can be made in the following way: a piece of dressed cow-hide is cut of a size sufficient to extend under the sole and up the inner side as high as the scaphoid. It is moistened and placed in the shoe, and the leather adapts itself in a measure to the shape of the foot. This is trimmed, dried, and the edges smoothed off. A piece of steel, which is bent so as to arch somewhat more than the foot when the patient stands, fitting the inner arch of the foot when the foot is slightly everted and sustaining no weight, should reach from the front of the portion of the os calcis which strikes the floor to a short distance behind the head of the second metatarsal. It should have arms which extend transversely across the foot from the level of the scaphoid to beyond the proximal end of the fifth metatarsal. The leather-sole which is designed to protect the foot can be moistened at any desired part and molded upwards as may be desired to fit the steel, the steel truss can be riveted to this. When this is done, a strong support will be furnished which, properly made, will not be uncomfortable and can be placed in any shoe. The steel after it is fitted should be spring-tempered and should be sufficiently strong as to bend but slightly under superimposed weight. If necessary, a second strip can be riveted to reinforce the first.

It will be seen, however, that these plates are not as firm as what can be furnished by metal. Metal plates are more difficult to apply, but more lasting after they are thoroughly fitted. In order to understand the exact method of furnishing metal plates, it is necessary to call to mind the anatomical conditions of flat-foot. It will be seen that the heads of the os calcis and of the astragalus should be prevented from descending, that is to say, a pressure upward and slightly outward should be exerted under the inner arch. In order that this should not be painful, this pressure should fall where the bones are less prominent, and it will be found that this is slightly behind and below the scaphoid. As the transverse arch of the foot at this point slopes in a curved line downwards and outwards, it is manifest that the support should transversely have this same curve.

It must also be remembered that the so-called flat-foot is in reality an everted foot, and that whatever plate or support is worn, eversion of the front of the foot must be prevented. In lighter cases this is readily done by means of the ordinary shoe, which supports the foot in a measure laterally. In the severer cases, however, this will not be sufficient, and shoes are necessary so constructed that they force the foot in the position of eversion of the front part. A combination of a metal plate and these shoes will be needed in the severe cases of flat-foot. The metal plate, it is needless to say, should be made so as to press only where pressure is required and not where pressure causes pain. The shape of the plate necessarily depends upon the shape of the distorted foot, and the amount of flattening of the arch as well as the amount of eversion of the front of the foot. The plate is made from a cast of the foot. It can be made either of silicon bronze which can be polished, and will not tarnish, or of hard rolled aluminum plates, but the strongest and best plates are made of steel hammered upon an iron cast of the foot taken from the plaster cast. Care is necessary in taking the cast of the foot that it should be put as far as possible in a corrected position, otherwise the plates will not fit accurately. In some instances it is necessary that the plaster cast

be shaved so as to increase the pressure at a desired point; this is, however, a matter which a little experience will naturally suggest.

In the severest cases, however, something more than this is required, for the reason that no plate can be worn which exerts, in these cases, as much upward pressure as is desirable. A series of successively higher plates can be used, but the result can be more speedily obtained by the use, in addition to plates of moderate height, of the oblique made by raising the sole on the inner side of the boots by lifts which are shaved off to the inner side so that the outer edge is not raised at all. In an adult the thickness should be in severe cases as much as three-fourths to one inch on the inner side. When this is applied, the patient is obliged to walk on the outer edge of the foot and eversion is prevented. As the patient's symptoms improve, the strained ligaments become rested, the weakened muscles strengthened, this sole can be removed and a metal plate substituted.

The satisfactory treatment of flat-foot does not consist simply in furnishing a support to the arch of the foot, but in placing the foot in such a position that the superincumbent weight does not fall upon a widened surface of the hollow of the foot which eversion at the medio-tarsal articulation brings in contact with the ground, but upon the normal semicircle which the outer part of the sole constitutes, together with the ball of the foot and the heel.

HÆMORRHAGE INTO THE PANCREAS AS A CAUSE OF SUDDEN DEATH.¹

WITH REPORT OF A CASE OF HÆMORRHAGIC AND GANGRENOUS PANCREATITIS.

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FROM its hidden position, the pancreas is, perhaps, the one vital organ which is most frequently overlooked at the post-mortem, and yet its lesions are so important that no autopsy is regarded as complete without a distinct mention of its condition. This is especially necessary in a legal examination, where a person in previously apparent good health is found dead. And in making an examination, it should be the invariable rule after inspecting the greater peritoneal cavity to separate the layer of omentum between the stomach and large intestine, and explore the lesser peritoneal cavity. At the posterior part of this cavity the pancreas should be seen, extending from the duodenum almost to the hilus of the spleen. It can readily be made out as a lobulated gland, the separate lobules of which stand out in slight relief against the fat tissue in which it lies imbedded; its more reddish-gray color also distinguishes it. Its shape is roughly like a hammer, the head being spread out along the duodenum, and the handle (or tail) stretching towards the spleen. Its length is about $7\frac{1}{2}$ inches, its breadth $1\frac{1}{2}$ inches, and its thickness $\frac{3}{8}$ of an inch. Its weight is $2\frac{3}{4}$ ounces. Its duct, which will admit a fine probe, opens with the common duct of the liver in the papilla, about six inches below the pylorus, in the duodenum. The mouth of this duct is slit-like, and is not easily found. In practice, a good way is to pass a probe down into the intestine through the gall-duct, which can always be easily found by its bile-stained wall;

¹ Read at a meeting of the Massachusetts Medico-Legal Society, February 7, 1894.

then to slit up the papilla for a little distance on this guide; and upon careful search, a little opening will be found about one-eighth to one-quarter of an inch from the tip through which the probe easily passes into the pancreatic duct. Occasionally the duct has a separate opening of its own into the intestine, and then it is more difficult to find. But pressure on the gland will often force out a drop of fluid on the intestine near the papilla, and thus its seat can be located. Examination of the duct should also always be made, as its occlusion or inflammation may be the cause of important changes in the gland itself.

After death the pancreas rapidly undergoes decomposition, and its cellular elements are frequently so altered that but little reliance is to be placed on the microscopic examination.

The pancreas is often the seat of cancer, and fatty degeneration is recorded, an increase of the connective tissue causing a cirrhosis of the organ; then, too, the duct is frequently tortuous and dilated, or the organ may be partly or wholly transformed into a cyst. All of these changes require time for their completion, and the physician has usually been called long before death, not always able, perhaps, to diagnosticate the exact condition, but, at any rate, convinced in his own mind that death, when it came, was from natural causes.

There have, however, been a series of cases reported, rare, it is true, where a person died suddenly after an illness of which the time had been fixed as varying from half an hour to twenty-four hours, and where the only lesion found was a greater or less hæmorrhage in and about the pancreas. Fitz, in his monograph on acute pancreatitis,² gives sixteen cases which he has collected. Since then (1888) only three or four cases have been reported, showing that the condition is one of the rarest that occurs.

From an examination of these cases, it appears that the pancreas is red, usually somewhat enlarged, and the outlines of the lobules mapped out by dark-red lines, for the hæmorrhage almost always follows the interlobular connective tissue, which can be seen microscopically to be infiltrated. The amount of blood poured out was, in the majority of cases, comparatively little, perhaps one or two ounces, not enough to be the direct cause of death. There are two or three exceptions to this, one recently published by Seitz, where over two quarts flowed out upon opening the abdomen, and the source of the hæmorrhage was from the region of the pancreas. And this is the only case on record in which the hæmorrhage is sufficient to account for death.

As to the cause of the hæmorrhage, we are as yet entirely in the dark, and also as to the reason of death. None of the theories advanced cover all the cases. One, that the flow of the blood over the cardiac axis causes compression of the great sympathetic ganglion and arrests the heart, does not seem to be borne out by the condition of that organ, which is found filled with blood. Another, that the hæmorrhage is due to disturbance of the central nervous system, similar to the hæmorrhages of the lung, meets with little support, as it was associated with this condition in only one case. To say that it is due to a trophic nerve disturbance is to confess our ignorance, as the physiologists have failed to demonstrate any trophic nerve other

than the vaso-motor nerve. And until this is done, their lesions can hardly be spoken about. The alcoholic habit has been marked in a number of the cases, but drunkards are not the only ones who have died in this way. Fat persons and lean ones have alike succumbed; the preponderance of the sex, however, is male, and usually past middle life.

What we know on the subject can be briefly summed up as follows: In rare instances, death has suddenly followed attacks of greater or less severity referred to the epigastric region. At the autopsy, a hæmorrhage of varying amount has been found in the pancreas and its vicinity as the only lesion.

This was the conclusion arrived at by Dr. F. W. Draper several years ago,² and, as far as I have been able to learn, nothing new has been added to it. His cases are the best single series that have ever been presented and give us more real knowledge than any others.

Although the above covers the entire subject of pancreatic hæmorrhage, I should like to trespass a few moments longer on your time and call attention to the subject of acute hæmorrhagic pancreatitis and its sequelæ, which have been so well worked out by Dr. Fitz in his monograph. I have seen a number of cases, and I have the specimen here of a case of this comparatively rare lesion of which I made the autopsy last week. In hæmorrhage into the pancreas the extravasation is the only lesion found. There are no evidences of an inflammatory condition in the organ, no cellular infiltration. In acute hæmorrhagic pancreatitis, in which the symptoms are of longer duration, from twenty-four hours to two or three weeks, usually, however, terminating within the first week, we do find alterations in the organ which point to an inflammatory condition. The organ, as a rule, is enlarged. There are single or multiple hæmorrhages throughout its substance, but they are not recent. The blood is not fresh; it has already been changed and very often it can only be made out from its coloring matter and not from the presence of any of the red corpuscles. With these there may be more recent hæmorrhages, and a greater or less infiltration of the connective tissue with round cells—evidences of an inflammatory condition of the organ. With this is also almost invariably associated a condition which is called fat necrosis. Throughout the fat tissue, especially in the neighborhood of the pancreas, in its interlobular fat tissue, in the root of the mesentery, at times in the omentum, and (in one case reported, all the fat tissues of the body were involved) are found opaque, white areas, quite distinct from the ordinary tissue. The presence of this necrosis has given rise to a theory, advanced first by Balzer, that it is the primary condition, and the hæmorrhagic pancreatitis is the secondary one. He considers that the changes in the fat tissue are due to disturbance in nutrition in fat people (and it should be mentioned that these cases of acute hæmorrhagic pancreatitis are very frequently associated with an overproduction of fat) in whom the fat has gradually undergone degeneration, has eroded the vessels in their neighborhood, and in this way the hæmorrhage has occurred. Fitz, on the other hand, regards the areas of fat necrosis as due to the action of pancreatic juice or some of its products on the fat tissue itself. Fitz's theory has this point in its favor, that in the greater number of cases the necrosis seems to start first in the

² Fitz, R. H.: *Acute Pancreatitis*. Cupples and Hurd, Boston, 1889.

² *Trans. Assoc. American Physicians*, vol. i (1886), page 243.

neighborhood of the pancreas, where it is always the most extensive, and when it is found in moderate degree it is in that region alone. This would point to its being a local condition, and one referable to the pancreas rather than part of a general condition. On the other hand, such a case as Formad's, where the fat necroses were found throughout the entire fat substance of the body, does point to some cause, central in origin, which causes its destruction in these small necrotic areas. It is possible that some ferment of the pancreas may be absorbed into the blood, and in this way, of course, receive a general distribution. For the present, we have to consider each of these as a possibility. There is no question about the association of these fat necroses with hæmorrhagic pancreatitis. For the causal relation, we shall have to have more light on the subject from the careful observation of future cases, and now that attention has been attracted to it on both sides of the water, it will undoubtedly be found.

In the specimen I have just passed about, we find that the hæmorrhagic pancreatitis is largely of the organ as a whole; the size is rather increased if anything, but there is no question that it is the pancreas that we have to do with. On the other hand, there is a series of cases (I made the autopsy in one last week), in which, apparently after one of these attacks of pancreatitis, the pancreas became entirely necrosed, remaining simply a slough. It lies almost as a foreign body in the place where the pancreas had been, and if it were not for the knowledge of what might occur, we should have difficulty in recognizing that it was the pancreas. The notes of this case, which occurred in the practice of Dr. Bush, have kindly been given me by him, and are as follows:

"The case is that of a widow, aged thirty-three, whose family history is good, with the exception of father, who died of cancer of the rectum.

"December 18, 1893. The history obtained was that for a year and a half she had eaten very little food, having had a very small appetite, and had kept up with stimulants. She would not eat regularly; in fact, the sight of food or the odor of cooking produced nausea. Yet at times she would help herself to sardines, cold chicken and such cold lunches as she could pick up from the cold closet or the refrigerator.

"When I saw her she was suffering from an attack of vomiting, accompanied by urticaria, which was very troublesome. The wheals were all over her body. The legs were somewhat swollen about the ankles. There was insomnia. The tongue had a light brown coat, and there was constipation. These symptoms, with the exception of the inability to sleep, rapidly disappeared upon treatment.

"There were no renal complications and no pain. There was a great deal of lassitude. Under appropriate treatment, these features disappeared to a marked degree, and she was able to take nourishment, the quantity of stimulants taken being diminished, and with the exception of not being able to sleep, she was feeling better than she had been for two years.

"January 14th, she was up and about the house as usual, and in the afternoon was taken with severe pain in the left hypochondriac region. The pain was so severe that it required large doses of morphine, given subcutaneously, to quiet it. At one time two grains of morphine were given within forty-five minutes, the pain being so acute. There was emesis and abdominal

extension. There was pain on deep pressure over the above region, and the bowels were constipated. The abdominal pain and vomiting lasted four days, accompanied with marked tympanites; at the end of that interval there were a few movements of the bowels. The general pain seemed to subside, but there was always pain upon pressure from the left back through to the front. The temperature was taken twice a day regularly, and sometimes oftener, but was never found to be higher than 101.8°. The rate of the pulse averaged 90. She was able to take a certain amount of milk in small quantities, and there was no vomiting for eight days, at which time she obtained some whiskey, of which she drank considerable, and the pain, distention and vomiting recurred. The matter ejected was of a green color, something like crème de menthe, and was mixed with mucus. The stools were extremely fetid in character. There were no urinary symptoms. Death occurred February 1, 1894."

At the autopsy, the abdomen alone was examined. Upon opening it, there was no evidence of any general peritonitis; the whole lower portions of the bowels were perfectly smooth and free, but on looking at the upper part the stomach appeared to be very much distended, and was greenish in color. On puncture, there at once came up a yellowish, thin pus, by estimate two quarts, and, exploring further, it was found not to come from the stomach, but from the lesser omental cavity. Then I suspected it was a case of pancreatic disease. The specimen was removed entire, and afterwards dissected. The stomach and duodenum were opened, and nothing of marked importance found. A probe was passed through the gall-duct, and by this guide the opening of the pancreatic duct was found, which is a little whitish track running about one-half an inch and then opening freely, with a slightly jagged edge, looking as if eaten off, into the cavity of the lesser peritoneum. In this lies a sphacelated mass, all that remains of the pancreas. A little portion of pancreatic tissue is still adherent to the intestine, and the black discoloration is evidence of the hæmorrhage which had taken place at some time into that organ. The pus had burrowed into the root of the mesentery on both sides, but had not broken through into the general peritoneal cavity.

On looking at the case, there is no question that the grave symptoms are of only two weeks' duration; that this extensive destruction of the pancreas could have occurred within that time, seems almost incredible. But we have reason to think that is probably the case. It is possible and even probable that the earlier attack in December was one of acute hæmorrhagic pancreatitis, and the condition continued until the necrosis of the organ began at the time concurrent with the second attack (January 14th), when the pus began to form and the peritoneal cavity to be distended. So this gangrenous pancreatitis is to be looked upon as the result of the hæmorrhagic pancreatitis.

There is still one other form of inflammation of the pancreas associated with the formation of the pus within the organ, which is spoken of as suppurative pancreatitis, and in which the disease is usually of long duration. It is a question, perhaps, of months — some deaths, however, occurring within the first month. But, as a rule, it has a longer course than acute hæmorrhagic pancreatitis. It is very rarely associated with any evidence of bleeding into the organ itself, and only rarely with any evidence of fat necrosis.