medical wards. Here he is handed over for instruction in the physical signs to a clinical tutor, a teacher whose knowledge is so little in advance of his own that he does not understand the significance of the facts which he teaches. Under the care of this clinical tutor, at a time when he is most susceptible to impressions, he has hammered into him a certain kind of knowledge which remains with him and influences him during the remainder of his life. Thus, he is taught how to recognize the sounds of the heart, the size of the heart and its rate and rhythm, and what is supposed to be the normal in a healthy individual. Then he is shown, as a contrast, diseased conditions, with murmurs and muffled sounds, hearts of varying sizes, rates, and rhythm. Consciously or unconsciously, he gets the idea that a heart to be healthy must be of a certain size, the sounds clear and free from murmurs, and the rate regular. This idea may be sought to be modified by more experienced teachers later on, but I am certain that every medical man who passes out of his hospital training does so with a false conception of the nature of phenomena which a healthy heart can exhibit. How this works out in after-life I will show you immediately.

How this Imperfect Teaching Affects the Practitioner in his Work.

You may think I am dealing at too great length with the part which the medical man plays, but if we wish to appreciate the full consequence of our errors and misconceptions, we must know how they have arisen. In order to bring before you more clearly the significance of what I am trying to prove to you, I will refer to my own experiences. Some ten or fifteen years ago there arose a strange notion of the dangers of athleticism in school-boys and college youths. I think this originated in London, but at all events it speedily spread over the face of the earth. Exponents of the idea did not limit their views to the medical press, but, if I remember aright, warnings were written in the lay press by some of our learned colleagues. So widespread did this doctrine become, that great numbers of boys returned to school with certificates of unfitness to play the usual games, to such an extent that in some schools one half of the boys were supposed to suffer from impaired hearts. At this time I was pursuing my work in an isolated town in the north, and I wondered what were the symptoms by which these enfeebled hearts were recognized, and what were the evidences of an athlete's heart. My boys played strenuous games and entered into occupations entailing severe bodily labour, but I never saw any of them unfit unless they had manifest disease of the heart. It was not until I came to London five years ago that the real solution dawned upon me. The first consultation which I had in London was concerning a young girl who had fainted. She lived in the country, and a London physician was called in, who recognized some form of heart abnormality, and had her removed to London to undergo a course of what is called Naheim treatment. She had had two courses and had been under treatment for three months when I was asked if I could suggest any remedy for this intractable complaint. Judge of my surprise when I was told that the only evidence of disease was a persistent irregular action of the heart, which I found to be the youthful type of irregularity—a phenomenon so far from being a sign of disease is, as I have told you already, presumptive evidence of a perfectly healthy heart. From this time onwards young folks were brought to me in increasing numbers, until I have seen a very large number of youths who were supposed to have athletic hearts, or were supposed to be unfit to play games or to row, because of some impairment of the heart. Except in a few instances of manifest heart disease, the evidence on which the heart's impairment was based was those manifestations of murmurs or irregularity which my experience had shown to be perfectly consistent with a healthy heart. In addition, I have seen a great many youths who have been rejected for life insurance and for the services, and other

occupations which entail a preliminary medical examination, because of the presence of these manifestations of a healthy heart.

In my communications with medical men I have found the notion that a murmur or an irregularity is an evidence of disease so deeply rooted that it is simply impossible to get many of them to look at the evidences which point to the contrary. I have had a great deal of disagreeable correspondence with doctors after I have written to them about youths whose hearts I have pronounced healthy in spite of murmurs or irregular action. I have had replies to the effect that they have had great experience in this subject, and that they know I am wrong. I have asked such correspondents to recite to me the history of one single individual who has ever shown the slightest sign of heart failure, in whom these symptoms were found, and so far I have failed to get the history of a single case. Nay, more, although you will find in the writings of authorities grave warnings of the danger impending on youths who show these phenomena, yet I have failed to find the record of a single case in which these forebodings were realized. Considering how numerous are individuals showing these signs, and considering the strenuous games which are played and the strenuous lives that are lived, had these signs the gravity they are assumed to have, there would be on record many cases of heart failure, yet, as I say, literature is silent on the subject.

OBSERVATIONS UPON THE ACOUSTIC PHENOMENA IN MITRAL STENOSIS.

(Preliminary Communication.)

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Method.

SIMULTANEOUS electrocardiogram (lead II) and heart sound record are taken, the latter by means of a microphone and separate string galvanometer. The two curves lie side by side on the same photographic plate, and the time relations of first and second sounds and murmurs

Fig. 1.—Simultaneous electrocardiogram and heart sound record. The upper curve shows, P, the auricular summit, and Q, R, S and T, the ventricular deflections. A hard vertical line is drawn at the commencement of systole; a dotted vertical line at the commencement of ventricular diastole. The lower curve shows the heart sound record: 1 = the first heart sound; 2 = the second heart sound; M = diastolic murmur. Taken from a case of mitral stenosis.

to the separate deflections of the electrocardiogram are calculated (Fig. 1).

Observations.

Preliminary observations, with a view to determining the time relation of the sounds at the apex beat to the electrocardiogram, were first undertaken in fifteen normal subjects.

1. The time relation of the normal first sound to the initial deflections of ventricular systole is variable. It may commence within 0.011 sec. of Q or within 0.002 sec. of R, or it may be delayed until 0.026 sec. after R or 0.039 sec. after Q. Usually it begins a little before or after the summit of R.

2. The time relation of the normal second sound at the apex to T, the last electrocardiographic deflection, is variable also. It may commence 0.01 or even 0.03 sec.

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before the end of *T*, but more usually it starts at the end of *T* or 0.01 or 0.02 sec. afterwards.

The sound curves from cases of mitral stenosis were taken in two series—a series over the area at which the diastolic murmur was audible, and a control series over areas at which the murmur was inaudible.

The positions and duration of the murmurs were estimated after careful comparison of the two sets of curves.

1. The time relation of the first and second sounds in the control curves of mitral stenosis are practically the same as in normal hearts. The sounds are usually much more intense, though of similar duration to those of the normal heart.

2. When the heart is beating regularly and the sequence of contraction is normal, the shortest diastolic murmurs of mitral stenosis precede the first sound, and consequently precede the initial rise of intraventricular pressure. They lie in presystole.

3. Generally speaking the presystolic or diastolic murmur is not a crescendo; the crescendo is an effect of the proximity of the loud first sound. The vibration frequency of the murmur is from 41 to 107 per minute. The murmur begins from 0.05 to 0.22 sec. before the commencement of *R* and runs up to the first sound. Usually it occupies the whole or greater part of diastole.

4. When fibrillation of the auricles is present an isolated presystolic murmur does not occur; the fixed time relation of the murmur is to the early phases of diastole; the murmur runs over a variable proportion of diastole, according to the variation in the length of the latter; in the longest diastoles and in slow acting hearts there is a period of silence between murmur and first sound; in a shortest diastole the murmur may occupy its whole extent.

5. When heart-block is present the position of the diastolic murmur is largely controlled by the position of the auricular contraction.

It is concluded that the diastolic murmurs of mitral stenosis are due to the rapid onflow of blood through the stenosed mitral orifice. Those periods of diastole are occupied by murmurs, during which the velocity of flow reaches a certain grade. When the auricle contracts at the normal time and the heart beats slowly, the velocity tends to be greatest in presystole. Otherwise it is usually greatest in early diastole; these are the periods at which murmurs are most commonly audible.

REGIONAL ANAESTHESIA.

BY

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THE greater attention recently devoted to the subject of anaesthesia, and greater knowledge of the subject, has revealed dangers that were before unknown and has shown how very much the ultimate well-being of the patient depends upon a careful selection of the method of anaesthesia used. It is quite obvious that the remote dangers of some anaesthetic drugs are far greater than the immediate, and it does not seem improbable that these sequelae may be more serious and far-reaching than we even now realize.

As the dangers of general anaesthesia in certain cases have been more fully appreciated, more attention has been devoted to the subject of local anaesthesia; so much so that if the condition of a patient is such that the administration of a general anaesthetic is likely to be specially dangerous, almost any operation of necessity can be successfully and painlessly performed under some form of local anaesthesia.

Until comparatively recent years local anaesthesia was very little used, on account of the toxicity of cocaine, the agent usually employed. But with the introduction of the comparatively innocuous substances, stovaine, novocain, and eucaïne, considerable attention has been devoted to the subject, and great strides have been made in the technique of this form of anaesthesia.

Broadly speaking, local anaesthesia may be placed under three heads:

1. *Spinal anaesthesia*, in which some form of anaesthetic drug is introduced into the spinal theca.

2. *Local infiltration anaesthesia*, in this case a very weak solution of the anaesthetic drug is employed, and the whole area to be operated upon is infiltrated with the solution.

3. *Regional anaesthesia*, a stronger solution of the anaesthetic drug is employed, and a small quantity is introduced around the nerve trunks which supply the part to be operated upon at some part of their course which is anatomically accessible.

The choice of the one or the other of these methods depends upon the condition of the patient, the necessities, and also upon the site of the operation. It is fortunate that for those cases in which one form is not suitable another frequently is. The advantages of spinal anaesthesia in septic abdominal conditions, especially acute appendicitis in the young, associated with much toxæmia, and in those cases in which abdominal relaxation is required, such as the radical cure of large irreducible herniae, ventral herniae, cases of intussusception and prostatectomy, are too well known to require further discussion here.

For those cases, such as cysts in the upper part of the breast, subcutaneous lipomata, the radical cure of hydrocele, varicocele, and varicose veins, in which it is often difficult, if not impossible, to isolate the nerve trunks supplying the part, the wide infiltration method with a weak solution is certainly preferable.

Regional anaesthesia can be used for any type of operation upon any part of the body supplied by nerves which are at some part of their course anatomically accessible. By anatomically accessible is meant that the nerve shall lie in such a position that it is possible to pass a fine needle down to it, and so introduce the analgesic fluid. It is almost impossible to inject the fluid around a nerve lying amongst muscles, as the difficulty of gauging the depth from the surface is so great. Further, even if the needle is introduced into the neighbourhood of the nerve trunk, the point may easily have passed through a layer of fascia or the sheath of a muscle, so that however much fluid is introduced, it will not be distributed around the nerve. In some few instances this direction of the fluid by the fascia may be utilized to facilitate the injection, the nerve itself lying in some fascial compartment, which can be filled up with anaesthetic solution. The musculospiral nerve in the arm or the median at the wrist are both cases in point.

The characteristics of this form of anaesthesia are:

1. Granted that a suitable anaesthetic solution is introduced around the trunk of a nerve, the whole area supplied by that nerve becomes anaesthetic—bone, muscle, fascia, skin, etc.

2. The method can be used for operations upon inflamed tissues provided that the injection around the nerve trunk be made at some point well above the septic area.

3. The anatomical relations of the part to be operated upon are not obscured by oedema caused by a large quantity of injected fluid, as is sometimes the case with the wide infiltration method.

4. The anaesthesia lasts for several hours.

5. The anaesthetic area is clearly defined by the anatomical distribution of the nerves. Consequently there is no risk of suddenly overstepping the limits of the anaesthesia, with most unpleasant results to the patient.

A very important factor in the success or otherwise of this form of anaesthesia is the solution used.

Either eucaïne, stovaine, or novocain may be employed, but the best results in my hands have been obtained with novocain. A 2½ per cent. solution of novocain in distilled water is prepared and sufficient sodium chloride added to make the fluid isotonic with the blood. The whole is then sterilized by boiling, which can be done without detriment to the novocain; it is, of course, absolutely necessary that this fluid should be sterile, and for this reason it should be freshly prepared for each case shortly before using. The formula of the solution is:

Novocain	...	...	...	...	2.0 grams.
Sodium chloride	...	...	...	...	0.5 gram.
Distilled water	...	...	...	...	to 100 c.cm.

5 drops of a 1 in 10,000 solution of adrenalin are added to each 20 c.cm. of solution immediately before use.

When the fluid is injected into the tissues the vessels are