any French statistical data, but the best proof of the benignity of the symptom is that none of the old authors, speaking of vicarious gastric haemorrhage, ever considered it to be a very serious matter.

As regards treatment we have to distinguish the treatment of the condition and the treatment of the symptom. The treatment is surgical or medical. Neither Sir Berkeley Moynihan nor Lord Dawson recognizes any marked improvement due to operation, but Professor Duval's patients grew very much better. A curious explanation was offered. It was said that his incision happened to cut across a small ulcer which was afterwards stitched up without being recognized! It is difficult to admit the explanation in one case, and in two cases it is impossible. It has also been suggested that a long cut through the stomach wall produces enervation of the stomach—the operation of Latarjet.

This might be admitted, and as a matter of fact in one of Latarjet's cases the patient, who suffered from haematemesis, was cured after gastric enervation. We might accept as a working rule in practice that if x-rays do not give any definite information no operation is justified, at any rate in our present state of knowledge. Furthermore, a patient who has had a severe haemorrhage is in poor condition to stand the shock of any operation.

The medical treatment, as has been shown by Sir William Willcox, consists primarily in complete rest. Dr. Hurst gives a striking statistical table showing the low mortality of the condition. As the question has been exhaustively discussed in this house this very month, it seems useless to insist. I am only sorry that hydrologists did not have a word to say as regards preventive treatment. This side of the question might be the object of some interesting remarks.

CONCURRENT VICIOUS CIRCLES.

BY

JAMIESON B. HURRY, M.A., M.D.,

READING.

THE morbid process known as the vicious circle, or *circulus vitiosus*, is widely recognized as playing a role of fundamental importance in pathology. It leads to the aggravation of disease, to the destruction of organs, and frequently to a lethal exitus. Recent medical literature abounds in references to this process, which frequently elucidates obscure phenomena in disease, and permits of more rational therapeutics.

Medical writers, however, usually confine their attention to some single and isolated operation of this circular

process in any disorder under consideration. Thus they may draw attention to the reciprocal interaction of anaemia and disordered haemopoiesis, of anoxaemia and exhaustion of the respiratory centre, of varicose veins and thinning of the vein wall, of gastroparesis and kinking of the duodenum, of retroversion of the gravid uterus and retention of urine, of glaucoma and blocking of the filtration angle, etc. As a rule, however, such succinct statements only represent one out of a series of concurrent reciprocally acting factors; the processes of disease are much more complex than such summary sentences might indicate. In truth there are usually numerous simultaneous circles which unite in perpetuating the evil and frequently convert what would otherwise be a simple and self-limiting disorder into a grave and complicated one. As a stream

Cardiac failure may involve—

1. Impaired coronary circulation	→	Anaemia of myocardium	→	Weakened systole	→	Cardiac failure.
2. Pulmonary congestion	→	Anoxaemia	→	Enfeebled myocardium	→	Cardiac failure.
3. Bronchitis	→	Paroxysms of coughing	→	Enfeebled myocardium	→	Cardiac failure.
4. Venous stasis	→	Hepatic congestion	→	Malnutrition of myocardium	→	Cardiac failure.
5. Gastritis	→	Fermentation and flatulence	→	Embarrassed cardiac action	→	Cardiac failure.
6. Nephritis	→	Ascites	→	Embarrassed cardiac action	→	Cardiac failure.
7. Arrhythmia	→	Retarded circulation	→	Malnutrition of myocardium	→	Cardiac failure.
8. Anoxaemia of bulb	→	Peripheral vaso-constriction	→	Increased cardiac effort	→	Cardiac failure.
9. Auricular fibrillation	→	Lowered blood pressure	→	Malnutrition of myocardium	→	Cardiac failure.
10. Tachycardia	→	Lowered blood pressure	→	Malnutrition of myocardium	→	Cardiac failure.
11. Persistent palpitation	→	Anxiety neurosis	→	Insomnia	→	Cardiac failure.
12. Restricted exercise	→	Obesity	→	Increased cardiac effort	→	Cardiac failure.

I. Cardiac Failure.

Pulmonary tuberculosis may involve—

1. Cough	→	Loss of sleep	→	Lowered resistance	→	Pulmonary tuberculosis.
2. Cough	→	Dispersal of bacilli	→	Infection of fresh foci	→	Pulmonary tuberculosis.
3. Haemoptysis	→	Blood pressure raised by anxiety	→	Renewal of haemoptysis	→	Pulmonary tuberculosis.
4. Haemoptysis	→	Anaemia	→	Lowered resistance	→	Pulmonary tuberculosis.
5. Pyrexia	→	Emaciation	→	Lowered resistance	→	Pulmonary tuberculosis.
6. Pyrexia	→	Dryness of mouth	→	Anorexia	→	Pulmonary tuberculosis.
7. Formation of cavities	→	Mixed infection	→	Suppuration	→	Pulmonary tuberculosis.
8. Absorption of toxins	→	Retarded haemopoiesis	→	Lowered resistance	→	Pulmonary tuberculosis.
9. Tuberculous laryngitis	→	Dysphagia	→	Emaciation	→	Pulmonary tuberculosis.
10. Hyperhidrosis	→	Physical discomfort	→	Restriction of exercise	→	Pulmonary tuberculosis.
11. Loss of strength	→	Unemployment	→	Malnutrition	→	Pulmonary tuberculosis.

II. Pulmonary Tuberculosis.

Obesity may involve—

1. Extra demands on heart	→	Cardiac hypertrophy and dilatation	→	Restricted exercise	→	Obesity.
2. Deposit of fat in mediastinum	→	Weakened respiratory activity	→	Retarded oxygenation	→	Obesity.
3. Deposit of fat in liver	→	Hepatic enlargement	→	Loss of active habits	→	Obesity.
4. Deposit of fat in mesentery	→	Sluggish peristalsis	→	Excessive absorption from ingesta	→	Obesity.
5. Hypothyroidism	→	Low basal metabolism	→	Diminished katabolism	→	Obesity.
6. Sense of exhaustion	→	Boulimia	→	Overnutrition	→	Obesity.
7. Muscular weakness	→	Restricted exercise	→	Saving of calories	→	Obesity.
8. Increased somnolence	→	Increased hours of sleep	→	Saving of calories	→	Obesity.
9. Tendency to hyperhidrosis	→	Physical discomfort	→	Restricted exercise	→	Obesity.
10. Increased body weight	→	Tendency to flat-foot	→	Restricted exercise	→	Obesity.
11. Diminished energy	→	Self-indulgent habits	→	Restricted exercise	→	Obesity.

III. Obesity.

Constipation may involve—

1. Absorption of water from faeces	→	Formation of scybala	→	Dyschezia	→	Constipation.
2. Dilatation of rectum	→	Weakness of muscles of rectum	→	Dyschezia	→	Constipation.
3. Anorexia	→	Diminished ingesta	→	Diminution of faecal matters	→	Constipation.
4. Haemorrhoids	→	Painful defaecation	→	Postponement of defaecation	→	Constipation.
5. Fissure of anus	→	Painful defaecation	→	Postponement of defaecation	→	Constipation.
6. Loading of colon	→	Coloptosis	→	Dyschezia	→	Constipation.
7. Loading of sigmoid	→	Kinking of sigmoid	→	Dyschezia	→	Constipation.
8. Formation of rectal diverticula	→	Obstruction of rectum	→	Dyschezia	→	Constipation.
9. Restricted exercise	→	Weakened peristalsis	→	Dyschezia	→	Constipation.
10. Irritation of intestinal mucosa	→	Spasm of intestinal walls	→	Arrest of faeces	→	Constipation.
11. Absorption of toxins	→	Weakening of intestinal muscles	→	Arrest of faeces	→	Constipation.
12. Coprolith	→	Defective action of levator ani	→	Dyschezia	→	Constipation.
13. Absorption of toxins	→	Hypothyroidism	→	Myxoedematous infiltration of intestine	→	Constipation.
14. Anxiety neurosis	→	Perversion of mechanism of defaecation	→	Dyschezia	→	Constipation.
15. Anxiety neurosis	→	Resort to quack remedy	→	Irritation of intestinal mucosa	→	Constipation.

IV. Habitual Constipation.

increases in strength, *ceteris paribus*, with the number of its affluents, so do simultaneous and concurrent *circuli vitiosi* exert a cumulatively potent effect. The result of such concurrence may often be observed both at the bedside and on the *post-mortem* table; indeed, a large proportion of deaths are the direct consequence of such cumulative action. The analysis of a few disorders may emphasize this aspect of disease; the procedure once understood can

Concurrent Circles in Cardiac Failure.

readily be applied in other conditions. We shall select as illustrations:

- (1) Cardiac failure.
- (2) Pulmonary tuberculosis.
- (3) Obesity.
- (4) Habitual constipation.*

A tabular arrangement will give the most complete survey of the morbid processes in operation, although the graphic representation of the circular process will leave a more durable impress on the memory than printed words can do.

Such tabular statements allow the best panoramic survey of the hostile forces that have been mobilized; and yet they do not reveal all the intricacies of disease. Each of the injurious reactions may in its turn give birth to other circling eddies or raging whirlpools. Such is the result of

* Fuller details of these reciprocally acting processes will be found in *Vicious Circles in Disease*, by J. B. H.

the intimate and far-reaching correlations existing in highly specialized organisms.

But a still more impressive, because more living, representation of the subtle interrelationships is secured by actually depicting the circular process, as has been done in the two accompanying diagrams. The limitations of space and of typography forbid an exhibition of the entire series of complications, but a sufficient number have been given

Concurrent Circles in Habitual Constipation.

to illustrate the principle. Any reader can, on a larger page, supplement the list.

There are many disorders that can be studied by this method, and it will be found a profitable exercise to resolve them into their constituent circular processes. Neurasthenia, Graves's disease, dyspepsia, and anaemia may be suggested as eminently suitable for the purpose.

Happily the circular processes mentioned above are never simultaneously present. The alert physician, however, will be on the look-out for their development and be prepared to adapt his therapeutics accordingly.

From the dawn of medicine the primary reactions of a disorder have absorbed universal attention, while the reciprocal influence of those reactions on the primary disorder have, *mirabile dictu*, been almost wholly neglected; and yet such influence may be of immeasurable import as regards the evolution, the progress, and the termination of disease.

THE X-RAY TREATMENT OF HYPERTHYROIDISM.

BY

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As a radiologist with over fourteen years' continuous clinical experience in the x-ray treatment of hyperthyroidism, I can bear witness to the undoubted value of x rays in this condition.

By the term "hyperthyroidism" I mean all types of thyroid activity in which there is excessive or disordered thyroidal secretion. The term therefore includes a simple mild hyperthyroidism without any macroscopic enlargement of the gland, up to an acute and severe hyperthyroidism with all the accompanying physical evidences and symptoms of Graves's disease. Three out of every four female patients in whom the disease has not lasted long enough to produce myocardial degeneration recover their general health and good functional activity of the gland; I stress the word "female" because in my experience males do not as a general rule respond so readily to the treatment. In some cases which fail to respond to radiation I believe other endocrine glands are probably involved; it is in any case wise to include the area of the thymus gland in the field of radiation. The intimate association of the ovarian and thyroidal functions is well known; and it is interesting to learn that Dr. C. M. Wilson and Mr. A. W. Bourne of London found speedy relief of symptoms

from x-ray applications to the thyroid in women suffering from so-called functional menorrhagia—that is, a type of menorrhagia in which there were no pelvic signs to account for the loss and which cases generally resisted curettage or other treatment.¹

I have found determination of the basal metabolic rate useful in the diagnosis of doubtful cases of hyperthyroidism, and I do not advocate the radiation of doubtful cases unless the basal metabolic rate has been carefully estimated and is definitely in favour of the condition being one of hyperthyroidism. It is also useful as a guide to the progress of a case, and should be more systematically undertaken.

Although the enlarged thyroid gland may not be reduced in size by radiation, and although the exophthalmos frequently remains, the pulse rate becomes slower, and the breathlessness, tremors, excessive perspiration, sleeplessness, and the general malaise gradually disappear and the patient gains in weight. The weight goes up as the pulse comes down, and a careful record of these factors serves as a practical guide to progress.

I was recently astonished to read Mr. A. J. Walton's statement: "I have no evidence that x rays can overcome hyperthyroidism even to the point of myxoedema, as is sometimes claimed; but, on the other hand, I have never found that it makes a future operation more difficult on account of the fibrosis. If I had evidence that it produced any fibrosis I should believe that it would control the hyperthyroidism." I welcome his statement that he has not found operative treatment rendered more difficult by