TRANSACTIONS
OF THE
PHILADELPHIA ACADEMY OF SURGERY

STATED MEETING HELD MAY 4, 1931

The President, Dr. George P. Muller, in the Chair

Calvin M. Smyth, Jr., M.D., Recorder

INTRAHEPATIC CALCULUS—CALCULOUS CHOLECYSTITIS COMMON-DUCT STONE

Dr. Hubley R. Owen reported the case of a woman who was admitted to the hospital of the Woman's Medical College, June 9, 1930, with the chief complaint of pain in the right side of the abdomen and back. The present illness began two months before with pain in the epigastrium which was at first referred to the left axilla then to the right lower costal margin, at times radiating to the left shoulder blade. The pain was inconstant and had no relation to the taking of food. There were associated headache and nausea. She had had the usual diseases of childhood, and pneumonia. She was operated upon at another hospital in 1921 for gall-stones, at which time cholecystostomy was performed. On admission there was no evidence of jaundice. Generalized tenderness over the abdomen especially over the region of the gall-bladder and epigastrium. This tenderness extended to the umbilicus. The liver was enlarged and extended almost to the level of the umbilicus. The spleen was not palpable. One hour after admission she had a severe attack of biliary colic; she was nauseated, vomited and the temperature arose to 103°. Her blood sugar on admission was 112.5, creatinin 1.4; chlorides 436, and blood urea 32 per 100 milligrams blood. On July 7, 1930, the blood sugar was 91; urea 17; and chlorides 400. The temperature gradually fell to normal and she was operated upon June 16, 1930, seven days after admission.

At the time of operation the liver was found to be greatly enlarged. The gall-bladder was large, thick-walled and contained innumerable calculi. The common duct was dilated and contained a large stone at its distal end. The gall-bladder and the common-duct stone were removed. A calculus was felt in the hepatic duct. An attempt was made to remove this calculus with a pair of Kelly forceps but the calculus crumpled and could be only partly removed. On palpation of the dome of the enlarged liver, an area of induration could be felt. With bi-manual palpation, one finger in the hepatic duct, the other hand being placed on the area of induration in the dome of the liver, it was found that the calculus was deeply embedded within the liver substance. The dome of the liver was incised with the cautery. A large branching calculus, 7 centimetres long and 3 centimetres in circumference, was removed through the incision in the dome of the liver. The calculus extended down the right hepatic duct. A "T" tube was placed in the common duct and a cigarette drain was placed to the incision in the liver which was not closed. Packing was unnecessary as there was no hæmorrhage. All sutures were removed ten days after the operation. There was very scanty drainage from the wound. After a rather stormy convalescence the patient was discharged on the twenty-ninth day after operation.

The reporter remarked that cases of hepatic-duct calculi are not uncommon. Intrahepatic calculi, especially of large size, are rather rare. Either may occur in the absence of calculous cholecystitis.

Frerichs[1] states that gall-stones in the interior of the liver and in branches of the hepatic duct are rare but quotes Morgagni who collected a series of observations from the works of Plater, Fallopius, Dodonoeus, Columbus, Paysch and others showing concretions which have been found in the interior of the liver. Most of these concretions were large, round stones and more rarely branched coral-like concretions which form casts in the ducts and are sometimes solid but at other times hollow. These concretions may give rise to inflammation, ulceration of the ducts also to hepatic abscesses and pylephlebitis.

There are said to be many specimens of multiple intrahepatic calculi in the museums of London and Westminster Hospitals. Beer[2] dissected 250 livers of patients who had succumbed to gall-bladder disease and found six cases of definite intrahepatic stone formation; that is, in 2.5 per cent.

Thudichum[3] reported six cases of large branching intrahepatic calculi. Another case of intrahepatic calculus was reported from St. George's Hospital of a man who died with diabetes from a secondary pancreatitis.[4] Vachell and Stevens[5] reported a case in which there were 520 calculi within the liver substances and the ducts. The largest was one and three-quarters inches long.

Intrahepatic calculi are chiefly composed of bilirubin calcium, whereas stones found in the gall-bladder are usually cholestrin stones. Because of this difference in the consistency of the calculi and because of the fact that intrahepatic stones may occur independently of calculi in the gall-bladder, the etiology requires further discussion. Beer[6] states that intrahepatic stones are probably formed in the liver rather than having been formed originally in the gall-bladder because of the fact that the stones removed from the hepatic duct and liver differ in shape, color and character from those usually found in the gall-bladder. Moreover, as mentioned above in many cases reported of intrahepatic stone, there have been no stones in the gall-bladder. Undoubtedly the intrahepatic calculi and the calculi found within the hepatic ducts must originate in the liver. In some cases of intrahepatic calculi, jaundice is present. In others, it is absent as in Draper's case.[7] In Hawkes' case[8] there was slight jaundice. In this case the gall-bladder had been previously removed. The patient left the hospital two weeks after cholecystectomy but attacks of pain continued. The patient was subsequently operated upon. No calculi were found in the ducts but "upon passing the hand upward toward the dome of the liver on the right side, a large calculus was found embedded in the liver substance about four inches from the free border of the liver." Hawkes performed this operation in two stages, introducing sterile gauze at the first operation to form adhesions. At second operation, four days later, the liver substance was incised and the calculi "dug out with the index finger from an indurated mass of surrounding tissue." Three large calculi were removed. There was considerable hæmorrhage which was checked by tamponade. In Doctor Owen's case the cautery was used for the liver incision and no worrisome haemorrhage occurred. Hawkes suggests the advisability of palpating the liver surface during operation in cases diagnosed as cholelithiasis where the findings in the region of the gall-bladder and ducts do not seem sufficient to account for the symptoms present. He further states that it "seems possible that liver abscesses of unknown etiology have arisen from such cause." Vachell and Stevens[9] reported a fatal case of intrahepatic calculus associated with multiple abscesses of the liver and subdiaphragmatic abscess. The gall-bladder in this case was normal in size and contained no calculi. Jaundice was not present until nineteen days before death. Chemical analysis of these calculi showed a predominance of calcium bilirubin. The culture from the abscesses of the liver showed *Bacillus coli* and whereas the patient had typhoid a number of years before, the typhoid bacillus was not found.

Again in Draper's case *ibid* occurring on the service of Dr. Arthur Newlin, at the Pennsylvania Hospital, there was no jaundice present and no local pain or tenderness. This case was not operated upon. At autopsy there were found one stone half the size of an egg, and a large intrahepatic stone with abscess of the liver. Lewisohn[10] reported a case of intrahepatic stone formation, there being several stones in the liver passages, one rupturing through the surface of the liver and causing general peritonitis. Jacobson[11] suggests that, in many secondary operations performed on cases of gall-bladder disease when stone is found in the common duct at the second operation, the apparent recurrence of the stone, which the surgeon at the time thinks was overlooked at the first operation, is actually an intrahepatic calculus which may have been present at the first operation but has descended to the common duct subsequent to the preliminary operative procedure. Weber[12] reported a fatal case of intrahepatic calculi. The case was operated upon for calculous cholecystitis and the gall-bladder was removed. The patient died three days after operation and at post-mortem there were found unrecognized intrahepatic calculi. He further emphasizes the fact that in intrahepatic calculi, though the hepatic duct actually appears to be blocked, jaundice may be variable in degree or even absent. McArthur[13] reported a fatal case of intrahepatic stone associated with stone in the common duct. There were no stones in the gall-bladder. McArthur discusses at length the etiology of calculous cholecystitis and intrahepatic calculi and reaches the following conclusions:

1. All gall-stones do not originate in the gall-bladder. 2. The origin of cholesterin stones is probably in the gall-bladder with subsequent growths either in the gall-bladder or ducts where they may lodge. 3. Bilirubin calcium is the constituent of the smaller intrahepatic duct stones. 4. Calculi in immense numbers may have existed for months in the ducts without producing a symptom. 5. The surgeon need not reproach himself too much if there be recurrence of the symptoms after common duct drainage.

This case is reported to emphasize three points:

1. The method of approach through the dome of the liver to remove the intrahepatic calculus. 2. The use of the cautery for the liver incision which minimized hæmorrhage. 3. The instance of post-operative hyperglycæmia due either to temporary chemical change in the pancreas or trauma to the pancreas inflicted at the time of operation. This temporary hyperglycæmia has been noted in a number of our gall-bladder operations.

REFERENCES

[1] Clinical Treatise on Diseases of the Liver, vol. ii, p. 512.
[2] Archives of Clinical Surgery, vol. lxxiv, p. 115, 1904.
[3] A Treatise on Gall-stones, p. 176, 1863.
[4] Transactions of the Pathological Society, vol. xlix, p. 133, London, 1898.
[5] British Medical Journal, vol. i, p. 134, 1906.
[6] Medical News, vol. lxxxv, 1904.
[7] Proceedings of the Pathologic Society of Phila., vol. xiii, p. 16, 1910.
[8] Medical and Surgical Report, Presbyterian Hospital of New York, vol. vii, p. 230, March, 1906.
[9] British Medical Journal, vol. i, 1906.
[10] ANNALS OF SURGERY, vol. lxiii, p. 535, 1916.
[11] Archives of Surgery, vol. i, 1920.
[12] Clinical Journal, vol. i, p. 165, 1921.
[13] Journal of A. M. A., vol. xlv, p. 1797, 1905.

MULTIPLE NEURITIS FOLLOWING PROPHYLACTIC INJECTION OF TETANUS ANTITOXIN

DR. HUBLEY R. OWEN presented a man twenty-eight years of age, who, on December 18, 1930, received a punctured wound of the right foot. On

the following day 1,500 units of tetanus antitoxin were administered into the subcutaneous tissues of the anterior abdominal wall. On December 25 he developed a severe generalized urticarial reaction for which he received an injection of adrenalin. On December 28 he was awakened during the night with very severe pains in the neck, more severe on the right side. pains in both shoulders, hands. forearms and in the intrascapular areas. He could not move his fingers or wrists and both upper extremities were weak. His hands and forearms felt as though they were swollen. The pain, which continued until the end of the first week in January, was associated with numbness and tingling in the hands and forearms.

January 5 the following findings were noted: The power in the left upper extremity was normal, excepting for slight weakness of the hand grasp. There was marked weakness in the grip of the right hand, and about 70 per cent. loss of power in the extensors of the wrist. He complained of very severe pain in the neck, shoulders, intrascapular areas and both arms. There was tenderness over the muscles of the right side of the neck, the axilla and over all the nerve trunks in arms and forearms. Extreme abduction of the arm caused severe pain. No objective impairment of sensation could be elicited, but subjectively there were numbness and tingling of the right hand and forearm. Tenderness, not as severe in character, was noted over the nerve trunks of the left arm. Power of both deltoids normal. There was definite weakness of the biceps and triceps muscles of the right arm. The left biceps and triceps muscles were normal. The bicipital and tricipital reflexes could not be obtained on the right side, but were normal on the left.

The above symptoms improved slowly. On January 9 he was able to resume light duty. By January 19 he had recovered sufficiently to return to active duty. Recent examination reveals that the power in both arms and hands is normal and equal. On lifting weights there is a moderate winging of both scapulæ. The patient states that he does not appear to have the same strength in his arms and hands as he had prior to the attack of neuritis.

The speaker remarked that cases of multiple neuritis following the prophylactic injection of tentanus antitoxin have been previously reported. The first report in the literature is by Thaon.[1] Approximately twenty cases have been reported. This manifestation of allergy is a comparatively rare one. Braunlich[2] cautions against the use of fresh tetanus antitoxin, stating that as a result of its use, serum reaction occurs more frequently and is more severe. Multiple neuritis may follow prophylactic injection of tetanus antitoxin or other sera. The prophylactic or therapeutic use of serum must be administered with the realization of this fact. None of the present indications for the administration of sera should be ignored because of the comparatively rare complication of neuritis. More careful testing for sensitization is advisable in the use of anti-sera to avoid this and all other unpleasant complications of serum therapy.

REFERENCES

[1] Thaon: Review de Med., September, 1912.

[2] Braunlich, George: Anaphylaxis Following the Injection of 1,500 Units of Tetanus Antitoxin. Iowa State Medical Journal, No. 17, p. 450, December, 1927.

In answer to the question whether the patient had ever received any injections of serum before, the reply was made that he had had an injection of anti-tetanic serum for a punctured wound about eight years ago. The speaker added that apparently those cases that are sensitized to serum are those in which this condition is more prone to develop. Prophylactic injection of toxin-antitoxin for diphtheria immunization has apparently been enough to sensitize many individuals to reactions of this sort.

DR. HUBLEY R. OWEN stated that in the police and fire departments of Philadelphia, it was necessary to give approximately three hundred prophylactic doses of tetanus antitoxin each year. In twenty-four years, this is the first case of neuritis which he had seen following the administration of antitoxin.

INFLAMMATORY REACTION OF THE LOOPS FOLLOWING GASTROENTEROSTOMY

DR. FREDERICK A. BOTHE presented two cases developing high intestinal obstruction following gastroenterostomy for duodenal ulcer. Secondary operations were performed and in each patient an inflammatory process was found in both the proximal and distal loops of the gastroenterostomy, with associated obstruction of the stoma.

The first case, a male, fifty-six years of age, was admitted to the Presbyterian Hospital, August 20, 1930, with a typical history of duodenal ulcer of fifteen years' duration. Twenty-four hours before admission he had a large gastric hæmorrhage, and passed several tarry stools. On admission, the hæmoglobin was 62 per cent. red blood cells 3, 600,000, and white blood cells 7,600. The routine management for the bleeding ulcer was instituted. On the fifth day the patient's general condition had improved; there was no evidence of bleeding and an exploratory laparotomy was performed with the pre-operative diagnosis of bleeding duodenal ulcer. At the operation a large duodenal ulcer was found in the first portion of the duodenum on the anterior wall. This was excised by the cautery, sutured, and the suture line was covered with a portion of the lesser omentum. A posterior gastroenterostomy and appendectomy were performed and at the conclusion of the operation, a blood transfusion of 300 cubic centimetres was given. The immediate post-operative reaction was satisfactory. Water was taken without any evidence of retention until the fourth day when fullness in the epigastrium and hiccoughs developed and the temperature rose to 101°F. Forty ounces of bile-stained fluid were recovered by gastric lavage. Blood chemistry studies showed a slight fall in the blood chlorides and an elevation of the blood urea nitrogen. The stomach was repeatedly lavaged with a Jutte tube and 1,000 cubic centimetres of 5 per cent. glucose in normal salt solution was administered intravenously twice daily. Although there was slight general improvement in the next thirty-six hours, the retention persisted and an exploratory operation was performed. Both the proximal and distal loops of the gastroenterostomy were markedly inflamed and the stoma was entirely closed. The inflammatory reaction extended down the proximal loop to within 2 inches of the ligament of Treitz and in the distal loop for the distance of about 5 inches. The ligament of Treitz was severed to mobilize the upper portion of the jejunum and an enteroenterostomy was made between the proximal and distal loops below the involved portions. A jejunostomy of the Witzel type was then performed. At the termination of the operation a blood transfusion of 300 cubic centimetres was given. Repeated gastric lavage and intravenous injections of glucose and salt solu-

tion were continued and in addition, 5 per cent. glucose in normal salt solution was administered through the jejunostomy tube by the Murphy drip. The patient's condition did not change very much in twenty-four hours, so a Jutte tube was left in the stomach and every two hours the gastric contents were aspirated and introduced into the jejunum through the jejunostomy tube. This procedure benefited the patient symptomatically and produced a definite improvement in the degree of dehydration in twenty-four hours. Charcoal was placed in the stomach after the aspiration as various intervals, but no trace of it could be found in the jejunum until seventy-two hours after the operation. On the fourth day the temperature became normal, and on the fifth day fluids passed through the stomach readily. Oral feedings were started and gradually increased; intravenous injections of glucose and salt solution were discontinued on the sixth day; feeding through the jejunostomy tube was discontinued on the eighth day, and the jejunostomy tube was removed on the fourteenth day. Subsequently, the convalescence was uneventful. Since his discharge from the Hospital, the patient has gained twenty-two pounds in weight and is symptom-free.

The second case, a man, forty-one years of age, was admitted to the Presbyterian Hospital April 18, 1927, under the care of Doctor Pfeiffer. He had an eight-year history typical of duodenal ulcer and the X-ray was positive for this lesion. April 22, 1927, a laparotomy was performed, a duodenal ulcer was found, and a gastroenterostomy and appendectomy were performed. The patient's immediate post-operative reaction was satisfactory and he was able to take soft diet with no discomfort. On the eighth day symptoms of gastric retention developed with an elevation of the temperature of 100 1/5° F. Gastric lavage was performed and glucose and saline were administered intravenously. Blood chemistry studies showed a more severe alkalosis than was found in the first patient. The Co^2 was 85 volumes per cent., the blood chlorides were 208 and the blood urea nitrogen, 26 per cubic metres of blood. The patient's condition became progressively worse and the gastroenterostomy was explored on the twelfth day. Both the proximal and distal loops were greatly inflamed, the stoma was closed and the distal loop was collapsed beyond the area of inflammation. An enteroenterostomy was made between the two loops. Gastric lavage and intravenous medications were continued. There was slight improvement for twenty-four hours, but the patient's progress was not satisfactory. On the second day a jejunostomy was performed with a marked relief of symptoms in twenty-four hours. Forty-eight hours after the jejunostomy the patient's temperature fell to normal and at the end of four days fluids passed through the stomach into the jejunum. The diet was gradually increased until solid food was taken with no evidence of retention. Three weeks after the jejunostomy, when the patient had completely recovered from the gastric retention, an upper respiratory infection occurred which was complicated by multiple abscesses of the lung and empyema which was ultimately responsible for his death, two and one-half months after the original operation. The respiratory condition is mentioned briefly as before the onset of this complication, the inflammatory reaction of the loops of the gastroenterostomy had subsided and the patient was well on the road to recovery.

These cases are presented for two reasons: First, inflammation of the loops was the cause of gastric retention following gastroenterostomy; and secondly, the jejunostomy placed the inflamed area at rest, permitting the inflammation to subside and thereby relieving the obstruction.

The etiology of the inflammatory process could not be determined. Both gastroenterostomies were performed in the routine manner and no inflammation was present at the time of the primary operation. There were several findings in the post-operative course which were considered of significance in arriving at this diagnosis. First, the onset of the symptoms of gastric retention developed suddenly in patients who were apparently taking oral feedings very satisfactorily, and secondly, there was a simultaneous elevation of the temperature. The sudden onset of symptoms may be explained by the fact that the inflammatory reaction had gradually encroached upon the lumen of the stoma, and it was not until the stoma was completely closed that the gastric retention occurred. The elevation of temperature is a valuable sign when there are no other physical findings to account for it.

Doubtless cases occur in which the inflammatory reaction is not severe enough to produce a complete obstruction. Possibly some cases which do not take fluids as well as usual, following gastroenterostomy, would fall into the milder group. A case which the speaker believed to be of this nature, occurred in the service of Doctor Speese, at the Presbyterian Hospital, in 1927. This patient did not have complete retention, but the gastroenterostomy did not relieve his symptoms. X-ray studies made two years after operation were suggestive of marginal ulcer. An exploratory operation revealed no evidence of marginal ulcer, as suggested by the X-ray, but the loops of the gastroenterostomy were bound down to the transverse mesocolon by dense adhesions. The stoma was found to be patulous and would admit two fingers. The adhesions were freed and the raw surface thereby produced, covered with omental grafts. Since the second operation the patient has had no further symptoms. This case strongly suggests a mild type of inflammatory reaction and with the subsidence of the inflammation, the loops became adherent to the transverse mesocolon in such a way as to produce mechanical interference to the proper functioning of the gastroenterostomy.

Jejunostomy has been shown to be of great value in inflammatory lesions of the stomach and upper gastro-intestinal tract, and in these two cases apparently it was the most important procedure in the relief of the obstruction.

Balfour has called attention to the value of jejunostomy in the treatment of apparently irremovable lesions of the stomach, complicated by inflammation. He has observed a number of cases with complete disappearance of symptoms after a few weeks of feeding through the jejunostomy tube and without recurrence following removal of the tube. The length of time for the tube feedings will depend on the röntgenologic evidence as to what changes are taking place in the lesion. If supplementary oral feedings become advisable, they should be based on a strict antiulcer régime. It is possible in some cases to perform secondary operations on the patients after some weeks, and excise the lesion when the inflammation has subsided. He reports a case operated upon in October, 1927, for a marginal ulcer following partial gastric resection. The ulcer had perforated onto the diaphragm and there was an extensive inflammatory process around it. A huge crater could be identified on the anterior part of the anastomosis. Owing to the great risk and technical

difficulties of major operative interference, a jejunostomy was performed. The patient had relief from pain in eight days; the jejunostomy tube was left in place for six months and during that time no food was taken by mouth. Eight months after the operation the patient returned symptom-free, all evidence of the lesion had disappeared and the X-ray was negative.

DR. DAMON B. PFEIFFER said that since the standardization of the technic of gastroenterostomy has been so well placed before the profession by many surgeons, notably Moynihan, we have become accustomed to think little of what was formerly called vicious circle. The physiologic gastroenterostomy makes it very much simpler for the contents of the stomach to enter the jejunum rather than go down to the proximal loop. These two cases show that there is a type of obstruction which is not a simple mechanical one but which is due to adynamic ileus. The speaker has seen a somewhat similar condition in the colon in which the bowel had lost its elasticity. One sees it most frequently in the late stages of ulcerative colitis. The physiologic block is not due to any actual obstruction but to the inflammatory ileus. He would hesitate very much to delay operation in cases showing marked gastric retention after gastroenterostomy, hoping it would disappear. It might disappear but the proper thing to do is to explore.

DR. EDWARD T. CROSSAN said that Doctor Bothe states that the gastroenterostomy was done in the usual manner. He would like to know whether the "usual manner" means that there were three layers of sutures posteriorly, or whether two layers were used. He would also like to know whether the opening in the transverse mesocolon was sutured close to the stoma. It would appear that if three layers of suture are used posteriorly, and in addition to this the rent in the mesocolon be sutured close to the stoma, there is sufficient irritation from the foreign bodies to cause an inflammatory reaction such as described in these cases. The speaker agrees with Doctor Pfeiffer that jejunostomy should clear up cases of inflammatory ileus.

DR. GEORGE P. MULLER remarked that operative interference was often unwisely postponed in the hope that obstructive symptoms would be relieved. This practice occasionally results in the neglect of a patient suffering from severe mechanical obstruction. The speaker, however, recalled one patient whom he had ordered prepared for re-operation when it was discovered that there was a marked alkalosis. Large quantities of hypertonic saline and glucose solution were given and in twenty-four hours the clinical picture had completely changed. Doctor Muller, therefore, advocates serious consideration of the chemical state of affairs and if treatment along these lines fails to give relief, operation should not be delayed. In certain cases infection from the stomach may be carried to the suture line and thus produce an inflammatory reaction in the stoma which will prevent it from functioning.

DR. FREDERICK A. BOTHE said that he used two rows of sutures and sutured the mesocolon about two and one-half inches from the anastomosis.

AVERTIN ANÆSTHESIA FROM THE SURGEON'S STANDPOINT

PENETRATING WOUNDS OF THE ABDOMEN

DR. ARTHUR E. BILLINGS and DR. ADOLPH WALKLING read a paper with the above title.

DR. CHARLES F. NASSAU remarked that there is one thing that he has missed in Doctor Billings' paper and that is the relationship between the result and the calibre of the bullet. Over a good many years he had the opportunity to operate upon gunshot wounds of the abdomen; not many stab wounds. With but two exceptions he has never seen anybody shot by a 38-calibre bullet get well. Those shot with 22-and 32-calibre bullets make almost uninterrupted recoveries where there is not too much irreparable damage done. He had under his observation one 38-calibre wound get well and one wound from a 41 Swiss pistol where the bullet was never found. He thinks it would be interesting if there were some way in which Doctor Billings could look up the calibre of the bullets that caused the injuries and show whether there is any basis in his cases for Doctor Nassau's belief.

DR. ARTHUR E. BILLINGS replied that he had thought of investigating that question but the calibre of the bullet is so seldom known in most cases that he was unable to get enough histories to make it of any value.

AVERTIN ANÆSTHESIA FROM THE ANÆSTHETIST'S STANDPOINT

DR. JOSEPH KREISELMAN (by invitation) read a paper with the above title for which see page 885.

AVERTIN ANÆSTHESIA FROM THE SURGEON'S STANDPOINT

DR. CHARLES S. WHITE (by invitation) read a paper with the above title for which see page 888.

DR. CHARLES H. FRAZIER said that the performance of cranial operations is different from those of the abdominal or general surgeons in that relaxation is not a very important factor. In cranial exploration under local anæsthesia alone he found that the method was entirely satisfactory in most respects, that is, in so far as being able to operate without pain. Cranial explorations are long drawn out affairs and patients are often on the table for two hours. There is a tendency for the pulse rate to become high and the blood pressure to fall. The addition of small amounts of ether improved the blood pressure and the irregularity of pulse would disappear. Doctor Grant and the speaker have tried avertin in a number of cases and in every respect it seems satisfactory. His anæsthetist experimented as to the dosage, it being desirable, of course, to use a minimum dose. She started with 80 milligrams and found it a little too much, there being a tendency to cyanosis and the early fall in blood pressure. At present she has found that 60 milligrams is quite sufficient. The administration is simple. The patient is given a colonic irrigation about one hour before being brought to the anæsthetizing room and fifteen minutes before that one-half grain of codein, followed in a few minutes by the avertin. Occasionally there is a fall in blood pressure within fifteen to twenty minutes, but it usually responds of itself. Occasionally he gives one-half an ampoule

of pituitrin. Doctor Frazier's experience with this dosage has been satisfactory and gave no cause for alarm.

DR. GEORGE P. MULLER said he saw the publication of Doctor White's previous paper. He had begun the use of avertin and during the winter had used it in forty-three cases, of which about half were goitre. Forty were successful from the standpoint of anæsthesia. Blood pressures usually fell for a short period but not nearly so much as occurred in spinal anæsthesia. Nitrous oxide gas was used as a secondary anæsthesia and the patients required but little of it. No patient showed any complication from the avertin.

DR. EDWARD W. BEACH said that he had used avertin, not so much as the essayists, but had found it very satisfactory. There is a drop in pulse pressure early in the anæsthesia. The reaction is very quick. Cyanosis has not given trouble although he always has a tank of CO_2 and oxygen present. He varies the dosage according to the operation; in major abdominal work using the larger doses. The advantage of nitrous oxide as the supplemental anæsthetic is that one maintains a high percentage of oxygen which is desirable as it maintains a higher metabolic rate. In other words, one can conduct a section on a 50-50 instead of an 80-20 mixture. Doctor Beach thinks avertin possibly impairs the action of the kidneys at first but only temporary. It certainly is an approach toward the ideal, and the patients are all well pleased.

DR. CHARLES S. WHITE, said that he believed the proper way to use avertin is to begin with a small dose, 60 milligrams for instance, and gradually increase it in various cases until the proper dosage is reached. This will be 80-90 milligrams per kilo. of body weight. He did considerable laboratory work in connection with avertin, but did not go into the matter of dosage because this has already been well worked out by the Germans. He believes avertin is a distinct advance in anæsthesia and is well worth trying. For a long time he has been considering the anæsthetic from a surgeon's standpoint, in his opinion it is now time to give the patient due consideration.

DR. JOSEPH KREISELMAN, replying to questions, said that he was not prepared to make a comparison between amytal and avertin. He had never used the former. It is a little difficult to give a definite dosage. In the beginning he used 100 milligrams almost routinely for abdominal surgery. He would use 100 milligrams in a young healthy adult man now; perhaps in a young woman. In an obese patient, say 160 pounds, he probably would use somewhere between 80 and 90. A recent patient who weighed about 170-180 pounds and had a blood sugar of 300 received what he estimated to be about 50-60 milligrams and there was practically no change in her blood sugar postoperatively. He has never used it intravenously. The speaker does not consider 80 milligrams enough for the average abdominal operation. On occasions 100 milligrams is slightly exceeded. The respiratory rate is decreased with the larger doses. Cyanosis has not been observed in any case.