THE

BOSTON MEDICAL AND SURGICAL JOURNAL.

VOL. XL. WEDNESDAY, JUNE 27, 1849. No. 21.

AN ESSAY ON INTESTINAL AUSCULTATION.

BY CHARLES HOOKER, M.D., PROFESSOR OF ANATOMY AND PHYSIOLOGY IN THE MEDICAL INSTITUTION OF YALE COLLEGE.

Read before the New Haven County Meeting of the Connecticut Medical Society, April 8, 1847, and communicated for the Boston Medical and Surgical Journal.

THE object of the following essay is to draw attention to an application of the art of auscultation hitherto neglected—the auscultation of the sounds produced in the intestinal canal. The cavity of the stomach and intestines, both in health and disease, contains, together with solid and liquid matters, a considerable quantity of aeriform substances. This is shown by examination after death, when air is invariably found in the intestinal canal, and may also be rendered evident, at any time during life, by percussion. These aeriform substances consist of common air, hydrogen and its different compounds, carbonic acid, and various other gases, in variable quantities and proportions in different subjects and in different conditions of the body.

The peristaltic action, which is constant in health and is commonly continued in disease, necessarily produces motions of the solid, liquid and gaseous contents of the intestines; and from the known laws of acoustics it might be philosophically inferred that these motions would be productive of sound. These sounds are sometimes audible at a distance from the body, and are noticed, under the term borborygmi, as a symptom in various diseases. As the quantity and proportions of the liquid and gaseous contents of the intestines are known to vary, and the peristaltic action to be variously modified, by the changes of disease, it might reasonably be presumed that the sounds produced within the intestines would be subject to corresponding variations; and it is not unphilosophical to suppose that these varieties of sound may afford valuable practical indications.

It is remarkable that a celebrated English philosopher, who was not a medical man, directed attention to this subject, many years before the discovery of the art of auscultation by Laennec. Hook, in his posthumous works, says, "There may be a possibility of discovering the internal motions and actions of bodies by the sound they make. Who knows but that, as in a watch we may hear the beating of the balance and the runnning of the wheels, and the striking of the hammers, and the grating of the teeth, and multitudes of other noises; who knows, I say,

The Boston Medical and Surgical Journal as published by
The New England Journal of Medicine. Downloaded from nejm.org at SANTA BARBARA (UCSB) on June 25, 2016.
For personal use only. No other uses without permission. From the NEJM Archive. Copyright © 2010 Massachusetts Medical Society.

but that it may be possible to discover the motions of internal parts of bodies, whether animal, vegetable or mineral, by the sound they make; that one may discover the works performed in the several offices and shops of a man's body, and thereby discover what engine is out of order, what works are going on at several times, and lie still at others, and the like?" "I have this encouragement"...." from experience, that I have been able to hear very plainly the beating of a man's heart; and *it is common to hear the motion of the wind to and fro in the guts* and other small vessels; the stopping in the lungs is easily discovered by the wheezing." The prediction of this philosopher, who, as Dr. Elliotson observes, seems almost to have prophesied the stethoscope, has been fully verified in reference to the thoracic viscera and the gravid uterus; but to this time it has been strangely neglected in the investigation of the condition and action of the intestinal canal.

It is now more than twenty years since I have habitually attended to the sounds produced in the abdomen in various diseases; and in the early stage of my investigations I indulged the hope, that in disorders of the intestinal canal auscultation might gain nearly the same distinctness and precision, that it had already acquired in relation to thoracic diseases. Though I long ago relinquished a degree of this sanguine expectation, continued observation has confirmed my opinion of the importance of the subject, and has enabled me to discover practical indications which I regard as of great value.

When the ear is applied to the abdominal parietes of a healthy subject, there is heard an almost constant succession of sounds produced by the motion of the contents of the intestinal canal. These sounds are varied by many causes, such as the quickness, regularity, and other variations of the peristaltic action, the degree of fulness of the intestines, the proportions of the gaseous and other contents, the fluidity of the liquid contents, &c. The sounds, thus varying with the causes of their production, afford indication of these several causes; and they thus become signs of actions and conditions of the intestines, a knowledge of which is of the utmost importance in investigating the diseases of these viscera. In most diseases of the intestinal canal the sounds do not afford definite diagnostic signs to characterize the different diseases, like the diagnostic signs disclosed by auscultation in thoracic diseases. They are chiefly signs of particular conditions or actions, which may occur in various intestinal diseases, rather than diagnostic signs to distinguish different diseases. In some diseases, however, signs are thus obtained, which perhaps may be considered as truly diagnostic of the diseases in which they occur.

In the *Asiatic Cholera*, which prevailed in New Haven in 1832, this application of auscultation was attended with interesting results, which were noticed in an account of the cases which came under my observation, published in the Boston Medical and Surgical Journal for July, 1833. Writers generally noticed the loud borborygmi, audible at a distance from the patient, which occurred in that disease; and to the ear applied over the abdomen the sounds were so peculiar—at least so different from what I have observed in other diseases—that they seemed

The Boston Medical and Surgical Journal as published by
The New England Journal of Medicine. Downloaded from nejm.org at SANTA BARBARA (UCSB) on June 25, 2016.
For personal use only. No other uses without permission. From the NEJM Archive. Copyright © 2010 Massachusetts Medical Society.

distinctly characteristic of that disease. These sounds manifested a rapid commotion of the whole intestinal canal, and might be compared to those produced by shaking together several flasks of various sizes partly filled with water. Frequently the sounds appeared to indicate that the rapid peristaltic motions were suddenly arrested and reversed by an anti-peristaltic action, which occurrence immediately preceded a paroxysm of vomiting. The large quantity of serum effused into the intestines, causing an extreme fluidity of their contents, with the rapid and irregular peristaltic and anti-peristaltic motions, would sufficiently account for this unusual variety of sounds.*

The effects of various remedies upon the intestinal action, as indicated by the sounds, were carefully observed. Practitioners were generally disappointed, in that disease, to find the frequent vomiting and purging not checked by the administration of stimulants and astringents; and the sounds manifestly indicated that the common effect of these remedies was decidedly to increase the intestinal commotion. Such was the manifest effect of opium, unless given in doses so large as to produce alarming prostration. On the contrary, frequent small doses of camphor, with a free administration of ice, appeared to have a soothing operation in moderating the rapid and irregular intestinal action. The comparative effects of large and small doses of calomel were strikingly interesting. Frequent small doses did not seem to diminish, but at least temporarily to increase, the disordered peristaltic and anti-peristaltic motions; while a single drachm dose almost invariably caused a total suspension of these motions. Calomel, in very large doses, thus seemed to be the appropriate remedy for the disease. It appeared to overpower the diseased intestinal action, arrested the vomiting and purging, and caused a total suspension of all intestinal motion, during which no sound was audible. An interval of perfect intestinal silence and repose now continued, ordinarily from eight to twelve hours, after which a natural peristaltic murmur indicated a gradual return of healthy action, which was in time succeeded by the grass-green evacuations, commonly regarded as evidence of a favorable crisis of the disease. Thus the large doses of calomel, instead of exhausting the system by an excessive cathartic operation, actually obviated exhaustion by arresting the profuse serous evacuations attending the disease.

Ordinarily the danger was considered as overcome, when the disordered intestinal action was suspended, and the stage of repose produced; and in this town few cases terminated fatally, when the practice was adopted of effecting this result by the large doses of calomel, before the system had been extremely exhausted by evacuations. In one case, however, that of a little girl, 10 years of age, who, without any premonitory symptoms, was most violently attacked with vomiting, purging and spasms, this treatment had the ordinary effect of promptly arresting the intestinal motions; but the system did not re-act, the pulse failed and became

* It remains to be shown, whether these sounds are constant diagnostic signs of this disease, or whether, as I have observed in dysentery and other diseases, the varying epidemic type, in different seasons, will produce in cholera a variation of morbid intestinal action, with a corresponding variety of sounds.

The Boston Medical and Surgical Journal as published by
The New England Journal of Medicine. Downloaded from nejm.org at SANTA BARBARA (UCSB) on June 25, 2016.
For personal use only. No other uses without permission. From the NEJM Archive. Copyright © 2010 Massachusetts Medical Society.

imperceptible within an hour from the attack, the coldness and lividity of the surface increased, and, without any return of peristaltic action, the patient died five hours from the attack.

Cholera Morbus is usually attended with intestinal sounds, which indicate a succession of quick and irregular peristaltic and anti-peristaltic motions. In some cases these motions continue until the contractile power of the intestines seems nearly exhausted, when a feeble, but more regular, peristaltic murmur indicates a gradual return of healthy action. The violent symptoms are not succeeded, as in Asiatic cholera, by a long interval of total inaction of the intestines; and the sounds are very different from those heard in that disease.

There is, however, a great diversity in cases commonly termed cholera morbus. Some cases commence with a violent diarrhœa, on the cessation of which occurs an obstinate vomiting, during which, as in colic, no intestinal sounds are heard, except those produced by anti-peristaltic action. Other cases commence with vomiting, without any downward motions, until at length the action is reversed, and the disease terminates with diarrhœa.

Colic is a disease which is variously divided by writers into several species. One of these, termed c. rachialgia, c. pictonum, &c., produced by the poison of lead, has characteristics certainly sufficient to give it a specific distinction; but the other divisions, I think, have reference to various exciting causes, or attendant circumstances, rather than to any proper specific characters. In the various forms of this disease auscultation affords results, which I regard as highly interesting, and of much practical value, and which may throw some light on the pathology of the disease.

Common Colic is characterized by "griping pain in the bowels, chiefly about the navel, with vomiting and costiveness." The exciting causes are various, as irritating indigested food, biliary derangement, habitual costiveness, hardened fæces, flatus, worms, exposure to cold, and—what I consider as much the most common cause—rheumatism affecting the intestines. With these various exciting causes, the general characters of the disease are similar; the severe griping pain, obstinate constipation and vomiting, constituting the prominent symptoms.

There is, however, an *incipient, forming, or latent stage*, which with strict observation I think may always be noticed, preceding the pain and other violent symptoms. The symptoms of this stage somewhat resemble those which precede the cold stage of intermittent fever. There is a general languor and inaptitude, often a degree of moroseness or peevishness, and commonly a slight chilliness. The sensations in the abdomen are variously described by patients, as a numb, dead, heavy, or cold feeling. Many speak of a sensation as of a cold weight, felt mostly between the region of the stomach and umbilicus. The physician is rarely consulted during this stage; and the symptoms are so slight, that ordinarily they are not particularly noticed by patients unaccustomed to attacks of the disease; while persons subject to frequent attacks learn to notice these sensations as the invariable precursors of the more violent symptoms. In this stage, which continues in different cases from half

The Boston Medical and Surgical Journal as published by
The New England Journal of Medicine. Downloaded from nejm.org at SANTA BARBARA (UCSB) on June 25, 2016.
For personal use only. No other uses without permission. From the NEJM Archive. Copyright © 2010 Massachusetts Medical Society.

an hour to several hours, auscultation discovers a perfect stillness within the abdominal cavity. Sometimes there is an occasional rumbling in the course of the large intestines; and, with a desire to relieve the unpleasant sensations, the patient, by a voluntary straining effort produces an evacuation of fæces with a quantity of flatus. There is, however, no indication of the slightest motion in the small intestines. This forming or latent stage of colic, which is commonly overlooked both by patients and physicians, is deserving of particular attention; because during this stage the peristaltic action is easily restored, and the violent symptoms thus prevented. In many cases this may be effected simply by the application of heat to the surface, especially to the extremities. Friction to the abdomen, with a sort of kneading process, contributes also to this effect. Often a free draught of hot coffee, or of some aromatic infusion, is sufficient; in other cases, a small dose of rhubarb, or other mild cathartic, with some aromatic, is required. A few drops of cajeput oil will commonly promptly restore the peristaltic action. My usual remedy for this purpose is camphor, in frequent small doses; and I have instructed many persons to ward off habitual attacks of colic, by carrying constantly in the pocket a small piece of camphor, to be gradually dissolved in the mouth, and swallowed with the saliva, whenever these premonitory symptoms occur. This remedy is often more effectual, in exciting peristaltic action in such cases, than a brisk cathartic.

This forming stage, unless the peristaltic action is soon restored, is succeeded by the violent symptoms of the disease. With occasional short remissions, the pain becomes severe; the abdominal muscles are rigidly contracted, producing a knotted appearance of the surface, and there is occasional nausea and vomiting. The patient groans, and throws himself into various positions, with the vain hope of relieving his distress. In this, as well as in the forming stage of colic, the ear applied to the abdomen discovers no evidence of peristaltic action, but on the contrary a perfect stillness within the abdominal cavity.

This *cessation of peristaltic action*, I may confidently assert, is a chief *essential character of colic*; the motion being suspended before the occurrence of the violent symptoms, and not recurring until the disease is about to yield. Sometimes, during the violent contortions of the body, a momentary sound is heard, indicating a slight intestinal motion, which seems to be produced by the mechanical pressure of the abdominal parietes, rather than by a peristaltic action. Occasionally, too, there are sounds produced by anti-peristaltic motions, which motions either terminate at the stomach causing simply nausea, or extend into the stomach so as to excite vomiting. By these circumstances, and by the variety of sounds, anti-peristaltic motions can commonly be distinguished from a regular peristaltic action. This distinction is important, for as a cessation of peristaltic action is a main essential character of colic, so a return of this action indicates a favorable crisis of the disease. The sounds produced by anti-peristaltic motions are only occasional and transient, proceeding commonly from a limited portion of the intestinal canal; and they are usually succeeded, as before stated, by nausea or vomiting. Those attending a regular peristaltic action are produced

The Boston Medical and Surgical Journal as published by
The New England Journal of Medicine. Downloaded from nejm.org at SANTA BARBARA (UCSB) on June 25, 2016.
For personal use only. No other uses without permission. From the NEJM Archive. Copyright © 2010 Massachusetts Medical Society.

throughout the whole course of the intestines, constituting an almost incessant rumbling, heard distinctly at one moment directly under the ear, then gradually receding until it seems like a distant echo, and again returning in the course of the convolutions of the intestines. There is thus a union of near and distant sounds, indicating a general action throughout the intestinal canal. When this description of sounds is heard in colic, the patient may be considered as safe, even if the pain continues severe; on the contrary, a complete subsidence of the pain and other violent symptoms, unless attended by a return of healthy peristaltic murmur, affords no favorable indication, in any stage of the disease, and in an advanced stage, when the strength is exhausted by protracted suffering, it indicates extreme danger—a loss of the sensibility and excitability of the intestine, and a failing of the powers of life.

Commonly, a return of peristaltic motion is followed, almost immediately, with a relief of pain and other severe symptoms; but in protracted cases, when the bowels have become inflamed, and the soreness such that the least external pressure cannot be tolerated, this return of peristaltic motion causes a decided increase of pain. This circumstance is similar to what is often observed during the resolution of pneumonia, when a return of respiration to a portion of inflamed lung, which has previously been impermeable to air, produces the keenest pain. In such cases auscultation informs us that all is well, when the sensations of the patient would indicate an aggravation of the disease. The signs thus furnished, in colic and other diseases, will often direct the withholding of medication, when it is no longer required, and when its continuance might sometimes be injurious. Frequently they have enabled me to assure patients that the cause of difficulty was removed, and that my services were no longer required, some hours before the general symptoms showed signs of any mitigation.

Some eighteen years ago, I called one morning to see an eminent medical friend, who had been subject to frequent attacks of colic, and who was now thought to be dying, after a night of extreme suffering with this disease. Applying my ear to the abdomen, I immediately assured him that a regular peristaltic action was restored, and that the danger was over. He replied that he experienced no relief of symptoms, saw little reason for encouragement, and felt as though he could survive but a short time. The pain was now severe and increasing; and it was more than two hours from this time before the apprehensions of the patient, and of his friends generally, were at all relieved. In this case, as in many others that I have observed, it was full three hours, after my confident assurance that the disease had made a favorable crisis, before there was any evacuation from the bowels.

In March, 1847, I was called at night to a man affected with colic. After the usual precursory symptoms, he had now, for about two hours, suffered severe pain, which had suddenly increased within the last few minutes, so that he could hardly be confined to the bed. The application of the ear discovered a regular active peristaltic motion. I concluded that this was a case, such as are sometimes observed, of a spontaneous restoration of peristaltic motion, and that this returning motion

The Boston Medical and Surgical Journal as published by
The New England Journal of Medicine. Downloaded from nejm.org at SANTA BARBARA (UCSB) on June 25, 2016.
For personal use only. No other uses without permission. From the NEJM Archive. Copyright © 2010 Massachusetts Medical Society.

had caused the present sudden increase of pain. As the pain had not continued long enough to induce any considerable inflammation or soreness of the intestines, I did not hesitate to assure him, that if he would keep warm in bed, the pain would soon subside. I remained with him about thirty minutes, and left him in a quiet sleep—not taking to myself the credit of a cure, as I might have done, had not auscultation informed me that a spontaneous natural action had rendered medication unnecessary.

Pathologists entertain different opinions in reference to the immediate cause of colic. Some, with Cullen, consider the symptoms as owing to a spasmodic constriction of the intestines; while Abercrombie and others attribute the inaction of the intestines to torpor, or a loss of their muscular power. I am inclined to the latter opinion—to attribute the inaction of the intestines to a suspension of the motor nervous influence, and the supervening pain to a morbid excitement of the sensitive nerves. Such an association of paralysis of motion, with morbid sensibility, is not uncommon in other parts of the body. Paralysis of the limbs is often attended with paroxysms of severe pain: and in a painful sciatica, and in neuralgia of various parts of the system, the motor nervous influence is usually more or less diminished.

It is well known, however, that all the symptoms of colic are produced by any obstruction which mechanically arrests the motion through any portion of the intestines; as in strangulated hernia, involution of the intestines, and in cases of obstruction from impacted fæces, calculi, or any solid substances in the intestinal canal. It is remarkable, moreover, that the same results are caused by sympathy of the intestines with obstruction in other parts; as a foreign substance in the *cul-de-sac* of the appendix vermiformis, calculi in the ureters, gall-stones in the biliary ducts, and also in severe cases of dysmenorrhœa.

In all these affections, in some stages of the complaints at least, there is the same total suspension of peristaltic motion, which occurs in colic. When the mechanical obstruction is obviated in these complaints, as in the relief of the strangulation in hernia, it is commonly observed that the relief is immediately succeeded by a rumbling sound in the intestines, which is usually followed by alvine evacuations.

It may be difficult to explain how these various mechanical obstructions should cause a suspension of the motor nervous influence in the intestines; but from my observations I may assert that there is commonly (I would not say invariably) the same numb, heavy sensation, preceding the pain and other violent symptoms, that I have described as constituting the forming stage of colic.

[To be continued.]

J. S. J.'S REMEDY FOR WORMS.

[Communicated for the Boston Medical and Surgical Journal.]

In No. 13, Vol. XL., of the Boston Medical and Surgical Journal, there is a communication from a correspondent, J. S. J., on the subject of

The Boston Medical and Surgical Journal as published by
The New England Journal of Medicine. Downloaded from nejm.org at SANTA BARBARA (UCSB) on June 25, 2016.
For personal use only. No other uses without permission. From the NEJM Archive. Copyright © 2010 Massachusetts Medical Society.