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BY

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THE classification of the pathological conditions underlying this disease is indeed difficult. Often the stomach is involved and there is a catarrhal change of the mucous membrane, a swelling of the peptic and of the hydrochloric acid glands, in which case we term the condition, along with the other, a gastro-entero-colitis. Under this term, for want of a better classification, come all conditions of this tract: Summer diarrhea, entero-colitis, and ileo-colitis, not forgetting the duodenitis of some authors.

Some writers introduce the subject under three headings: (1) Thermic fever; (2) summer diarrhea; and (3) cholera infantum. Others, as Ladd, of Boston, under fermental diarrhea, intestinal digestion, gastric indigestion, and ileo-colitis.

The gastro-intestinal tract, says Krehl, continually receives micro-organisms swallowed with the food; some are destroyed by the acid in the gastric juice, yet, since the stomach begins to empty itself shortly after the ingestion of food, and since the first acid secreted is bound by the proteids of the food, and since the gastric juice does not reach the interior of many large food particles, there always exists a possibility that virulent organisms will pass through the stomach into the intestines, often without affecting the stomach in their passage. Bacteria pass through the walls of the intestines, and the toxins are not absorbed from the normal intestinal canal, for they are either destroyed or rendered non-toxic by the digestive ferments. This intestinal indigestion or catarrhal inflammation of the digestive tract is primarily induced in infants under two years by certain articles of diet, combined with a low resisting power, caused by excessive heat and possibly great humidity, as well as by faulty surroundings and dentition. These conditions allow the

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bacteria normally present in the intestines to propagate with enormous rapidity, which reduces the resistance of the intestinal flora. Various toxic compounds result from bacterial decomposition, such as lactic, butyric, and acetic acids, indol, skatol, and phenol, which irritate the stomach and intestines and cause lesions of the gastric and intestinal epithelium. Such gases as hydrogen, carbon dioxide, and methane in excess cause tympanites and intestinal colic. We have, therefore, to fear both proteid and carbohydrate decomposition. Often a large proteid diet is followed by etherial sulphates in the urine, and a similar increase is noted in the catarrhal conditions of the intestines.

Of the various micro-organisms underlying this group of diseases, we find the Shiga, or alkali-producing bacillus, the Flexner-Harris, or acid-producing bacillus, the coli-communis, the lactis aerogenes, the streptococcus, the proteus vulgaris, the oidium albicans, together with colonies of leucocytes. In these conditions we usually find diarrhea, rarely constipation.

Again, the underlying disease, the gastric indigestion, may so weaken the resistance of the intestinal mucosa that the latter falls a prey to the normal flora of the intestines or to bacteria which are introduced into the gastro-intestinal canal either by mouth or by secretions from the infected body. The toxins undoubtedly add to the diarrhea, says A. W. Hewlett. Another factor, and probably the most important one, is that caused by excessive stimulation of the intestinal mucosa by the intestinal contents. Extreme peristalsis is excited by chemical irritants introduced from without or produced from within the intestinal canal, such as organic acids or gases resulting from fermentation. In acute gastro-entero-colitis, therefore, the diarrhea is due to two causes: Increased intestinal irritability and increased stimulation of the intestines by the products of abnormal fermentation; in other words, toxins. As you are aware, if the food is hurried through the upper part of the small intestine, absorption is interfered with, and the tiny patient suffers from malnutrition; if prolonged, from marasmus. On the other hand, when the diarrhea is due entirely to an increased peristalsis of the large intestine, the most nourishing part of the food has already been absorbed. Just

these conditions influence our treatment. The gross lesions of the gut may range from a simple catarrhal inflammation to a deeper lesion of the mucosa or the submucosa, and muscularis. Undoubtedly no one micro-organism causes these severe lesions, but rather a combination of two or more, as Shiga bacilli with streptococci, and the toxic products of others. We find these cases almost always fatal.

Treatment.—In the treatment of infants we must be guided by many things, as the vomiting, number and condition of the stools, pre-existing diseases of the infant, particularly those of the digestive tract, length of time of faulty and irregular feeding, condition of the intestinal tract, tympanites, tenesmus, prostration, dentition, and of the amount of intestinal intoxication. With the fever, which may range from 100 to 106° F., depending upon the amount of intoxication, we have little to do. In the unstable nervous system of the infant, vomiting is often not only from gastric-fermentation-irritability, but from an irritability of the vomiting center from the toxins absorbed. The heat center is likewise strongly affected. Rarely can we judge from the symptoms, if the cause is due to a carbohydrate or proteid decomposition. Besides grocers' milk, condensed milk, and at times excellent milk, which has been allowed to stand in the sun or heat, we find in infants that raw apples, coarse vegetables, oatmeal uncooked, too many eggs, and often canned vegetables bring about the condition of excessive vomiting; high fever, with stools ranging from yellow green to all shades of green or brown, of foul odor, and perhaps containing a small or large amount of large or small hard curds or undigested food, with usually quite a bit of mucus of dull appearance, from the upper tract, or glistening and glary from the lower gut. The infants which are stricken suddenly, without previous existing indigestion, get well soon.

Unfortunately, in the treatment of dysentery we cannot as yet rely upon the serums; we may in the future, however.

As to the classes of infants to be treated, we may denote them under three headings: (1) Those mildly ill; (2) those cases between mild and severe; (3) severe cases.

In the mild types is found a slight hyper-

emia of the mucous membrane of the stomach and intestines, and a moderate catarrh, The stools, many in number, often contain curds or, in older children, undigested food, or are fluid, watery, or semi-watery, containing a small amount of mucus. There is often no vomiting, the temperature ranging high, or not above 100° F. The mother notices, perhaps, that the child appears "out of sorts," is losing its appetite, is thirsty and fretful; the face is pale, the skin dirty. If the baby is wet nursed, often the fault lies with some irregularity of the diet of the mother. Fluid extract of cascara, ½ dram every three hours, regulation of the mother's diet, less proteid, more fresh vegetables and fruits, with bathing and hygienic home conditions, and ½ dram of castor oil t. i. d. for the infant, usually clears up the condition without taking the baby from the breast. The bathing of the baby two, three, and four times a day in water about 80 to 90° F. also helps. In these cases there is often much gas in the stomach and intestines. Rectal irrigations and stomach washings are rarely necessary. Often there is present a stomatitis ranging from a simple catarrhal to an aphthous form. Besides the above treatment, potassium chlorate, 40 grn., plus distilled water, 2 oz., one dram every hour, or sopped in the mouth, usually relieves the trouble. In older children fed upon the bottle it is best to remove the milk for from twelve to twenty-four hours, the milk often being badly modified, containing too much starch or sugar. Infants are usually dressed too warmly in the summer, and their clothing fits too tightly. Bathing with surface friction in these cases is very important, especially where the diarrhea is of fluid or semi-fluid consistency. Bathing acts as a general tonic to the system, and indirectly stimulates the delicate muscle fibers of the intestines to renewed life; it tends to heal the mucous membrane, to stimulate the lymphatics, to neutralize or weaken the toxins, and to encourage the young, large villi of the intestines to work normally.

In these cases barley-water is the best substitute for milk. It should be made from 2 drams to a pint or a quart of water, boiled down one-half, then the original amount of boiled water added, then strained through two layers of clean muslin cloth. Bismuth

in any form I find useless. For these children the seashore is rarely necessary, but cleanly surroundings certainly are. Albumen water I have discarded, as it often forms an indigestible mass in the stomach. An ice-cap is unscientific; one may as well put a fire out with a medicine dropper. Fever we need, as it points out to us the general run of the toxemia. After the barley-water, the infant is brought back to a suitable diet by easy stages, beginning with a low proteid and fat, and gradually increasing the strength, using the barley-water as a basis. It is best to sweeten the mixture gradually, as sugar forms in the stomach carbonic acid gas and alcohol, and acts as a mild tonic. Often the addition of a few drops of old sherry wine not only acts as a good tonic but precipitates the curds into a more flocculent condition, thereby rendering their digestibility easier. Tenesmus in these cases is usually rare.

Medium Severe Type.—Here are found severer lesions. Vomiting, one to ten times or more daily, often at each attempt at taking food. Temp., 102 to 106°, gas eructations and flatus, prostration, at times collapse, depressed abdomen, great restlessness or extreme apathy. The infants have suffered from three to six weeks or more from intestinal indigestion. It means a fresh infection superimposed upon a constitution weakened and devitalized, and which cannot respond to the defensive forces of the lymph, bile, and other juices. Undoubtedly cholera infantum, with its markedly acute violent onset, protracted vomiting, high temperature, frequent serous discharges, great prostration, and often death, comes, to my mind, under this heading, and should not be considered a separate disease. The stools number from 10 to 12 daily, varying from yellow to green to shades of brown and black, depending upon the food ingested and the type of bacteria. They are watery, frothy, curdy, with large or small, hardened, cheese-like masses, alone or imbedded within a glary or deadened mucus; they are foul, and at times sour, the latter if due to carbohydrate decomposition. Gas is found in the large and small intestines, as well as in the stomach. Colicky pains are common, as is tenesmus; the tongue is furred, the pharynx subacutely inflamed. In cases of collapse

there is marked cardiac depression. These cases I have never seen in breast-fed infants. Blood, even in threads, is rarely seen. Intense straining at stool is common; less so, rectal prolapse. In excessive vomiting, as in this class of cases, stomach washing may be of service, but not under eight months, because the stomach before this time is very much undeveloped, its submucosa and muscularis structures being weak. To plunge a stomach tube into the stomach without care is unpardonable. Map out the cardiac end of the stomach, place one end of the tube—say a 21 to 26 French—over it, carry the tube upward to the angle of the jaw, curve it forward to a line with the mouth, add a small glass funnel holding a couple of ounces, and you are ready. Gently work it downward during inspiration. It may rarely catch a moment at the cricoid cartilage and more rarely at the cardiac orifice. It is to be remembered that the stomach and rectal tubes act at all times as a foreign body to an already inflamed mucous membrane, which is hemorrhagic, is raised, and the pepsin and mucous glands of which are swollen and possibly granular.

Where there is much foulness, much mucus, or many curds—after an initial dose of calomel 1/10 grn. every hour for four doses—a rectal irrigation may be useful, preferably with salt solution at about 100° F. A two-quart fountain syringe is needed; a not too flexible rubber tube, 19 to 22 French, with a blunt end and orifices near the end, is all that is necessary. The syringe should not be held high above the patient. Insert the tube, allowing the water to run slowly, hardly pushing it in the least, the nurse in the meantime gradually raising the buttocks higher and higher. The running solution forms an entering wedge, so that the catheter may extend beyond the sigmoid into the colon. At times the catheter doubles on itself. This is due to a too small tube, a too long mesentery, or to forms of M or S mesenteries, which conditions can usually be surmounted by placing the child in different positions.

Bathing should always be given with superficial massage. Vibro-massage with a rubber cup over the abdomen, using half the current, often does wonders. In this

class of cases we see the true marasmic or non-metabolic condition. For collapse, strychnine 1/150 to 1/100 grn. should be given subcutaneously. High fever should be combated by frequent cool spongings, never a cold pack, and rarely an ice cap. Brandy containing 39 to 47 per cent. and whisky 44 to 50 per cent. of alcohol should never be given by the mouth. They are too irritating; hence give sherry wine or aromatic spirits of ammonia instead.

Calomel for these cases is excellent, followed by castor oil. The infant should be taken off the bottle. Give barley-water at short regular intervals for twelve to twenty-four hours. When the curds have disappeared and the foulness has decreased—never mind about the mucus—begin with a low proteid diet with the original barley-water, adding at the same time sherry wine to each feeding for a day at least. Alcohol, you remember, cannot supply the place of the nitrogenous foods, but given along with them may lead to greater economy of the tissues.

During convalescence it is well to keep the patient hungry. Opium for increased peristalsis or for tenesmus is best given in the form of a Dover's powder. A mustard plaster over the abdomen often relieves the acute colicky pains. These plasters should be left on until a faint reddish blush is induced. In extreme malnutrition cases, bordering upon marasmus, inunctions of cod-liver oil are good. Care at all times should be taken to give the infant plenty to drink, boiled water, for instance, as the thirst is marked from the depletion of the tissues by the excessive diarrhea and vomiting. Gradually begin with foods leaving little residue, such as whey, koumyss, buttermilk, beef-juice in small but ascending doses, never forgetting the best food of all, milk. A change of climate is often advisable, particularly a change to the mountains.

Beef juice contains of proteid....2.19 per cent.
Barley water contains of proteid.. .09 per cent.
Buttermilk contains of proteid....3.00 per cent.
Broths contain of proteid.....1.00 per cent.
Whey contains of proteid.....1.00 per cent.
(from whole or skim milk)
With wine is doubly valuable.

Under the third and last heading are found the *very severe lesions* of the gut—a true dysentery. Often from the medium

severe forms the transition is a gradual one, but these cases are usually seen in infants suffering for a very long time, often three months, from gastro-intestinal indigestion. The fever, vomiting, tenesmus, meteorism, malnutrition, marasmus, and collapse may simulate similar conditions under the previous class; marasmus and collapse are usually more frequent, however, due to the marked pathological condition of the bowels, whose mucosa, submucosa, and muscularis layers are markedly altered. The stools are similar to those of the last group, except that streaks of blood upon the mucus, free blood, and rarely blood clots, are seen. Tenesmus is more common and severe, and relieved best by cocaine suppositories. Marasmus is common, and patients are often moribund when seen. The stomach shares in the general condition; its walls are thinned and hemorrhagic. For the moribund condition and the collapse use stimulation with warm baths, brandy or strychnine subcutaneously, rectal feeding with peptonized foods, bouillons, brandy and egg, etc. Salt solution enemas containing a weak solution of tannic acid (dram to the ounce) may be of service, but unfortunately they rarely get to the whole seat of the infection. To suprarenalin there is the same objection, except as a stomach wash, when it can be used (dram to the ounce). Often, before death, I have recorded subnormal temperatures. The treatment should aim at keeping the patient alive by daily spongings, feedings small in size and few in number, moderate stimulation, fresh air, gradually increasing the strength of the food, avoiding an excess of sugars and fats, thus preventing sour, acid stools. A change of air and climate is almost essential. Never use a purgative or a strong cathartic, only a laxative. The complications are rarely severe, and the kidneys rarely badly injured. I have seen, however, septicemia and a general glandular involvement with suppuration. Pyelitis, pyelonephritis, and cystitis may infrequently occur. Above all, it is necessary to treat the individual infant primarily, and secondarily the disease.

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