

necessarily mean syphilis, and that a diagnosis of syphilis cannot be based on weak and medium inhibitions when they are employed. We hold that weakly positive reactions with syphilitic liver-extract mean nothing but syphilis. Even though it were true that the cholesterinized antigens give a more delicate reaction and may furnish positive results in cases of syphilis that are negative to the syphilitic liver-extract, it is a very much less serious error to overlook an occasional case of syphilis than to saddle a diagnosis of the disease with all it entails on a patient who does not have syphilis.

Considerable harm is being done at present by the use of unreliable non-specific or artificial extracts, in two ways:

1. The marked discrepancies between the results of the Wassermann test and the clinical findings in many cases are causing skeptical clinicians to lose confidence in the value of the reaction, and thus they are being deprived of an important diagnostic and therapeutic aid.

2. A great many unfortunate persons are being treated for syphilis who have not and never had syphilis, as the result of weakly positive and doubtful reports of workers using these antigens.

By all means let the experimental work go on, in the endeavor to improve the technic of the Wassermann reaction; but until the results obtained with innovations are proved to be more reliable than those with the generally accepted methods, let us adhere to the technic and reagents that have withstood successfully the assaults of time and which are supported by clinical experience.

116 South Nineteenth Street—1623 Walnut Street.

### INCREASE IN TOXICATION OF ETHER BY NEW METHODS OF ADMINISTRATION

RAYMOND C. COBURN, M.D.

Anesthetist, New York City and New York Post-Graduate Medical  
School Hospitals; Supervising Anesthetist Beth Israel  
Hospital  
NEW YORK

The small amount of ether administered in the intravenous method, as compared to that used in the inhalation and insufflation methods, has led some to believe that this direct method of introduction lessens the amount of ether utilized by the patient in the maintenance of anesthesia, whereas the reverse is true. Anesthesia is maintained by keeping the ether and the blood at a certain ratio. When the blood remains constant in volume, increase or decrease in the percentage of ether deepens or lightens the anesthesia accordingly, and conversely, the amount of ether within the system remaining constant, an increase in the volume of the circulating fluid decreases the depth of the anesthesia. To maintain surgical anesthesia in the intravenous method, then, the amount of ether required is increased in the proportion that the saline solution bears to the original, total volume of blood.

In the normal adult (150 pounds) the amount of blood varies from 4.58 to 4.65 liters, and from this can readily be calculated the extra burden of ether toxication thrust on the patient. In such a patient, using preliminary hypodermic medication, intravenous administration requires for induction about 8 ounces of saline solution; that is, at the end of induction there is being thrown into circulation about 5 per cent. more ether than is required in other methods; at the end of an

hour's surgical anesthesia the excess is 15 per cent., and at the end of a prolonged operation, in which it is reported that 4¼ pints of saline solution were administered, the excess was more than 40 per cent.

It is futile to hold that this pronounced excess of ether does not increase ether toxication. While some of the saline solution transudes into body cavities and tissues, it carries ether with it, and this must subsequently be excreted. The comparative freedom from postnarcotic nausea and vomiting does not necessarily indicate lessened ether toxicity, for the methods of administering ether that avoid passing a strong vapor continually over the olfactory nerves are likewise followed by less nausea and vomiting. The odor of ether, *per se*, is nauseating, and causes much of the vomiting in the cruder methods of administration.

In the oil-rectal method of administering ether the same ultimate result—increasing the amount of ether in circulation—seems to follow, although the *modus operandi* is entirely different. Here, in the adult, about 6 ounces of ether, plus 2 ounces of olive-oil (both by volume) are introduced into the rectum. All of the ether thus introduced reaches the patient's circulation, except that which is subsequently withdrawn, as there is no source of evaporation, such as occurs in other methods. It requires only 1½ ounces of ether in the patient's circulation without rebreathing to induce and maintain an hour's surgical anesthesia. The amount of ether withdrawn in the oil-rectal method shows that a much larger amount than this reaches the patient's circulation. The much larger amount of ether required in this method is probably due to the oil interfering with the anesthetic action of ether. Theoretically, of course, this is true, and it seems to be verified practically. Not only is there very much more than 1½ ounces' difference in the original amount of ether introduced into the rectum and that withdrawn at the end of an hour of surgical anesthesia, but there is a decidedly greater tendency toward respiratory paralysis without the corresponding depth of anesthesia that occurs in other methods. This indicates that while the oil may lessen the anesthetic action of ether it does not correspondingly decrease its toxic action on the respiratory center. Certain it is that the margin of safety between surgical anesthesia and respiratory paralysis is considerably reduced in the oil-rectal method.

It is not contended that these methods are without value, for each possesses decided advantages; but the price that is exacted for these advantages should always be given proper consideration.

Hotel Bretton Hall, Eighty-Sixth Street and Broadway.

### VAGOTONY AND ITS RELATION TO MUCOUS COLITIS

B. L. SPITZIG, M.D.  
CLEVELAND

The classical work of Eppinger and Hess in recent years materially advanced our knowledge of visceral neurology. Through their initiative a more thorough investigation of the relationship existing between the nervous supply and visceral function was instituted, and this investigation has resulted in clarifying hitherto obscure problems pertaining to this subject. In many complex disorders, particularly those dependent on changes in the glands of internal secretion, there is a

change of tonus in the two important systems, the autonomic<sup>1</sup> and the sympathetic. The former comprises chiefly the oculomotors, the vagi and pelvic nerves. An overaction of this system is shown in certain cases of ulcer, bronchial asthma and pollakiuria, whereas in exophthalmic goiter and diabetes mellitus the effect of the sympathetic predominates. It is supposed that in certain states there may be an insufficiency of the one system or a hyperplasia of the other; and again, it may happen that both systems hypofunctionate or hyperfunctionate coincidentally.

Clinically, disorders of the vagal tract are the easiest to understand, and this paper will deal chiefly with hypertonicity of that system (vago-tony). On account of the anatomic distribution of the nerve, symptoms of increased innervation are readily identified in the gastrointestinal tract. Perhaps the most constant result of such activity is the state of hypertonus in the musculature of the stomach and intestines. The bowel, chiefly the colon, remains in a more or less constant phase of overcontraction. This condition is demonstrable in that type of constipation, referred to as spastic, which is frequently found in early and middle adult life. The tender, palpable colon is a prominent sign of vago-tony, as well as the frequent presence of a tightly contracted external sphincter. Rectal palpation furnishes valuable aid in identifying this state of hypertonicity and should never be omitted. The complaint of abdominal pain is a frequent, but not necessarily a constant occurrence. In cases of pronounced spasticity patients complain of intermittent pain in the locality of the large bowel. Commonly, the transverse part is affected from the right to the left sides, which phenomenon arouses visions of cholecystic, duodenal or gastric lesions. Often the pain is referred to the cecal region, and this circumstance is responsible for the removal of countless innocent appendices. The descending colon is involved in most instances in which pain is a prominent symptom and is most likely to show evidence of spasticity—a valuable feature in differentiating from chronic appendicitis and other common abdominal lesions.

Many cases in which colic occurs are complicated by other colonic anomalies, pericolic membranes, kinks and ptoses. This relationship has been discussed in an earlier communication.<sup>2</sup> The interesting point is that many patients complain of abdominal pain which is characteristic in its location and often in its relation to defecation, occurring usually before and after the evacuation of the lower colon. Sometimes this pain occurs after taking cold drinks or after too rapid eating, when it is followed by a profuse, mucous evacuation, the "nervous diarrhea" of former writings. Nicotin seems to have some relation to this disorder, for excessive smoking and chewing may result in attacks of colic. Possibly it acts as an irritant to the vagus, as does lead in cases of plumbism.

The number of patients showing the absence of abdominal pain is equally large, but this does not militate against the existence of hypertonicity. Physical examination usually elicits evidence of varying degrees of tenderness and palpability of the large bowel. A careful abdominal examination and palpation of the rectal canal show the existence of this condition when

it was least expected from the anamnesis. The frequency of the disorder is astounding; perhaps two-thirds of young adults are sufferers at different times. Commonly, a history of the cathartic habit justifies the suspicion of the probable existence of colonic spasm, as most cases of resistant constipation in early adult life are proved to be spastic in character.

The influence of vago-tony is referable to changes in the stomach. Delayed evacuation of the gastric contents frequently indicates pylorospasm, which results from overfunctioning of the vagus. With this factor hyperacidity is usually concomitant—a group of signs very suggestive of ulcer. Indeed, it is supposed that the ischemia from muscular spasm and an excess of acid, together with a possible infectious cause, may lead to ulcer formation. Perhaps most gastric ulcers that have been permanently relieved by medicinal measures were no further advanced than the stage of pylorospasm and hyperacidity. Other gastric neuroses, cardiospasm and singultus, may further suggest the diagnosis of this condition.

The cardiac system may present the signs of bradycardia and occasionally mild arrhythmia. The lungs sometimes offer confirmatory evidence of vago-tony in the occurrence of attacks of bronchial spasm or a tendency to sighing with forced expiration. The rarer signs of increased vagal innervation are miosis, salivation, increased perspiration and urination, facial flushing and cold extremities.

Within the last year a pupil-test has come into vogue. On forced inspiration the pupils are dilated and contract on expiration. Similarly, the pulse is quickened and slowed during the same respiratory phases. Both these tests, when positive, indicate vago-tony. In the limited number of cases tested in personal work more than half showed positive results. It was found that the pupil-test sometimes fails when demonstrated too often in rapid succession.

There is little difficulty in recognizing pronounced cases of vagal overstimulation; but there are other conditions, not so outspoken, which respond to the appropriate treatment and can possibly be included in that category. Status lymphaticus, for instance, has been treated with success through measures directed toward controlling vagal activity. Mucous disease of childhood shows a certain relation to the last-named. The pasty anemia and exudation of the skin are characteristic. Abdominal pain and distention, clay-colored stools with excess of mucus, marked irritability and asthenia complete the picture. Bronchial spasm and lymphatic hyperplasia sometimes occur. Errors in diet, an excess of starchy and coarse foods and a lack of proteins seem to be causative factors and may induce the clinical picture by stimulating the vagal system. This chronic intestinal indigestion readily responds to dietetic and medicinal treatment that relieves such overstimulation.

In mucous colic of adults there may be a similar relation to vago-tony. The cause of this disorder does not lie in the intestinal mucosa, as there is usually no evidence of a colitis. The lesion is more central and may have its site, at least in the early stages, in a disturbance of the autonomic system. The hypochondriasis suggests that the sympathetic as well as the autonomic system is involved. In this neurosis chronic constipation precedes and attends the disorder, and it is conceivable that this factor induces an overstimulation of the vagus (probably through the internal secretions) and later of the sympathetic system in cases of inherited or even

1. The term refers to the essential autonomic system. Some writers include both systems under autonomic and distinguish them as the sympathetic autonomic and the craniosacral autonomic or autonomic proper. For the sake of brevity the simpler terms are used.

2. Spitzig, B. L.: Intestinal Intoxication and Thyreotoxicosis, *Ohio State Med. Jour.*, 1913, ix, 408.

acquired nervous instability. The fact that many patients suffering from mucous colitis give a history suggestive of prolonged intestinal spasm is important. The seasonal recrudescence also is interesting. Attacks occur periodically after a season of intensive application to work, during which time intestinal and general hygiene are neglected through attention paid to other duties.

In a short series of these cases the pharmacodynamic methods<sup>3</sup> yielded interesting results. Two-thirds of these patients reacted severely to epinephrin, thus indicating increased sensitiveness of the sympathetic system. Nearly all tolerated large doses of atropin, which factor suggests that vagotomy was present. The pilocarpin test was not constant in results.

#### MODE OF TREATMENT

In relieving vagotomy, belladonna and its active principle are the remedies *par excellence*. Hyoscyamus and opium are sometimes useful, but do not compare with the first-mentioned drug. As a routine treatment, a dose of 5 drops of the tincture or 1/6 grain of the extract is ordered three or four times daily, and is continued until the symptoms of dry throat and mydriasis appear. The dose is then decreased and thereafter varied to suit the individual tolerance. Occasionally there is marked idiosyncrasy toward the remedy, but the apparent relief from vagal disturbances outweighs the irritation from the drug. Medication is continued for one or two weeks, until all abdominal soreness has disappeared and tenderness is no longer evoked by palpation of the affected colon. After an intermission of two weeks another course of belladonna is advisable in resistant cases.

The correction of constipation is very important, but the methods used must in no way aggravate the spasticity. Consequently, massage, severe bending exercises and iced applications are decidedly contra-indicated. Similarly coarse food and laxatives as aloin, senna, rhubarb, podophyllin and violent salines are to be avoided. The mildest drug is phenolphthalein, but a more natural laxative is the undigested sea-weed agar-agar. This seems most helpful in 1-dram or 2-dram doses after meals, until the dietary can be enlarged to include more cellulose. The diet is general in character—proteins, carbohydrates and fats are allowed, provided there is no contra-indication to any class of these foods. Fruits and tender vegetables are permitted, and as the colonic irritation subsides the coarser foods are added to the dietary. The habit of regular defecation is to be emphasized at the outset of treatment.

Mucous disease of childhood demands special consideration. In this condition agar and belladonna are of great service in hastening the disappearance of the abdominal symptoms. Dietetic modifications are needed

3. In explanation of these tests it may be stated that epinephrin (1 c.c. of a 1:1,000 solution) indicates a positive reaction by the onset of chills, arrest of secretions, marked tremor, mydriasis, tachycardia, intense headache and vertigo (from increased cerebral pressure). Pilocarpin (from 1/10 to 1/15 grain) is used to indicate autonomic sensitiveness and shows a positive response (usually when sympathetic hypertonus is absent?) by the occurrence of flushing, increase of all secretions, miosis, bradycardia and syncope (from cerebral vasodilatation). When atropin is tolerated in large doses (from 1/75 to 1/150 grain) and can be continued for long periods before the physiologic effects are obtained, the existence of vagotomy bears confirmation; at least the untoward symptoms, xerostoma, mydriasis, tachycardia and precordial distress, encountered when the tonus of normal vagi is depressed, are not so readily induced in subjects presenting clinical signs of vagal overstimulation. An exception to this statement appears in those cases in which there is evidence of coincident sympathicotony. It appears that in this situation the sympathetic needs to be depressed (calcium, ergot, morphin) and the larger doses of atropin are thereby tolerated.

in the reduction of starchy products and the withdrawal of all foods coarse in structure and irritating to the tender intestines of the child. Proteins rich in iron are useful and a moderate quantity of fats. Coffee and tea naturally deserve denunciation. Regular meals are to be prescribed with a minimum of liquids, and lunches of starchy foods and sugars omitted. The tender fruits are allowed, and as the condition improves other cellulose foods are added.

The treatment of mucous colitis is the most difficult of all. Many patients show earlier gain with insistence on absolute rest, physical and mental. Two weeks' rest in bed is time well spent. During this period the regimen of treatment can be properly inaugurated. Hot abdominal compresses are always beneficial and can be ordered best during the period of confinement in bed. The diet is of no mean importance in mucous colic. For several days the food is bland and non-irritating, but of high nutritional value. As soon as possible general diet is ordered and forced feeding is instituted to continue far beyond the time of convalescence. There is no more abstemious eater than the neurotic with mucous colitis. Usually he has dieted himself to the verge of inanition, and his lack of food tolerance is more mental than physical. As soon as he is carried to a stage at which he realizes that an abundance of food is beneficial, he acquires his full share of self-confidence and his progress is assured.

The medicinal treatment has been suggested before. Belladonna is ordered in full doses. In severe cases morphin is combined with atropin. A capsule of opium and belladonna, each 1/8 grain, and 1/2 grain of phenolphthalein is given four times a day, the laxative preventing self-medication. The use of belladonna is sufficient in milder cases that seem free from intense sympathetic stimulation. In the latter event a capsule of calcium lactate, 5 grains, and extract of ergot, 2 grains, given four times daily, seems to have some effect in quieting sympathetic excitation. When this fails, opium is used, as indicated above. Other measures are of less importance. Agar is ordered in place of coarse diet, and olive-oil is given internally. Liquid petrolatum does not seem superior to cottonseed-oil, and castor oil may be of some benefit. The question of the value of enemas is undecided. Olive-oil or a starch solution injected into the bowel can do no harm. Some patients judge the ability of their medical attendant by comparing his methods with those of his predecessors. It may be diplomatic not to omit intracolonic injections of oil, but astringent solutions of various kinds are idle therapeutic measures.

Complete restoration of vigor after an attack of mucous colic may be retarded over a variable period. It seems, however, that by recourse to this intensive treatment the time of convalescence is materially hastened. After all is done it sometimes happens that complete relief is obtained ultimately through a change of environment. A sojourn at the seashore often precludes the necessity of resorting to colostomy or colectomy, procedures extremely doubtful as to their permanent worth.

I acknowledge the many courtesies extended by the clinical staff at the Charity Hospital Experimental Department of Western Reserve University.

446 Rose Building.

**Psychasthenia.**—Psychasthenia is always congenital by virtue of the heredity which outlines the characteristics of our brain.—Dubois.