porary relief from their complaints. It is quite true that many persons with delicately poised nervous systems are greatly benefited by the correction of very low degrees of astigmatism, since any attempt to abandon their glasses leads promptly to a return of their headaches, but I am convinced that in others the glasses afford relief by a species of suggestion, precisely as they would be relieved by the mummeries of a bonesetter, a "Christian Scientist," or Osteopath. As an illustration of this class of patients I recall the history of a patient, referred to me by Dr. H. C. Wood, who displayed marked reflex phenomena apparently due to eye strain. She had a nearly emmetropic right eye and a significant degree of astigmatism in the left which I sought carefully to correct. During one of her consultations in which she had made the most of her symptoms, she claimed such a dread of light that she could not bear to look at the table of test letters. This I knew was not true, and simply directed her positively to open her eyes and look at the letters, that there was no sufficient reason for her not doing so. She obeyed at once, and the subjective examination was made without further difficulty. This over, she took a chair near me as I sat at my desk to write a prescription for glasses. She placed herself on the very edge of the chair, sat erect while a tense expression came into her face, a far-away look in her eyes. Her fingers were clenched tightly into the palms of her hands, every muscle was tightly fixed, and she said, "Doctor! don't you think it would be a good thing to send me away from home on a journey? somewhere! anywhere! I am oppressed, I am stifled at home. My husband is an excellent man, but plain, stolid and matter-of-fact. He can't comprehend me. I am not like other women. I am like a delicate, tightly-strung harp, the vibrations of every string causing the most exquisite sensations. A beautiful poem or painting, the odor of flowers, the stars at night, an exquisite strain of music drive me wild with a delight that borders on pain." She received a pair of glasses which she has not been able to neglect, but I am convinced that the relief she experienced was not so much due to her glasses as to a few weeks of "rest cure" in the hospital. Certain it is that she returned to her home with the tightly strung "harp strings" relaxed to such a normal tension that their vibrations gave only such sensations as cause pain or pleasure to ordinary mortals.

The following conclusions may be regarded as established by clinical experience:

1. Abnormalities of the ocular apparatus are in a large group of patients the sole and sufficient cause of headache.
2. These abnormalities of vision may be the unsuspected cause, and therefore, the absence of symptoms obviously referable to the eyes does not exclude them as an etiologic factor in headache, insomnia, vertigo, petit chorea in children, and certain stomach derangements.
3. The recent or sudden development of symptoms, after attacks of severe illness, as typhoid fever, the exanthemata, etc., or in association with more or less acute exacerbations of some general dyscrasia, is not sufficient evidence against ocular participation in causing the symptoms.
4. The participation of the eyes as an etiologic factor in headache can be positively excluded only in the absence of ocular disease or after the most painstaking correction of any existing error of refraction or abnormality of binocular balance.
5. For the relief of reflex symptoms accurate corrections are essential, and these can be secured only by the more or less prolonged use of a strong cycloplegic.

6. Immediate relief by these corrections in a large group of patients is not to be expected, since the pain is frequently due to associated pathologic conditions of the fundus oculi, and these require time for cure.

HEADACHES OF GASTRO-INTESTINAL DISORDERS.*

BY FRANK BILLINGS, M.D.

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Gastro-intestinal disturbance is a very common cause of headache. The gastric disturbance which may give rise to headache may depend on organic stomach disease, or may be associated with the many functional disturbances of the stomach and bowels. The gastro-intestinal disturbance which apparently causes headache in some individuals is manifest in others by some other form of nervous or bodily distress. Organic disease of the gastro-intestinal tract probably does not primarily cause headache. The resulting dyspepsia fermentation, constipation and lessened antiseptic action of the stomach secretions are the probable source of an autointoxication, which may result in a disturbance of the nervous apparatus, and headache may be one of the symptom expressions of the toxemia.

In functional disorders of the stomach, like the dyspepsia due to hygienic errors, the neuroses of the stomach associated with general or local nervous disorders, like neurasthenia and tabes dorsalis, and the gastric neuroses manifested often in pelvic disorders of women, in floating kidney, etc., are marked by many of the symptoms; constipation, pyrosis, flatulence, epigastric fulness and tenderness or pain as in organic gastric disease, and headache is quite as common if not more constant than in organic disease.

Disturbance of function with or without organic disease seems to be the main causative factor of headache in gastro-intestinal troubles.

There are many conditions of the body which may disturb the stomach which are themselves the chief causes of headache, but for which the stomach receives the blame. In all conditions of the body associated with marked anemia, with cardiovascular disease, with functional or organic diseases of the nervous apparatus, with disease of the excretory organs—kidneys, skin, etc.—the nervous apparatus is much disturbed and perception of pain may be so exaggerated, that headache may result from any slight cause—"a last straw" to the overburdened irritable nervous apparatus. In short, in many such cases the headache is, like the stomach disturbance, a result of some bodily condition. On the other hand, the dyspeptic or the individual with chronic gastritis may, in consequence of dietary errors, suffer, in time, from malnutrition including anemia and a resulting nervous apparatus and headache.

It is sometimes very difficult to assign the headache to the proper cause when there are present, with the gastro-intestinal disorder, conditions of malnutrition, anemia, neurasthenia, etc. Heredity and the personal equation play an important part in many of these mixed cases. One finds a history of stomach disturbance with headache in families, and apparently quite as much an inheritance of poor digestive organs as the unstable nervous apparatus of neurotic families. The individual equation is also apparent in stomach disturbance and it must be confessed that the patient is usually a hysteric or a neu-

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rastrhenic and the headache and the gastric trouble therefore due to the same general condition.

Fundamentally, headaches due to gastro-intestinal disorders are probably toxic. Of this we have no exact proof. The clinical conditions which exist in all headaches associated with disturbance of the stomach and intestine are most easily explained on this theory, and further emphasized by the therapeutic management, which gives the greatest relief to the patient.

An acute toxemia may occur in a perfectly healthy individual, from the overingestion of food, from the ingestion of indigestible food or from food contaminated by preservative chemicals or from food contaminated by toxins of decomposition. The epigastric pain and tenderness, the nausea and vomiting, the diarrhea or constipation, the depressed nervous apparatus; the cold extremities, small pulse, headache, dizziness, etc., during the acuteness of the attack, are typical of intoxication. We presume that the headache sometimes associated with cases of atony, dilatation and ptosis of the stomach is due to a toxemia by the poisons absorbed from the fermenting or decomposing contents of the stomach.

Not headache only, but weariness, melancholia, tinnitus, vertigo, sleeplessness, palpitation of heart, syncope and tetany or convulsions may occur. Atony, dilatation and ptosis may occur in cancer, ulcer, chronic gastritis and in constitutional states, and the above-named phenomena in the diseases named.

"Bilious" attacks with nausea, vomiting, constipation, heavily coated tongue, foul breath, with headache, nervous depression, etc., are conditions apparently of chronic recurrent intoxication usually associated with gastro-intestinal dyspepsia, imperfect oxidation and assimilation by the liver and aggravated by defective excretion by the skin, liver and bowel. The idea of intoxication by bile, to which these characteristic symptoms were thought to be due and which gave it name, is no longer accepted as causative, inasmuch as headache and many of the other phenomena named are not often present in real cholemia.

Chronic constipation may cause headache, and when it occurs it is doubtless toxic. However, in many cases of severe constipation, especially among women, no headache, or indeed no other nervous symptoms may appear. We have all seen individuals who were perfectly comfortable with constipation, the bowels moving only once a week or even at a longer interval. Again, constipation is such a common occurrence in so many other bodily conditions that it is fair to assign the nervous phenomena, including the headache, to the combined effect of the general or local state plus the effect of the toxemia due to the constipation. In some individuals constipation apparently produces depression of spirits, irritable temper and headache, and the symptoms disappear with a thorough evacuation of the bowels.

The toxic substances causing headache are really unknown. Bunge's theory, that the stomach is an organ of protection, rather than an organ of nutrition, by disinfection of the ingesta before they pass on to the intestine, where the digestion properly takes place, is worthy of much consideration. The acid contents of the stomach we know protect one against infection from cholera and typhoid. The presence of acids also prevents the formation of toxins from albuminous foods. It is possible, therefore, that the acidless contents of the stomach in atony, dilation, etc., may allow the formations of ptomains, Brieger's peptoxin, acetones, diacetic acid and other poisons which the normal acid gastric juice would not permit.

Senator, Bamberger, Lorenz, Haig, von Jaksch, von Norden, Bouchard, Rachford and many others have presented theories of autointoxication in gastric-intestinal disease and ascribed the intoxication to leucomains—uric acid, paraxanthin and xanthin—ptomains, peptoxin, acetone, diacetic acid, etc. Some of these poisonous principles have been found in the decomposed stomach contents, and others have been found in the urine during toxicemic seizures. Furthermore, the isolated poisons injected into the bodies of animals have produced toxic symptoms similar to the phenomena associated with the gastro-intestinal disease.

Headache due to gastro-intestinal disturbance is said to be located definitely. In my experience this is not true. The brow of the whole frontal region is the most common seat, but may be occipital, vertical or general. It may be dull or sharp in character, with or without a sense of fulness or throbbing, and is usually aggravated by noises, bright light or by mental or physical effort. In acute attacks, nausea and vomiting usually occur. In the more chronic forms nausea may occur and rarely vomiting.

The diagnosis of headache due to gastro-intestinal disease or disturbance may be difficult. One must remember that gastro-intestinal disturbance, including constipation, is frequently secondary to states of general malnutrition and anemia, also to neurasthenia and other neuroses, to local disease of the skull, meninges or brain, to disturbances of the eye, ear and nose, to pelvic disorders, etc., and that the headache is due primarily to one or more of these conditions aggravated by the secondary gastro-intestinal disturbance. Indeed, the increasing experience of years has constantly narrowed the writer's cases primary of gastro-intestinal headaches and constantly broadened and increased the cases of headache due to general conditions of malassimilation, malnutrition and faulty excretion in which the gastro-intestinal condition was recognized as one of the results of an unhygienic life; a result which doubtless does aggravate the pre-existing poor general conditions and therefore becomes a secondary causative factor of headache.

Decomposed stomach contents, the presence of gastric ulcer, or cancer, chronic gastritis, duodenitis with intestinal indigestion and constipation with headache, and especially when the history and examination show no other abnormal conditions, will justify the diagnosis of headache due to primary gastro-intestinal disease.

Migraine or a condition much resembling it may sometimes be due to gastro-intestinal autointoxication. The diagnosis can be verified only by the cessation of the attacks after the removal of the gastro-intestinal cause.

TREATMENT.

Treatment of headaches of gastro-intestinal origin is palliative and curative.

Palliative: Remove the source of the poison by emptying the stomach, by emesis or lavage; move the bowels by cathartic or by colonic flushing; promote excretion of the poison from the blood by diluent drinks to aid skin activity and diuresis, and relieve the pain by small doses of the bromids combined with caffeine, or by the cautious use of phenacetin or some of the other petroleum derivatives or, in very severe cases, by a small dose of morphin hypodermically. In incurable organic disease of the stomach palliation will be the limit of treatment.

Curative treatment will consist of the application of the laws of hygiene, modified to suit the individual case; a selected diet for each individual; the free use

of pure water as a diluent drink; recreation in the form of physical exercise or physical rest, commensurate with the mental activity or physical tire of the individual; the correction of irregular habits of sleep, of time of taking food and of exercise; the withdrawal of tobacco, tea, coffee and alcoholic drinks, which is usually necessary, and especially in the patients who suffer from the neurosis. Lavage the stomach when necessary and overcome the constipation by hygienic measures, if possible without drugs. In the conditions of malnutrition and anemia, give restorative tonics and an abundant simple diet. In short, a sensible hygienic life will not only prevent the headache, but will usually remove the gastrointestinal disease or cause.

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QUANTITATIVE ESTIMATION OF ALBUMIN IN THE URINE.*

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Our present lack of a uniform method of expressing quantities of albumin in the urine detracts much from the value of all our methods; indeed, it renders the subject very confusing. As commonly employed, the term "percentage of albumin" is applied indifferently to gravimetric and volumetric measurements, as though they were synonymous, when, as a matter of fact, the two possess the most widely different significations. Thus, we commonly hear and read of percentages of albumin in the urine ranging from 20 to 40, etc., without further qualification. Such amounts expressed by actual weight would be a physical impossibility, since the proportion of albumin in the blood-serum itself never exceeds 9 per cent., and it would therefore be clearly impossible for the proteid contents of a fluid derived directly from the blood—such as the urine—to exceed that in the blood itself. As a matter of fact, the albumin in the urine expressed gravimetrically, rarely rises above 2 per cent., and perhaps never exceeds 3 per cent. It would therefore seem beyond question that at present we greatly need for clinical purposes some rapid, accurate, and ready method for estimating albumin in the urine, coupled with a more definite and exact method of expressing results obtained.

The author of this paper claims to have recently supplied this want, but before entering into a description of his method a brief survey will be taken of the more prominent methods heretofore employed.

THE GRAVIMETRIC METHOD.

The process consists in coagulation of the albumin, which may be accomplished either by boiling, or by means of a chemical agent; the succeeding steps being filtering out the albumin, collecting, drying and weighing.

Coagulation by Heat.—In this process a certain quantity of urine is taken—say 100 c.c.—a few drops of acetic acid added until the urine is distinctly acid, and then it is filtered. The urine is then put into a flask and gradually heated to boiling. The boiling should be continued for a half minute, and the urine then passed through a filter, the weight of the latter having been first ascertained and noted. The flask is next washed with distilled water, to secure all the adherent particles of albumin, and the contents of the flask are then again thrown on the filter. Next, the albumin is washed with boiling distilled water, by means of a pipette, the jet

being directed so as to wash the albumin toward the center of the filter. The washing should be continued until the albumin becomes perfectly clean and white. Sometimes it is necessary to use hot alcohol to cleanse the albumin. The filter is next placed in an oven, the temperature of which is 100 C. (212 F.), and then left until desiccation is complete. Drying is known to be complete when two weighings at an interval of an hour are identical. From the whole weight that of the filter is deducted, and the difference represents the weight of albumin in 100 c.c. of urine, from which the whole amount may be readily calculated. The tediousness of the process is its chief drawback for clinical purposes, since it can not be carried out in less than five or six hours.

TITRATION METHOD OF TANRET.

This method consists in precipitating the albumin by means of double iodid of mercury and potassium solution, and estimating the amount of albumin by the amount of mercuric solution required to precipitate all the albumin. Thus, one drop of the precipitating solution delivered from a pipette of standard size precipitates exactly 0.005 gm. of albumin. Therefore as many drops as it takes to precipitate all the albumin in a given quantity of urine represents that number of times 0.005 gm. of albumin present.

The formula for the precipitating solution is: Potassium iodid 3.22 gm., hyd. bichlorid 1.35 gm., aqua destil. to 100 c. c. The formula for the confirmatory solution is hyd. bichlorid 1 gm., aqua destil. to 100 c.c.

Process.—It will be more convenient to always conduct the test with a certain quantity of urine—say 10 c. c.—as in such cases the number of drops of the solution it takes to precipitate all the albumin in 10 c. c. of urine will represent so many half grams of albumin per liter. Thus, if it takes 10 drops of the precipitating solution to precipitate all the albumin in 10 c. c. of urine, then we have 0.05 gm. of albumin in the 10 c.c. of urine, which gives us 5 gm. albumin per liter. We proceed by then taking 10 c.c. of the albuminous urine and adding to it 2 c. c. of acetic acid, and stirring well with a glass rod. Next the precipitating solution is added, drop by drop, stirring thoroughly each time. After the addition of each drop of the precipitating reagent, a drop of the urine is placed on a porcelain dish or tile and a drop of the confirmatory solution is brought into contact therewith. As soon as a yellowish-red color appears all the albumin is precipitated, and the process is completed. The amount of albumin may at once be determined by taking the number of drops of the precipitating reagent employed, subtracting 3 as having been used in excess to make the color development perfectly apparent, and considering the remainder as so many half grams of albumin per liter, or so many 0.005 grams in the 10 c. c. of urine.

So long as any albumin remains in solution in the urine, the precipitating reagent will not form red iodid of mercury when the bichlorid solution is added, but it immediately does so when all the albumin is precipitated, therefore the bichlorid solution constitutes a perfect and beautiful indicator.

The above test is a fairly ready and rapid method which might be made available for practical clinical work were it not for the fact that it can not be depended upon in point of accuracy. As is well known, Tanret's reagent precipitates all known proteids in the urine, and unless corrected by means of heat, many of these would often be estimated for albumin. All alkaloids likewise are thrown out by this reagent. In short, if this test

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