CARDIOSPASM WITH SACCULATION OF THE ESOPHAGUS, WITH SPECIAL REFERENCE TO THE PERSISTENCE OF THE SAC*

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Since reporting, two years ago,¹ a series of ten cases of cardiospasm with sacculation of the esophagus, we have had the opportunity of studying four additional cases and of observing the after-results in eight of the fourteen cases treated. The clinical and x-ray observations of the results in these cases have ranged over periods of from one to four years after the cessation of treatment. It is to these observations especially that we wish to call attention here.

When our original paper on this subject was presented, insufficient time had elapsed following the treatment of the cases to justify any absolute statements as to the ultimate results, but based on the pathologic findings we ventured the statement that while a fairly complete symptomatic cure was possible, an anatomic cure seemed most improbable in those cases in which sacculation existed to any marked degree. We believed that even after complete stretching and paralyzing of the cardia, it was questionable whether any of these patients in whom sacculation existed would be found entirely free from symptoms; that they would always have to exert more or less care in the amount and character of food taken, and the manner of ingesting it; furthermore, that the more marked the distention of the esophagus the less complete would be the cure and the more pronounced the after-symptoms. Since that time we have been able to observe three of our patients for periods of four years or more, and five for periods ranging from one to three years, and have been able to verify in them the belief expressed at that time.

We may accept as a fair example of these patients those who received treatment four years ago and who to all intents and purposes are well, are experiencing little or no difficulty in swallowing, and yet are made to realize that they are not normal individuals. Without exception they state that their condition is so much better than prior to the treatment that they pay little or no attention to the existing minor ailments, yet they must exert care in eating and must not eat rapidly or swallow their food in large masses, some finding it best to avoid very cold fluid and solid articles of diet. Some of these patients have observed that the foods which are light enough to float on water cause more difficulty than those which are heavier, a fact which is to be readily accounted for through our observation that fluid secretions collect in the sac as the result of the negative pressure which exists there, and that very light articles of food are kept afloat within the sac. In spite of the brilliant results obtained through the forcible divulsion of the cardia through hydrostatic pressure, we have been unable to find a single case of advanced cardiospasm with sacculation in which these mild symptoms did not exist, and we believe that others who may later report the after-results in their cases will have met with practically the same experience.

PERSISTENCE OF THE SAC AFTER CURE OF CARDIOSPASM

The reason for the persistence of the symptoms has been clearly shown by us to be due to the persistence of the sacculation, which seems to undergo but little shrinkage after the spasm has been overcome, and to the consequent loss of the normal peristalsis of the lower third or two-thirds of the esophagus.

In our attempts to demonstrate the persistence of the sac in all of the cases that we were able to keep under observation, we resorted first to the introduction into the esophagus of a stomach-tube with an intragastric, thin rubber bag attached, somewhat similar to that which has been described by others. Into this the water was gradually injected by means of a large glass-metal syringe until the patient experienced great discomfort as a result of the distention. It was found invariably that almost as much fluid could be injected into the sac four years following the "cure" as could be introduced just prior to the commencement of the treatment. In other words, we could introduce into the sacculation that persisted as long as four years after the treatment, from 200 to 400 c.c. of fluid. This led to the observation of these cases before the fluoroscopic screen, using bismuth suspension in soured milk.

Figure 1 shows the radiograph of Patient 4 of our original series taken with over 300 c.c. of bismuth suspension injected into the bag. This patient subjectively and objectively seems perfectly well, and carries on his work as bank clerk with practically no discomfort. His weight is now 168 pounds as compared with 138 pounds prior to his treatment four years ago. He experiences no obstruction whatever, but has learned by experience that he is most comfortable if he eats slowly and avoids coarse foods and cold drinks. He finds, too, that a small quantity of fluid secretion collects in the sac, and he is made aware of its presence through its regurgitating into his mouth and nose during the night. To avoid this he empties the sac at night by bending forward with his head low and forces this fluid out through an expulsive movement. The expelled fluid never contains food particles, but is composed of a frothy, mucoid solution, evidently largely saliva.

Figure 2 is the radiograph of Patient 5 of our original series. This patient though well, manifests similar minor symptoms, but the sac easily contains 350 c.c. of bismuth suspension. These are fair examples of the x-ray observations made in all the cases we have been able to follow. The persistence of the sac was demonstrable in every case, the only variation being in the size of the sac.

In order to determine to what extent the normal esophagus can be stretched, a series of normal persons were observed in a similar manner, and in no case were we able to inject into the intragastric bag within the esophagus more than 40 to 60 c.c. of fluid without causing the patient the most intense discomfort. Figure 3 represents the radiograph of the normal esophagus stretched to the utmost.

The technic of this work is perfectly simple, the tube with intragastric bag being readily introduced either with or without a mandrin. The fluid is then injected by means of a large glass-metal syringe.

If these patients be placed before the screen and be given bismuth-pap mixture, it is seen to drop rapidly to the cardia, where it halts for a second and then enters the stomach. In other words there is no food retention in the sac as is the case prior to treatment.

In spite of the recent excellent literature on the subject of cardiospasm, it is evident that the condition

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is not being recognized by the majority of practitioners, and especially not until far advanced and irreparable damage, such as that described above, has been done. It will not be amiss, therefore, to call attention again to the symptom-complex of this interesting phenomenon, and to review briefly the means of diagnosis.

Believing firmly that the spasm is the primary manifestation and sacculization secondary to it, we are convinced from these studies that the earlier the condition is recognized, the more complete will be the cure, and the longer the condition remains untreated, the more incomplete both the clinical and the anatomic cure.

SYMPTOMS OF CARDIOSPASM

In some of the cases which came under our observation gastric symptoms had existed for a considerable period before definite symptoms of spasm were evident; in several of the cases the onset was sudden and unac-

stomach-tube were used more systematically as a diagnostic measure in all cases of indigestion, more cases of early cardiospasm would be discovered through the obstruction offered to the passage of the tube. At this stage the patient begins to complain that food "lodges under the end of the sternum," and endeavors to force it through by swallowing air, or following each mouthful with a sup of water. Each act of deglutition is now accompanied by more or less obstruction as the food passes the cardia, and then soon follows the stage of definite obstruction, when the patient finds it impossible to swallow coarse articles of food, such as meat, bread, etc. He voluntarily resorts to soft or liquid foods, such as eggs, purées, cereals and the like. As the obstruction becomes more complete many of the soft foods are also discarded, and only liquids taken.

Up to this time the wall of the esophagus has been undergoing hypertrophy in its effort to overcome,

Fig. 1.—Radiograph showing the persistence of the sac four years after the successful treatment for cardiospasm. Capacity over 300 c.c. of bismuth suspension. Recumbent, oblique position. Intensifying screen.

Fig. 2.—Radiograph showing persistence of the sac several years after successful treatment of cardiospasm. Capacity over 350 c.c. of bismuth suspension. Recumbent, oblique position. Intensifying screen.

companied by previous gastric symptoms. The earlier manifestations, in the cases of gradual onset, had almost invariably been treated as milder forms of indigestion, usually as nervous dyspepsia, being characterized by a "lump in the stomach," a feeling of fullness after eating, burning sensations in the epigastrium, and in some cases pains radiating from the epigastrium toward the hypochondriac regions. We have been impressed with the frequency with which patients have complained of pains radiating from the region of the cardia apparently along the diaphragm toward both sides and more especially the right side. The complaint of a "lump in the stomach" and a feeling of great discomfort at the moment the food enters the stomach is a common one. Within a comparatively short period these patients begin to experience difficulty in the process of deglutition, and are treated for hysteria. We feel that if the

through increased peristalsis, the obstruction at the cardia, and there now occurs, as is usual in obstructed, hollow viscera, a dilatation or sacculization. After sacculization occurs, the patient is somewhat relieved of the actual pain that he has been experiencing. Up to this time he may have been spitting up mouthfuls of food from time to time, but now begins to eructate large quantities. This process must be differentiated from actual vomiting, for these patients find it practically impossible to vomit, since the cardia will not relax sufficiently to permit the return of the food that has entered the stomach. At this stage the patient is often compelled to get up from the table and empty the esophagus, and then return and eat more. As the sac increases in size, he may even retain an entire meal before eructating any of the food, all the while, however, experiencing a feeling of great discomfort and pressure

under the sternum. He learns to eat slowly, chew his food thoroughly, and to stop after each act of deglutition to "tease the food through." Coarse and ice-cold foods are the most difficult of deglutition, warm soft foods and liquids being the easiest to dispose of. The patient is often surprised to find that at one time he is able to swallow with considerable ease, because of a temporary relaxation of the spasm, and that within a few moments he is unable to force anything through. A small quantity of solid contents and fluid secretions can practically always be found in the sac, and at night will in certain positions of the patient, flow from the mouth during sleep, soiling the pillow, sometimes flowing into the nose and occasionally into the trachea, causing fits of coughing and strangulation. One patient, for instance, found that when he turned to his left side the contents of the sac always gravitated into his mouth.

It must be borne in mind, however, that during a moment of temporary relaxation even a large bougie may pass readily.

In order to determine the presence and the size of the sacculation, a stomach-tube with intragastric bag attached, as described before, should be employed. This is introduced to the point of obstruction and water gradually injected until the patient complains of considerable discomfort, when the water may be withdrawn and measured, and a fair idea of the degree of sacculation obtained.

One of the most important diagnostic measures is the chemical analysis of the contents of the esophagus as compared with that obtained from the stomach. In order to obtain the stomach contents and esophageal contents separately, we have found it well to introduce a small stomach-tube or nasal tube containing a mandrin directly into the stomach, removing the mandrin

Fig. 3.—Radiograph showing degree to which the normal esophagus can be stretched by means of a thin rubber bag. Capacity 40 to 60 c.c. of bismuth suspension. Recumbent, oblique position. Intensifying screen.

With such a clinical picture as this, the diagnosis of cardiospasm should at once be suspected, even without further examination, but instrumentation and chemical analysis of the contents should always be resorted to in order to make an absolute diagnosis.

METHODS OF DIAGNOSIS

On the introduction of bougies or stomach-tubes an obstruction is met about 40 to 45 cm. from the teeth which is sometimes readily overcome, but at others very resistant. The soft tube may be more or less misleading in determining the existence of an obstruction, unless a mandarin is used, for the tube, instead of passing the cardia, may double up in a large sac in such a way as to give the impression that it has entered the stomach. The blunt, paraffin-silk bougies are preferable for determining the existence, location and degree of obstruction.

Fig. 4.—Radiograph in a case of untreated cardiospasm showing the act of swallowing a bismuth mixture; the enormous size of the esophagus and its efforts at peristalsis may be noted. Recumbent, oblique position. Intensifying screen.

and obtaining the stomach contents, then withdrawing the end of the tube into the esophagus, and through siphonage or suction obtaining the contents of the sac itself. The character of the gastric and esophageal contents is different; those from the stomach are well chymified and finely divided, with the typical odor, contain free hydrochloric acid but as a rule no lactic acid, show traces of sugar, have normal peptogenic power and contain yeast cells, etc.; whereas the esophageal contents are coarse, flocculent and poorly chymified, contain much mucus and salivary admixture, are practically odorless, are slightly acid in reaction, containing lactic acid but no hydrochloric acid and have no peptogenic power; sugar is present in considerable quantity because, as we have stated previously, there is present here every factor necessary for carbohydrate digestion and sugar production. For demonstration

purposes one may introduce fluids of different colors, for instance, carmin and methylene-blue, one into the stomach and the other into the esophageal sac, and afterward may obtain these fluids separately.

Both fluoroscopy and radiography are great aids in the diagnosis. If the patient in the oblique position before a screen be given a bismuth suspension or pap, it is seen gradually to collect just above the diaphragm and form a large shadow depending on the size of the sac. A small quantity may be seen to trickle gradually through the cardia into the stomach. It is especially interesting in these cases to employ the intragastric bag partially filled with bismuth suspension and observe it in relation to the heart-beat, respiratory movements, the process of deglutition, the act of vomiting, etc. The sac lies practically in direct contact with the heart, and when distended shows the indentation of the right auricle and ventricle, each pulsation causing a wave on

Fig. 5.—Radiograph of a case of untreated cardiospasm, by means of a large, thin, rubber bag, part of which is in the stomach and part in the esophagus, showing the point of constriction at the cardia. (The bag ruptured in the stomach at the moment the exposure was made.)

the surface of the bismuth suspension. It is surprising that there are not more marked cardiac symptoms manifested as a result of the direct pressure of a large quantity of contents in this sac, especially when we take into consideration the cardiac symptoms that may be produced as a result of slight pressure from beneath the diaphragm.

It is a fact, however, that these patients experience little or no cardiac disturbance. This is to be accounted for, it seems, through the accommodation of the heart to the gradual development of the sac. So far as our observations go, the heart is not perceptibly displaced through the filling of the sac. Radiographs taken immediately after a bread and bismuth meal show the sacculation nicely, but not so satisfactorily as when the intragastric bag is used.

The chief value of the esophagoscope in these cases lies in the differential diagnosis between cardiospasm, carcinoma and stricture of the esophagus, due to scars, the result of chemical or mechanical insults. In doubtful cases one may take sections by means of the biting forceps for microscopic examination. In our experience, however, this is seldom necessary, for a careful history together with a demonstration of an enormous sacculatation of the esophagus is usually sufficient for diagnosis. Advanced carcinoma could not easily be mistaken for cardiospasm, nor could advanced cardiospasm be readily mistaken for carcinoma. It is only in the early manifestations of both conditions that one may be left greatly in doubt. Carcinoma of the esophagus seldom results in such dilatation as is found in cardiospasm. If there is any doubt, however, as to the existing condition, the esophagoscope only can clear up the diagnosis promptly and definitely. The interior of the esophagus, as seen through the esophagoscope, is quite different from the normal; the walls are flaccid, and the mucosa is thrown into small rugae or convolutions and is edematous in appearance, presenting a state of esophagitis. At the cardia occasionally may be seen small erosions or ulcers. The cardia itself presents a rather smooth, regular, whitish appearance in contradistinction to the reddish, granular, cauliflower appearance of the carcinoma, the angry, injected appearance of the ulcer or the white, glistening, irregular outlines of scar tissue.

It is not our intention to enter into any details here concerning the technic of treatment more than to repeat that division by means of a silk-rubber bag from 3 to 3.5 cm. in diameter by hydrostatic pressure gives most satisfactory results. Either the water-pressure with manometer attached may be used, or the large, glass-metal syringe, which in our hands has given quite as satisfactory results.

The etiology is still a dark chapter, and we are not prepared to present any more definite information on this point than that contained in our original article.

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ABSTRACT OF DISCUSSION

DR. H. S. PLUMMER, Rochester, Minn.: In looking through the literature one finds a tendency to associate diffuse dilatation of the esophagus with a congenital or acquired neurosis. Among the ninety-one patients coming under my observation with diffuse dilatation of the esophagus without anatomic stenosis there were only a few of a neurotic type. Mild cardiospasm without diffuse dilatation of the esophagus occurs, as a rule, in neurotic persons. Cardiospasm may accompany such gross gastric lesions as syphilis, ulcer, carcinoma, etc.; diffuse dilatation of the esophagus does not often follow the spasm in the latter group of cases. There are many reasons why these conditions have been so frequently overlooked. A stomach-tube or sound may pass the cardia without encountering any resistance at a time when neither liquids nor solids will pass the cardia. Frequently the tube coils in the sac and the contents are withdrawn without the operator having any suspicion that the tube has not entered the stomach. In some instances the history is much like that of a gastric neurosis. With a few exceptions the seventy-three cases which I have reported as cures are absolutely free of any evidence of dysphagia. I have not as yet been able to determine the ultimate fate of the dilatation of the esophagus. In three patients whom I examined approximately three years after the last dilatation, the esophagus had returned to normal size and as far as I could determine to normal function.

DR. G. W. McCASKEY, Fort Wayne, Ind.: I wish to discuss cardiospasm in its relation to malignant disease. I have had under observation about fifteen cases of cancer of the cardia.

In six or seven of these there occurred prolonged attacks of cardiospasm. In some of these the complete closure of the cardia which occurs with the advancing growths of the neoplasm was undoubtedly partly spastic in character, as it fluctuated materially and would permit the passage of food or instruments at one time and not at another. Temporary improvement in deglutition has followed mild instrumental dilatation in some cases. This is best explained on the assumption of spasm relieved by divulsion. Of course this improvement is only transient, and too slight to be entitled to any serious consideration excepting in its bearing on the pathology of cardiospasm, and the question of differential diagnosis in the earlier stages. In cases of cardiospasm of recent evolution, the possibility of the existence of cancer of the cardia as the etiologic factor should be considered, and every means utilized to make an accurate differential or complete diagnosis.

DR. J. W. WEINSTEIN, New York: I fully agree with Dr. Myer that cardiospasm is not often recognized, and masquerades under a variety of names, chiefly neuroses, because the stomach-tube is not used often enough. I must say, however, that the diagnosis is often difficult even if the aid of the stomach-tube is invoked. The main difficulty is the differential diagnosis of cardiospasm and carcinoma of the cardia. Of course, in the typical cases the diagnosis is easy. Thus I have now on hand a patient who has complained of dysphagia for the past four years. His general appearance is not bad. On passing a bougie I find that it meets with an obstruction at the cardia. By using a little force I make the bougie pass through into the stomach. The *x*-ray examination shows a slight pouch above the cardia. A case of this order means nothing else than cardiospasm. On the other hand, if a patient of cancerous age comes with a history of short duration, with loss of flesh and strength; if the introduction of a bougie invariably meets with obstruction at the cardia and causes bleeding, and if a fetid odor emanates from the tip of the stomach-tube or bougie, a case of this kind is a carcinoma of the cardia. A large number of cases, however, do not come under those headings at all. Thus a patient was referred to me recently by his physician for diagnosis with a history of dysphagia for the past eight months. The *x*-ray showed a stenosis of the cardia with a small pouch above it. The general condition was good and the diagnosis of cardiospasm was made. The patient kept on improving in all respects for about six weeks, when he suddenly developed a metastatic tumor in the cecum. Dilatation of the esophagus above the seat of obstruction is by no means characteristic of cardiospasm. I have seen that repeatedly in carcinoma of the cardia. Even the gastroscope is not proof against error, for it happens from time to time that the carcinoma of the cardia will be covered over by normal mucous membrane, and the gastroscope will reveal in such cases a normal appearance of the esophagus concealing the cancer underneath from view.

DR. FRANKLIN W. WHITE, Boston: I wish to emphasize two points that have been mentioned: First, while, according to statistics, cardiospasm is comparatively a rare disease, much less common than cancer of the esophagus, I do not believe this. I feel sure that many cases that have been diagnosed as simply nervous dyspepsia are really cases of early cardiospasm before the sacculization has developed. Remember that the chief symptom of cardiospasm is distress immediately after eating. Second, the spasm is intermittent. It contracts and relaxes. At one moment we may get a normal *x*-ray picture of the esophagus and a few minutes later during spasm, a clear picture of a filled and dilated esophagus. Recently I have had several such experiences.

DR. ANTHONY BASSLER, New York: There seems to be a subconscious understanding that cases of cardiospasm are due to closures of the cardiac orifice of the stomach because of a constriction of the circular fibers surrounding it. *X*-ray plates of cardiospasm suggest that the area of spasm is at the level of the diaphragm within its esophageal opening. The esophagus extends about an inch and a half below this before it reaches the cardiac orifice. Careful fluoroscopic observation in these cases shows that a spasm is never located in this

abdominal portion of the esophagus which runs in back of the liver or at its opening in the stomach. According to a series of observations that I have made, there is reason for the belief that cardiospasm is not due to spasm of the circular fibers of the esophagus but to spasm of the esophageal opening of the diaphragm. I shall report my observations when I have a large enough series of cases. Further, cardiospasm, like pylorospasm, may occur reflexly. We know that gall-stones, gastric or duodenal ulcer and chronic appendicitis are commonly found as exciting causes in pylorospasm; so in cardiospasm, pathologic processes above or below the dome of the diaphragm may cause this spasm in not a few of those which have been looked on as neurotic cases. I have done post-mortems in a few cases in which cardiospasm was a feature during life. In practically all of them, lesions of a chronic nature were found in the chest, if not in the abdomen. Among the causes which must be added as productive of cardiospasm are firm adhesions of the pleura, mostly of a tuberculous nature, particularly those present at the bases of the lungs. Normally the lower end of the esophagus is funnel-shaped, or at least has parallel walls. The opening is not completely closed as a rule even during normal digestion. It is probable that during the process of gastric digestion, the cardiac orifice of the stomach prevents regurgitation of food into the lower end of the esophagus, not by closure of the esophageal opening of the diaphragm or the circular fibers at the esophagogastric junction, but by the peculiar arrangement of the rugae extending from the esophagus into the stomach, which act like flaps of a valve when pressed on from below.

DR. JESSE S. MYER, St. Louis: I should say to Dr. Plummer, concerning the cause of the obstruction met by the tube in these cases that it is not always possible to determine whether this obstruction is offered through the contact of the tube with the walls of the sac, or whether it is due to the spasm at the cardia. There is no doubt in my mind, however, that the obstruction is often the result of the spasm. I have often been able to demonstrate this by introducing a sound to the point of obstruction, when without any manipulation it will often suddenly slip through. I do not want to convey the impression, however, that there is constantly present a tonic spasm in these cases. With regard to the persistence of the sac, and the persistence of minor symptoms, it is unfortunate that Dr. Plummer has not been able to follow more of these patients after successful stretching of the cardia. Of course the reason for this is that they have been so decidedly relieved that there was no occasion for returning for further treatment; but from my own observation, I feel reasonably sure that it would be possible to demonstrate that in all of the severe cases the sac has persisted for years after the major symptoms have been relieved. I agree with Dr. Weinstein that the diagnosis is sometimes difficult to make; nevertheless, one would seldom take a case of advanced cardiospasm for carcinoma, or an advanced case of carcinoma for cardiospasm. It is in the early manifestations of these two conditions that one is most likely to be misled. A case which I had under observation for over two years, and which I had considered one of cardiospasm, proved to be a slowly developing scirrhus growth involving the cardia and a portion of the fundus. One seldom sees so marked a dilatation of the esophagus in carcinoma at the cardia as is observed in this case.

Feeding Children After Anesthesia.—A breast-fed infant can be put to the breast two hours after coming out of the anesthetic. He should be nursed for only half the usual time; if all goes well, next time he may be nursed his full nursing period. A bottle-fed infant can be fed two hours after coming out of the anesthetic with his regular bottle-feeding diluted one-half with water; if all goes well, his next bottle-feeding should consist of his usual food. A child can be given something to eat not sooner than two hours after coming out of the anesthetic. This food consists of hot broth; in throat cases the first food should consist of cold broth.—Kilmer in *Archives of Pediatrics*.