"finger's breadth of liver substance and peritoneum as a hinge posteriorly"; or, as by Caspar, one where it was "completely ruptured transversely, so that the anterior portion lay loose in the abdominal cavity"; and another, in which "the entire edge of the right lobe seemed as if it had been gnawed by animals."

In the most severe of these cases death occurs within two hours, and the autopsy shows an amount of blood in the abdominal cavity which readily accounts for the rapidly fatal course. Minor injuries to the liver are often found, combined with other conditions of a more serious character (Cases 1, 4, 5, 6, 8, 16 and 17). In Case 3 we have one in which the contused liver tissue has a "point of escape," with resulting hemorrhage into the abdominal cavity.

RUPTURE OF THE KIDNEYS.

While in the opinion of many pathologists rupture of the kidney is of rare occurrence, and Caspar classes it among those "other organs" in which "rupture is almost never observed," the diagnosis of rupture of the kidney is made more often clinically than that of any other organ. This is probably due to the fact that not only is increase in size in or about the organ more easily demonstrated than of the liver or spleen, but that by means of the urinary passages hemorrhage is more apt to show itself. That ruptures of the kidney occur not infrequently is the experience of every surgeon who has much to do with traumatic surgery; and that a rather large proportion of them recover under rest and ordinary care I think would be allowed. Reports of those cases which come to autopsy and operation would lead one to feel that they were even more common than we are apt to suppose. Erichsen says, "The absence of blood in the urine must not be taken as an indication that the kidney is uninjured"; in this connection Cases 20 and 21 are interesting.

There certainly are many cases which appear in the hospital wards after accidents which might well result in severe injuries to the kidneys, which present most of the symptoms of such a rupture, and which in their subsequent history during convalescence simulate very closely cases of rupture, but which are classed as injuries or contusions of the abdomen on account of the absence of hematuria. Ruptures may take place in any part of the kidney, may be one or many, and of all grades of severity; the symptoms which present themselves must vary greatly with their location and importance. Unless there is great laceration of the tissues the peritoneum is not involved; peritonitis rarely follows, but lumbar abscess is not infrequent. Erichsen reports a case in which the ureter was ruptured together with the kidney, and calls attention to this as one of the reasons why hematuria is absent in certain cases.

RUPTURE OF THE SPLEEN.

The spleen is said by most authors to be one of the most frequently injured of the abdominal organs, and from its position and consistency one would expect this to be the case. In the cases which I am able to report it is much rarer than some of the others.

When the spleen is enlarged from any cause it is much more liable to rupture than when of normal size. As in the other organs ruptures may occur in the spleen in any part; they are usually transverse, but not uncommonly are more in the nature of a crush (as in Case 6).

Death after rupture of the spleen occurs at about the same intervals and under the same conditions as after rupture of the liver. One of the most common secondary causes is said to be subdiaphragmatic abscess; and Pollock reports a case of death from subdiaphragmatic abscess and empyema following rupture of the spleen and diaphragm, the result of accident eleven weeks before death.

RUPTURE OF THE PANCREAS.

On account of its deeply seated position it would be natural to suppose that the pancreas would be little liable to injury from external violence. That its position does not entirely protect it is shown in Cases 10 and 11, and that such injuries are not necessarily fatal by Case 22, which was lately at the City Hospital under the care of Dr. H. W. Cushing.

In both Cases 10 and 11 the injury to the pancreas was associated with more severe ones to other organs, and while the amount of hemorrhage from the pancreas is unknown in both cases, it would not appear to be excessive, and it is fair to assume that death was not, in either case, due to the injury to that organ.

In Dr. Cushing's case the amount of hemorrhage must have been slight.

The character of injury to the organ varies in each case. In Case 10 there were "many superficial ruptures and lacerations"; in Case 11 it was "crushed off one inch from its tail"; while in Case 22 the injury, whatever it was, evidently obstructed the outflow of the gland.

Except as it would be modified by the relatively limited blood-supply of the gland, there is no reason why the first effects of pancreatic rupture should differ from similar injuries to other organs.

(To be continued.)

THE FATIGUE OF DEAFNESS.¹

BY CLARENCE J. BLAKE, M.D., BOSTON.

THAT impairment of the hearing power should be an inconvenience is readily understandable; that it may make so large a demand upon the nervous energy as to be a source of fatigue, needs personal experience or observation for its full appreciation.

The investigations of Ogston and others show that the middle ear is usually cleared of its protective cushion of tissue with the first cry, and that the infant is apparently sensitive to sonorous vibrations within a few hours after birth.

The education of the brain through the organ of hearing, therefore, begins at a very early period; and the habitual classification of sounds, in reference to their cause, their indicative importance to the individual, and the location of the sound source, is early assured.

The establishment of a perceptive habit implies provision for the expenditure of nervous energy along a given line, deviation from which necessitates a further expenditure of energy proportionate to the degree of deviation from what was formerly the line of least resistance.

Changes in the tension of the sound-transmitting apparatus of the middle ear and in its sound-transmission incident to disease may so alter or decrease the sounds

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perceived as to make them unfamiliar and needing explanation by a mental process; and the total or even partial abolition of the hearing power of one ear, the other remaining intact, may so far interfere with the ability to appreciate the direction of a sound source, which is one of the habits of normal binaural audition, as to be not only a cause of embarrassment but to make a serious demand upon the nervous energy as well.

To the individual possessed of a reasonably perfect machine, the working limitations incident to possible imperfections in that machine are with difficulty appreciable by any merely mental process, and it is, therefore, only the sufferers themselves or those whose business it is to study imperfections, effect repairs and suggest compensations, that the full cost in expenditure of nervous energy required to overcome an obstacle, either to perception or expression, can be adequately understood.

With the abolition or limitation of one or another of the channels of communication through the human machine, a portion of that nervous energy which is constantly seeking peripheral expression must be expended in the adjustment to the new conditions and the utilization in a compensatory way of other channels of communication.

Given, therefore, a limitation of sight, of hearing, or of tactile sense, an expenditure of energy in what may be termed the conversion of force is required, which evidences itself in the individual as that complex of symptoms to which we give the name of fatigue; and the purpose of this short communication is to direct attention to one form of the mechanism of force conversion, which is evidenced by what may be called the fatigue of deafness.

In view of the fact that the normal ear has very nearly double the amount of hearing power necessary for the ordinary practical uses of every-day life, it is understandable that one-half of the binaural hearing power may be lost without serious inconvenience to the individual; beyond that point of deficiency, however, a distinctly appreciable effort must be made to hear, and, in default of this, a still further effort to gather through other sensory channels such information as may serve to supplement the defective hearing.

The channel which is especially available for this supplementary purpose is that of sight, because through it there may be brought to knowledge the character of the particular mechanical process originating the mode of motion to our appreciation of which we give the name of sound, and the most important illustration of this visual aid to defective hearing is found in the effort to appreciate the sounds of the voice at their true value.

Human speech is made up of a series of vocal sounds, all within a short compass, which are modified, obstructed or terminated by changes of position in the articulating apparatus, to the effects of which we give the name of consonant checks.

A superficial study of these checks shows that some of them are formed in the front, some in the middle and some in the back of the mouth; that they are, with few and slight exceptions, accompanied by a greater or less degree of resonance in the nasal and pharyngeal cavity, and that they vary considerably in the amount of muscular energy required for their production; and furthermore, that the principal distinction to the ear between such consonant sounds as are similar in character is due to the greater or less preponderance of a small number of qualitative overtones.

Further than this we are aware that the consonant sounds which nearly resemble each other, in both force and musical value, are produced by the coördinating operation of very nearly the same sets of muscles, and therefore are accompanied by very nearly the same facial expressions.

Given, therefore, an average case of marked impairment of hearing, the result of a slowly progressive middle-ear disease, the patient will hear most readily the consonant sounds which require most force in their production; these include four explosives—*t*, *d*, *p* and *b*—which very nearly resemble each other in force and tone value; they are, however, formed in the front of the mouth, *p* and *b* being distinctly labial, and *t* and *d* as distinctly formed by the contact of the tip of the tongue with the upper incisors. From the position and formation of these consonants and the necessity for distinguishing between them, it usually ensues that their differentiation makes the first step in that instinctive study of lip reading, which to the appreciably deaf person becomes eventually more or less habitual, and which offers another channel for the expenditure of nervous energy in the effort to see, as well as to hear, the spoken word.

The other consonant sounds having the greatest logographic or force value, *k* and *g*, for instance, are those formed in the back of the mouth, and are accompanied by a lesser degree of recognizable facial expression than the front consonants, while the consonants having the least force value—*f*, *l*, *n*, *m*, for instance—very nearly resemble in the mechanism of their construction the harder consonant sounds of nearly the same musical value.

It thus comes about that the deaf person will, when a soft consonant occurs in a sentence, substitute for it, mentally, the hard consonant sound most nearly resembling it, which would have been heard had it been used. In any given sentence, therefore, there are to the very deaf, though seeing persons, certain consonant sounds which are distinctly heard, others which are imperfectly heard, others which are detected by sight, and still others which are merely inferred.

In high grades of imperfection of hearing, therefore, both the effort to hear and the effort to see combined are inadequate to the presentation to the mind of the complete spoken sentence, since there remain gaps in the array of consonant sounds which must be filled in judiciously from the context, and the completion of the sentence thus presented means the solution of a puzzle and a third demand upon the nervous energy in addition to that required to hear and to see.

In other words, the exercise of the ordinary communication with his fellow men demands of the deaf person the operation of three distinct brain processes to achieve that which is normally accomplished without conscious effort, and the resultant fatigue may be justly estimated as a possibly important factor in many cases of nervous overstrain.

SURGEONS IN ORDINARY TO THE PRINCE OF WALES.—Sir William MacCormac, president of the Royal College of Surgeons, and Alfred Downing Fripp, assistant surgeon to Guy's Hospital, have been appointed surgeons in ordinary to His Royal Highness. Mr. Fripp obtained his licentiate in the Royal College of Surgeons only eight years ago and was but recently appointed assistant surgeon to Guy's Hospital.