

masses remain in the sacculi. Finally, some large fecal masses drop into the canal, and symptoms of occlusion at once appear.

Symptoms.—The cause and the seat of the occlusion affect somewhat the character and development of the symptoms, but there are certain symptoms common to all forms: these are pain, arrest of the intestinal movements, gaseous distention of the bowels, and vomiting. The pain is not acute and lancinating, but is severe, colic-like, with a feeling of soreness, and is aggravated by pressure. In the beginning the pain is felt about the umbilicus, in the iliac regions, and radiates thence over the abdomen. When tenderness to pressure exists at the outset, it is indicative of the seat of the lesion, but the tenderness is rather a feeling of soreness, and has not the painful character of the tenderness which is developed later on when peritonitis appears. It is important to note that the tenderness and pain cease when collapse comes on—for the author has known this to be mistaken for improvement. At first, and usually after the administration of an enema, there may be an evacuation from the lower bowel, and this is often a source of misapprehension, for it is assumed that the canal is not obstructed. It may be regarded as an evidence that the obstruction is above the sigmoid flexure, but it has no higher significance than this. At the beginning of symptoms—of intussusception, for example—some liquid feces may escape, but presently the obstacle to the passage of fecal matters and of gas is complete. Even when those exceptional discharges, just referred to, escape, there is no improvement in the feelings or condition of the patient; they do not diminish the fullness and tension of the abdomen. When complete obstruction has existed twenty-four to forty-eight hours, the abdomen is no longer soft and flexible, but the muscles have become rather rigid, and the whole abdomen is swollen and hard, returning on percussion a note of tympanitic quality, except where an accumulation of feces gives a different tone. In the further progress of the case, more and more gas distending the intestines, they can be distinguished as inflated, sinuous cylinders: the small intestines filling the umbilical space, the large intestine, the flanks, and the lower epigastric region. Not unfrequently the abdomen is uniformly distended, the highest point in the centre and falling off in all directions, and the walls drawn as tense as the tightened drum-head. Besides the immediate and local distress thus occasioned, the functions of the thoracic organs are interfered with by the upward pressure. The respiration is thoracic, oppressed, and hurried, a distressing hiccough supervenes, and the action of the heart is troubled. Vomiting is a most characteristic symptom under certain circumstances. It sometimes begins early, immediately after the obstruction, and consists at first of aliment, then of mucus, mucus and gastric juice, mucus and bile from the gall-bladder forced up by the straining. On the other hand, vomiting may be postponed until the

signs of obstruction are well advanced. If vomiting persists, presently the matters returned consist not only of greenish sero-mucus, but of the contents of the lower ilium, and having a fecal odor. Indeed, distinctly formed but not molded feces have been returned by vomiting, but usually it is a yellowish fluid, having the consistence of soup, and an odor and taste sufficiently definite. The fecal vomiting recurs from time to time, and, if it well empties the intestines of their contents, the abdominal symptoms are improved; there is much less distress, and the distention is diminished, so that the thoracic organs are not so embarrassed, but this merely local improvement does not help the case otherwise. The gravity of the case is illustrated in the systemic condition, which becomes rapidly bad. There is no fever, but a temperature below rather than above the normal. The countenance at first expresses great anxiety, then becomes contracted and drawn, the eyes deeply sunken and surrounded with a livid circle, the nose pinched and blue, the lips blue, the tongue dry, the voice husky and sepulchral, the surface of the body generally cold and covered with a cold sweat, the skin livid and wrinkled, hiccough persisting and more and more harassing, the breathing more shallow and rapid, the temperature declining a degree or two Fahr.—such is the complexus of symptoms in the approaching collapse. Usually the mind is clear and the anxiety great, but there may be an inexplicable apathy, and in rare cases acute delirium. Toward the close, the increasing difficulty in hæmatisis develops carbonic-acid poisoning, and then stupor ensues. The symptoms of occlusion, due to invagination, differ somewhat from the other forms of obstruction, and must therefore receive attention. The attack usually sets in suddenly as the intussusception occurs quickly, and the first symptom is violent, colic-like pain, which is followed by vomiting, the more prompt and certain the nearer the trouble is to the stomach. In children the first colic-attack is followed after a few hours by relief, which continues for several hours until a new seizure; but in the case of adults the pain which marks the occurrence of the intussusception continues for several days, after which it is paroxysmal, there being intervals of exemption from suffering. A very troublesome diarrhœa is coincident with the invagination, from ten to twenty, or even thirty discharges occurring daily, and these soon assume a dysenteric character, owing to the intense congestion of the intestine at the point of invagination. This symptom has greater significance, because no other form of occlusion of the bowel presents it. The tenesmus is all the more severe when the bowel descends into the rectum, as it sometimes does in children, and with this condition may be associated involuntary discharges of mucus and blood, because of paresis of the sphincter ani. There may be considerable variation in the meteorism in invagination—great distention occurring immediately after the accident has occurred, then subsiding as the diarrhœa goes on. A cylindrical, soft,

yet somewhat resisting tumor can often be detected on palpation, when the invaginations are in certain places: in the cæcum, transverse and descending colon, and at the sigmoid flexure. It is especially in children and in the chronic cases that these invagination tumors can be detected. There are peculiarities about these tumors which should be noted: they change in position somewhat, and in form, under the influence of peristaltic movements excited by the necessary palpation, or occurring spontaneously. In children the descent of the ilium is so very rapid that the rectum may be reached on the second day. An intussusception may induce obstruction at once, and death occurs in from three to six days, partly by exhaustion, partly by the local inflammation. In other cases, after the immediate closure of the bowel, the canal is partly restored by a subsidence of the local congestion, or the obstruction has at no time been complete: diarrhœa of an exhausting kind comes on; gangrene of the invaginated portion takes place; and in children death ensues from the fourth to the seventh day, but in adults the fatal result is postponed to the second, third, and fourth week, according to the acuteness of the symptoms. When, in the process of separation of the invaginated portion of the bowel already described, the discharge of the gangrenous parts takes place, it does not always occur in its entirety, but shreds and masses of various sizes are cast off, so that, indeed, the fact of such sloughs being present in the evacuations may escape detection. In the only case of invagination in which the bowel itself sloughed off in its entirety, in the practice of the author, the lost piece, a part of the ilium, was eight inches in length, entire as respects the presence of all the layers of the bowel, and showing the evidences of gangrene only at the line of separation. This occurred on the eighteenth day of the disease, the patient recovering. Again, cases of intussusception become chronic, last for months, even for a year or two, and then recovery ensues, or death takes place by gangrene, by perforation, by peritonitis, or by all of these accidents combined.

Diagnosis.—The diagnosis involves the two questions—1. Of the form of disease causing obstruction; 2. Of the seat of the obstruction.

1. *Form of Obstruction.*—This is usually a matter of inference; nevertheless, there are considerations which may conduct the observer to right conclusions. Palpation and inspection of the rectum may determine the existence of a tumor, an enterolith, or fecal accumulation. Fecal accumulations may also be distinguished by palpation at the sigmoid flexure and at the cæcum, and the diagnosis may be aided by the history of constipation. The occurrence of previous attacks of hepatic colic, if within a reasonable period, would be a presumption in favor of obstruction caused directly by a biliary calculus, or of impaction, the calculus serving as a nucleus for the formation of fecal masses. If attacks of typhlitis, of pelvic peritonitis, or of peritonitis

in other situations have occurred before, it may be that a knuckle of intestine has been fastened by such a band. If a floating kidney or other tumor has been known to exist in a situation to compress the bowel, when sudden occlusion occurs, the cause will be at once suspected.

2. *Seat of Obstruction.*—The diagnosis of the position at which obstruction has occurred is a little less uncertain than the determination of the form of disease.

The distention of the abdomen—the meteorism—may furnish valuable diagnostic indication. When the colon at its lower part is obstructed the rectum will be empty, but the transverse and ascending colon will form a prominent roll, the rest of the abdomen being relatively sunken. Ultimately the stretching of the large bowel will render the ileo-cæcal orifice incompetent, and then the small intestines will be inflated and the whole abdomen swollen. When, as is so frequently the case, the obstruction is at the ileo-cæcal valve, the whole of the large intestine will be empty, and then the flanks, and the epigastrium will be relatively flat and sunken, while the center of the abdomen, all around the umbilicus, will be prominent and distended. By palpation and percussion the situation of a tumor, or of a fecal accumulation, can be made out.

When obstruction occurs in the jejunum or duodenum, the course downward into collapse is more rapid, the vomiting and hiccough more persistent and exhausting than when the same obstruction exists at other points. Furthermore, the abdomen is not distended, may be retracted even, and the vomited matters contain no feces. The urine is scanty in obstructions high up, and plentiful when the obstacle is low down in the colon.

If the symptoms have occurred suddenly, and are very acute, especially if peritonitis is present, a tight strangulation is probable—behind a band, in a slit in the omentum, or beneath the attached appendix.* If acute symptoms of obstruction have set in after some violent muscular efforts—as jumping—the patient previously free from disease, a twist in a loop of intestine has probably taken place. Has blood passed by stool in a child who has suffered from diarrhœa, and the symptoms of occlusion have come on suddenly, intussusception is the most probable nature of the accident. Whenever symptoms of obstruction occur in a woman who has borne many children, or is the subject of external hernia, or in one who has had attacks of peritonitis, the existence of strangulation by bands of adhesion is very probable.†

Course, Duration, and Termination.—All of these points have been more or less discussed, but some additional observations may be neces-

* Bryant, "The Medical Times and Gazette," vol. i, 1872, p. 363.

† J. Hutchinson, *ibid.*, vol. i, 1858, p. 34.

sary. The various occlusions, even when they have existed to a partial extent for a long time, begin suddenly and with violent symptoms; their course is rapid, and they terminate in recovery, in partial recovery, in peritonitis, with or without perforation or gangrene. Peritonitis is a common result. It is announced by greater fullness of the abdomen, increased embarrassment of breathing, more frequent vomiting and hiccough, rise of temperature, and deepening of the collapse. The duration in the average is, according to Leichtenstern, six days; but a child may be killed by the shock of an intussusception in a few hours. They may last two or three weeks.

Prognosis.—In every case of occlusion the prognosis is grave; for, although even very unpromising cases may yield to treatment, the result is so usually fatal that the most guarded opinions only should be given. The prognosis is more favorable in cases of impaction by feces than in any other form of obstruction.

Treatment.—Until the character of the obstruction is ascertained, no attempt should be made to procure a movement of the bowels by active purgatives or by enemata. If impaction be discovered, the treatment already described should be put in force. If intussusception be the cause of obstruction, then certain kinds of enemata are used. Nevertheless, the rule holds good that in obstruction all violent and perturbing measures are improper. On the other hand, the utmost quietude is necessary, in respect to the movements of the patient as well as to the use of remedies. Foremost, and above all measures, stands opium, administered with the view to maintain a quiescent state of the intestinal canal, and not less for its influence over the inflammation and spasm which arise in the course of the various obstructions. The most effective mode of administration is by the hypodermatic injection of morphine. The quantity is measured solely by the effect produced. There should be sufficient morphine administered to quiet the pain, to lower the pulse, and to maintain a state of somnolence from which the patient may be easily aroused. This is accomplished in adults by one fourth of a grain of morphine and $\frac{1}{15}$ grain of atropine for the first injection, and by one eighth of a grain subsequently, and every four to six hours, according to the degree of effect. With each subsequent dose from the first, the quantity of atropine should not be greater than $\frac{1}{30}$ of a grain, for the effect is much longer maintained than is the case with morphine. When impaction exists, the use of the opium would seem not to be indicated, since constipation is a leading factor, but even in these cases the result of its administration is much more favorable than the treatment by purgatives, which in vain are used to overcome the obstacle; while, if the opium be persisted in, the bowels move spontaneously. Purgatives failing to remove a fecal accumulation, an invagination, or internal strangulation, increase all the dangers—of gangrene, of perforation, and of peritonitis. Although this agent is more effective when used in the form of

morphine subcutaneously, various preparations of the crude drug may be administered by the stomach or by the rectum, the object in view being the same. Next to the subcutaneous method, probably the most satisfactory mode of administration is by the rectum. For stomachal use the best preparation is the official deodorized tincture.

If the meteorism be very pronounced, this increases the difficulty of relieving the invagination or the internal strangulation by maintaining an over-distention of the intestine above the point obstructed. The gas may be safely removed by puncture with a fine, long needle of the aspirator. This little operation, by removing an accumulation of gas, has permitted the reduction of strangulated hernia, which had previously resisted the most skillful taxis. Experience has abundantly shown that the distended intestines may be punctured at various points without any ill result, immediate or remote.* An intussusception through the ileo-cæcal valve or an impaction of the cæcum and ascending colon may now and then be overcome by hydrostatic pressure—by filling the intestine gradually with water at 95° from a reservoir placed at a sufficient elevation. Air or gas may be used for the same purpose. A neat way to effect it is to disengage carbonic-acid gas in the rectum by injecting first a solution of sodium bicarbonate, and following this with a solution of tartaric acid. About a drachm of each will be required. A firm compress must be held against the anus with sufficient strength to prevent the escape of the gas. Such is the elastic force of the gas that the intestine is distended, the ileo-cæcal orifice expanded, and the intruded bowel forced back. For the success and safety of this expedient it is essential that it be used before peritoneal exudation and adhesions have formed—before, indeed, the intruded bowel is much swollen. If put off too long, adhesions, to prevent rupture into the peritoneal cavity, may be destroyed, or a softened condition of the bowel will yield before the pressure of the gas and a rent occur. For these and other reasons an experiment of this kind should be undertaken early. The distention of the bowel by air forced in by an ordinary pump may be used instead of gas, or tobacco-smoke may be injected, partly to act mechanically, partly as a relaxing agent. The infusion of tobacco was formerly much employed, but rarely now, as an enema to relax the muscular fiber of the intestine. It is a very dangerous application, and is not as effective as other means now used. Recently irrigation of the stomach has been warmly advocated. It is alleged that, by thoroughly emptying the bowel of gas and feces through the stomach-tube, the distresses of the patient are much mitigated, and the obstruction, if due to impaction, invagination, or twisting, is overcome.

Warm applications to the abdomen afford comfort, if they do not affect the course of the disease. If there be local tenderness—in the

* Trousseau, "Clinique Médicale," *op. cit.*

right iliac fossa, for example—an ice-bag may be placed over the painful spot, and, if the temperature is elevated, leeches may be used cautiously. Whenever, in intestinal maladies, leeches are to be applied, the anal region should be selected. As the strength of the patient is rapidly reduced, much attention should be paid to alimentation. Solid food should not be given. Milk, eggs, and meat-juice are proper. If vomiting persists, lime-water should be added to the milk. Champagne and cracked ice are highly grateful to the patient, and allay vomiting. Stimulants are required as the symptoms of collapse appear. Carbohc acid in mint and cherry-laurel waters is useful to allay nausea and to remove the fetor of stercoraceous vomiting. The author is aware that many practitioners administer various agents in combination with opium, partly to increase its efficacy, it is supposed, and partly on account of some virtue in the remedy. Calomel is most frequently so employed, and, as the author believes, to the injury of the patient, except when given in very minute doses to allay irritability of the stomach. The relief of internal strangulation, by surgical methods, does not come within the scope of a strictly medical treatise. The reader is referred to papers by Mason and Ashhurst.*

INTESTINAL PARASITES.

Forms.—Only those parasites having their *habitat* in the intestinal canal will be considered. Trichinosis, the most important subject in helminthiasis, pertains to the class of general diseases, and will therefore be treated of in that connection.

But twenty-one of the large number of parasites infesting the human body are found in the intestinal canal, and of these only eight are peculiar to man. They are as follows :

Cestoda (Tape-worms):	{	Tænia solium, Tænia saginata, Bothriocephalus latus.
Nematoda (Round Worms):	{	Ascaris lumbricoides, Oxyuris vermicularis, Trichocephalus dispar, Trichina spiralis, Anchylostomum duodenale.

One parasite at a time is the rule—two is not an uncommon number ; but Rosen † reports the case of a child four years of age in whose intestines there were ten lumbricoid worms, an innumerable quantity of oxyures, and four tæniæ. According to Davaine, ‡ children are

* "The American Journal of Medical Sciences," 1873 and 1874, vols. lxxi and lxxviii.

† "Traité des Entozoaires et des mal. Verm.," par C. Davaine. Paris, 1879.

‡ Ibid.

more affected by nematoda (round worms), and adults by cestoda (tape-worms), but Heller* maintains that adults are more affected by both classes of parasites.

Origin.—The doctrine of spontaneous generation having received its fatal blow, it is unnecessary to discuss this theory as applied to intestinal worms. It may be regarded as settled that the ova or embryos are admitted from without and conveyed into the intestinal canal by articles of food and drink. Hence, those who handle fresh meats or eat uncooked animal food are specially liable to become hosts of parasites.† Uncleanliness is also an influential factor, and for obvious reasons.

General Results of the Presence of Parasites in the Intestinal Canal.—There is scarcely a symptom which has not been referred to worms. Formerly, as an etiological factor, worms had a high degree of importance ; but their influence has been less and less regarded, so that now they are almost wholly overlooked. As is usual, doubtless, the truth lies between these extremes. The presence of parasites in the intestinal canal is not incompatible with perfect health and the entire absence of symptoms. The effects produced are local and systemic. The local symptoms are, disorders of digestion, abdominal pains, especially around the umbilicus, and an irritation, usually an itching, around the anus ; but the chief symptom is the appearance of the worm or worms. The remote or systemic signs are very numerous : thirst ; salivation ; a capricious, absent, or exaggerated appetite ; emaciation ; irregular action of the heart, palpitations, or intermittence of the pulse ; cough, dyspnœa, laryngismus stridulus ; disorders of taste, hearing, smell, vision ; convulsions—such are the varied reflex disturbances produced by parasites in the intestinal canal. They are, however, far from usual ; indeed, they are exceptional, and not determined by the size, number, character, or position of the worms, but on some special susceptibility of the affected person.

CESTODA—TÆNIA—TAPE-WORMS.

Varieties.—Tænia saginata—beef tape-worm—is the form most common in this country ; tænia solium is occasionally encountered, while the bothriocephalus latus is rare.

Causes.—The development of tænia in its different phases has now been thoroughly demonstrated. Bothriocephalus latus has, however, thus far eluded research. A tape-worm reaches its final growth in the intestinal canal from an embryo—an intermediate stage in its course of development—admitted into the canal by means of infested meat. Since the introduction of the Russian method of curing diarrhœa by the use of finely-scraped raw meat, and the modern taste of eating

* "Intestinal Parasites," *loc. cit.*

† Cobbold, "Entozoa." London, 1864, p. 232.

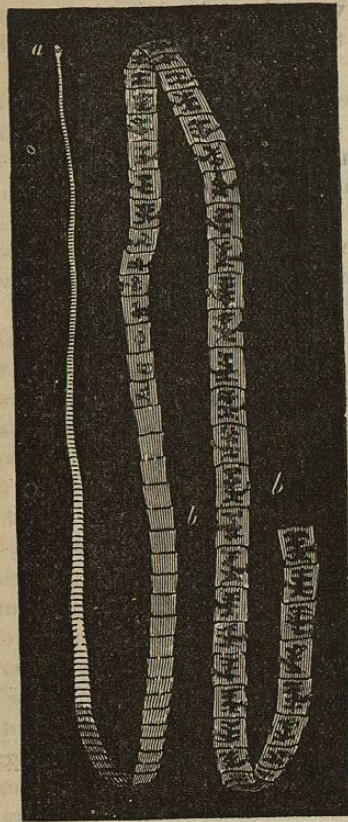


FIG. 5.—*Tænia solium*, or solitary worm. *a*, head, or scolex; *b*, tape formed of many individuals, the last of which, completely sexual, separate under the name of *proglottides*, and represent the adult and complete animal. Each solitary worm is a colony.—*Van Beneden*.

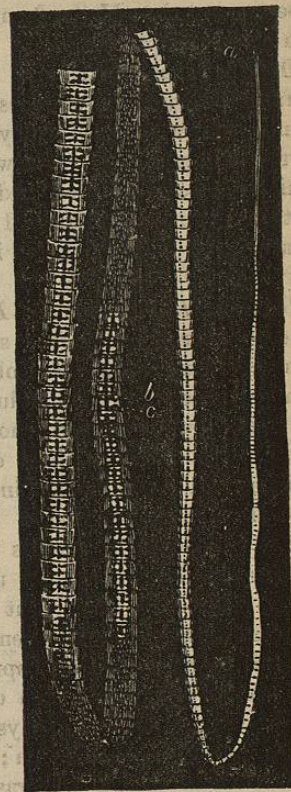


FIG. 7.—*Bothriocephalus latus*. *a*, scolex; *b*, the proglottides; *c*, the sexual organs.—*Van Beneden*.

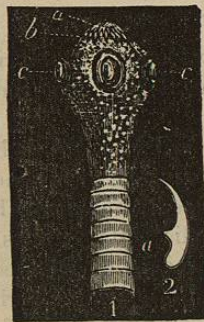


FIG. 6.—*a*, Rostellum; *b*, crown of hooks; *c*, *c*, suckers; 1, scolex of the *tænia solium*; 2, hooks expanded; *a*, heel of the hook.—*Van Beneden*.

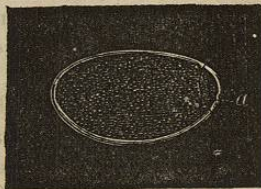


FIG. 8.—*Bothriocephalus latus*, egg.—*Van Beneden*.

rare steaks, etc., tape-worm has become more common. *Tænia solium* is derived from the embryos contained in pork, known as *cysticercus cellulosus*, and *T. saginata*, from embryos found in beef. The bothriocephalus is supposed to be derived from an embryo found in fish, but not correctly so, as it occurs among peoples living on the seashore and at the borders of lakes, and in the interior of continents as well.

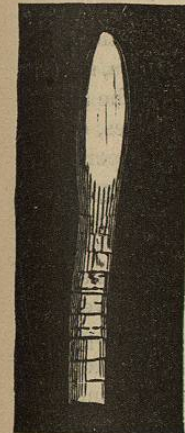


FIG. 9.—*Bothriocephalus latus*, scolex.

Symptoms and Results.—The small intestine is the abode of *tænia*, but when very long it may reach into the large intestine. The head is fixed against the mucous membrane just below the pylorus. The *T. solium* is usually solitary, but not always, and a number of them may be found in one host. The immense length of the segments discharged often gives rise to the impression that there must be several of them to produce such a quantity. Although more frequent in adults, no age is exempt, and infants at the breast have been infested after feeding on raw beef-pulp. Dr. Armor* reports a case of *tænia* in an infant five days old.

Women are more subject than men to *tænia*: in one hundred and sixty-four cases, ninety belonged to women and seventy-four to males. Segments or strobila of the tape-worm colony pass in numbers spontaneously, and after the action of medicines; and now and then the living proglottides migrate, crawl out of the anus, and are felt, cool and moist, wriggling about the hips, thighs, and genitals. Very rarely, portions of a tape-worm are thrown up by vomiting. The length of time they remain in the intestine is by no means a fixed period; they have been known to exist there ten to twelve years, and even longer; but there are very obvious difficulties in the way of accurate determination of this point.

The presence of a tape-worm when recognized by the patient induces serious inquietude of mind, but not necessarily any disturbance of the bodily functions. Not unfrequently, a tape-worm produces, absolutely, no symptoms. The degree of disturbance caused is determined by the characteristics of the affected person—they who suffer much are nervous and easily susceptible to impressions of all kinds. In a large proportion of cases, the presence of the proglottides in the evacuations is the first intimation of the presence of the worm in the intestinal canal. The principal symptoms are: emaciation, notwithstanding an inordinate appetite; a feeling of lassitude; colicky pains felt through the abdomen; palpitation of the heart, faintness; salivation; disordered digestion; pruritus of the anus and nose; disorders of the special senses, notably feebleness, etc. Sometimes the disagreeable feelings in

* "New York Medical Journal," December, 1871.