27.—Mrs. T. J., astigmatism thirteen days after operation, 2.5 ax. 180 = 20/30; ten and one-half weeks after operation, 2. ax. 180 = 20/30.

28.—S. P., astigmatism four weeks after operation, 1. ax. 180 = 20/30.

29.—P. V. J., astigmatism nine weeks after operation, 2. ax. 180 = 20/30.

30.—Mrs. W. C., astigmatism nine and one-half weeks after operation, 0 = 20/40.

In two cases astigmatism two weeks after operation, = 3.5 D., average, 17.5; in ten cases, two to six weeks after operation, = 14.5 D., average, 1.45; in fourteen cases, six to twelve weeks after operation, = 16. D., average, 1.14; in six cases, three to six months after operation, = 7.5 D., average, 1.25; in five cases, six to twelve months after operation, = 3 D., average, 0.6.

As a summary of the above tables we have the following: Thirty consecutive cases of simple extraction compared with thirty cases of extraction after preliminary iridectomy, excluding all those in which vision fell below 20/40.

	C. F. C.	J. A. L.
Simple Extraction. After prelim. Irid.		
Average degree of astigmatism at last examination	2.7 D.	0.96
No astigmatism	3 Cases.	14 Cases.
2 dioptries or more	20 "	8 "
4 "	7 "	0 "
5 "	5 "	0 "
Highest degree of astig.	7 D.	3.5 D.
Average vision	20/25.36	20/31.33
20/20	18 Cases.	6 Cases.
20/25	1 "	0 "
20/30	4 "	14 "
20/36	4 "	0 "
20/40	3 "	10 "

A careful study of the complete list from which the above cases were drawn reveals a very slight advantage in average results in favor of the operation with a preliminary iridectomy, but when the individual cases are studied there remains a doubt in one's mind as to its real advantage in this respect.

That a preliminary iridectomy greatly diminishes the tendency to the production of post-operative astigmatism is reasonably established by the above figures. Whether it accomplishes this: 1, by permitting the more thorough cleansing of the aqueous chamber; 2, by allowing the aqueous to escape through the coloboma and between the lips of the wound, thus relieving temporary increase of intraocular tension during the healing process, as has been claimed for it by its advocates; or 3, whether the larger pupillary opening and the cicatrization of the edges of the coloboma prevent, in a measure, the contusion and inflammatory reaction in the iris which at times retards the healing process and thus favors the displacement of the edges of the wound, may be an open question. But I am strongly of the opinion that the more thorough cleansing and the avoidance of contusion of the iris during the delivery of the lens are the most important factors in preventing the development of astigmatism.

In order to make a fair comparison of the degree of astigmatism following the various methods of operating it is necessary to confine ourselves to a study of corresponding periods after the operation, or to choose a period so late as to be reasonably sure that no change is likely to occur. This limits us to a small number of cases for comparison, but the following tables, while for this reason they are not conclusive, are of interest as they include a comparison of the results as far as astigmatism is concerned, of three instead of two operators.

While the average degree of astigmatism in my cases was lower than that reported by Pfingst at the end of two weeks after the operation, it will be observed that at the end of six or eight weeks it was somewhat in excess, while at every period at which comparison was

made, Dr. Lippincott, who performs a preliminary iridectomy, had a much lower average.

We are, perhaps, not justified in drawing conclusions on so important a subject from so small a number of cases, nor from the work of so limited a number of operators, but judging by the facts at our command, it would seem that a cataract extraction after a preliminary iridectomy is apt to be followed by far less astigmatism than a simple extraction, and one would naturally draw the inference from this that an operation with preliminary iridectomy as practiced by Dr. Lippincott was to be preferred, but it would appear that, at least in the series of cases presented above, this advantage is gained at the expense of a sacrifice in acuity of vision, as there were only six cases with vision of 20/20 among the thirty in which a preliminary iridectomy was performed as compared with eighteen among an equal number with simple extraction.

A COMPARISON OF THE DEGREE OF ASTIGMATISM FOUND AFTER OPERATION IN A SERIES OF EIGHT CASES IN WHICH ASTIGMATISM WAS MEASURED SIX TO EIGHT WEEKS AFTER OPERATION. RECORDED BY A. O. PFINGST, J. A. LIPPINCOTT AND C. F. CLARK.

		A. O. P.	J. A. L.	C. F. C.
2 wks after Op.		46 Cases, Aver. 6.3 D *	2 Cases Aver. 1.75 D	9 Cases Aver. 4.72 D
1.	6 weeks after op. 2. D	8 weeks after op. 4.5 D	7 weeks after op. 2.5 D	
2.	8 weeks after op. 1.25 D	6 weeks after op. 1. D	8 weeks after op. 2. D	
3.	8 weeks after op. 2.5 D	6 weeks after op. 2. D	8 weeks after op. 1. D	
4.	6 weeks after op. 7. D	8 weeks after op. 0. D	7 weeks after op. 1. D	
5.	6 weeks after op. 2.25 D	6 weeks after op. 2. D	7 weeks after op. 4. D	
6.	8 weeks after op. 1.25 D	8 weeks after op. 2. D	8 weeks after op. 3. D	
7.	6 weeks after op. 2. D	6 weeks after op. 0. D	6 weeks after op. 6. D	
8.	6 weeks after op. 2.5 D	7 weeks after op. 1. D	7 weeks after op. 3. D	
		8 20.75 D	8 12.5 D	8 22.5 D
Average astig.		2.59 D	Average Astig. 1.56 D	Average Astig. 2.81 D
Highest		7. D	Highest 4.5 D	Highest 6. D
Lowest		1.25 D	Lowest 0. D	Lowest 1. D

* These records were taken from cases in the practice of H. Knapp of New York.

[Discussion next week with other papers of the symposium.]

PANCREATIC HEMORRHAGE.

WITH REPORT OF TWO CASES; AND A TABULATED LIST OF CASES FOUND IN LITERATURE—FORTY IN NUMBER.*

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PHILADELPHIA.

I desire at the outset to give an abstract of the histories of two cases.

CASE 1.—S. C. N., aged 28 years, single, a physician, was admitted to the Medico-Chirurgical Hospital, July 26, 1898. The family history revealed the fact that his father had died of pernicious anemia two years previously. All of the remaining members of his immediate family were living and healthy.

The patient had had some of the affections peculiar to childhood, and whooping-cough only two years prior to the onset of his last illness. The disease that caused his death began two months before the date of admission, with an acute onset. The patient first experienced a severe pain in the epigastric region, followed by slight diarrhea. In a few days the latter ceased, and was succeeded by obstinate constipation—a symptom that was present throughout the rest of the illness. Ten days after the date of onset jaundice set in, and gradually deepened until it became quite pronounced;

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the urine now became porter-colored, and the stools clay-colored.

This case had been treated as one of ordinary catarrhal jaundice up to the time when he entered the hospital. On admission, a duodenal ulcer was suspected to be a complication, on account of the marked pain, which would invariably develop two hours after the ingestion of food, even though the latter was of the lightest sort. (This symptom I had previously noted in cases of duodenal ulcer, in which the diagnosis was confirmed by necropsy.) The patient was kept in bed in the recumbent posture. On the morning of the second day of his stay in the hospital, he suddenly developed sharp abdominal pains, and, at the same time, grew weak and faint; his pulse was feeble, small and rapidly running, while the skin surface became cool, then cold and clammy. When I reached him, one hour after the onset of this sudden change, I found him in profound collapse—a condition obviously due to internal hemorrhage. One-half hour later he died.

The autopsy was made twelve hours after death. On opening the abdomen, the lesser peritoneal cavity was found to be filled with blood, and a large blood-clot was found external to but compressing the duodenum, in the vicinity of the head of the pancreas. The liver was engorged—enlarged—and the gall-bladder greatly distended with bile. The pancreas, duodenum and liver were placed in an appropriate solution for preservation, and only recently submitted to Prof. Joseph McFarland for examination. He reported as follows: "I have examined the specimens carefully, and find the lesions of primary carcinoma of the pancreas, with marked secondary involvement of the lymphatic glands about the hepatic duct and duodenum. I have been unable to locate definitely the source of the hemorrhage, but it is not from anything in the duodenum, and I suppose was caused by the changes produced by the neoplasm. In the wall of the duodenum there is a small rounded ulcer, the size of a very small pea, not descending below the mucosa, and certainly not the cause of the hemorrhage, which is altogether outside of the coats of the intestine."***

I am indebted to Dr. H. S. Anders, under whose care the patient was at the Samaritan Hospital, Philadelphia, for the following synopsis of a case of acute pancreatitis with fatal hemorrhage.

CASE 2.—P. M., aged 28, was single, and an Irish horse-shoer of muscular build. No family history was obtainable. He had always been well until about two years previous to the present attack. At that time he was injured on the right side, by being jammed against a post by a horse he was shoeing. Since then violent exertion or scuffling has elicited pain in the side, deeply felt. He has been a very heavy beer drinker for years, and for several months troubled with much abdominal distress, several hours after eating, flatulence and irregularity of the bowels.

One week before admission into the Samaritan Hospital, he was taken suddenly with severe pain in the pit of the stomach, and nausea—no vomiting—lasting several hours. Anorexia, nausea, and some pain continued next day, with a feeling of heaviness, abdominal distension, and constipation. He kept about the house for several days and received no treatment. Three days before admission he was chilly, weak, and complained of hurried breathing. The next day he had an

attack of syncope and exhaustion, accompanied with acute abdominal pains, lasting about two hours, after coming down stairs. From that time he grew gradually worse until brought to the hospital. His condition on admission was one of absolute prostration and shock; pale, cool, slightly moist skin; small, rapid, feeble pulse; anxious expression of countenance, with eyes listless; abdomen rather full in the epigastrium, but not locally or generally distended; great tenderness a few inches below and to the left of the xiphoid, over an area about palm-sized, with intense exacerbations of pain now and then. He sank rapidly, and died of collapse in about two and a half hours after admission.

Ruptured gastric ulcer and acute intestinal obstruction being excluded, a diagnosis of hemorrhage with probable pancreatitis was made; this was confirmed by necropsy. Nearly eight ounces of dark, clotted blood surrounded the pancreas, lying particularly over the region of the left kidney and some fat layers of mesocolon in front. The pancreas, macroscopically, showed several pinhead to pea-sized hemorrhagic and abscess-like spots.

The specimen for section and staining, by inadvertence in not using sufficient alcohol, was spoiled.

In Case 1 it is probable that death was due to pancreatic hemorrhage, and that the peritoneal covering of the gland may have been ruptured. A point worthy of especial note is the fact that carcinoma of the pancreas may have an abrupt onset, marked by active symptoms, as in this case, with rapid course; I had frequently noted a similar invasion in several cases of carcinoma of the stomach. The carcinomatous growth of the pancreas had reached an advanced stage, although the man had been entirely healthy up to within a period of two months of the date of admission to the hospital.

In both of the cases herewith reported, abdominal pain was intense at the moment when signs of internal hemorrhage appeared; it was doubtless the pain of peritonitis. When trivial hemorrhages occur, particularly into circumscribed portions of the gland, little or no pain may supervene. Systemic collapse, as shown by the cold, clammy extremities, pinched facies, feeble pulse, and marked dyspnea, characterized the occurrence of the hemorrhage, which led to a fatal termination in both cases, in 1½ hours and two days respectively. In patients previously free from symptoms, a sudden onset, characterized by an intense, usually fixed, epigastric pain, followed by the evidences of collapse, are the symptoms of greatest diagnostic importance in the apoplectic form of pancreatic hemorrhage.

It is well known that hemorrhages of the pancreas, resulting from the hemorrhagic diatheses of certain infectious processes, as scurvy, purpura, and the like, may take the form of minute petechiæ, of extravasations into circumscribed portions of the gland, or a diffuse hemorrhagic infiltration. The majority of cases belonging to this class are of slight or insignificant clinical importance. Again it happens that the hemorrhage spreads to points outside the boundaries of the organ; thus in one of the cases reported above the blood was found surrounding the pancreas, lying particularly over the region of the left kidney behind, and the mesocolon in front, and in the other case it filled the lesser peritoneal cavity, with slight infiltration of the head of the gland. We must recognize a symptomatic pancreatic hemorrhage which often forms a terminal condition or event.

Symptomatic or secondary pancreatic hemorrhage is dependent on a variety of primary affections of the

***Previous to the examination by Dr. Joseph McFarland, the specimen had been dissected by my colleague, Dr. W. E. Hughes, who also regarded it as carcinoma of the pancreas.

gland. Perhaps, the lesion most commonly associated with apoplexy of this gland is acute pancreatitis; it was most probably present in one of the cases reported above.

An examination of the pathologic findings, a synopsis of which may be found in the subjoined tabulated list of cases, will show how conspicuous is acute pancreatitis as an associated condition. In this connection two facts should be borne in remembrance: 1. That pancreatic hemorrhage may, in cases in which death is delayed for two or more days, induce acute pancreatitis. 2. That the latter affection may exist without associated hemorrhage.

In the present state of our knowledge it is impossible to state in all cases, from the lesions found post-mortem, whether acute pancreatitis has originated in an initial hemorrhage—give the presence of the evidences of somewhat recent bleedings—or whether, on the other hand, the latter is secondary to acute inflammation of the gland. In either case the hemorrhage may be responsible for the fatal termination, in the first instance indirectly or remotely, while in the latter, directly or immediately.

True, acute pancreatitis, says Fitz¹, is an inflammatory process affecting the interstitial tissue, both fibrous and fatty. It seems to me neither feasible nor advisable to attempt to disassociate pancreatic hemorrhage and acute pancreatitis with fat necrosis, owing to their clinical and pathologic interdependence. Pancreatic hemorrhage may arise secondary not only to acute pancreatitis, but also to lesions of a chronic character, particularly carcinoma of the organ.

An organ that maintains a fixed position in certain portions of the economy is subject to injury. For example, the duodenum is liable to traumatic influences from an overdistended stomach or duodenum itself, from an overloaded colon, a motile kidney, straining muscular movements, and external injuries. It is probable, also, that the frequent modifications in the gastric and pancreatic secretions exert a traumatic effect from time to time. What is true of the duodenum in this respect is even more true of the pancreas. Carcinoma of the duodenum may also terminate acutely from fatal hemorrhage in a manner similar to carcinoma of the pancreas. Heulin² has examined the literature and found several cases that ended with violent hemorrhage.

Again, free and commonly fatal bleedings may occur in an apparently healthy subject—idiopathic hemorrhage. Fitz³ states that there are a considerable number of recorded cases which show that sudden and unexpected death may occur, and a conspicuous hemorrhage be found in or near the pancreas as the sole significant lesion.

Klob⁴ found pancreatic hemorrhage in extreme portal stagnation only, and was led to the opinion that it not rarely occurred. Klebs⁵ suggests that in cases in which no inflammatory changes in the interstitial tissue is met the hemorrhage may be due to corrosive action of the pancreatic secretion.

Finally, it is difficult to comprehend the occurrence of extensive hemorrhagic extravasations in the pancreas without distinct evidences of necrotic action from disease, corrosive action, as of the pancreatic secretion itself, or traumatism. In other words, it is a question whether true spontaneous hemorrhage of the pancreas occurs, and a careful study of the pathologic findings of all cases recorded in the literature (see table below) is strikingly confirmatory of this view. Doubtless, so-

called spontaneous pancreatic hemorrhage would often be found to be dependent on latent pathologic processes of various kinds on post-mortem examination. At all events, "idiopathic" hemorrhage in the pancreas is of decidedly obscure causation. I would suggest that apparently spontaneous instances may sometimes be due to rupture of the organ—traumatism—in consequence of its fixed position, and its normally adherent peritoneal covering. These facts suggest the possibility of successful operative intervention in suspected cases of pancreatic hemorrhage in which neither local nor general previous conditions proscribe exploratory celiotomy. A number of instances of pancreatic hemorrhage associated with non-carcinomatous lesions of the gland of a chronic nature have been recorded. Anger⁶, Kuster⁷, Kocher⁸, Hagenbach⁹, Steele¹⁰ and others have recorded cases in which bleedings into the contents of pancreatic cysts occurred.

Among predisposing factors are sex and age—males, after the middle period of life, and the alcoholic habit. I have been able to collect 40 cases of pancreatic hemorrhage—given below in tabular form. Of these, 25 were males and 9 females, while in the remainder the sex was not given. The ages of 30 of the patients was stated; they ranged from 26 to 70 years; and 13 of the 30, or about 43.3 per cent., occurred in patients over 45 years of age. Of the remaining 17 cases, 3 were 28 years of age, 2 were 30 years, and 3 the age of 31, while the youngest was only 26. There was a history of chronic alcoholism in 12 cases, or about 30 per cent. But since special reference to this habit is made in only 18 cases, the percentage is much higher, or about 66.6 per cent. It is currently stated that a rich diet also engenders predisposition to pancreatic apoplexy, presumably by impairing the histologic integrity of the vascular walls, especially in an atheromatous subject.

From personal experience, and an examination of the literature, the belief that pancreatic hemorrhage, particularly as an immediate cause of death, is of greater clinical and medicolegal importance than has hitherto been supposed well founded. It must be confessed, however, that the condition is comparatively infrequent, although not by any means a curio among clinical and pathologic findings. According to Draper, who met with 19 cases of pancreatic hemorrhage in 4000 autopsies, the condition is rare; in 9 or 10 of this series it was the sole discoverable cause of death. Cases are also recorded in which persons had been found dead, or died from extensive hemorrhagic extravasations in the pancreas or surrounding tissues or cavities before medical aid could be summoned. On the other hand, the immediate effects of the bleeding may be survived, and death occur at a later period in consequence of shock and increasing anemia.

As Prince¹¹ suggests, one of the most interesting questions connected with the subject is the direct cause of death in those cases that have ended suddenly. Thus in Case 2, in which the loss of blood amounted only to eight ounces, the hemorrhage in itself was not sufficient in quantity to be fatal, yet death ensued within twenty-four hours. Without stopping to adduce all the theories that have been advanced in the past to explain the cause of sudden death in these cases, I may mention a few: Friedreich attributed it to reflex paralysis of the heart, due to pressure on the semilunar ganglion from the sudden enlarged pancreas; Zenker believed that venous congestion of the semilunar ganglion, without alteration of the ganglion cells, causes death by reflex paralysis of the heart, as in Goltz' experiment of tap-

No. of cas.	Author.	Date and where reported.	Causes and primary disease.	Clinical picture.	Morbid anatomy.	When death occurred.
1	Zenker	Verhandlung- en der Phys. Med. Soc., July, 1874.	Man, unknown age, though old. No previous his- tory, though well the same day.	Found dead in a river. No history.	Fatty degeneration and infiltration (hemorrhagic) of the pancreas and high grade hyperemia of the semi- lunar ganglion.	Unknown.
2	Zenker	Deutsche Zeit- schrift für Prakt. Med., Oct. 10, 1874.	Male, age 48, fat person. No ante- mortem diagno- sis.	Sudden onset with in- disposition, slight vomiting, tenesmus without a stool, fol- lowed by almost in- stantaneous death.	A small cardiac aneurysm (not ruptured); the duode- num filled with bloody mucus; the pancreas through- out intensely stained from hemorrhagic infiltration; fatty infiltration at a single small point.	Almost imme- diately.
3	Zenker	Deutsche Zeit- schrift für Prakt. Med., Oct. 10, 1874.	Strong man, age 28. No history. Fat person, an epileptic.	Found dead in the woods.	No brain lesions; pancreas, state of hemorrhagic infil- tration; macroscopically, fatty degeneration of the pancreas of mild grade.	Seen in good health one hour previ- ously to be- ing found dead.
4	W. F. Whitney .	Bost. Med. and Surg. Jour., 1881, vol. cv, p. 593.	Healthy male.	Similar to above.	Pancreas 20 cm. long. Dark red. Interlobular tis- sue of an opaque white. A small nodule about 5 cm. in diameter. Some similar nodules were found near head. Microscopically, found these changes due to pressure from effused blood.	In 54 hours.
5	F. W. Draper . .	Bost. Med. and Surg. Jour., 1880, p. 615.	Alcoholic, but healthy, except a cold for two weeks. No de- scribable cause. Male, age 31.	Sudden pain in abdo- men. Nausea and de- sire to vomit, but could not.	Left ventricle dilated. Old endocarditis. Pancreas normal as to size, and blood was infiltrated into retro- peritoneal tissue; also around the organ and colored it dark. Splenic artery, large and tortuous; its interior rough and granular. Microscopic. Inter- lobular infiltration of pancreas with blood; it had permeated amongst the cells, here the corpuscles were destroyed.	Died in cari- age on way to hospital.
6	F. W. Draper . .	Bost. Med. and Surg. Jour., 1886, cxv, p. 339, (5 cases).	Not an alcoholic.	Found dead in room. Previously in good health.	Heart, lungs and abdominal viscera normal. Extrava- sation of blood into the retroperitoneal tissue around pancreas for area size of hand. Organ was infiltrated, mostly at center and tail. The outer third of organ was very soft. Splenic artery large and tortuous. Brain normal.	
7	F. W. Draper . .	Bost. Med. and Surg. Jour., 1886, vol. cxv, p. 339.	Male, exemplary habits. Age 55 years. Previ- ously in good health.	Seized by cramp in stomach at 10 A.M., left work and went to room. Found dead at early evening.	Viscera negative. Retroperitoneal tissue filled by blood; blood extends for two inches from pancreas. Pancreas larger than normal, and equally infiltrated with recently effused blood most marked in center.	Within eight and one-half hours.
8	F. W. Draper . .	Bost. Med. and Surg. Jour., 1886, vol. cxv, p. 339.	Female, age 26, alcoholic. Very fat.	Kick in abdomen a week before death. Twen- ty-four hours before death went to bed with intense pain in abdomen. Spat up blood; tried to vomit; 14 hours later found pulseless (shock).	Bronchial mucous membrane dark red color. Trachea contained frothy blood. Abdominal cavity—22 ounces of red fluid. Everywhere the subperitoneal tissue was infiltrated with blood. Hemorrhage was most marked at middle and tail of pancreas. Organ soft. No peritonitis.	Died in 24 hours.
9	F. W. Draper . .	Bost. Med. and Surg. Jour., 1886, vol. cxv, p. 339.	Female, age 44. Used beer daily (not to excess). Healthy.	Went to bed with head- ache. Found dead a few hours later.	A depression in the peritoneum contained 8 ounces of red fluid. Spleen red and soft. Cardiac end of stom- ach was reddened. Pathology. Pancreas was infil- trated with blood throughout, but more pronounced at splenic end. Some blood effused into the retro- peritoneal tissue. Section interlobular infiltration only.	
10	F. W. Draper . .	Bost. Med. and Surg. Jour., 1886, p. 339.	Good health. Age 31.	Cramp occurred after heavy meal. Nausea, but could not vomit.	Viscera fairly normal. Pancreas and retro-peritoneal tissue infiltrated with blood. No free clot at any point. Involved two-thirds of organ, and one inch above and below pancreas are infiltrated with blood.	Died in a few minutes.
11	Wm. Russell & R. F. C. Leith.	Edinb. Hosp. Report, 1896, vol. iv, p. 124.	Not stated.	History of sharp pain in abdomen. Some days later severe pain in abdomen, vomiting, chills and soon col- lapse.	Pancreas dark, sloughing mass. Not a trace of the gland structure could be made out. It was impossi- ble to find where artery ruptured.	Died in a few hours after 2d attack of pain and col- lapse.
12	Robert Muir . .	Edinb. Hosp. Reports, 1896, vol. iv, p. 141.	A male, age 54, slight tendency to fatness. Well until day previ- ous to death.	The day before his death was seized with a sud- den attack of severe epigastric pain, fol- lowed by collapse.	The head of the pancreas was enlarged and firm; an excess of fat around it. Pale patches scattered through the gland, or necrosis. Hemorrhages in sur- rounding tissues, especially beneath the gland, the region having a dark purple-red color.	Duration of acute symp- toms one day.
13	Oscar Kollmann.	Aertzl. int.—B 1, München, 1880, xxvii, p. 427.	Stout person, fe- male. Had had mitral stenosis and left sided pleuritic effu- sion.	For long period at in- tervals had abdomin- al pain, but continued work. On the night of Nov. 12, 1878, after meal, developed dys- pnea, restlessness, chills. Sat up most of the night, and Nov. 13, after breakfast, lay herself back on the pillow and instantly expired.	Pancreas excessively hyperemic, and blood in retro- peritoneal space; the cauda pancreas also hyper- emic, and the seat of hemorrhagic infiltration. The mucous membrane of the intestinal canal healthy. No appearance of fatty degeneration of pancreas.	Within 24 hours.
14	F. W. Draper . .	Trans. Ass'n Am. Phys., I, p. 143, 1886.	Male, age 45. Strong, rugged. Drunk at long intervals.	Found dead in a chair, as if asleep. Seen well within 48 hours.	Pancreas infiltrated with and surrounded by extrava- sated blood.	Seen well 48 hours before.
15	I. Spies	Schmidt's Jahrb., cxxx- iv, 1867, p. 270.	Male, adult.	Sudden death.	Extensive interlobular, pancreatic hemorrhage, and considerable hemorrhage behind the pancreas and spleen, between the peritoneum and abdominal wall.	
16	Klebs	Handbuch der Path. Anat., pp. 1, 2, 555, 1870.	Not stated.	Unexpected death.	Extravasation of fresh blood in the pancreas; no in- terstitial inflammatory changes; no thrombosis of large vessels near pancreas.	
17	Maynard and Fitz	Ms. Notes, v., p. 26, 1875.	Female, adult. In usual health.	Sudden pain in lower chest. Hurried respi- ration, feeble pulse.	Thin, flaccid pancreas, with slight, subperitoneal and intra-glandular hemorrhages. Cut surface dotted with white specks. Extensive fatty degeneration of gland-cells. Fat-crystals and blood-crystals. Noth- ing abnormal in celiac plexus.	In a half hour.
18	Gerhardt	V. Kollmann, loc. cit.	Female, age 47. Bronchial, ca- tarrh, emphyse- ma, anasarca, as- cites, albuminu- ria, cyanosis.	Died in collapse.	Inconsiderable interlobular pancreatic hemorrhage. Tissue behind pancreas, as far as the spleen, infil- trated with blood. Duodenal mucous membrane almost black, and peritoneum over its convexity in- filtrated with blood. Ecchymosis in mucous mem- brane of cecum.	Not stated.

No. of case.	Author.	Date and where reported.	Causes and primary disease.	Clinical picture.	Morbid Anatomy.	When death occurred.
19	Reynolds and Gannett.	Bost. Med. and Surg. Jour., cxii, 1885, p. 275.	Male, age 66. Abundant fat tissue.	Suffered from epigastric pain and constipation. Felt better on the next day, but in the evening found pulseless and collapsed.	Pancreas enlarged one-half. Consistency diminished. Cut surface reddish black from much extravasated blood nearly uniformly distributed. Blood-vessels and pancreatic duct unaltered.	Within 36 hours from the attacks of pain.
20	Le Fleur	Medical News, 1888, lili, p. 80.	Male, age 50. Ob. cure dyspepsia for several years.	Severe epigastric pain, vomiting, collapse.	Pancreas doubled in size, dark red, firm. The cut surface mottled with capillary hemorrhage, separated by a grayish-red, translucent material. Fatty degenerated tubules and acini. Cellular tissue around pancreas blood-stained.	Death in 24 hours.
21	Driver and Holt.	Ms. Notes, v., p. 52, 1888.	Male, age 58. At a dinner party before his death. Thin person.	Awoke at 2 A.M. with severe abdominal pain, nausea, weak pulse, and prostration. Speedy vomiting and collapse.	Duodenal half of the pancreas infiltrated with blood. Each side of the heart contained a little fluid blood.	Within one-half hour.
22	Williams	Ms. Notes, v., p. 55, 1888.	Male, age 70. Thin; temperate. Always well.	Sudden epigastric pain, vomiting, weak pulse, slight epigastric swelling; collapse in a few hours.	Tail of pancreas infiltrated with blood. Slight mesenteric hemorrhage. No evidence of peritonitis.	In 16 hours.
23	G. H. Weaver . .	Medicine, Nov. 1897.	A healthy man 31 years of age. Thought to be syphilitic. Used beer, though not excessively.	Was suddenly taken with a severe pain behind the middle of the sternum, radiating to the shoulders and arms. No relief. The patient became weaker until he died.	Marked hemorrhage into the pancreas, and in its neighborhood; marked sclerosis of the arteries of the pancreas, kidney and liver. Coronaries and the aorta not atheromatous.	In 12 hours.
24	Dieckhoff	Festschrift gewidmet Theo. Theifelder, Leipzig, 1895.	Male, age 63 years. No cause.	No definite symptoms, though great loss of power and bedridden. Seems to have died of retention of urine, due to chronic enlargement of the prostate, after 3 days' illness.	Considerable blood in the peritoneal cavity; hemorrhage into the pancreas with destruction of pancreatic tissue (areas of fat necrosis).	Three days; hemorrhage probably a terminal symptom.
25	Dieckhoff	Festschrift gewidmet Theo. Theifelder, Leipzig, 1895.	Middle aged woman, giving a history of diabetes extending over a period of years.	For 4 weeks before death suffered from severe pains in the abdomen; otherwise negative.	Peritoneal cavity contained blood, hemorrhage into the pancreas and areas of fat necrosis.	Hemorrhage a terminal symptom.
26	Prince	Bost. Med. and Surg. Jour., July 13, 1882.	Woman, age 65. Intemperate. The day before had fallen down stairs, but afterward went to work.	Body found dead in the morning by patient's bed-fellow, lying on her right side on the floor.	Sub-peritoneal tissues adjacent to organ infiltrated with recently effused blood; gland showed marked hemorrhagic infiltration throughout, but mostly at its head.	Must have been suddenly.
27	Hlava	Gaz. Hebdom. de Med. et de Chir. n. s., vol. ii, 1897.	Age 35. Previous tuberculosis of larynx and lungs.	Symptoms of gastro-intestinal catarrh.	Pancreatic and peri-pancreatic hemorrhage.	Not stated.
28	Hlava	Gaz. Hebdom. de Med. et de Chir. n. s., vol. ii, 1897.	Age 36. Negative.	Symptoms pointed to hemorrhage into peritoneum.	Marked pancreatic hemorrhage with fat-necrosis of pancreas, mesentery and meso-colon.	Not stated.
29	J. M. Anders . .	In this paper.	Male, age 28. Temperate habits. For two months prior manifested symptoms and course of duodenal catarrh, pain two hours after meals of the blandest sort and intense jaundice.	Sudden Collapse.	Recorded above.	In 1½ hours.
30	H. S. Anders . .	In this paper.	Male, age 28. Heavy drinker. Injured on right side by being jammed against post by a horse. For months troubled with much abdominal distress several hrs. after eating.	(See ante.)	Recorded above.	Within 2 days
31	Oppolzer	Allg. Wien. Med. Zeit., 1858, xiv Med. iz. Neuigk. 1859, ix, 105. Wiener Med. Woch., 1868, vii, 7.	Male, adult, young, Strong.	Sudden cardialgia, without known cause, becoming violent on strong epigastric pressure. Constant bilious vomiting, obstinate constipation. High fever, quick pulse, collapse. No evidence of poisoning. Diagnosis, perforating gastric ulcer.	Pancreas at least doubled in size, dark-red. Hemorrhage between the lobules, and much extravasated blood in the vicinity of the pancreas, between the mesenteric folds.	In 3 days or more.
32	Hilty	Corresp. Bl. f. Schweiz Aerzte., 1877, vii, 666.	Male, age 30. Strongly built, fat, looked fond of spirits. In past few years frequent palpitation and occasional dyspnea.	Sudden abdominal fullness and tension attributed to new beer. Anxious, restless. Feeble pulse, rapid breathing, cold sweat, sub-normal temperature; abdominal pain; distended, tympanitic upper abdomen; nausea; collapse 2d day; spontaneous defecation; violent delirium. Diagnosis, peritonitis from perforation.	Pancreas doubled in size, firm, dark-violet. Extensive interlobular hemorrhagic infiltration. In the head many nodular hemorrhages as large as cherry-stones, marked bloody infiltration of the peri-pancreatic tissue.	Death in 36 hours.

No. of case.	Author.	Date and where reported.	Causes and primary disease.	Clinical picture.	Morbid Anatomy.	When death occurred.
33	G. P. Biggs . . .	Proceedings of N. Y. Path. Soc., Jan. 8, 1890, p. 107.	Male, unknown age. Alcoholic.	Had gone into a saloon and taken a few glasses of beer, then went outside and fell down on the sidewalk dead.	At the time autopsy was performed there was considerable decomposition present, and nothing could be found except a hemorrhage around the pancreas and a number of minute hemorrhages within the organ. Not much could be determined concerning the changes in the pancreas because of the degree of decomposition present. "The case was one of sudden death due to pancreatic hemorrhage."	Instantly.
34	G. P. Biggs . . .	Proc. of N. Y. Path. Soc., Jan. 11, 1893.	German laborer, age 32. Had been in good health, although a heavy drinker. Had been drinking heavily for two days.	Taken suddenly with intense pain in right side at junction of right inguinal and lumbar region. Soon after began to vomit. When admitted complained of pain in epigastric region. Pulse slow; tem. 100. Palpation reveal'd nothing. Pulse soon became rapid and feeble; vomiting bile frequent; tossed in bed holding hand over site of pain.	Nothing found in the organs except changes due to alcoholism—fatty liver and a moderate amount of chronic nephritis. Intestines filled with a large quantity of mucus, which contained the usual amount of bile. The pancreas was enlarged to three or four times its normal dimensions. The entire organ of a reddish-brown color, and to the naked eye presented no trace of pancreatic tissue, looking like one firm clot. Scattered through this mass were very dark spots, probably the site of older hemorrhages. The layers of fat between the latter and the mesentery also extensively infiltrated with very dark blood.	Death occurred 24 hours after onset of the pain.
35	Biggs	Proc. of N. Y. Path. Soc., Jan. 11, 1893.	German laborer, age 45 yrs. Very intemperate.	Two days before his death there was a gradual development of dyspnea and pain in epigastrium. There was vomiting. Very severe dyspnea was the most marked symptom.	Pancreas considerably increased in size. The entire organ was of a brownish-black color. Extensive infiltration of the dark blood into the surrounding tissue; behind the peritoneum, between the tail of the pancreas and the diaphragm, there were about 1½ pints of fluid blood. Some of the hemorrhage seemed to be old, as the sections under the microscope showed considerable black pigment; extensive destruction of the pancreatic tissue, and extensive fatty change in the portion still remaining also noted.	Died within 48 hours.
36	H. D. Rolleston.	Trans. Path. Soc. of London, vol. xlv, 1893, p. 74.	Male, age 30. Year and a half ago cart passed over his abdomen, but he apparently was not much injured. Except for occasional attacks of abdominal pain, had been entirely healthy.	After dinner was seized with sudden abdominal pain and severe vomiting; the bowels acted once after the onset; after that no feces or flatus passed; was very collapsed. Laparotomy was decided on and the abdomen opened.	Areas of fat necrosis scattered over the peritoneum. The spots were especially numerous near the pancreas. The pancreas weighed 7 ounces; there was recent hemorrhage around it, apparently spreading from the region of the pancreaticoduodenal arteries, it passed over the entire surface of the organ as far as the spleen. The substance of the organ was firm and to the naked eye normal. The most probable origin of the hemorrhage seemed to be the rupture of a small aneurysm on pancreaticoduodenal arteries. Microscopic examination of pancreas showed quite recent hemorrhage passing for a short distance between lobules. There was no sign of old extravasations into the pancreas. "This seemed to be then a case of pancreatic hemorrhage and not of hemorrhagic pancreatitis."	Not stated.
37	Frerichs	Klinik der Leberkrankh., 1861, ii, 382.	Male, age 41. Given to brandy drinking. Suffered for long time from disturbed digestion. Gastric cramps; diarrhea and repeated jaundice.	During an attack of cramp felt the sensation of tearing in upper abdomen and the outpouring of a fluid. Became feeble and fainted. The next day there was complaint of pain in ileo-cecal regions. Intelligence was clear, but patient collapsed. The abdomen was swollen and tense.	The pancreas was found to be large and flabby. On section a network of broad and narrow whitish-yellow streaks was seen, which were chiefly composed of fat drops and granules. In the head of the pancreas was a puriform focus of the same nature, near which was a small vein opening into the vena porta, closed by a red clot. Large masses of clotted blood were in the vicinity. The duct of Wirsung was covered with a soft fat layer. There was extensive hemorrhage, the source of which could not be found, of partly clotted, partly fluid blood, forming a reddish-brown tumor below the liver and reaching from the gall-bladder to the spleen. The blood was extravasated between the layers of the small omentum, hepatoduodenal and gastrosplenic ligaments and transverse mesocolon. It extended downward to the kidneys and along the pancreas from the portal vein to the spleen.	Died within 66 hours.
38	F. A. Harris. . .	Bost. Med. and Surg. Jour., 1889, p. 606, vol. 2.	Female, age 35; occupation, domestic. Alcoholic.	At noon was seen in good health, apparently. Late in the afternoon was seen to sit down in a doorway; complained of feeling ill generally; no distinct symptoms. Fell on street about 6 p.m. Died on way to hosp.	Autopsy showed pancreatic hemorrhage. There was hemorrhage into the splenic end of the pancreas, the whole of this third of the organ being infiltrated with blood, which was easily expressed on section. There was a small amount of blood effused into the subperitoneal tissue, extending nearly to the supra-renal capsule. The whole amount of blood was apparently not more than a dram and a half, by estimate. In gross, the pancreas presented otherwise nothing unusual.	In a few hours.
39	H. P. Hawkins .	Lancet, 1893, vol. ii, p. 358.	Male, age 40. Had had typhoid fever 10 years before, and one attack of either rheumatism or gout. Was alcoholic.	Took two liver pills for slight intestinal trouble; next morning bowels acted; sick after breakfast; most acute pain in abdomen. On admission pale, cold, collapsed; severe pain across middle of abdomen and at corresponding point in back. Abdomen distended. Next day stools, mucus and blood. Pain and collapse continued. In evening found dead in bed.	The peritoneal cavity contained about a pint of bloody fluid. The pancreas was six inches long, greatly increased in bulk and weighed rather more than 12 ounces. At the head of the gland its structure could not be recognized; it was black with infiltrated blood. This condition became less intense toward the tail, the interlobular septa were infiltrated with blood. There was very extensive hemorrhage under the peritoneum. There was fluid blood around each kidney, and on the front of each psoas, but the greatest amount of extravasation occurred around the pancreas, and retro-peritoneal blood had traveled from a spot in the head of the pancreas. The liver was fatty, absence of arterial disease. Spots of fat necrosis of the pancreas.	Death within 48 hours of time of onset.
40	J. Wigglesworth.	Liverpool Med. Chir. Jour., xviii, 1898, p. 220.	Female, obese; age 37. Ageneral paralytic.	Vomiting rather suddenly set in, which gradually became urgent, and the only action of the bowels that was obtained was by means of enemata; there was great distension of abdomen, collapse rapidly set in, and she died three days after the onset of the vomiting.	The pancreas is somewhat enlarged, particularly central third, diminished in consistency, and markedly reddened. Along the periphery of the organ are distinct hemorrhagic areas, about 1 cm. in diameter; most marked toward the head. Microscopically, the cells of the acini do not present any definite departure from health; in places they appear somewhat flattened. There is an abundant fibrinous exudation, with numerous red blood corpuscles. The morbid change appears to have been a sanguineous effusion, possibly of inflammatory origin, beneath the capsule which has forced itself way down the trabeculae between the acini. The distinct hemorrhagic areas referred to above contain ordinary black blood clot. In the omental fat around the pancreas were numerous hemorrhages; and patches 1 to 2 inches in diameter, areas of fat necrosis.	Died within 72 hours.

ping on the abdomen of the frog. Perhaps the best explanation is furnished by the state called "shock," using the term, as Prince¹² suggests, to denote "a sudden and profound depression or inhibition of the nervous centers, as a reflex result of so sudden and extensive injury to the pancreas itself, without requiring the mediation of the semilunar ganglion."

I have appended below a tabulated list of the cases hitherto reported; its careful study will serve to emphasize the importance of the subject of pancreatic hemorrhage, both from a clinical and a medicolegal viewpoint. I have endeavored to exclude those cases of acute pancreatitis and other morbid states in which there was only slight hemorrhagic infiltration occurring as a symptom. Oppositely, I have selected those cases in which the symptoms pointed to marked or fatal internal hemorrhage suddenly developed and the hemorrhage was confirmed by necropsy. The cases previously reported in a classic article by Dr. R. H. Fitz¹³, 16 in number, are included in the subjoined table. Draper¹⁴ had previously reported a series of cases of sudden death from pancreatic hemorrhage, of which six are also embraced in my table. There are to be found in the literature a large number of cases which I omitted, concerning which, however, there is room for a difference of opinion as to the cause of death, for the reason that all other obvious direct causes of death could not be reliably excluded. Judged by this test, few if any of the cases narrated in my table will be regarded as doubtful instances of pancreatic hemorrhage. It will be observed, also, that while most cases terminate quite acutely or even suddenly, others in which a fatal ending is attributable to pancreatic hemorrhage reached death more gradually, interrupted even by remitting periods.

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A STUDY OF CODEIN AND ITS SALTS.*

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Codein has been employed since its discovery in 1832 for various affections accompanied by pain, as a substitute for morphin, which had been in use for seventeen years before the above date. The drug has gained a prominence not hitherto accorded it, with the appearance of epidemic influenza and its sequelæ throughout this country during the severe winter just past.

Codein is administered alone or as one of its salts. It forms combinations with the mineral and organic acids, which are much more soluble than the alkaloid itself. The *acetate*, *citrate*, *hydrobromate*, *hydrochlorate*, *hydroiodate*, *nitrate* and *sulphate* have physical and therapeutic properties in common and are soluble in

from five to twenty parts of cold water, more so in hot water, from which they recrystallize to a certain extent on cooling. The *phosphate* is a white crystalline powder, soluble in four parts of cold water, and is especially suited for hypodermic use, as it is less irritating than any of the other salts. It is largely employed in this form in continental Europe. The *salicylate* is said to possess, besides analgesic, antirheumatic properties while the *valerianate* is especially beneficial in nervous troubles. All the salts of codein are subject to the general rules of incompatibility.

Kunkel¹ found, in his experiments on dogs and guinea-pigs, that codein has a powerfully irritating effect, producing convulsions in the extremities and the muscles of the neck, and where death results, it is due to its influence on the cerebellum and medulla oblongata. It acts on the circulatory apparatus, inflames the parts with which it comes into immediate contact, and its effect is greater when taken up by the cellular tissues than when absorbed through the stomach.

There are many contradictory reports regarding the action of this drug. Thus Hagen² states that it checks the urinary secretion, while most observers hold that it increases the amount of urine. Again, most writers speak of its advantage in not causing gastric disturbances, but its administration has been repeatedly followed by such excessive nausea and vomiting that it had to be altogether discontinued, as even a greatly diminished dose had the same effect as a larger one. These effects on the stomach are rarely seen when the drug is given in combination with one of the coal-tar preparations, such as acetanilid, probably due to the controlling influence of the latter on the cerebral centers.

Kersch³, in experimenting on dogs and cats, confirms the observations of Trousseau that the first effect of codein is paralysis of the hinder limbs and contraction of the pupils. Another characteristic symptom in animals is the frequent micturition, setting in as early as one hour after the injection of the drug in poisonous doses, whereas morphin causes retention of urine. Quite different was the action of the heart. In codeinized, deeply comatose animals, the pulse and respiration were accelerated, while the reverse was the case in morphinized animals. This acceleration occurred only in those animals having received a lethal dose and shortly before death, a symptom of paralysis of the vasomotor centers.

Reiner⁴, quoting Schröder, states that the physiologic action of codein in small, narcotic doses on the intestinal canal is to reduce peristaltic action; large, poisonous doses produce bloody diarrhea. This does not apply to the human being, as therapeutic doses are never followed by constipation, nor is the appetite diminished, as is the case with morphin.

With regard to the pupils, in therapeutic doses, no especial changes take place, but in toxic doses considerable dilatation is present. Locally, neither codein nor morphin produces mydriasis, so that the dilatation is a secondary phenomenon, in contradistinction to such substances as atropin and hyoscin, which act directly on the pupils. The blood-pressure is not influenced by codein, the pulse but slightly and respiration is slowed at first in toxic doses, and later returns to normal or above it.

THERAPEUTICS.

Cohen⁵ thinks the dose as given in most text-books is too large. While the drug may safely be given, if necessary, in doses of from 2 to 6 grains, on the basis that its narcotic power is but one-fourth that of morphin,

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