it may last only a few months; but, at any rate, it must go; plug it with cotton wool, gutta percha, or amalgam, as you will, its fate is sealed.

Often, however, its course is not so simple; and I may here repeat, I know nothing so much to be dreaded as the total absence of pain, for it leads the patient into supineness, or a false idea of security, from which very serious consequences may arise. Thus, instead of relieving itself by a simple ulcer (gum boil) in the gum, it may set up inflammation in the cheek; the capillaries becoming congested, and breaking down, the effused blood is converted into pus, which may ultimately make its escape, by one or more orifices, through the integuments of the face; and if you pass a probe into such an orifice, you will find it leads directly through the carious socket to the root of the tooth itself.

In the upper jaw, diseases of the roots of molar teeth often originate diseases of the antrum, the lining membrane of which becomes inflamed, and secretes pus to a considerable extent. This may escape daily through the natural opening into the nostril, or force a passage for itself through the outer wall into the cheek.

Repeated attacks of periosteal inflammation also give rise to the formation of bone on the root of the tooth, and to the distressing symptoms familiarly known as rheumatism of the face, facial neuralgia, or tic douloureux—a class of diseases arising from constitutional causes only, happily of very rare occurrence.

Decayed teeth lead also to the formation of tumours in the face, or in the maxillary bones; to large vascular growths on the roots; and to fungoid tumours of the gum.

Abscess of the parotid gland, involving the destruction of branches of the seventh pair of nerves, and consequent paralysis of the face, with permanent deafness, I have also satisfactorily traced to the irritation of a diseased tooth.

Now, all these may result without pain being felt in the tooth or root, or without there being anything more than a slight tenderness to the touch; and the patient will persuade himself, and often the medical man too, that the teeth have no share in producing them. It is surprising how long people of all classes and conditions will cheat themselves and persuade others into this belief. The rich and educated classes will gravely ask you to stop a tooth in a state of acute or chronic inflammation, while the lightest touch of the cleansing instrument is like an electric shock, or while pus is actually exuding from the tooth or the adjacent tissues; and the poor applying at the hospital will, with the cheek freshly blistered, describe their complaint as *rheumatism*, and be sent to the physician, who hands them over to the surgeon; while the latter, ascertaining the locality of the pain, and suspecting the cause, transfers them to the dentist; the patient all the while protesting that "the teeth have nothing at all to do with it."

[To be continued.]

DIPHTHERIA, OR DIPHTHERITE.

By DAVID THOMPSON, Esq., Launceston.

ABOUT three years since, this neighbourhood was visited by an epidemic of this rare disease. The first cases occurred in the town; and no others then appeared for several months, when it again broke out in the district north of this place, where it prevailed for several months; whilst the south side was comparatively free from it. From the north, it gradually spread, until the whole line of country had been visited by it. There appeared to be no difference in the geological nature of the country, the level, or the aspect, in increasing the severity, or granting an immunity from the disease. The premonitory symptoms varied somewhat. A few retired to rest comparatively well, and awoke in the morning with the throat sore, and covered with white deposit. In the majority, it was preceded by all the ordinary symptoms of pyrexia, of which headache was one of the most severe; followed in the course of a day or two by the usual throat symptoms. An extreme feeling of depression, not to be accounted for, by the amount of mischief in the throat, was a characteristic symptom in each case. An external examination of the throat showed the tonsil generally to be swollen, hard, and tender to the touch; while sometimes the parotid gland participated in the swelling. Internally, the tonsil was swollen, and either covered with the diphtheritic deposit, which frequently extended over the pharynx, and sometimes into the nares and palate; or else it would be scooped out into an ulcer, with raised violet coloured edges;

the floor exhibiting a dark ash coloured slough. In some instances there would be no deposit or ulceration at first, but simply the tonsil painful and enlarged. These cases generally changed for a state of ulceration, which began in several distinct spots, and gradually spread over the whole tonsil. In the most severe examples, the tonsil sometimes sloughed *en masse*. I saw one instance in which this occurred, in an early stage of the disease; and where now (two years since it occurred) a cavity remains, capable of containing a pigeon's egg; across the surface of which extends a small band of mucous membrane, which did not slough at the same time, and gives great inconvenience, from retaining the food impacted in the hollow during deglutition.

I have seen no case in which I could detect the extension of the disease into the œsophagus; but in many it has entered into the air-passages, this being the most frequent and most fatal complication. Of 485 cases that came under my own observation, the instances in which the air-passages became involved in the disease amounted to fifteen; and of this number eleven died, the greater number within a few hours after the first symptoms of croupy breathing began. The false membrane formed on the tonsil and pharynx extended into the larynx, trachea, and frequently far into the minute divisions of the bronchi. In one instance, a girl, aged 17, expectorated, within twelve hours after the first symptoms of croup made their appearance, a complete cast of the larynx, trachea, and bronchial tubes, extending to the fifth division of the bronchi; in a few hours afterwards, a fresh membrane formed, and she died from suffocation.

In many instances, I saw numbers of minute casts expectorated from the lungs, while at the same time a stethoscopic examination gave all the symptoms of capillary bronchitis. A gentleman, aged 46, died from this condition of the lungs. His throat was first affected. After a few days, the breathing became impeded, with all the ordinary symptoms of capillary bronchitis in the first stage; the throat continuing to improve. He gradually sank, constantly expectorating casts of the small tubes, precisely similar to the deposit in the trachea.

I kept accurate notes of 125 of the most severe cases, including all the deaths.

	Cases.	Deaths.
Males	55	9
Females	70	4
Totals	125	13

The deaths, with two exceptions, were all below fifteen years of age; and, with two exceptions, were all from affections of the air-passages. In the two who died from other causes than affections of the air-passages, death occurred in one from the sloughing of a blister, applied for three hours to the upper part of the sternum; and in the other from extreme debility remaining after recovery from croup. There was a very remarkable tendency for blistered surfaces to take on unhealthy action; and I frequently saw the irritated surface covered with a deposit, similar to that on the throat.

A strong similarity appears to exist between this disease and scarlet fever—so strong, as almost to lead one to hazard the opinion that it may be a modification of that disease. The following are the reasons for considering so:—

1. Diphtherite prevailed in this neighbourhood as a contagious(?) epidemic at the same time as well marked scarlet fever, and chiefly among children.

2. In the same house, the father and mother had well marked scarlet fever severely, without any ulceration or deposit on the throat; while the three children had all the marked symptoms of diphtherite, without much feverishness and *no* rash, though attended by the same premonitory symptoms. The cases occurring at the same time.

3. In many instances, cases of apparently pure diphtherite were, after some days, attended by a rash, that seldom remained more than a few hours.

4. The disease in most instances commenced with all the symptoms of fever, its duration being similar to that of scarlet.

5. In cases of apparently pure scarlet fever, the throat became, after a few days, covered with diphtheritic deposit.

6. The sequelæ of the two diseases nearly resembled each other. Albuminous urine, with casts, being present in eight cases of diphtherite; and anasarca proving fatal from convulsions in one.

It would occupy too much space to give more than a mere outline of the subject; but future and more extended experience than mine may prove whether there is any connection

between the two diseases. Deafness was a not unfrequent sequela of diphtherite and temporary paralysis; in all instances these were recovered from. I have only known one case of diphtheritic ophthalmia to have occurred in the neighbourhood. In that instance, the deposit extended over the lower half of the conjunctiva.

The treatment most successful was the early and thorough application of lunar caustic to the throat, together with the use of a stimulating gargle of nitrate of potass and capsicum, or solution of chlorinated soda (Beaufoy's) diluted. When there was much feverishness in the early stage, an emetic appeared sometimes to benefit. Mild but continued counter-irritation over the upper part of the chest appeared of great service. General treatment, beyond keeping the secretions regular, was of little use, and frequently injurious. Depletion of any sort did an infinite deal of harm. Stimulants were often required in an early stage. The chances of recovery when croup set in severely were but small. The only chance seemed to be, in the rapid exhibition of small doses of calomel and ipecacuan, with stimulants. Under this treatment, four out of fifteen recovered who were affected with this complication. Tracheotomy was tried, but of no service, as the false membrane extended beyond the trachea.

In a number of the *Lancet* for, I think, the year 1832, there is a most characteristic case described by Dr. Alison, of Edinburgh, as having occurred in the Royal Infirmary, and which terminated, as the fatal cases here did, in croup.

A careful microscopic examination of the white deposit showed nothing different from the usual appearances of exuded lymph.

Abstract of Lectures

ON THE

PHYSIOLOGY OF THE NERVOUS SYSTEM.

DELIVERED AT THE

ROYAL COLLEGE OF SURGEONS.

By E. BROWN-SEQUARD, M.D.

[From Notes by ALEXANDER HENRY, M.D.]

LECTURE I.

THE subject of the lectures will be the manner of transmission of sensitive impressions to the brain; of the transmission of the dictates of the will to the muscles; and of the transmission of influence through the nerves that go to blood vessels. All these kinds of transmission are distinct from each other; and yet they have a reciprocal influence.

Transmission of Sensitive Impressions by the Roots of Nerves. The principal experiment on which Sir Charles Bell founded his doctrine regarding the functions of the different parts of the spinal cord was section of the anterior and of the posterior roots of the spinal nerves. Irritation of the anterior roots was found by him to produce motion in the parts supplied by the nerves, not pain; irritation of the posterior roots, on the other hand, was found to produce pain, not motion; and hence it was inferred that the anterior roots of the nerves are for motion, and the posterior for sensation. The interpretation was apparently right; but the facts are not correctly stated. Irritation of the anterior roots of the nerves does produce pain. But how is the pain produced? It is not because the anterior roots convey sensitive impressions towards the spinal cord and brain; for, if it were so, we should not find what is observed in the following experiment. If we divide the anterior root of a nerve, and irritate the part still connected with the cord, pain is never produced. There is no sensibility in the anterior root; and there is no sensation of pain transmitted from the anterior root to the spinal cord and brain. If we irritate the distal part of the divided root—its peripheral portion—pain is produced, as has been observed by Magendie, Claude Bernard, Schiff, etc. The explanations given of this fact, however, have not been satisfactory. Magendie, for instance, described the pain produced as "retrograde" or "recurrent". But the true cause of the introduction of pain is the following. The anterior root of a nerve goes to muscles: when it is irritated, the muscles contract, producing what is commonly known as cramp. This is a sufficient cause of pain, which will be felt in proportion to the intensity and duration of the crampy contraction. There is no

retrograde sensibility, such as Magendie imagined to exist. The anterior roots are purely motor; and the pain which is produced by irritation of them is dependent on the muscular contractions excited.

The effects of irritating the anterior roots of nerves may be compared with those produced by galvanism. When a muscle is stimulated to contraction, the nerves lying in connexion with it, and passing to other muscles, are irritated. But each muscle consists of a series of muscles, supplied with sensitive as well as with motor nerves; hence, when crampy contractions are produced, these nerves are irritated, and pain is felt. There is in muscular contraction some effect produced very like galvanism; and it is this condition which gives us the ordinary sensation of muscular movement. When there is excessive contraction, there is consequently excessive stimulation of the sensitive nerves. The amount of galvanic discharge which takes place during muscular contraction is in proportion to the resistance which the muscle has to overcome. If a muscle be divided from its tendon, and irritated, little or no galvanic discharge takes place; there is no resistance to overcome, and no sensation. This is what takes place in division of the sphincter ani; the resistance being removed, the galvanic discharge—or whatever it be that much resembles it—is also removed, and the pain is destroyed.

With regard to the function of the posterior roots, there has been an objection raised to Sir Charles Bell's doctrine; which, however, may be readily put aside. If we divide the posterior root of a nerve, and irritate the part furthest from the cord, no muscular movement is produced. No experiments are known which prove the contrary; although some have imagined that they have seen the muscles contract after irritating the peripheral part of a divided sensory root. If we irritate the part of the root attached to the cord, movements take place; but these are of a secondary or reflex character.

What are the Channels by which Sensitive Impressions are conveyed to the Brain? Sir Charles Bell ascribed this function to the posterior columns of the spinal cord. But in 1836 he changed his view—a fact not generally known; and said that a better explanation had to be sought. The posterior columns of the cord pass almost entirely into the cerebellum; this organ, then, should be capable either of producing or of transmitting sensitive impressions. But Sir Charles Bell well knew that the cerebellum is often diseased or injured without any loss or diminution of sensibility; and therefore, finding that the view of transmission of sensation by the posterior columns could not be supported, he was led, on anatomical grounds, to ascribe this function to the lateral columns. There is an experiment, however, which consists in the transverse division of the lateral columns. If they alone conveyed sensation, the animal should be paralysed of sensibility; but this does not happen. Previous observers found this; but they did not notice another fact—namely, that in dividing the lateral columns, sensibility is often greatly increased in the distal parts of that side on which the division has been made. The lateral columns have been divided in two rabbits—in one more deeply than in the other. The more deeply the division is carried, to a certain limit, the greater is the hyperæsthesia. If the hind foot of one of these rabbits be pinched on the side where the division has been made, the animal cries out; now, rabbits never cry out when pinched, except there be hyperæsthesia.

The preceding observations prove that the posterior columns are not the only channels by which sensitive impressions are conveyed. Another experiment, however, is more decisive. If the whole spinal cord except the posterior columns be cut through, sensation is entirely lost, so that no pain can be produced by pinching, galvanism, or any other means. This is a decisive experiment; but some Germans have made contradictory statements regarding it. If the parts at a distance from the section be irritated, there is no pain; if the parts near the section be irritated, pain is produced. The explanation lies in the fact, that the fibres of the posterior roots pass a short way up the cord in the posterior columns, and then enter the grey matter. The parts, therefore, at a distance—the nerves of which pass into the grey matter below the division of the cord—are paralysed of sensation. If a second similar division of the cord be made at some point above the former one, the parts in the neighbourhood of the lower section will be deprived of sensibility.

Why, if experiments are so clear, has it occurred that Longet, a very able experimenter, has held that the grey matter cannot be the conductor of sensitive impressions? The explanation lies in his having overlooked an important distinction. There