violent arterial haemorrhage took place that the patient collapsed. The bleeding artery had retracted far up behind the angle of the jaw, and spouting into the enormous cavity left by the removal of the tumour, filled it with a churn of blood and foam. Dr. Sackville Martin, who was assisting, managed to secure the vessel, but not before the patient was practically bloodless. The wound was then closed and drained and the patient given large quantities of isotonic saline by the rectum. She made an uninterrupted recovery.

ADHESIONS.

During the time that a thyroid tumour is undergoing cystic degeneration two changes are concurrently taking place in the cyst wall. 1. Scaly deposits of calcareous material gradually line the inside of the cavity, which may be filled with a clear or light brown fluid, perhaps containing oily globules, or with a sterile substance in appearance like oily pus, or more rarely with a gluey fluid, which is probably changed colloid. These deposits render the walls rigid, and difficult to manipulate. 2. The cyst wall, stimulated to a slow inflammatory activity by this deposit of insoluble and irritating salts, begins gradually to form adhesions with surrounding structures. As the tumour grows the muscles of the neck are stretched out in thin layers upon its surface, to which they adhere, gradually becoming part of the cyst wall. The great vessels of the neck, especially the internal jugular, also become adherent, and before long the vein, if not actually calcareous, becomes so brittle that any attempt to dissect it away from the tumour almost certainly results in a tear. In time the oesophagus, trachea, vertebrae, and even the dome of the pleura, also suffer. The following case very adequately illustrates these difficulties:

A gentleman, aged 52, a patient of Dr. Sephton, of Culcheth, was operated on in January, 1909. Eighteen months previously a left-sided thyroid tumour of twenty-five years' standing had begun rapidly to enlarge, giving rise to very warrantable suspicions of malignancy. The patient had been advised against operation, for he was stout and plethoric, with intermittent action of the heart, but the pain became so constant and the pressure symptoms of dyspnoea and dysphagia so urgent that surgical interference was a matter of necessity. Under eucaine-morphine-adrenalin anaesthesia the growth was exposed by a long incision from the mastoid process to the sterno-clavicular joint. The muscles were indistinguishable one from another and cut like raw ham, which they much resembled in texture and appearance. No sooner had the deep aspect of the cyst been reached by an exploring finger than it burst, flooding the wound with about a pint of curdy yellow fluid mixed with drops of oil. The patient then vomited a quantity of the same material through an opening into the oesophagus. This opening was closed by a single suture of chromic gut. The cyst wall was adherent to the vertebrae, the oesophagus, the trachea, the angle of the jaw, and the clavicle. It was dissected away piecemeal amid much haemorrhage, which fortunately was easily controlled by Dr. Auden, who was assisting. A portion of the wall, deep behind the clavicle, had to be left. It was probably adherent to the dome of the pleura, as it rose and fell with respiration. Four long-handled artery forceps had to be left on vessels situated too deeply behind the sternum to be ligatured. These were removed in forty-eight hours. The patient made an excellent recovery, and is now in the best of health.

TECHNIQUE.

Certain practical points may briefly be touched upon. Kocher's "collar incision," while excellent in many ways and giving good cosmetic results, does not allow of a sufficiently wide field of manipulation in difficult cases. I find it useful to prolong the ends of the incision upwards for a couple of inches towards the angle of the jaw, thus permitting the all-important superior thyroid vessels to be secured at an early stage.

The material chosen for a ligature is a matter of personal predilection. Kocher uses and recommends silk for all aseptic surgical work, and especially for thyroidectomy; English and American surgeons prefer catgut; but ordinary Irish linen thread, well boiled and stored in an alcoholic solution of phenol, provides a cheap and trustworthy ligature. I have used linen thread very extensively in general surgical work, and have had no reason to regret the choice. For the radical cure of hernia it is, I may mention in passing, perhaps the ideal material.

The question of anaesthesia has been settled by the almost unanimous preference of surgeons for local infiltration methods. The use of the weak eucaine-adrenalin solution recommended by Mr. Barker gives perfect results

from the point of view of the surgeon, and, if preceded by an injection of scopalamine-morphine, from the point of view of the patient also. I have never seen post-operative vomiting in cases in which scopalamine-morphine had been used either alone or together with a local or general anaesthetic.

The preparation of the field of operation is a matter of the utmost importance. The skin of patients with bronchocele is usually so tender that irritating lotions and dressings must be rigidly eschewed. Mercurial preparations in particular are to be avoided. A boric fomentation the night before operation, another in the morning, and a light washing of the skin with 1 in 40 alcoholic solution of phenol immediately before the incision is made will be found to give the best aseptic results. The wound is dressed with sterile xeroform or iodoform gauze. Cases so treated and not requiring drainage have invariably healed under one dressing.

ON THE CAUSES DETERMINING THE PRODUCTION AND DISTRIBUTION OF THE ERUPTION IN TYPHOID FEVER.

By J. P. H. GREENHALGH, M.D., CH.B.MANCH.,
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ACCORDING to Jenner,¹ the eruption in typhoid fever "is due apparently to an increased flow of blood only to detached points, and rupture of the vessels at these points never occurs." The typhoid bacillus has been demonstrated in the spots since the above was written, but there is little else to add.

In the eruptive fevers which are primarily infections of the blood, the eruption is distributed over the whole or greater part of the body. In typhoid fever, which is not primarily an infection of the blood, but has definite anatomical lesions, the eruption is confined with conspicuous regularity to that area of skin which is in direct communication, by means of nerve fibres, with the foci of infection—namely, the small intestine and its lymphatic glands, and the spleen.

The small intestine is innervated by branches from the superior mesenteric, and the spleen by branches from the coeliac plexuses, both of which are direct continuations of the solar plexus. The solar plexus receives the great splanchnic nerves, which take origin from the thoracic ganglia of the sympathetic included between the sixth and the tenth; and the coeliac plexus receives the lesser splanchnic nerves, which take origin from the tenth and eleventh thoracic ganglia, and a portion of the smallest splanchnic nerve, which takes origin from the twelfth thoracic ganglion. The great and lesser splanchnic nerves also have intercommunicating fibres in the thorax.

The thoracic ganglia giving origin to the splanchnic nerves communicate, by means of both afferent and efferent fibres, with the sixth to the twelfth dorsal spinal nerves; and these spinal nerves supply a segment of the body bounded above by a quasi-horizontal line encircling the chest a little below the level of the nipples, and below by a similar line a little above the level of the brim of the false pelvis. The area enclosed by these two lines represents the area to which the eruption in typhoid is, as a rule, confined.

Dr. W. H. Gaskell² has shown that the outflow of visceral nerves from the central nervous system into the sympathetic system takes place by means of the white rami communicantes. Each white ramus contains also the afferent fibres for impulses passing from the viscera by way of the sympathetic.³ The late Professor Ross,⁴ Drs. Head,⁵ Mackenzie,⁶ and others have shown that afferent impulses arising from disordered viscera excite sensations which are referred to the sensory terminations of the spinal nerve or nerves directly in relation with the spinal cells receiving such impulses; and Dr. Head has mapped out the cutaneous areas in which referred pain is felt, by means of a study of cases of herpes zoster. The skin areas in which the herpetic eruption appeared were found by him to coincide with the areas which have increased sensibility to pain in visceral disease.

The cutaneous area which Dr. Head found was associated with disorder of the intestines is that supplied by

the ninth to the twelfth dorsal nerves inclusive. He determined this association on clinical grounds, but experimental inquiry into the motor nerve supply of the intestine bears out his conclusion. In the dog, inhibitory fibres for the small intestine have been found in the sixth dorsal to the first lumbar nerves inclusive, and principally in the ninth to the twelfth dorsal⁷; and vasomotor fibres in the sixth dorsal to the second lumbar nerves inclusive.⁸

Dr. Head has not described a tender area in relation with the spleen; but, by virtue of its position, it probably has the same as that assigned by him to the stomach—namely, the area supplied by the sixth to the ninth dorsal nerves inclusive. The extent of its motor innervation, derived principally from the sixth to the eighth dorsal nerves inclusive,⁹ supports that view.

Thus, the skin area having the same innervation as the small intestine and spleen coincides with the area to which the eruption in typhoid is, as a rule, confined. For convenience of reference this area will be called *the reflex zone*.

The phenomena in the reflex zone are different from those which Dr. Head has described in his areas of referred visceral pain. In these, increased sensibility for painful stimuli is always present, which is not so in the reflex zone of typhoid. I have found that moderate pressure of one or both points of a pair of dividers on the skin of the abdomen in typhoid is often not felt at all; the pressure having to be increased considerably to excite a definite perception of contact. In only 2 of 23 cases was any feeling of pain caused by this experiment. In his areas, Dr. Head did not find any alteration in sensibility for touch; but in the reflex zone of typhoid I have found that sensibility for touch is diminished. To determine this, I have estimated the liminal distance for touch, according to Weber's method, in 23 cases of typhoid fever in the eruptive stage—(a) within the reflex zone; (b) outside the reflex zone. The results were controlled by similar observations on the same number of patients, selected to conform to the typhoid patients in point of age, duration of illness, and height of fever, but suffering from other diseases. Care was taken to exclude from both groups cases showing hysteria, pain, high fever, delirium, or other state which would discount the value of the aesthesiometric observations. The intrazonal measurements of the liminal distance were taken on the skin over the abdomen, within a radius of 3 in. from the umbilicus; the extrazonal measurements on the inside of the thigh, 3 in. above the level of the knee-joint. The former area is within the distribution of the sensory fibres of the ninth, tenth, and eleventh dorsal nerves, and the latter within that of the fourth lumbar nerve. The area supplied by the fourth lumbar nerve is included in Dr. Head's "lower gap," which is not affected in disorder of the viscera.

In Dr. Head's areas, the superficial reflexes normally present are always increased; but in typhoid I have found the superficial reflexes in the reflex zone often diminished, or absent, during the eruptive stage of the fever. Of 27 cases examined on this point, the epigastric reflex was diminished or absent in 21, and the abdominal reflex in the same number.

In the accompanying table the diminution of tactile sensibility in the reflex zone of typhoid is expressed in terms of the increase (1.6 cm.) in the liminal distance for touch in that area, over the liminal distance for touch in the same area in other diseases. The equivalence of the liminal distances in the extra-zonal area in the two groups of cases goes to show that general diminution of cutaneous sensibility for touch is not more characteristic of typhoid than of other febrile diseases. [That the percentages

relating to the state of the reflexes in the two groups are in inverse proportion is entirely a coincidence.]

The tonus of skeletal muscle innervated from the spinal level of the reflex zone appears to be diminished. Resistance to abdominal palpation is not usual in typhoid, and I regard the fullness of the abdomen seen in ordinary cases as partly due to loss of tonus in the muscles of the anterior abdominal wall. Cognately, these muscles are those most often affected by Zenkerian degeneration.

Impaired nerve control in this area is shown by other signs. Professor Osler has observed lines of atrophy, like those of pregnancy, in the skin of the abdomen in typhoid; and regards them as being of neuritic origin. Sacral bed-sores occur more frequently in typhoid than in other diseases—nervous excepted—where the patient remains on the back for the same length of time. After laparotomy for perforating ulcer of the intestine, suppuration at the site of the incision often occurs; the wound shows a tardy disposition to heal; and a hernia is sometimes formed.¹⁰ Typhoid spine, which Professor Osler regards as a neurosis, usually implicates the lower dorsal region.

Dr. Mackenzie¹¹ has pointed out that the pilomotor nerves, over areas of skin corresponding to Dr. Head's painful areas, are rendered abnormally sensitive by visceral disease; a goose-skin reflex is more readily brought about than in health. The uncovering of a patient's abdomen, and the application of a hand often colder than the patient's skin, are likely to excite the pilomotor reflex; but in the few cases of typhoid fever in which my attention was directed to this point, the reflex was not observed.

The loss of vascular tone in the skin of the reflex zone is striking. In the pre-eruptive stage of the fever, the skin of the abdomen is often uniformly flushed (Jenner, Dreschfeld, Professor Osler). Marey's sign—the *tache cérébrale*—is always vivid in typhoid fever, especially on the abdomen; and I have come to look upon the *tache cérébrale*, and the diminution or absence of the epigastric and abdominal reflexes, as signs of decided value in the clinical diagnosis.

The long latent period, persistence, and slowness in fading of the *tache cérébrale* point to its being a vaso-dilator reflex: one may assume that the tonic influence of the vaso-constrictors is in abeyance, and that these nerves suffer the same depression in function as the pilomotors, nerves for touch, and nerves supplying the muscles of the abdominal wall.

Some other considerations support this view:

(a) The vaso-constrictors follow the same course as the pilomotors, and innervate similar histological elements; it is, therefore, not unreasonable to suppose them similarly affected.

(b) The pre-eruptive flush and the branny desquamation sometimes seen over the chest and abdomen during defervescence are signs of vasomotor and trophic disturbance.

(c) Perspiration, and the eruption of sudamina, are frequently confined to the abdomen and chest. The secretion of sweat is brought about directly, by the passage of an increased volume of blood through the sweat glands; and unless it be that the sweat-secreting nerves are specially active—an assumption which has nothing in its favour, and which the prevailing state of neural tonus opposes—the eruption of sudamina in the reflex zone is a result of local hyperaemia.

(d) Dicrotism of the pulse is very common in typhoid. Curschmann¹² states that it is more common in typhoid than in all the other infectious fevers combined, and is a valuable diagnostic sign. The fall in arterial tension

Table of Observations.

	Average.			Abdominal Reflex.		Epigastric Reflex.			Average Liminal Distance.	
	Age.	Day of Disease.	Tempera- ture.	Normal.	Diminished or Absent.	Normal.	Diminished or Absent.		Intra- zonal.	Extra- zonal.
				Per cent.	Per cent.	Per cent.	Per cent.			
1. Typhoid (27 cases) ...	21.9 years	15 9	101 9°	22.2	77.7	22.2	77.7	23 cases	5.64 cm.	3.74 cm.
2. Other febrile diseases (27 cases)	21.6 years	12.6	102.4°	77.7	22.2	77.7	22.2	23 cases	4.01 cm.	3.70 cm.

which it denotes is probably due to reflex paresis of the splanchnic vaso-constrictors in the abdominal cavity.

(e) The frontal headache of ingravescens typhoid is not referred intestinal pain. Dr. Head has found that frontal headache of visceral origin arises from disorder of thoracic viscera, and he does not mention the headache of typhoid in his enumeration of visceral headaches and other pains referred to the distribution of the cranial nerves. The frequent occurrence of epistaxis during the onset of the fever suggests that the headache is congestive; and its automatic subsidence in the second week of the fever agrees in point of time with the appearance of diuresis in the pulse.

The *tache cérébrale* reaches its greatest intensity about the beginning of the second week, and continues in that phase during the eruptive period. As the rose spots cease to appear, the *tache cérébrale* becomes less vivid; during the decline of the fever it tends to disappear. It can, however, often be elicited in a modified degree after the temperature has become normal.

In his Croonian Lectures,¹³ Dr. Cayley says that he has "long looked on the persistence of the *tache cérébrale* as indicating that the intestinal lesions have not yet healed;" which is tantamount to what I wish to maintain—that the inhibition of the vaso-constrictor and other nerves in the reflex zone in typhoid fever is due to the reflex incidence on them of specific impulses originating in the small intestine, mesenteric glands, and spleen. The bearing of this proposition on the production of the rose spots may be briefly discussed.

The rose spots do not appear until the depression of the vaso-constrictor fibres has become well established, and the specific agglutinins in the blood have become demonstrable by the Gruber-Widal reaction. As the arterioles relax, the blood pressure in the terminal capillaries becomes increased, and the circulation retarded. It is also possible that, the endothelial cells of the capillaries being weakened by the depression in function of their intrinsic nerves, the increase in blood pressure brings about some passive dilatation.

The influx of a greater volume of blood to the skin in the reflex zone brings a correspondingly greater number of bacilli to the cutaneous capillaries, where the sluggish flow of blood, and the impaired resistance of the endothelial cells, permit them to loiter in the capillary network. There they are joined by others; the agglomeration being due partly to the inherent tendency of the bacilli to compose themselves into groups whenever possible, but chiefly to the clumping power of the blood as the agglutinins come to be liberated therein. The assembly of bacilli thus formed sets up inflammation, which becomes visible as the circular, slightly raised rose spot, fading on pressure. Bacteriolysins continue the work begun by the agglutinins, and, in a little time, the assembled bacilli are devitalized, dispersed, and disintegrated; the point of inflammation subsides, and the rose spot fades.

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THE American Association for the Study and Prevention of Infant Mortality, organized at the convention recently held in New Haven, Connecticut, has established permanent headquarters at the Medical and Surgical Faculty Building in Baltimore, where it will begin active work. We learn from the *Boston Medical and Surgical Journal* that the president of the association is Dr. J. H. M. Knox, of Baltimore. Dr. William H. Welch, of Baltimore, is chairman of the section on federal, State, and municipal prevention; Dr. L. Emmet Holt, of New York, chairman of the medical section; Dr. Helen C. Putnam, of Providence, of the educational section; and Dr. Hastings H. Hart of the section on philanthropic prevention. Membership in the association is not limited to doctors, but will be open to teachers, publicists, philanthropists, and sociologists.

A NOTE ON THE VALUE OF BALL'S OPERATION FOR PRURITUS ANI.

By PATRICK LEIGHTON, M.D.,

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I VENTURE to record the following two cases, on which I operated this year, as since endless remedies have been tried for this horrid affection none are a certain cure.

Before recommending the operation devised by Ball, I take it for granted that any local cause has been excluded, such as eczema, paralysis, etc. It is just those cases, as we all know, where we can find no local cause, that are the most difficult to cure. I am aware that there are some surgeons who maintain that there is a cause in every case, and that we have overlooked it in our examination.

The malady is looked on as a neurosis, and the interesting point is that if we give the nerve terminations in the skin a rest by dividing the trunks, the vicious circle is broken, and the itching does not come back even after sensation is re-established.

Some authors state that the operation should not be lightly undertaken, and it is to encourage other men in general practice like myself to cure their patients by it that this note is written.

The two main complications that may follow the operation are sloughing of the flaps and sepsis. The first may with care be avoided; the second is difficult to prevent, but does not in any way interfere with the result.

The cases were prepared as for a pile operation. The first came into hospital four days, and the second two days, before operation. Frequent bathing of the anal region in weak Jeyes' fluid was used in both cases. The parts were shaved, and 2 grains of opium given the night before. The rectum was washed out with boric lotion the following morning. In Case II there were some cracks and excoriations which I think had something to do with the sepsis that followed, even though pure carbolic acid was applied to them when the patient was on the table. Sir Charles Ball's method was followed, as is described in his book on the rectum.

The following details seemed to be of value:

(a) After putting the patient in the exaggerated lithotomy position, the covering of the table was folded so as to raise the pelvis, the end of the table being also a little raised. This position was a great help in undercutting the posterior pedicle (the only difficult part of the operation).

(b) A plug of gauze on a string in the rectum to prevent soiling if the patient strained, as they both did, the anaesthetic, C.E., being badly taken by both.

(c) In cutting the flaps care should be taken to include a layer of subcutaneous tissue in order to ensure the vitality of the skin, and thus avoid sloughing; button-holing the anal canal leading to fistula is also avoided. The sutures of fishing gut were left long and twisted in a bunch on each side to prevent pricking.

The dressing was cyanide gauze. I intend in my next case to use a picric acid dressing to dry up the skin, as I am sure the moisture of the region encourages sepsis. The bowels were kept confined for four days, and not much food given.

In one case the wounds healed by first intention, the sutures were taken out in a week, and at the end of a fortnight he was able to sit. Considerable ecchymosis appeared on the third day over both buttocks, but in no way interfered with the healing. In the second case suppuration occurred in both wounds, but was healed in three weeks.

Both were men about 40 years of age, and the itching had persisted for three years. One had had his sphincter overstretched, with no benefit. They were unable to sleep at night, and were looking wretched in consequence.

One man is a harness maker, of a very placid disposition; the other has a good position in a bank, as well as being a tenor of no mean ability, but, like many tenors, very neurotic. He was losing his memory and completely demoralized by his complaint.

The result in both cases was more than gratifying—immediate relief. The second patient told me that the night after the operation was the first peaceful one he had