thered as a department of a university. This we definitely plan to accomplish. Up to the present, limitation in the number of applicants, with a sufficiently extensive preliminary training to admit them on the same educational level as the university students, has prevented this. The university, however, stands ready to establish a department of health and nursing just as soon as we can conscientiously advise them that the work is here to do. With the organization of such a department, a diploma from this department, whether it represents the intensive instruction in the specialized training of the nurse or along the lines of social service, will carry with it the same distinction as a university degree given in other departments.

On such a basis, the training of the nurse immediately becomes a profession. Such a training is not alone applicable and desirable for those who expect to do this as life's work, but it should offer, beyond the mere technical side, a training equal to that of the university or college as a preparation for that greatest of all duties and pleasures—homemaking.

I believe that we have in no sense seen a glorified vision of the possibilities of this development in the training of women. The demands of the day require it; the available material, we believe, will justify it. Surely, satisfying this fundamental principle of supply and demand, the result cannot but be an advance.

Original Articles.

X-RAY EVIDENCE IN EARLY AND LATENT CANCER OF THE STOMACH.*

BY FRANKLIN W. WHITE, M.D., BOSTON,

Instructor in Medicine, Harvard University; Assistant Visiting Physician, Boston City Hospital,

AND

RALPH D. LEONARD, M.D., BOSTON,

Assistant in X-ray Service, Boston City Hospital.

[From the X-ray Department of the Boston City Hospital.]

MEDICAL literature is filled with accurate descriptions and beautiful x-ray pictures of late cancer, but we all know that many cases of early cancer and many cases of latent cancer have escaped detection by former clinical methods. The present study was made to find out how far the x-ray is helping to discover these early and latent cases. The early symptoms and chemical changes due to gastric cancer are often vague. We hoped to find that the early anatomical changes in the stomach wall, which could be detected by the x-ray, would prove to be more definite and characteristic.

The patients are recent ones, in order to make the most of recent improvements in x-ray tech-

nic. They were carefully studied by other methods of diagnosis.

The diagnosis of cancer was verified by operation, autopsy, or an unmistakable course. Most cases in which cancer was ruled out have been followed to operation, or for six months or more after examination, to verify the diagnosis as far as possible.

The material for this study consists of 114 hospital and private cases, examined within a year and a half by clinical and x-ray methods in which cancer of the stomach was suspected or found. In 40 cases cancer was ultimately proved and in 66 ultimately ruled out, 8 remain doubtful at present. Thirty-three cases of cancer are excluded from this paper as being well developed, leaving 81 early, latent or suspected cases. These 81 cases were classed at the end of our clinical and x-ray examination, as follows: 1 (or 2) early, 6 latent, 62 ruled out, 12 (or 11) doubtful. In all cases a complete physical examination was made, usually including tests of secretion and motility of the stomach, and an examination of the feces and gastric contents for blood. With the x-ray both fluoroscope and plates were used, immediately after a bismuth meal and at six and twenty-four hour intervals.

In 33 cases of proved cancer, the diagnosis was definitely made by the well-known signs and symptoms and the x-ray examination was merely confirmatory. The remaining group of 7 cases of proved cancer, though small, is very interesting and represents either early or latent cancer. Many cases of cancer are called latent in general practice because no thorough examination of the stomach is made. When examination is made they are readily discovered. There is another group which are truly latent, the cases which remain hidden or very doubtful even after careful clinical examination of the stomach and which may be first demonstrated clearly by the x-ray.

The per cent. of these doubtful and difficult cases is rather high in this series as they are the ones which were most frequently seen in consultation and most frequently chosen for x-ray examination at the hospital.

Technical Evidence. The direct demonstration of the cancer itself is of far more value than indirect evidence, such as motility and residue.

The most important evidence is a constant defect in the outline of the stomach on filling it with bismuth. In the very earliest cases this is due to a slight local thickening with disturbed peristalsis, and hard or impossible to recognize as cancer. In later cases the defect is irregular in outline and of any size, and looks like a jagged bite out of the stomach shadow. It may be annular at the pylorus and extending upward, making the stomach funnel shaped with a long narrow canal. The shadow may have a worm-eaten appearance. There is usually rigidity of the wall and local absence of peristalsis.

* Read at the twenty-ninth annual meeting of the Association of American Physicians, Atlantic City, May 12-13, 1914.

Cirrhosis growth may thicken the wall without projecting into it, making a "leather-bottle" stomach with little or no peristalsis and high position in the abdomen.

The stomach usually empties rapidly in the latent cases. This is usually due to the relaxed pylorus found with low secretion, or occasionally to a rigid open pylorus, involved in cancer.

If the pylorus is obstructed the stomach empties slowly. Such cases may be confused with ulcer or adhesions about the pylorus. In some small cancers at the pylorus which cause early obstruction, the obstruction may be marked and the deformity slight.

The malignant degeneration of an old ulcer may present great difficulty in diagnosis. Slight or marked irregularity in outline favors cancer, but is not distinctive. To put this more in detail, we may say, that the chronic ulcer is often definite, the transition stage from ulcer to cancer usually indefinite and impossible to diagnose, the later cancerous stage usually definite and characteristic.

At the cardia the character of the shadow frequently does not distinguish cancer from other causes of obstruction. We may say in general that the technical evidence of cancer is *absolutely characteristic* in only part of the cases. In the majority, it must be judged in connection with other clinical data.

Early Cancer. The word "early" in this connection must include very small cancers. It is practically impossible to tell the "age" of many cancers of the stomach.

For early diagnosis of cancer, we must see the patient early.

What brings the patient for examination? His symptoms. We shall not see him till he develops some. These early symptoms and signs of cancer are often vague. The important question is: Are the early anatomical changes in gastric cancer, discoverable by x-ray, more definite and characteristic?

We have tried to avoid delay in examinations and have used the x-ray in all suspicious cases in hopes of discovering the anatomical signs of early cancer.

This faithful search for early cancer in a large number of suspected cases has given little result. The earlier the cancer the less clear the picture with the x-ray as with other methods, until a point is reached where the evidence is very doubtful indeed. In primary cancer the small area of induration in the earliest cases may be in no wise characteristic, and in cancer developing on ulcer the transition stage may be very difficult or impossible to diagnose by the x-ray.

In short, while anatomical changes in the stomach wall, discoverable by the x-ray, accompany the early clinical symptoms, the anatomical changes themselves are not always definite and characteristic of cancer.

We have, however, one proved case with a

possible second (both examined by Dr. A. W. George):—

A man of 50 years had mild attacks of epigastric distress and vomiting for several years. Physical examination was practically negative. Gastric secretion was normal. No blood was found in gastric contents or feces. There was slight 12-hour gastric stasis. A diagnosis of doubtful chronic ulcer was made. A diagnosis of cancer was made after x-ray examination on the basis of a very small annular defect at the pylorus, showing slight but definite irregularity, and resection urged. The surgical diagnosis at operation was chronic inflammatory tissue, but resection was done. The pathologist's report on gross examination was the same, but cancer was found on microscopical examination. We must give the radiologist the credit of making the correct diagnosis, and if such results are confirmed by a later series of cases they will prove of great value. We do not feel sure, however, that such x-ray evidence will always distinguish cancer from ulcer.

The second case, age 50, had several years before, severe distress and vomiting of several months' duration, some mild but continuous symptoms since. Physical examination showed nothing abnormal. There was normal gastric secretion, no stasis and no evidence of bleeding. A diagnosis of very questionable old ulcer was made.

X-ray examination showed a slight defect at the pylorus, very slightly irregular, normal motility. A diagnosis of probable early cancer was made. At operation a slight induration was felt at the pylorus, but the surgeon did not feel justified in operating upon the stomach. It is *possible* that in this case also the x-ray may precede the surgical diagnosis of cancer. It is also possible that the diagnosis after the x-ray is an error. Time will tell. Such early diagnosis, if experience justifies it, is brilliant and important. Further data is needed before passing an opinion.

One more case should be mentioned in this connection. A man of 54 with short history of distress and vomiting and loss of weight, showing poor gastric secretion, some stasis, and occult blood in the feces; in short, a "well-developed" case clinically was shown by x-ray examination to be relatively "early" to have a stomach wall almost entirely intact and a very small cancer at the pylorus, and proved an ideal case for operation. The x-ray examination did valuable service in urging the operation.

We may briefly summarize our experience in searching for early cancer as follows:—

One of the greatest difficulties has been in *getting the patient early*. The first examination when positive has usually discovered well-developed, not early cancer. Our x-ray evidence of early cancer is very scanty, but we believe the method will occasionally aid in its discovery and should be given a trial in every suspected case. The better the x-ray technique and the more thoroughly the case is studied, the better the chance for an early diagnosis. Well marked cancers are easily found with fluoroscopic examination and a few routine plates. This is not true of early cases.

Dr. Cole* has recently stated that gastric cancer at any stage of development may be detected with as great a degree of accuracy as bone fractures. We cannot believe this is true, regardless of the number of plates taken. Neither do we believe that at present a positive or negative diagnosis after x-ray examination is as accurate in early cancer as an exploratory laparotomy, or can replace it. On the other hand, patients of cancer age with few symptoms will consent to an x-ray examination readily when they would refuse an exploration.

The x-ray will occasionally show in an evident case with definite symptoms and signs, that the cancer is small and mobile and ideal for operation. This is almost as important as early diagnosis.

Latent Cancer. Cancer of the stomach may remain latent or hidden because no careful search is made for it. It is quite common nowadays for the radiologists to discover a large cancer in a stomach which has *never been examined before* by any method. These are not latent in a strict sense; they are found when looked for. On the other hand, there is a small group of cases which remain hidden or very doubtful after thorough clinical examination. These are latent in the strict sense in which we use the word in this paper.

We have been impressed with the size and extent of some of these latent cancers in comparison with the vagueness of gastric symptoms, the prompt emptying of the stomach, and sometimes the lack of significant bleeding, and also the ease with which they were discovered by the x-ray.

In our six latent cases, the diagnosis was verified by operation. The patients were all of middle age or beyond; the symptoms were either vague and apparently due to age, arteriosclerosis or syphilis, or pointed to the bowel or gall-bladder, when actually the stomach was involved. In other cases the diagnosis of ulcer was made, and in others gastric catarrh or achylia. Prompt emptying of the stomach was the rule. The gastric secretion was either within normal limits, or if low, was attributed to functional disturbance, age or catarrh. Blood was either absent (in one or two cases) or not considered significant of cancer, being laid to slight abrasion of the stomach by the tube, to piles, ulcer, syphilis, etc. No tumor was felt.

We will consider the types of latent cancer of the stomach more in detail.

Case Called Senile or Functional. We have one example of this class where the vague symptoms and loss of weight seem to be well explained by the process of growing old, and the absence of gastric stasis (where the pylorus is not involved), and the lack of significant bleeding wake little suspicion of cancer. Low gas-

tric secretion is considered functional and due to increasing age. The presence of some other lesion like interstitial change in the kidney, is doubly misleading and seems to account for the symptoms. The cancer was readily discovered and located with the aid of the x-ray on the lesser curvature, not obstructing the pylorus.

Case Called Catarrh of the Stomach. When chronic gastric catarrh is present, even though the patient is carefully studied and followed for years, the final development of cancer may come so quietly as to escape observation. The gastric secretion has long been so low that cancer does not lower it. There may be no 12-hour stasis. The blood test may not be significant. In this case the passage of a stomach tube had often provoked a tiny streak of blood and the patient had piles.

Case Called Syphilis. The presence of syphilis shown by skin or bone changes and a strong Wassermann reaction may seem to explain all symptoms of a general kind, loss of appetite and moderate loss of weight, dull pains and distress and even gastro-intestinal symptoms. Even the presence of blood in feces or gastric contents may be explained by syphilitic ulceration of the gastro-intestinal tract, and thus the evidences of cancer may be confused and overshadowed by the presence of the serious disease, syphilis, which is recognized.

The x-ray evidence in this case was definite and clear, but sometimes it is not. Syphilis sometimes resembles cancer too closely to be distinguished.

After x-ray examination we have two such syphilitic patients, both of cancer age, classed among the "doubtful cases." (One proved to have cancer also, the other was diagnosed as syphilis at operation and subsequent history for a year confirms it.)

Cases Called Ulcer. Patients with a history of chronic recurrent ulcer, extending perhaps over many years, may readily develop cancer without important symptoms which call attention to the change. The weakness, pain, loss of weight, vomiting or blood may all be laid to ulcer. Full or high gastric secretion helps to conceal the cancer. The bismuth defects in these cases were irregular, bitten out and typical of cancer, and in one case surprisingly large.

The x-ray usually helps the diagnosis between cancer and ulcer, and in advanced cases will clearly distinguish. In a large number of the cancer cases, however, it will not differentiate between old ulcer and the malignant degeneration of old ulcer (see doubtful cases). Cole* in a recent paper makes no attempt to distinguish by the x-ray between chronic ulcer and cancer, and groups them together as "surgical cases."

Case Called Cancer of Other Organs. The patient's symptoms may point strongly to the bowel, or gall-bladder or other abdominal organ,

* The Positive and Negative Diagnosis of Gastric Cancer by Means of Serial Roentgenography. L. G. Cole, N. Y. Med. Jour., Feb. 14, 1914.

and if at the same time the gastric functions are well preserved, even an advanced cancer of the stomach may be overlooked, and a diagnosis made of cancer of the bowel or gall-bladder. This is far less serious than overlooking cancer altogether, for such cases are likely to be explored, but the vagueness of the clinical diagnosis contrasted sharply with the definite diagnosis of cancer of the stomach made at once after x-ray examination.

In looking over these latent cases, it is important to note the position of the cancer. Most have been in the *median* part of the stomach, where they are hard to recognize clinically. No tumor is felt because the cancer is behind the ribs, the wide lumen is not obstructed. We have found that in most cancers in this region, even the large ones, the stomach empties more rapidly than normal. The x-ray evidence has not only helped in discovering these latent cancers, it has also located them definitely and has shown their size and extent. It has given valuable evidence about operability in many cases (though we should often hesitate to decide this question on x-ray evidence alone). On the other hand, the value of the diagnosis to the patient is limited by the fact that almost all the latent cancers discovered were large and inoperable.

We have discovered no latent cancers of the *cardia* in this series. The diagnosis has either been clear before x-ray examination, or else has been doubtful after it. The early diagnosis of cancer of the *cardia* has less value at present than in cancer lower down, owing to the great difficulties of radical operation on the *cardia*.

Suspicious Cases. X-ray evidence has proved very valuable in ruling out cancer in a long list of suspicious cases, 63 in number. These include people of cancer age with various combinations of one or more suspicious symptoms, such as loss of weight and strength, anemia, epigastric pain or distress, vomiting, blood in vomitus or feces, epigastric tumor, poor gastric secretion, gastric stasis, and in which the final diagnoses were as follows: Senility, arteriosclerosis, gastric neuroses, achylia, gastric catarrh, pernicious anemia, cirrhosis of the liver, cyst of the liver, gastric ulcer, syphilis, tumor of kidney, and other abdominal tumors, cardiospasm, chronic appendix, intestinal stasis, adhesions of gall bladder to pylorus, tabes. Most of these patients were faithfully followed to operation or autopsy or for six or more months after examination to verify the diagnosis as far as possible. This has been our hardest task, but the results have been striking. Up to this time in no case in this group where a normal picture of the stomach was found, has cancer been proved.

We have discovered very few *early* cases and yet the method proved a great help in ruling out cancer. How explain this paradox? How can we rule out early cancer if we are not sure of detecting it? We believe the explanation is that the majority of patients did not come for exam-

ination in the very early or "incubation" period of cancer. Either a fairly developed cancer was present and readily found, or the symptoms were not due to cancer and it was easily ruled out. When patients who have had symptoms a long time come for examination and we find a normal picture of the stomach, we can definitely rule out cancer as the source of symptoms, and free the patient from uneasiness and constant observation.

Doubtful Cases. The following cases illustrate the limitations in x-ray evidence:—

In a moderate number of cases (12) the diagnosis remained doubtful after all examination. These were mostly elderly people, all but two were aged 55 to 68. In order of their frequency they were classed as follows: 6 ulcer or cancer, 2 syphilis of stomach or cancer; 2 organic stricture of *cardia*, nature not determined, probably cancer in 1 at least; 1 doubtful early cancer of stomach already referred to; 1 adhesions or cancer. All these cases had some defect or deformity of the stomach, 3 large, 5 moderate, and 4 small. Obstruction of the *cardia* was present in 2 cases and obstruction of the pylorus was moderate in 8, slight in 2, absent in 2. An absolute diagnosis between indurated ulcer and malignant degeneration of old ulcer is quite often impossible. Half the doubtful cases were of this type. Gastric secretion was practically normal; food stasis and blood were present.

Cases of syphilis sometimes resemble cancer too closely to be distinguished. Our two patients had triple positive Wassermann reactions and good-sized, irregular tumors in the median part of the stomach. Gastric secretion was very low and no stasis occurred. One at operation was considered syphilis of the stomach, the other cancer.

Cancer of the *cardia* is difficult in many cases to positively diagnose or rule out. The *cardia* is less accessible than the pylorus, cannot be manipulated, changes in peristalsis noted, etc., and the contour of the lesion is less clear than at the pylorus. Our two strictures proved to be, one cancer, one benign.

In one man of 55, it was impossible from history, examination, or x-ray, to decide between gall-bladder adhesions and early cancer. There was previous history of colic and jaundice, the gastric secretions were a little below normal, there was slight gastric stasis and no blood in gastric contents or feces. A small defect was found, involving pylorus and duodenum. Operation refused.

The doubtful early case of cancer has already been discussed.

Mistakes. The following four cases illustrate errors in x-ray and other evidence. The diagnosis made *before* x-ray examination was cancer in three cases (two of stomach, one of gall-bladder) and in one chronic duodenal ulcer. The chief mistake lay in our anxiety to make as early a diagnosis of cancer as possible.

Three of the patients were elderly, 51 to 57 years of age; their symptoms and loss of weight were marked. Secretion was lowered in two; blood was found in one, in feces and gastric contents. There was no gastric stasis. In short, we suspected cancer and overstepped the mark in our anxiety to make an early diagnosis. In three cases after x-ray examination slight defects and irregularities in outline were interpreted as *early cancer*, two primary, one on an ulcer base, while in all three cancer was definitely ruled out, in two by operation (finding one ulcer and one stomach with a few adhesions, evidently due to a healed ulcer), and in the third case, in which operation was refused, by practically complete recovery and good health ten months later. In the fourth case the error in diagnosis after x-ray examination was less important, but less easily explained. It consisted in diagnosing a tumor, external to the stomach, adherent and indenting and deforming it, when it actually was a cancer of the stomach itself. The patient was a man of 30 with pain and "constriction" in the epigastrium for a year, vomiting, no blood seen, loss of fifteen pounds. There was slight twelve-hour stasis and high normal secretion. Blood was found intermittently in the stomach contents. An indefinite mass occasionally felt in the epigastrium. The clinical diagnosis was cancer of the stomach. X-ray examination showed an hour-glass deformity, and a diagnosis was made of tumor in the region of the spleen, deforming the stomach by indentation and spasm. The man's age and full gastric secretion may have biased the radiologist in his diagnosis. Exploration showed an inoperable irregular tumor the size of a baseball, in the middle of the greater curvature, adherent posteriorly and extending as far as the spleen.

We have not thus far found a single case in our series in which cancer has been proved after being ruled out by our clinical and x-ray examination.

Our errors have been of commission not omission. The cases diagnosed cancer, which were not cancer, were partly the result of a desire to make a definite diagnosis in as many cases as possible. The moral is to recognize the limitations of x-ray evidence. This is the only way to avoid mistakes; in some cases the diagnosis must be left doubtful.

The mistakes we have been able to find are few; some may have escaped us in spite of careful search.

Dr. Richard C. Cabot* in a recent paper found 72% of correct diagnoses in a series of cases of gastric cancer studied at the Massachusetts General Hospital. These cases dated back nearly twenty years. During that time the clinical study of the stomach has become more complete and accurate. Functions are carefully tested and occult blood regularly looked for. It is interesting to compare with these older figures the correct diagnosis made in 34 operated cases in our series: before x-ray examination 83%, after x-ray examination 89%. (The balance, of 17% and 12%, respectively, represent cases remaining doubtful after all ex-

aminations and errors in diagnosis.) Modern clinical methods have helped much, and now the x-ray takes us another step forward to better diagnosis of gastric cancer.

SUMMARY.

In the very large majority of cases of cancer of the stomach at the time when they have presented themselves for our examination and if the stomach is thoroughly examined for secretion, motility, and bleeding by the usual clinical tests, the x-ray evidence has merely confirmed the diagnosis already made. These more or less typical cases we shall pass over as they are outside the scope of this paper.

Our x-ray evidence of *early cancer* of the stomach is very scanty; anatomical changes in the wall appear at the time of the early symptoms, but the early anatomical changes are hard to recognize; the earlier the cancer, the less clear the evidence.

The small areas of induration in early primary cases are often not characteristic and the transition stage in cancer developing on ulcer is very difficult or impossible to distinguish from ulcer. The difficulties may be realized when we say that we have been more often wrong than right in our efforts to diagnose early cancer with the help of the x-ray.

Very rarely (in one or possibly two cases), in this series an *early* diagnosis has been made. We believe the very small number of these early cases is due in part to the limitations of the method, and in part to the lack of sufficiently early examination.

The most important technical evidence is an irregular defect, with rigid stomach wall. The better the technic, the better the chance for early diagnosis. A few routine plates and fluoroscope examinations may not be enough. It has recently been said that by using a large number of plates, gastric cancer at any stage of development may be as accurately detected as a bone fracture, and also that x-ray diagnosis, whether positive or negative, is as accurate in gastric cancer as a laparotomy. We do not agree to either statement.

Early examination is necessary for early diagnosis. In order to find *early cancer*, patients must be examined more early and often than is now the rule. The *ideal* seems to be early examination of every patient of cancer age who has digestive disturbance.

While our x-ray evidence of *early cancer* is very scanty, we believe the method will occasionally aid in its detection, and should be given a trial in every suspected case.

It is well recognized that a small group of cancers, probably not over 10%, remain latent even when well developed. This group increases in size if the patients are carelessly examined, and shrinks if modern clinical methods are faithfully used. In this small group of latent cases x-ray evidence has been valuable in making

* Common Diagnostic Errors. *Jour. of Med. Soc. of New Jersey*, 1912.

a clear, definite diagnosis when other signs were doubtful. This has most frequently occurred with cancers in the *median* part of the stomach, in which the stomach emptied rapidly. The most common latent cases were cancers developing on an old ulcer, or anacid cases called senile, catarrh or achylia, or patients with syphilis. We must admit that the value of the diagnosis to the patients was limited by the fact that all our latent cases were well developed when discovered, and resection was only possible in one instance.

X-ray evidence has been valuable in helping to rule out cancer in a long list of suspicious cases. In no case where a *normal picture* of the stomach was found, has cancer been proved to exist. In our whole group of cases we may say that either *no cancer* or *well developed cancer* was usually found. We believe this occurred because most cases did not come for examination in the "incubation" period.

X-ray evidence has its limitations. After all examinations a doubtful group remained, about twice as large as the group of latent cases discovered. These were cases of disease at the cardia or where the diagnosis lay between cancer and ulcer or syphilis.

A few mistakes were made in our anxiety to make an early diagnosis in suspicious cases; we overstepped the mark three times and diagnosed cancer where it was absent. We must recognize the limitations of the method and occasionally leave the diagnosis doubtful and have the patient explored.

In spite of these limitations and errors the x-ray evidence had distinctly improved our diagnosis. In 34 operated cases, the correct diagnosis before x-ray examination was 83%, after x-ray 89%. It is almost needless to say that we have studied the x-ray findings in connection with the other clinical data and have not attempted to build a diagnosis on x-ray data alone. This addition of the x-ray method to our other examinations gives an accuracy and completeness to our diagnosis impossible with either alone.

In addition to aiding in diagnosis, the x-ray evidence has definitely located the cancer, shown its size and extent, and helped decide about operability. It may show that a cancer with marked symptoms is small and mobile and ideal for operation.

In short, the x-ray evidence has been a help in discovering and localizing latent cancer and an equal help in ruling out cancer. Our known mistakes have been few, and the group of doubtful cases rather small, and it seems reasonable to expect that with better technic and greater experience, less mistakes will occur and less cases remain doubtful, and with more early and frequent x-ray examination of patients of cancer age, that early diagnosis will be more frequently made, and latent cases discovered earlier, so that radical operation will be possible.

TRAUMATIC ENDOCARDITIS.

By S. G. WEBBER, M.D., BROOKLINE, MASS.

THE situation of the heart between the sternum and the spine, exposes it to severe injuries from blows on the chest, especially in the young, whose chest walls are very yielding. The heart is compressed between the sternum and the vertebrae.

The severer lesions caused by external violence, as rupture of heart or pericardium, rupture or tearing of valves, give rise to symptoms which are recognized very soon or immediately after the accident and are generally fatal at once or after a comparatively short time. They are easily diagnosed, and reports of many such cases are found in medical literature.

Less severe injuries may give rise to slight lacerations of the cardiac muscles or to ecchymoses into its substance or just beneath the endocardium which cause only temporary inconvenience, the symptoms thus produced soon disappearing. These slighter injuries may, however, give rise to changes in the valves which develop slowly and can be recognized only after the lapse of a longer or shorter time. These slight injuries have often been overlooked or entirely ignored as causes of valvular disease, the cardiac changes being ascribed to other causes.

Several cases have been reported in which the early cardiac symptoms have been absent or of short duration and have seemed insignificant. After an interval of apparently restored health, valvular changes have developed, with their usual consequences.

M. L. Rembaud¹ says that in certain cases traumatism can be the true determining cause of a cardiac affection.

In cases of endocarditis, vegetative hemorrhages; in chronic cases, cicatrices and valvular sclerosis are found, also hypertrophy of the heart.

Immediate signs of endo-myopericarditis may be wanting, yet there is generally precordial pain, dyspnea, palpitation. Then at the end of some days, sometimes months and more, the usual symptoms of pericarditis, of a myocarditis, or of an endocarditis are developed,—mitral 12 times, aortic 7 times.

The course of pericarditis is generally rather acute. Myocarditis has a chronic course, and often ends in death several years after the injury. Endocarditis may be acute and cause death in some days. Generally it is chronic from the beginning, and the injured, who has been able to return to his work, complains some time after of symptoms of cardiac insufficiency; examination shows valvular lesion.

Richard Bernstein² collected and analyzed 126 cases. He found that the cardiac symptoms appeared immediately after the accident in 85 cases, 67.6%; after an interval of one month, 22 cases, 17.5%; after interval of one year, 6