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THE CONSERVATIVE USE OF THE STOMACH TUBE IN THE TREATMENT OF GASTRIC DISEASES.

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The use of the stomach tube in the treatment of gastric affections has become so common in certain localities that it is necessary to call attention now and then to the dangers, as well as to the advantages of its use, and to study its scientific application.

Since Kussmaul urged the advantages of the stomach tube in 1867, the profession has given more or less thought to it; Leube in 1874 recommended the tube for diagnostic purposes, and in 1875 Ewald used the soft rubber tube for washing out the stomach. During the last twenty years it has gained in favor, and diseases of the stomach have been so thoroughly investigated by means of this instrument and the chemic analysis of the stomach contents, that a new specialty has been placed in the medical field.

A word of caution needs to be uttered to prevent the popularity which this method has attained from carrying its use too far. No more cases occur now which need the tube than did before the discovery of its value rendered its use so common. It requires skill and patience to know when it should not be used and to wait for the slower processes of other methods of treatment.

It is well, then, to mention briefly some objections to, and dangers accompanying its use. Some degree of alarm is occasionally felt at finding portions of mucous membrane attached to the tube when it is withdrawn from the stomach. Especially is this the case with stiff instruments. It may occur also with the soft tubes. Where the patient's mucous membranes are thin and easily irritated, and where the epithelium is more readily removed than seems normal, I dislike to use the tube. In such cases abrasions are likely to occur, and although there is a tendency to rapid healing under such circumstances, the possibility remains that some cases may not heal and the traumatism may lead to ulcer of the stomach. The possibility of such an occurrence should suggest a careful investigation of the mucous membrane before introduction of the tube. In aphthous and other inflammatory states it is ordinarily not advisable to use the tube. Another danger is that perforation of the esophageal or gastric wall sometimes occurs. The possibility of this accident should be remembered in stenosis of the cardia or esopha-

gus, in ulcer of the stomach and in the later stages of gastric cancer. This accident has occurred in very skillful hands and is not to be lightly viewed. Such cases have been reported by Abercrombie, Frey, Richs and others. I should consider the stomach tube contra-indicated in stenosis due to pressure of aneurysm or abscess, and in cases accompanied by degeneration of the tissues above the stricture—a matter, however, which could not be easily discovered before death. In ulcer and the later stages of cancer of the stomach, the danger of perforation is sufficient to contra-indicate the use of the tube except in rare instances. An objection to the use of the tube in inflammation or congestion, in ulcer and in altered conditions of the mucous membrane is the fear, even the probability, of causing hemorrhage. These hemorrhages are not always manifested as a sudden hematemesis but may, by causing an abrasion of the mucous membrane or rupturing a small vessel, produce an oozing or slow hemorrhage, sometimes shown only by darkened or blood-stained stools. However, an alarmingly profuse hematemesis may occur and the possibility of this accident should be eliminated or reduced to the minimum by extreme caution in such cases.

The fact that syncope and death have resulted from the use of the stomach tube is a matter of considerable interest and great importance. The varying pressure upon the great abdominal plexuses of the sympathetic, produced by filling and emptying the stomach with the tube is believed by Fenwick to be the cause of this accident. The indiscriminate washing out of the stomach and filling the stomach with excessive quantities of water are to be discouraged.

Besides the evil results which may occur from pressure upon the sympathetic plexuses, it is undoubtedly true that the mere irritation of the mucous membrane in the stomach by the presence of the tube may produce fainting or syncopic attacks, as also occurs occasionally when food is introduced into the stomach. These cases seem to occur under circumstances where the irritation would ordinarily produce vomiting, but some idiosyncrasy causes the syncope instead of nausea, or perhaps both sensations may be experienced.

Spasm and tetany are sometimes met with and the latter may prove fatal. Manges gives 72 per cent. as the mortality in cases of tetany. Although few cases have been reported as compared with the great number of times the tube has been used, still precaution is urged, as we do not know in advance what patient may die from this complication. The spasm of the throat is very common and in many cases requires the use of cocain. Spasm in children may prevent the use of the tube except under chloroform or ether. Another objection to the use of the tube, which has been considered by some even more serious than those already mentioned, is the removal of the

natural secretions by lavage. The habitual washing out of the stomach when considered from this point of view only, undoubtedly is to be discouraged. The withdrawing from the body's nourishment of the chyme which the stomach labors so hard to manufacture is not to be considered lightly; but if the digestive and absorptive powers of the viscus are impaired it can not be known that undigested food does not remain in the stomach until it acts as a foreign body. If relief is afforded the patient by the use of lavage it may be accepted usually as evidence that good has been accomplished. Still it must follow that no general treatment by lavage should be adopted until careful investigation has shown that the benefits to be derived outweigh the risks assumed.

Again, when lavage has accomplished its work it should be stopped. Further use may prove to be a positive evil. I know a case where a young lady was advised to use the stomach tube for nervous or functional dyspepsia. She submitted to the treatment by a young physician who was very enthusiastic in his work. The patient improved for a time. At this point a conservative physician would have stopped the treatment. The lavage was persistently continued for months, however, the case growing worse; and after a year of such treatment the too submissive patient was not so well as she was when the lavage was begun. Such instances of indiscretion in the use of any remedial agent, while suggesting caution, do not militate against the value of the measure when properly used.

I should advise the use of the tube for the purpose of lavage or washing out the stomach for the following six objects: 1, to remove undigested food and foreign matters; 2, to cleanse the mucous membrane for the action of medicines; 3, to check hemorrhage; 4, to give antiseptic douchings; 5, for sedative purposes; 6, for general tonic effects upon the stomach, mucous membrane and parietes.

1. The removal of undigested foods may become necessary in indigestion, functional dyspepsia, dilatation, cancer and pyloric stenosis. In such cases nothing can be done until the stomach has been relieved of the offending matter. Frequently in some of these cases vomiting can not easily be induced, and in others it is not to be encouraged. It is a common experience that no treatment gives such complete temporary relief in functional dyspepsia, dilatation, cancer and stenosis as lavage. This removes the undigested remnants of food, fermentative and putrefactive products, and exercises a beneficent tonic influence upon the gastric mucous membrane.

2. In atrophy, chronic gastritis and also in functional dyspepsia, as in other neuroses, washing the tenacious mucus from the membrane gives a surface by which medicines are more readily absorbed. There is no doubt that tardy recoveries or entire failures in the treatment of some neuroses, including atonic or nervous dyspepsia, are due in part to the failure of the gastric mucous membrane to absorb the medicines prescribed. This occurs often where the absorptive function is not materially impaired. Such cases can be explained by supposing that the tenacious mucus on the mucous membrane interferes with the process of absorption. The removal of this mucus will facilitate the action of the medicines which are given.

3. The application of cold is a common method of

controlling hemorrhage. Ice-cold water can be applied to the mucous membrane of the stomach in hematemesis in two ways. First, the patient may be required to drink ice water and swallow bits of ice. The quantity which can be thus used is limited. Second, it frequently happens that hemorrhages occur in ulcer and other pathologic conditions under circumstances which do not forbid the use of the stomach tube and where a prolonged application of cold to the gastric surface is desirable. In such conditions one is justified in applying a continuous douching by withdrawing the water after it has been in the stomach four or five minutes and re-introducing a supply of ice-cold water to be again withdrawn in the same manner. This process may be continued as long as necessary, if no untoward symptoms arise from the prolonged use of cold. In ulcer, cancer, and rupture of vessels of considerable size, danger may attend the expression method of emptying the stomach; hence it is wise to use an aspirator or exhausting bulb or syringe to remove the water.

4. One of the most simple and advantageous uses of the tube is for the purpose of removing the products of fermentation and putrefaction. In all diseases where fermentation occurs, as in functional dyspepsia, certain other neuroses, dilatation, chronic gastritis and cancer of the stomach, the gases and other abnormal products of faulty digestion act as irritants, and nothing relieves the patient so quickly and completely as lavage. In many of these cases, especially nervous dyspepsia and gastrectasis, and often in chronic gastritis, lavage not only serves to give temporary relief, but is also an excellent therapeutic agent in accomplishing a permanent cure.

5. Perhaps no class of diseases of the stomach is so generally benefited by lavage as the neuroses. Functional dyspepsia has already been mentioned. Gastralgia, nervous eructation, hyper-secretion, the various conditions accompanying neurasthenia and nervous vomiting are frequently thus relieved, the depraved condition (if one exists) which allows these states to arise removed, and a gentle tonic influence imparted to the gastric mucous membrane which is spread until it helps to remove the cause of the neurosis. The impression made upon the general nervous system, the quick response of the sympathetic system, the increase in the circulation and consequently the improved general metabolism are, without doubt some of the most important effects of washing out the stomach in these cases. The readiest means of relieving obstinate hiccough, heartburn and other symptoms of gastric irritation may often be found in the use of lavage. No one who has had large experience in such cases can doubt the beneficial influences of lavage. Nevertheless, there are some neurotics who can not submit to the lavage treatment on account of syncopic or other distressing symptoms.

6. It can not be doubted that cold or tepid bathing and sometimes hot bathing produces general tonic effects. Similar effects are often observed in the lavage treatment of the stomach—bathing or washing that viscus. In atonic conditions of the muscular coat of the stomach, in anemic conditions of the mucous membrane and in deficient gastric secretion, there are few remedial agents which will produce better results than systematic lavage. Auto-lavage, or the use of the tube by the patient is not to be encouraged, except in the few cases where definite in-

structions with proper cautions and restrictions will be observed.

A review of the foregoing study of our subject reminds us that while the field for lavage is large and its position as a therapeutic measure established, it requires skill and care to use it always for good and not for evil. There are many conditions, idiosyncrasies and circumstances which will forbid its use. Some of these can be overcome, some can not. Conservatism should mark the physician's course here, as in most departments of medical practice.

THE EFFECT OF INHALATION OF OXYGEN UPON THE HEMOGLOBIN.

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Ever since the discovery of oxygen by Priestley in 1774, it has been used as a therapeutic agent. In fact, Priestley himself made a number of experiments upon animals with the gas, thus preparing the way for experiments upon the human subject. A few years after his discovery, Lavoisier and Spalanzani demonstrated the relationship of oxygen to atmospheric air, and showed in a rough way the changes it produced in the blood. These experiments were more physiological than therapeutical, but not long after this date, Caillens in 1783 employed oxygen therapeutically. Jurine of Geneva, and Chaptal of Montpellier, followed with reports of cases of phthisis benefited by its use. The report of Fucroy to the French Academy was very extreme, making as it did absurd claims for oxygen in the treatment of numerous diseases. Beddoes in 1789 made a number of important observations upon the physiologic action of oxygen, and also employed it in practice. In conjunction with Sir Humphrey Davy and James Watt he established an institution for the treatment of disease by oxygen, an account of which may be seen in an extremely interesting paper on its therapeutic use by Dr. A. H. Smith in the *New York Medical Journal*, April, 1870. Gardner in the *American Journal of Medical Sciences*, 1844, makes the remarkable statement that, "by the use of peroxid of nitrogen, or by rapid breathing, an increased quantity of oxygen enters, and as it can not be expelled as an element it acts upon more atoms of fibrin." Richardson made a number of experiments upon animals, and concludes that "the blood does not take up more oxygen unless more CO₂ is given off." (*Lancet*, 1878.)

The above citations taken from the literature of the century following the discovery of oxygen, will give some idea of the way the profession regarded the subject. The literature is quite considerable but of little real value, since the rather crude experiments proved little, and the clinical experience related proved entirely too much. The experiments of Lavoisier and Spalanzani referred to above, showed the effect of oxygen upon the blood, although the fact that blood exposed to the air changed color was known long before this time, as early as 1665. Davy then extracted oxygen from blood; Regnault and Reiset and also Liebig announced that animals used the same amount of oxygen when breathing an atmos-

phere composed of that gas alone as when they breathed ordinary air. (McKendric.) Liebig claimed that the gases were not merely dissolved in the blood, but existed in a state of loose chemic combination. Funke, Hoppe-Seyler, Schmidt, Stokes and others between the years 1853 and 1864 carefully worked out the nature and function of hemoglobin.

The history of the experiment of placing animals in an atmosphere of pure oxygen is an interesting one to physiologists, serving as a valuable object lesson. For many decades after the discovery of Priestley it was held that an animal could not live in this pure element. Then it was discovered that by providing for the absorption of the expired CO₂ the life of the animal could be indefinitely prolonged. In regard to the number of respirations, my experiments showed that for the first few minutes there was a great rise, then a fall to about half the normal number. In the human subject the inhalation of pure oxygen seems to have little effect upon the pulse or arterial tension, but diminishes the number of respirations.

Admitting the fact that inhalations of pure oxygen under normal temperature and pressure, cause merely a diminution in the number of respirations a very practical question arises, namely, whether in the inspiration of pure oxygen the blood becomes more highly oxygenated than it does when ordinary air is breathed. The early observers fixed hardly any limit to the absorption of oxygen, believing it to be merely dissolved in the fluid as a whole. Then it was shown that the hemoglobin of the red corpuscle played a very important part, appropriating the oxygen from the plasma. As a matter of fact the serum is capable of absorbing little if any more of this element than of distilled water. The relationship which hemoglobin bears to the red corpuscle is still somewhat *sub judice*; we simply know that the combination of oxygen with hemoglobin is a very loose one, subject to certain laws of pressure and temperature, and that disassociation may be very easily brought about without disturbing the molecule of hemoglobin. (Foster.) The old observers thought that by the inhalation of pure oxygen a condition of what they termed "super saturation" of the blood was obtained. More exact observation showed this view to be untenable. Under pressure it is possible to make the serum take up more oxygen just as distilled water will do under like conditions. The quantity taken up by the hemoglobin of the red corpuscles is fixed, or nearly so. Experiments upon a solution of hemoglobin show that if a sufficient quantity of oxygen be present, each gram of the solution will take up 1.59 c. c. If there is an insufficient quantity present the hemoglobin will not be completely satisfied, or, to quote Foster: "We may perhaps say that a part only of the hemoglobin gets its allowance of oxygen, while the remainder continues reduced." Or it may very well be that while breathing ordinary air, a certain proportion of the red corpuscles pass through the pulmonary capillaries with their hemoglobin unsatisfied, or only partially satisfied with oxygen. The following experiments bear upon this point. The animals were placed under a glass jar which was first filled with pure oxygen which had been washed several times and a stream of the gas was allowed to pass into the jar from a cylinder. A sufficient quantity of caustic potash was kept in the jar to absorb all the CO₂. The hemoglobin was measured by the hemo-