived at are entitled to the weight which such exhaustive examination by a competent observer must always demand. The outcome of this study was, that the auditory nerve could be excited by the electric current, which in the normal state responded to it by certain constant phenomena; and that these phenomena were reduced to exact formulæ for the guidance of others, who would ascertain by means of electricity the state of the nerve of audition.

That Brenner's conclusions should meet with opposition, is only what may have been expected. Without desiring to prejudice the discussion, I shall state very briefly two points which seem to my mind fatal to the sufficiency of the experiments, and therefore to the conclusions deduced from them.

The conditions of the experiment make it probable that the auditory nerve is not reached by the current at all. The reasons for this conclusion are, that, when a nerve is superficially placed, covered only by integument—*i.e.*, when the electrode is applied to it—a very considerable portion of the current is diffused in the surrounding tissues. Bone being a bad conductor, this loss of electricity, de Watteville and Hitzig argue, not taking place, increases the probability of the current reaching the auditory nerve. (The electrode is placed in the external canal, previously filled with water.) But the current must previously affect other nerves within reach—the branches of the fifth—and reflexly excite spasm of the tensor tympani, before it reaches the auditory nerve. Now, the effect of exciting a powerful contraction of the tensor tympani is to make pressure through the stapes on the intralabyrinthine fluid. Dr. Weber-Liel of Berlin has pointed out to me that direct pressure over the stapes, when this bone is exposed by means of a probe, is accompanied by a sound which the patient experiences, resembling "ting-g-g." The correspondence between this sound and that produced by Brenner, and understood by him to imply a normal reaction to galvanism of the auditory nerve, is very significant. At any rate, it leaves one's mind in a state of doubt as to whether Brenner's normal reaction was not the result of inducing contraction of the tensor tympani in a healthy ear, seeing that such contraction, when in excess of what occurs in response to ordinary stimuli, is undoubtedly associated with a sound; that is to say, the sound is due in both cases to mechanical pressure, and not to electric excitation of the auditory nerve.

Another point, which stands somewhat in the light of a corollary to the preceding, is this: the supporters of Brenner's hypothesis attach great importance to the fact that, when the test is applied to a badly

diseased ear of long standing, the phenomena do not occur in that ear, but in the opposite one, to which no electricity is applied; or they occur in both ears in a reverse order. The current is here supposed to pass along the partially paralysed auditory nerve of the diseased side, and to be transferred to the other and unaffected nerve by communications at their origin. Now I think there is another explanation, and a more reasonable one. It is very rare for an old-standing case of ear-disease to be free from paresis of the tube-muscles on the affected side. Now, if the conclusion at which I have already arrived hold good—*viz.*, that the sound in question is the result of contraction of the tensor tympani—it is very obvious that, if this muscle be paralysed, or only partially paralysed, on the side to which the galvanism is applied, it will fail to react to the stimulus, or will react partially, or differently from what it would do otherwise. It is not improbable, under these circumstances, that the current would travel to the opposite branches of the fifth nerve; and that contraction of the tensor tympani of the opposite ear would ensue, and give the ordinary result in this, the unaffected side. That such cross action of a stimulus in the case of the fifth nerve does occur, is borne out by the following suggestive fact. A lady about fifty years of age, suffering with deafness and paresis of the tubal muscles of the right ear, not of an extreme type, states that, when she bites a crust or hard substance on her *left* upper second bicuspid tooth, she gets a distinct momentary ringing sound in her *right* ear. She is an intelligent common-sense person, not at all likely to imagine the symptom; and the statement I have repeated was volunteered to me. I need not stay to point out that the connection here can only be through the fifth nerve, and that it was transferred to the opposite side; thus establishing, as far as it goes, the possibility of a sound being excited through this nerve in the opposite ear.

"Professor Hughes's audiometer is an instrument for exactly measuring the power of hearing, and chronicling the progress of recovery from deafness." In the *Practitioner* for May 1880, Dr. Richardson is reported to affirm that it "may be used to differentiate between deafness through the external ear and deafness from closure of the Eustachian tube—throat-deafness; or to determine the value of artificial tympanums in instances of deafness due to imperfection or destruction of the natural tympanum." Others speak of it as an expensive and imposing toy. I cannot say that I am in a position to throw any light upon these extreme views, though I trust the discussion may do so.

I now have to consider the value of electricity in ear-disease, considered as a curative agent simply. I do not know how far the experience of other otologists corresponds in this respect with my own, but I am quite free to confess to a growing recognition of the paramount importance of muscle-paresis as a chief factor in the causation of deafness and its concomitant symptoms in a very large proportion of those cases of the disease which occur in adult life. To Dr. Weber-Liel of Berlin is undoubtedly due the credit of having first pointed out this important fact in his work entitled *Progressive Schwerhörigkeit*, published in 1873. Three years ago, before I became acquainted with this work, I had quite independently arrived at the conclusion that paresis of muscle was in some way concerned in the production of the symptoms referred to, because I met with quite a number of cases in which these symptoms were associated with marked paralysis of the palato-tubal muscles. It is true that most of my cases presented some marked divergencies, as regards simply aural conditions, to those described by Weber-Liel; and I presented the first *résumé* of them to this Section in a paper which I had the honour of submitting to it last year at Cork. It would be beside my duty on this occasion to occupy your time with further details on this subject; suffice it to say that there appear to me two distinct phases of paralytic affections of the auditory apparatus—*viz.*, that described as "progressive" deafness by Weber-Liel, and that which I have elsewhere described as "paretic" deafness. Now the importance to our present purpose of these observations, resides in the fact that it is in these paretic aural affections that galvanism will be found of essential service. That is to say, it is in the treatment of deafness in adult life, when this acknowledges a more deeply seated constitutional lesion of the nervous system, that the true province of electro-therapeutics, as it relates to otology, will be found to lie. Speaking strictly within the limits of my own experience, I have to regret that, even in this large class of cases, the use of electricity is essentially a limited one. The reason of this resides in the fact that we seldom meet with uncomplicated cases; for it is inherent in the nature of any affection which interferes with the function of the Eustachian tube—as paralysis of its muscles does—to induce a greater or less degree of passive congestion of the middle ear. Now it has been conclusively shown by the experiments of Morant and Dastre, a detailed account of which will be found in the *Comptes Rendus*, 1878, that, after galvanising motor nerves, there follows considerable hyperæmia in the tissues to which the branches are distributed, which condition

\* Read at Cambridge to introduce the discussion on this subject at the Otological Section, August 1880.