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OPERATION AND REOPERATION FOR GALLSTONE DISEASE*

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WITH A REPORT ON PATHOLOGIC RESEARCH BY

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PHILADELPHIA

The question of recurrence of symptoms after surgical treatment of affections of the gallbladder and the biliary passages is one that has been much discussed during the past decade, and one which I believe will bear further consideration.

In 1916, reporting on more than a thousand operations on the gallbladder and the biliary passages in my service at the Lankenau (formerly the German) Hospital of Philadelphia, I found that 4.07 per cent. were reoperative cases (some of the patients having had three operations). Among 800 cases coming under my care in the same hospital since January, 1916, it appears that 8.5 per cent. (seventy cases) were secondary (there were also a few tertiary) operations. Confronted with this increase in recurrence, we naturally turn to seek the cause.

Of the recent series, fifty-one patients were originally operated on elsewhere by other surgeons, the remaining nineteen having been operated on by me at the Lankenau Hospital.

In thirty-six of the fifty-one, recurrence took place after a cholecystostomy and fifteen after a cholecystectomy. The longest interval between operations was fifteen years. This patient (reported in a previous communication), in fact, had been operated on twice before coming under my care. The first operation—cholecystostomy—for the relief of gallstones had been done seventeen years previously, followed two years later by a choledochoduodenostomy and repair of an incisional hernia. At the third operation numerous adhesions were found about the anastomosis, the dilated common duct contained numerous stones as well as foul smelling grumous material, and the ampulla of Vater was constricted.

The information regarding the condition found at the primary operation is not complete for all the cases of this group. Among those for which data are at hand, the shortest interval between operations was seven months. The symptoms in this case recurred three months after the cholecystostomy. At the second operation, in addition to a mass of adhesions, stones had again formed in the gallbladder, and stones were also found in the common duct. The gallbladder was

then removed, and the common duct emptied and drained. In another case—empyema—in which the colon bacillus was cultivated from the pus, the symptoms returned about seven months after the draining of the gallbladder. At the secondary operation—cholecystectomy—the pancreas was found chronically and markedly diseased.

The average interval between operations in this group was about five years and nine months, the average period of freedom from symptoms being about two years and three months.

In the fifteen "ectomized" cases, in addition to adhesions which were present in all but one, reoperation was necessitated by the presence of fistula in four instances, common duct obstruction, stone or stricture, nine, and pyloric obstruction three. Three of the patients in the group failed to derive any benefit from the primary operation; of the others, the longest interval of freedom from symptoms was four years, the average being about four months, and the average interval between operations about eight and a half months.

In considering my personal cases (those in which the primary and secondary operations were done by me), I find that in eight the symptoms recurred after primary cholecystostomy, one after choledochostomy, and ten after cholecystectomy, or 1.3 per cent. after removal and 10 per cent. after drainage operation.

Excluding the fifty-one cases of the first group (in which the patients were primarily operated on elsewhere), a primary cholecystectomy was performed in 611 and cholecystostomy in seventy-eight cases; other primary operations consisted of cholecystoduodenostomy, 27; choledochostomy, 11; choledochoduodenostomy, 1; exploratory, 16; pancreatostomy, 4, and duodenotomy, 1. The last represents a case of carcinoma of an aberrant pancreas found in the duodenum and excised.

The longest interval between operations in the drained cases was fourteen years, the shortest one month, with an average of six years and four months, while freedom from symptoms averaged three years, the longest period being thirteen years and the shortest one month.

Of the fourteen patients whose gallbladders were removed, five remained well for a period varying from two months to two years, two were not benefited by operation, and seven required secondary operation during convalescence.

Taking this recurrent series collectively, we find the pathologic condition most frequently noted after operation to be adhesions (noted thirty-nine times), while the most potent cause for return of symptoms after operation proved to be stone in the gallbladder and ducts (twenty-six), which coincides with our pre-

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vious experience. Next in frequency, in the order named, were: persistence of infection, cholecystitis, seventeen; fistula, eleven—biliary, nine, duodenal, two; common duct obstruction, ten; chronic pancreatitis, eight; pancreatic lymphangitis, six; cholangitis, six; pyloric obstruction, five; dilatation of ducts, five—common duct, four, cystic duct, one; carcinoma, four—pancreas, two, gallbladder, two; stricture of the ampulla of Vater, two. Some of the cases presented one or more of the conditions mentioned.

ADHESIONS

It thus appears that adhesions were noted in 52 per cent. of the recurrent cases. The damaging and symptom-producing adhesions are principally those that form after cholecystectomy, and bind the duodenum, in some instances with the pylorus, the great omentum, and not infrequently, the hepatic flexure of the colon to the under surface of the liver. The symptoms caused by this deformity do not as a rule make their appearance for some time after the operation, or until they are in the process of organization and have reached the stage of contraction. There are exceptions to the rule, however, as for example persistent vomiting coming on from one to two weeks after operation, making it impossible to nourish the patient by mouth and where lavage demonstrates considerable gastric retention. I have seen this complication several times and for its relief have been obliged to do a posterior gastro-enterostomy, after which convalescence was rapid and uninterrupted.

It is generally admitted that gastro-enterostomy has its greatest usefulness in pyloric obstruction, and ulcer of the duodenum and stomach, but the operation also has a distinct place in a certain class of complicated gallstone cases. The very fact that gallstone disease, without operation, or after operation, can cause a condition requiring gastro-enterostomy should of itself be enough to do away forever with the expression "simple gallstones."

Ulcerative communication between the biliary passages, the stomach and the duodenum, not infrequently seen by those of us operating on patients previously operated on for gallstone disease, is a well-known phenomenon. That this can and does result in obstruction to the onflow of the stomach contents which, I am sorry to say, is not always recognized by the diagnostician, I know to be true.

Deferred action in these cases is inadvisable, and medication ineffectual. Rectal alimentation is a makeshift. Filling the rectum with sodium bicarbonate and glucose is not a very pleasant procedure, nor does it do any good except for the sorry consolation it may give of having done something for the patient, who usually dies.

In late cases of duodenal and pyloric obstruction I find it safer to do a posterior gastro-enterostomy than merely to separate adhesions, safer in that it is more permanent and less likely to require further operation. We all know that adhesions tend to recur and that nothing will prevent their formation if the raw surfaces cannot be covered with peritoneum. I have mentioned duodenal obstruction before pyloric, as in my experience the duodenum is more often obstructed than is the pylorus. In an old case of extensive adhesions in which the viscera normally in relation with the gallbladder are matted into an almost unrecognizable mass, the operation of separating and covering

the denuded surfaces is likely to be a very difficult procedure attended with great risk of tearing the duodenum and in some instances the colon. I have had this happen, and have had to resect the torn duodenum with the pylorus and make a posterior gastro-enterostomy.

The comparative ease with which the duodenum can be repaired so as not to expose the patient to the risk of a duodenal fistula, a most dangerous and difficult proposition with which to deal, reads well and sounds well, but the seriousness of it must ever be borne in mind. Occasionally after separating the adhesions and disentangling the viscera I interpose a portion of the great omentum between the liver, the duodenum and the pylorus, and have had no cause to regret the maneuver.

When the removal of the gallbladder is carefully and anatomically done, few adhesions should follow the operation. The gallbladder being fully exposed, the neighboring viscera well protected and kept out of the way by properly placed moist gauze pads, not gauze towels (held in place by retractors), with the gallbladder held taut, as it were, the first step in the operation is the opening of the right free border of the gastrohepatic omentum and the identification of the common, cystic and hepatic ducts and the cystic artery, which, with the hepatic artery, may be found anomalous. Anomalies of the ducts or arteries make little difference to the operator who knows his anatomy and does the operation in this manner. Lack of care in grasping the cystic duct with hemostatic forceps or the cystic artery, if perchance it has been severed, is a frequent cause of injury to the common or hepatic duct with stricture or obstruction of the duct as a result. I refer to this later. For the occasional operator, therefore, I would suggest a drainage operation and not removal of the gallbladder. It is better for the patient to run the risk of recurrence of gallstones than be left with either a damaged common or hepatic duct, a condition I have had to deal with a number of times, and which warrants me in being very emphatic on this subject. In doing many hundreds of operations for gallstone disease, one becomes more or less familiar with the danger signals. I have never taken any stock in the theory of biliary duct angulation due to adhesions or the traction of a movable kidney as the cause of symptoms of gallstone disease, particularly jaundice, because I have not encountered any instances of the kind in my numerous operations.

That adhesions form after a drainage operation is true; but they are neither so dangerous nor so productive of serious trouble as are the adhesions that follow removal if the operation is not very gently and carefully done.

NEW STONE FORMATION

The second most common cause of recurrence of symptoms is the presence of stone or stones. With few exceptions the stones found at the second operation were probably present at the primary operation but were not detected. The time elapsing between the two operations, or perhaps a third one, has a bearing on the subject. Even though, at the first intervention, all of the stones that were palpable to the finger or that could be removed with the scoop were taken out, subsequent stone formation occasionally takes place. It may happen that small granules of stone adhering to the mucosa of the gallbladder are present in the neck of the latter, or in the common or the hepatic duct, or

its ramifications, and subsequently develop into one or more good-sized stones. Often after opening a gallbladder that has been removed I have seen such tiny stones adhering to or embedded in the mucosa. How long a time is required for these stones to develop cannot be definitely stated. Some of the patients returned in a few months, others remained well for thirteen years.

When a number of years have elapsed between the original operation and the reoperation there is every reason to believe new stone formation has taken place. And in nearly all cases, as before the first operation, a history of infection will in all likelihood be obtained for the interval between operations. The sequence of events in gallstone formation I believe to be: infection, inflammation, obstruction to drainage, retention—bile stasis—proliferation of epithelium, formation of cholesterolin, etc. In recurrence after drainage operations we know that it is not uncommon to find stones. For the recurrences after removal of the gallbladder, with the subsequent presence of stone or stones in the common duct or the hepatic duct, the most plausible explanation is that a small stone located high up has descended and has lodged either in the hepatic or in the common duct and there increased in size until it is too large to be passed and has thus caused obstruction. I have observed this in a number of instances; in fact, I have seen it occur three times in the same patient before obtaining complete freedom from recurrence. In some of these cases I have been able to predict the probability of a return of symptoms, especially when I had been able to feel a stone high up in the duct, but could not remove it; or when, having brought the stone into the hepatic duct, it has slipped away and has been lost; or when I have found the ducts filled with sandy material, and when, after removing as much of the latter as possible, with the ducts laid open as far as possible, I have instituted prolonged drainage. Even in these cases it is no surprise to learn of subsequent common duct obstruction by stone.

CHRONIC CHOLECYSTITIS

The third most common cause of recurrence—persistence of infection—in the shape of chronic cholecystitis, I believe to be inexcusable. First of all, the frequency of recurrence from this cause lends support to the theory that noncalculous cholecystitis is a clinical entity distinct from the calculous gallbladder inflammation, and justifies removal of the gallbladder in such cases. Furthermore, it is inexcusable, in view of the fact that dyspepsia or chronic indigestion is not a clinical entity of itself, but the accompaniment or the result of a greater or less degree of a pathologic condition in one or the other of the abdominal viscera, and that next to appendicitis, the most common type of indigestion is gallbladder dyspepsia. The differentiation between the two is not always possible except by operation, and even then one cannot always tell whether or how far the appendix is also responsible for the symptoms, in those cases in which the gallbladder has undergone pathologic changes. Owing to this uncertainty, it becomes necessary in the majority of cases to remove both the appendix and the gallbladder. This brings up the question of priority of responsibility for the symptomatology. You are all, no doubt, aware of my conviction that the guilt for most of the upper abdominal ailments lies primarily within the appendix, although I may say in passing that I am

not unmindful of other possible sources of focal infection. How rarely do we find an appendix, removed as a routine procedure in our abdominal operations, that is not diseased, and markedly so, in most instances?

Chronic cholecystitis is not always difficult to diagnose; it can generally be recognized by a proper correlation of the history and the results of physical examination, especially local tenderness and more or less local rigidity. In cases of doubt we can call on the roentgen ray and various laboratory methods of examining the condition of the stomach, duodenum, pancreas, intestinal tract, etc. Having once arrived at the diagnosis, prompt action is essential. Dilly-dallying with medicines, in my experience, not only profits the patient nothing, but rather favors further visceral involvement and the possible extension of the process by way of the lymphatics or the blood stream to other important organs. This possibility is well illustrated by the researches carried on in the pathologic department of the Lankenau Hospital under the able direction of Dr. Stanley Reimann, whose investigations I have incorporated in this paper. This interesting work of Reimann, I believe, should settle the question of medical versus surgical treatment of persistence of infection in chronic cholecystitis and its responsibility for so large a percentage of recurrences after cholecystostomy.

OTHER CAUSES OF RECURRENCE

The recurrent series includes ten cases of noncalculous common duct obstruction. Six were due to stricture, three to scar tissue, and one to ulceration.

The principles involved in the treatment of obstruction of the common duct by stricture, scar tissue and ulceration are practically the same. In stricture of the common duct, whether annular or linear, the duct is laid open to the extent of involvement in the line of the duct, and drainage established by the T-tube; for annular stricture involving a wide portion of the duct resection and end-to-end anastomosis is best; or if the stricture is too near the duodenum to make this feasible, anastomosis of the proximal end into the duodenum and closure of the distal end can be done, this layer of suture being reinforced by the great omentum. These operations I have done a number of times with good result.

In ulceration of the duct, the treatment is practically the same as for stricture. Obstruction of the duct by scar tissue occurs where the duct has been cut away, and the scar tissue forms in the shape of a cord connecting the two ends. Under these circumstances the most difficult portion of the operation is to identify the lower end of the duct. The proximal end, unless well within the transverse fissure of the liver is, as a rule, not so difficult to identify if we aspirate with the hypodermic syringe. When the greater portion of the duct is destroyed, it is best to mobilize the duodenum and anastomose the proximal end to the duodenum. Sometimes the T-tube or a small piece of rubber tubing introduced into the end of the duct and the duodenum can be used to advantage in the anastomosis. I always reinforce the anastomosis with the greater and the lesser omentum. This, however, is difficult and trying surgery, calling for the greatest gentleness of manipulation, patience and utmost skill, ingenuity and judgment.

Biliary fistulas, of which there are nine in the series, are practically all the result of stone in the common duct, and can be obliterated only by relieving the

obstruction. This type of fistula rarely is due to malignancy, but when attributable to such cause is nearly always irreparable. Quite as serious is duodenal fistula, reported twice in the series. Resection, pylorotomy and gastro-enterostomy are the procedures indicated, but they are not always possible and not always successful, owing to the depleted condition of the patient.

It will be noted that chronic pancreatitis and chronic pancreatic lymphangitis were the cause of twelve recurrences. While pancreatic lymphangitis is frequently corrected by removal of the gallbladder, this does not apply to chronic pancreatitis, particularly in the long-standing cases. Although I have so often called attention to the importance of pancreatic lymphangitis as a forerunner of chronic pancreatitis, I cannot refrain from mentioning it once more as a factor to be seriously reckoned with in gallstone disease surgery. Drainage, of course, is the *sine qua non* in the presence of chronic pancreatitis, and, if, owing to diseased condition of the gallbladder and the cystic duct, cholecystotomy is not possible, drainage must be established through the common duct.

Duct drainage is also indicated in cholangitis, the result of gallstone disease, and must be continued for a number of weeks. I have known patients who have carried a drainage tube in the common duct for as long as four years; it is only in very obstinate cases, however, that such prolonged drainage is required. The simplest means of accomplishing this is by way of the gallbladder; but when this is not feasible, drainage through a cholecystoduodenostomy or by way of the common duct will be necessary. Incidentally, I may remark that biliary cirrhosis may result from chronic cholangitis if not given the benefit of radical surgery.

Dilatation of the common duct in the presence of an irremovable cause is best treated by a choledochoduodenostomy—not by any means a very difficult thing to do with the duct enlarged.

Benign stricture of the papilla of Vater, which is not infrequent, I have always been able to correct by dilatation through an incision of the common duct.

Carcinoma of the head of the pancreas, as well as carcinoma of the ampulla of Vater, or the common or hepatic duct cannot always be differentiated except by opening the abdomen; nor can the differentiation of obstruction of the common duct by a silent stone always be differentiated from malignancy. I have seen a number of confusing cases which were cleared up only by operation. Carcinoma of the gallbladder is another one of the uncertain diagnoses, except in the presence of a palpable swelling which can be identified, or perhaps by roentgen-ray demonstration. It is worth mentioning that the majority of cases of carcinoma in which I have operated have been associated with stone; furthermore, I have no hesitancy in saying that I believe persistent cholecystic infection is primarily the responsible agent in the causation of this most unfortunate condition. It may not be out of place for me to mention a case of carcinoma of the fundus of the gallbladder that had not metastasized, but was adherent to the hepatic flexure of the colon, indenting the colon to such an extent that the roentgen ray seemed to indicate carcinoma of the bowel. This patient has remained well for more than two years since the operation (cholecystectomy).

The great variance between recurrences after radical surgery of the gallbladder and those that take place

after conservative surgery leads to the manifest conclusion that radical treatment gives the greater prospect of a permanent cure. Perhaps if the work recently reported by Vincent Lyon¹ of Philadelphia on the physiologic drainage of the gallbladder based on Meltzer's theory of contrary innervation can be developed into a more practical one—practical in the sense that any but the highly trained specialist can make use of it—we may obtain a valuable aid in early diagnosis and the possible prevention of the serious consequences of biliary stasis. For the present, however, radical surgery, although it falls short of being ideal surgery, is the best means we have of removing a pathologic condition and its pernicious effects. "If thy right hand offend, cut it off."

PATHOLOGIC REPORT BY DR. REIMANN ON RELATION OF STREPTOCOCCUS TO GALLBLADDER DISEASE

In classifying the pathologic histology of gallbladders, we have recognized an interstitial involvement of both acute and chronic nature in by far the large majority. Simple involvement of the mucosa was seldom encountered. The interstitial involvement, that is, infiltration of either acute or chronic inflammatory products into submucosa, muscularis and peritoneum, means only one thing—that organisms or their toxins or both are present in the walls of this organ. This picture makes plain the reasons for the frequent peritoneal adhesions, pancreatic lymphangitis and lymphadenitis, and chronic pancreatitis. Infection, of course, in the largest proportion of cases comes from within the lumen of the gallbladder.

A direct way of approaching this subject is afforded by the method developed by Rosenow and his associates. It consists of removing surface infection by either washing the organ, taken directly from the hands of the surgeon, in large volumes of saline solution, or dipping it momentarily in boiling water, then grinding it up in a meat grinder, and triturating with sand and saline solution. This procedure is carried out in a specially constructed box which allows of sterilization. The ground-up tissue is then planted in special mediums. Rosenow's results have indicated the presence of streptococci in the walls of the gallbladder as well as in other organs.

Forty-five gallbladders were treated by us in this way, and streptococci, all of the *S. viridans* variety, were found in nine instances, or 20 per cent. The pathologic examination of these gallbladders disclosed that all had a marked interstitial involvement. In more than half, there were acute changes engrafted on obvious preexisting chronic ones. Seven of the nine contained calculi. Other organisms were detected in many; but, since the discovery of streptococci was the main object, these were not definitely identified. In the other thirty-six specimens, practically half showed lesions that were confined entirely to the mucosa. The others showed more or less interstitial infiltrations of a chronic nature. Four showed acute involvement as well.

Surgical and pathologic experience demonstrates over and over again that in most instances the gallbladder in an operative patient has been the subject of at least several acute inflammatory processes. In a number, however, there has possibly been present a chronic, slowly progressing inflammation from the start.

1. Lyon, B. B. V.: Diagnosis and Treatment of Diseases of the Gallbladder and Biliary Ducts, J. A. M. A. 73: 980 (Sept. 27) 1919.

The clinical experience is that a gallbladder which has once given trouble and recovered without operative interference will, in a large majority of instances, make its presence known again, usually in a more unfavorable way. This is quite reasonable when streptococci can be so easily demonstrated in the walls of at least 20 per cent. (in Brown's series in 50 per cent.). The ability of streptococci to remain latent for long periods of time is too well known to require emphasis. A scheme of treatment based on the laws of contrary nervous innervation must take this infection of the walls into very serious consideration. The instillation of magnesium sulphate and other such materials by tube into the duodenum may cause the gallbladder to empty itself, and thus be of advantage in draining infection from within the lumen of the organ. It seems unlikely, however, that infection within its walls can be removed by this means.

The question of elective affinity of these streptococci was investigated, and careful examinations were made of the gallbladders of rabbits in which recovered human streptococci were intravenously administered. It was recognized that rabbits are, on the whole, somewhat resistant to streptococci. The organisms were isolated from the human gallbladders, were suspended in saline solution, and injected intravenously into a number of differently controlled animals. Two special sets were used: one was presumably normal, and in the other a point of lowered resistance was induced by pinching the gallbladder with a hemostat. None of the animals died from the injection of streptococci. They were killed at various intervals, and the organs and fluids examined and cultures taken. No streptococci were recovered from any specimen in any case after the second day after injection. They were recovered, however, as a routine, in all the organs and fluids in animals killed on or previous to the second day. These included the gallbladder, bile, liver, kidney, heart's blood and spleen. Cholecystitis was not present grossly or microscopically in any of the previously uninjured gallbladders. The time allowed to elapse between operation and injury of the gallbladder, and the injection of the streptococci, varied from immediately to two weeks. After several days, recovery from the operation, as evidenced by the behavior of the rabbit, was perfect. Microscopically, these injured gallbladders showed the usual processes of necrosis to fairly complete organization at the site of injury, but no especial lesion beyond this zone of reaction.

From the whole series of experiments, the conclusion must be reached that the particular streptococci recovered from human gallbladders and injected intravenously into rabbits showed no elective affinity for the gallbladders of the animals; at least not with one injection of what seemed an adequate number of organisms.

This conclusion in itself, however, does not negative the importance of the streptococci in the human gallbladder. It is only a fact in the biology of the organisms. Their importance in the particular human being from whom they were recovered cannot, of course, be positively evaluated; but the following points may well be remembered:

With streptococci in the gallbladder, a chronic toxemia may be present for long periods of time; a constant stimulus for lymphangitis and connective tissue proliferation is present, and an opportunity for a general bacteremia is always at hand.

IDEALS AND THEIR FUNCTION IN MEDICAL EDUCATION *

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The influence of the war on medical research, public health and medical education has been notable. Medical army officers of different nations have been in close association; research councils have exchanged suggestions and ideas; investigation has been stimulated; new possibilities of immunology have been discovered; important advances in surgical technic have been made.

Public health policies have been profoundly affected; camp sanitation has been carried to higher levels of achievement; the American army in Europe made a new record in the control of venereal diseases. The League of Red Cross Societies represents a movement in the interests of preventive medicine on an international scale. The work of the International Health Board in many countries has played an appreciable rôle. In all this, standards and methods of medical education have been necessarily involved.

Evidences of an almost universal interest in the training of physicians and public health officers accumulate. The British "unit" plan, which, with the opening of this year and under the auspices of the board of education, is being given a trial in four medical schools of London, is a significant experiment. In Belgium there is agitation for a reorganization of medical training under the auspices of the University of Brussels. Pathology and public health departments have been introduced in two medical schools in Brazil, and are influencing the other divisions of these institutions. A strike of medical students in Lima, Peru, against the alleged inefficiency of professors in the medical school is a symptom of the times. In China a modern medical school is being opened in Peking under American auspices. At Tsinanfu and Changsha, progress is being made. The University of Hongkong has a program for the modernizing and development of its medical department. The Chinese government medical schools are giving evidences of awakened interest and of improved methods. The Siamese government is seeking cooperation in the creation of a medical school in Bangkok. In the Near East there are several projects for new centers of medical teaching. Medical students are coming to the United States in increasing numbers from Japan, China, Czechoslovakia, Poland and Brazil.

IDEALS OF MODERN MEDICAL TEACHING

In order to measure achievement and to guide progress there is need of ideals or standards by which to appraise existing institutions and methods. Without tests of this kind there is danger that opportunism, provincialism, even a narrow nationalism, will prevent the development of medical education on a broad, international basis. To be of value, ideals must not be merely *a priori* and abstract aims: They must be rational projections of tested experience; they must combine, in one organic whole, elements each of which has somewhere proved its value. For example, the American type of medical education has incorporated features from the German laboratory institute, from the English clinical clerkship, and from other sources.

* Read before the Annual Congress on Medical Education and Licensure, Chicago, March 1, 1920.