attached to a hospital centrally situated in London should be devoted solely to post-graduate medical education. This, it was felt, should be a school of the University of London, but, the *British Medical Journal* points out, the University of London, the body which primarily ought to be interested, has, in spite of good intentions unofficially expressed, so far, done nothing.

* * *

Our contemporary recalls the meeting summoned last March by the Fellowship of Medicine, an open meeting at which free expression of opinion on arrangements for post-graduate teaching was invited. At that time representatives of the Services attended and expressed their satisfaction with the arrangements made for their medical officers. But the *British Medical Journal* is right to point out that the conditions in the Services are special and afford little guidance for the solution of the larger problem presented by the civilian profession.

* * *

"Every credit is due to the Fellowship of Medicine for its persistent efforts to supply the need," says the *British Medical Journal*, and then proceeds to refer to Sir Thomas Horder's expression of regret at the meeting to which we have referred that the authorities of the majority of undergraduate schools should have withdrawn their support or, at any rate, their active interest when post-graduate teaching is in question. This is a detail to which we have already referred; it is perhaps the most important detail which will exercise the minds of the members of the new Committee. Once more to quote our contemporary: "One of the first points to be decided will be whether to seek to adapt to the purpose of post-graduate medical education an existing school, or whether to follow the example of the London School of Hygiene and Tropical Medicine and strike out for an entirely new institution."

* * *

The new Committee assembles in October, so that we may hope for some information of its activities to communicate in our next number. And we desire once more to offer an invitation for the discussion of this and similar topics in our correspondence columns. One thing is certain, it is abundantly evident, not only that the importance of post-graduate instruction is sufficiently recognised, but that support will not be lacking for the furtherance of any enterprise which can adequately establish its claims.

* * *

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MEDICAL ASPECTS OF GALL-STONES.*

BY

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THIS subject is so large that it is necessary to select some aspects only for consideration, and it will perhaps be most useful first to refer to the causation of cholelithiasis and then, as it is in part dependent on it, to the treatment. After this some of the clinical pictures, for they are many, will be briefly sketched.

In the first place it should be mentioned that the clinical label gall-stones or cholelithiasis is often and naturally used for symptoms common to them and to inflammation of the gall-bladder—conditions very commonly combined but also occurring independently. Although a distinction is drawn between them in systematic treatises, and of course exists, they are very closely bound up together, being often successive or alternating stages in the patient's history and giving rise to very similar symptoms. Unless a calculus is indicated by X ray examination or is passed in the stools, a diagnosis of gall-stones even after an acute attack of biliary colic, is open to doubt; and yet it is more often made than the less committal one of cholecystitis, which in the original sense means merely disease of the gall-bladder. It is, of course, true that the termination "itis" now has a universal significance of inflammation, but it was not always so. Originally the affix "itis" was a Greek feminine adjectival termination, and in words like neuritis, peritonitis, pleuritis, agrees with νόσος (disease) understood, so that ἡ νευριτις νόσος simply meant the disease of the nerves, and the implication that the disease of organs was inflammatory came later. In a somewhat similar manner μελάνα signifies the black disease, and pneumonia the disease of the lungs.

There are two distinct views about the formation of gall-stones:—

(1) The infective or inflammatory theory enunciated by Naunyn to the effect that a local inflammation of the gall-bladder walls leads to an increased formation of cholesterol by the epithelium lining the gall-bladder, and that the liberated cholesterol is cemented together by bilirubin calcium. According to this view cholecystitis is a necessary antecedent to the formation of calculi, but it has been urged that cholelithiasis does not invariably follow cholecystitis, and therefore that some additional

* A Post-Graduate Lecture delivered for the Fellowship of Medicine on January 30th, 1925, at the house of the Royal Society of Medicine.

factors, such as an increased amount of cholesterol, stagnation with excessive concentration of the bile in the gall-bladder, are necessary. It should be noted that concentration of bile, to perhaps one-eleventh of its original bulk, is a normal function of the healthy gall-bladder (Rous and McMaster), and that therefore an excessive concentration, such as might occur in stasis, must be premised. That infection of the gall-bladder and biliary stasis causes cholelithiasis has been repeatedly proved in animals (Gilbert, Mignot), and the association of infection—post or propter—with gall-stones is universally acknowledged in human pathology.

Another explanation of the mechanism by which infection causes cholelithiasis is that put forward by Hurst—namely, that as cholecystitis always sets up hepatitis (Evarts Graham) the formation of bile acids, which keep cholesterol in solution, is inhibited, and accordingly cholesterol is precipitated. Cholecystitis may be set up by micro-organisms reaching the gall-bladder wall by the blood-stream, for example, from the throat and from infection at the apices of the teeth; streptococci from the throat have been found to have a special selective tendency to attack the gall-bladder (Rosenow). But generally speaking infections of the alimentary canal, especially with virulent *B. coli*, appear to be the more common causes of cholecystitis, the micro-organisms being carried to the liver, excreted into the bile, and thus reaching the cavity of the gall-bladder. Thus appendicitis and cholecystitis are frequently present in the same patient, and probably the usual sequence of events is that the infection originates in the appendix and secondarily attacks the gall-bladder. It has recently been urged that latent appendicitis, in which there is no clinical history of an attack, is often the antecedent of cholecystitis (Caplesco).¹ When an operation on the gall-bladder is undertaken the appendix is usually and rightly examined, and if diseased removed, so to speak, in the surgeon's stride; but the converse is not so frequent, and accounts for some cases in which the symptoms persist after operation, because the reflex dyspepsia is partly or largely due to the irritation exerted by a chronically inflamed gall-bladder. In the past enteric fever, meaning thereby infections due to *B. typhosus* and *B. paratyphosus* A, B, and C, took a high place in the ætiology of cholecystitis and gall-stones for the following reasons: The clinical sequence was often noted, typhoid bacilli are constant in the bile in the disease, and they have been demonstrated in the calculi; but there is a reaction against this view, for enteric fever has become comparatively rare in this country, and gall-bladder affections are, if anything, more frequently recognised. Infections are prone to occur in the puerperal state, and this is one, but not the only or chief, cause of the frequency of gall-bladder disease in women who have borne children.

The influence of a nucleus, such as bile thrombi, organic débris, calcium bilirubinate, detached cholesterol-laden villi of the gall-bladder mucosa, for calculus formation has been much discussed. Rous, Drury, and McMaster² argue that inflammation favours the formation of nuclei for calculi, not by producing a chemical change in the bile, but by diminishing the motility of the ducts and so favouring the accumulation of organic débris. Knott and Bowell³ refer the process to necrosis of the gall-bladder epithelium around which the deposition of cholesterol commences, and cannot confirm Rovsing's statement that the nucleus of gall-stones is always formed of bile-pigment.

Rovsing,⁴ from examination of the gall-bladders in 530 cases of gall-stones, found that 314 were sterile, and believes that infection of the gall-bladder is always secondary to the presence of gall-stones, and further, that when infection has once occurred it remains and does not die out, thus meeting the obvious criticism which the adherents of the inflammatory theory might bring against his results—namely, that failure to cultivate organisms from the gall-bladder does not prove that there has never been any infection.

(2) The biochemical or metabolic view of the ætiology is that there is an increase in the cholesterol content of the blood and so in the bile, and that thus pure cholesterol calculi are produced (Aschoff and Bacmeister); such calculi which are nearly always single, may, by damaging the gall-bladder, reduce its resistance to infection and so may lead to the production of other calculi as mentioned above. On the other hand, it should be mentioned that experimentally Rous, McMaster, and Drury produced showers of small calculi composed of organic débris and calcium carbonate and calcium-bilirubinate in sterile bile; and it has been suggested that in man simultaneous formation of multiple calculi occurs from metabolic or chemical alterations in the composition of the bile—a critical deposition. This is supported by the very large number—the record at present appearing to be 14,000 (Schackrev)—of small calculi all of about the same size.

The origin of the blood cholesterol is of interest in connexion with the prevention of gall-stones. Like uric acid, it may be either endogenous, namely, produced in the body, or exogenous and taken in as a constituent of foods, especially brains, yolk of eggs, and fat. The organs of the body richest in it are the central nervous system, the cortex of the adrenals, and the corpora lutea. Sixty years ago Flint, of New York, considered that it was formed in the brain and so passed into the circulation; Chauffard's pupils, Laroche and Grigaut,⁵ in 1913 disproved this by experiment, and it has been thought that it is carried there to

² Jour. Exper. Med., Baltimore, 1924, xxxix., 97.

³ Guy's Hosp. Reps., 1924, lxxiv., 256.

⁴ Rovsing, T.: Acta Chir. Scandinav., 1923, lvi., 103.

¹ Caplesco, C. P.: Bull. Acad. de méd., Paris, 1924, 3e sér., xcii., 869.

⁵ Vide Chauffard, Leçons sur la lithiase biliaire, 1914, p. 54.

build up myelin (Mott). Chauffard, Laroche, and Grigaut⁶ believe that cholesterol is formed in the adrenal cortex and the corpora lutea, especially of pregnant women who have to supply the foetus with large quantities of cholesterol for its nervous tissues, whereas Landau and McNee⁷ regard the undoubted accumulation of cholesterol in the adrenal cortex in conditions such as arteriosclerosis, and in the corpora lutea as deposits and as an index of the cholesterol content of the blood. The endogenous origin of cholesterol is thus open to question, but as cholesterol is occasionally present in inflammatory effusions, such as hydroceles, pleuritic and pericardial exudations, and in cholesteatomas of the central nervous system and ear, its endogenous origin cannot be hastily put aside.

The cholesterol content of the blood varies much with the amount taken in food, but in normal persons it is difficult to induce a permanent well-marked increase in the amount of cholesterol in the blood, and this suggests that there is a metabolic mechanism which maintains an equilibrium in this respect. But disorder of the fat metabolism, like that of protein and carbohydrate metabolism in gout and diabetes, may well exist and lead to a retention of cholesterol in the body. In this connexion it may be noted that gall-stones are not infrequently hereditary. Any inherited disability to deal with the metabolism of fats would, of course, render the subject specially prone to develop cholesterolaemia on a diet containing much cholesterol; such a diathesis helps to explain differences in the racial incidence of gall-stones—common in German women, rare in Russians, Indians, and Japanese. A high cholesterol content of the blood may also depend on diminished excretion; thus, in hepatic insufficiency, especially in obstructive jaundice, the amount in the blood is usually increased, and in chronic cases deposits, or tophi, of cholesterol—xanthomas—may occur, a process analogous to uratic tophi in the gouty; the familiar arcus senilis, the sparkly synchyses in the vitreous humour, and the white spots of albuminuric and diabetic retinitis are also regarded as deposits of cholesterol. In the form of slight cholecystitis known as “the strawberry gall-bladder,” from the contrast between the reddened background and the yellow specks due to collections of cholesterol in the mucosa, it is unsettled whether the cholesterol in the villi is absorbed from the bile in the gall-bladder or deposited from the blood. But by whatever route the cholesterol reaches the inside of the villi it seems probable that detachment of these cholesterol-laden villi provides the nuclei of future multiple calculi.

Aschoff suggested that women after delivery, who are prone to show a high cholesterol content of the blood, are particularly likely to develop gall-

stones if they do not suckle their babies and thus fail to excrete fats in their milk.

To sum up, it may safely be stated that both these aetiological factors of gall-stones—the infective and the metabolic—are operative, sometimes one alone, probably more often both together, the infective factor being enforced and assisted by the metabolic both, therefore, must be taken into account in the prophylactic measures and the medical treatment.

PROPHYLACTIC OR PREVENTIVE TREATMENT.

From the point of view of the infective causation it is obvious that focal infections, such as pyorrhœa, dental caries, enlarged tonsils, suppuration in the accessory nasal sinuses, and appendicitis should be removed or otherwise cured. In enteric fever, in which the bile in the gall-bladder contains typhoid or paratyphoid bacilli though cholecystitis is relatively infrequent, it is well to give during convalescence hexamine (urotropin) for its bactericidal action. The rationale of the hexamine treatment of gall-bladder and biliary tract infections requires a few words of explanation and may be dealt with here; hexamine acts as an antiseptic by giving off, in an acid medium, formaldehyde but as the bile is not acid, it is not at first sight clear how it removes experimental infection of the biliary system, as shown by Crowe,⁸ and how it appears to act beneficially in cholecystitis. Scepticism has naturally been expressed as to the real value of hexamine in biliary infections, and indeed, De Edes,⁹ though not dealing with gall-bladder infections, concludes, as the result of rather elaborate chemical research, that there is not any good evidence for the use of hexamine orally or intravenously as a systemic antiseptic in various infectious diseases and localised infections. Recently, however, Knott¹⁰ has shown that in infected bile the bacteria produce around them sufficient acid to liberate formaldehyde. A large quantity, according to Crowe¹¹ 75 gr. daily, of hexamine is required to disinfect the gall-bladder and bile-ducts, but amounts far short of this often irritate the urinary bladder causing frequent micturition so as to interfere with sleep and the patient's comfort, and sometimes even hæmaturia. As the vesical irritation is due to the liberation of formaldehyde in acid urine Hurst¹² gives sufficient citrate of potassium to keep the urine alkaline, and thus obviates this troublesome result, finding that eventually as much as 90 gr. of hexamine daily can be given.

From the biochemical or metabolic aspect of causation, prophylactic measures should be directed to the restriction of articles of food rich in cholesterol to patients prone to develop a high cholesterol content of the blood as the result of pregnancy

⁸ Crowe, S. J.: Johns Hopkins Hosp. Bull., Baltimore, 1902, xix, 109.

⁹ De Edes, F.: Arch. Int. Med., Chicago, 1924, xxxiv., 511.

¹⁰ Knott, F. A.: Guy's Hosp. Reps., 1923, lxxiii., 195.

¹¹ Crowe, S. J.: Johns Hopkins Hosp. Bull., Baltimore, 1912, xxiii., 255.

¹² Hurst, A. F.: Practitioner, London, 1923, cxi., 195.

⁶ Chauffard, Laroche et Grigaut: Ann. de méd., Paris, 1920, viii., 149.

⁷ Landau, M., und McNee, J. W.: Beitr. z. path. Anat. u. z. allg. Path., Jena, 1914, l., 667.

and recent enteric fever. The foods in question are yolk of eggs which contain the closely allied body lecithin, brains, and fats such as cream, butter, bacon, pork, stews, fried fish, goose, duck, sweet-breads, liver, kidneys. Vegetables, with the exception of beans and peas which are fairly rich in phyto-cholesterol, and meats, skimmed milk, carbohydrates, and sugar may be taken, but with regard to the latter it must be remembered that obesity should be guarded against. Food should be taken at comparatively short intervals and in small amounts, as this leads to frequent evacuation of the gall-bladder. Over-eating should be prevented and exercise as far as possible insisted on. A lax condition of the abdominal walls should be met by breathing and other exercises.

TREATMENT.

Medical treatment is, of course, not so radical or so satisfactory as the surgical removal of the calculi and the gall-bladder, which when symptoms occur is almost always infected and inflamed. Attempts to dissolve gall-stones cannot be regarded as likely to succeed; calculi have been introduced into healthy gall-bladders in animals and observed to disappear; but it is doubtful if this observation can be applied to man, for these experiments were performed on dogs (Harley and Barratt; Bain; von Hanseemann) in which the cholesterol content of the bile is low, and further, human gall-bladders are usually infected and inflamed. Olive oil certainly dissolves gall-stones in a test-tube, but the administration of olive oil by the mouth cannot reach the gall-bladder. There is a fallacy about the supposed success of the treatment by olive oil given orally, namely, that the altered oil—crystals of the fatty acids—may be regarded as softened calculi. Some of the good clinical results ascribed to olive oil may be due to the inhibition of hyperchlorhydria accompanying the reflex gastric disturbance due to the gall-bladder irritation. Oleic acid has been regarded as a cholagogue, and oleate of sodium is sometimes given in order to increase the flow of bile and so lead to solution of the cholesterol of the calculi by the bile-acids. But of the numerous drugs at one time or another reputed to be cholagogues, bile-salts are the only certain ones; salicylate of sodium, which is often given with this object, benzoates, chloral, and vitamin extract of yeast, though stated by some, cannot be regarded as proved, to be true cholagogues; bile-salts are given in a cachet or capsule. In other respects the general treatment is on much the same lines as the prophylactic measures.

CLINICAL PICTURE.

The symptoms associated with gall-stones may be divided into groups determined by two factors:

(1) Their position (*a*) in the gall-bladder, (*b*) cystic duct, (*c*) common bile-duct, (*d*) ampulla of Vater, and (*e*) exceptionally in the intestine causing

obstruction. The effects are then either purely mechanical or due to reflex action, such as reflex dyspepsia.

(2) Whether or not infection and inflammation of the gall-bladder and bile-ducts supervene. These processes vary in degree and may spread to the liver, the pancreas, and the adjacent organs, giving rise to toxic manifestations, suppuration, fibrosis, and fistulæ.

In the *gall-bladder* the purely mechanical effects as apart from those due to chronic inflammation are rare; a large gall-stone or a considerable collection of calculi in the gall-bladder may occasionally press on the pylorus or duodenum sufficiently to interfere with the passage of food, on the common bile-duct giving rise to jaundice, or on the portal vein so as to induce thrombosis. But calculi of such a size are usually associated with chronic inflammatory changes—peri-cholecystitis. The weight of a heavily laden gall-bladder may by the traction exerted favour elongation of the right lobe of the liver—Riedel's lobe. Primary carcinoma of the gall-bladder, which is said to form 5 per cent. of all cases of carcinoma examined after death (Kaufmann), is associated with gall-stones in from 70 to 95 per cent. of the cases, and is therefore a good example of the general association between chronic irritation and carcinoma. Experimentally Leitch¹³ found that the neoplastic factor of gall-stones was purely mechanical, but in human pathology there is much evidence of chronic cholecystitis; clinically, on the other hand, cases of gall-bladder carcinoma often fail to show any history of cholelithiasis (Fawcett and Rippmann).¹⁴

The earliest and most frequent clinical associations of calculi in the gall-bladder are the so-called masked or inaugural symptoms due to reflex dyspepsia of a flatulent character and very resistant to ordinary symptomatic and medical treatment, in fact, like appendix dyspepsia, surgical indigestion. The diagnosis in this inaugural stage is very difficult if ordinary physical examination only is employed, though deep tenderness to the right of the spine about the seventh and eighth ribs, which apparently is due to pericholecystic adhesions, is of some value. X rays may, either by showing gall-stones or indirectly by changes in the duodenal cap, provide evidence of an organic lesion.

The symptoms are in reality due to the chronic irritation and inflammation of the gall-bladder rather than to the gall-stones alone. The close proximity of the gall-bladder makes it, when irritable, a very uncomfortable bed-fellow, so to speak, for the stomach; the introduction of food and the resulting gastric peristalsis may stir up the susceptible gall-bladder and so give rise at once to pain. More often the pain comes on three or four hours after food, and resembles the hunger pain of duodenal ulcer. Though some observers record hyperchlorhydria, the majority describe

¹³ Leitch, A.: Brit. Med. Jour., 1924, ii., 451.

¹⁴ Fawcett and Rippmann: Guy's Hosp. Repts., 1913, lxvii, 41.

hypochlorhydria. The flatulence is mainly due to aerophagy, unconscious or uncontrolled. In some instances the chief symptom is referred pain in the right shoulder and arm suggesting neuritis.

In the *cystic duct* the impaction of a calculus sets up biliary colic without jaundice unless the spasm or accompanying inflammatory swelling spreads to the common bile-duct; for as it has been thought that the passage of a stone is the result of cholecystitis the inflammatory process may extend into the common duct. Recurrent attacks of biliary colic have been ascribed to the calculus slipping in and out of Hartmann's pouch at the neck of the gall-bladder and the orifice of the cystic duct, and intermittent distension of the gall-bladder analogous to an intermitting hydro-nephrosis may thus occur. The presence of calculi in the cystic duct was in one case under my observation associated with uncontrollable vomiting but without biliary colic. When a calculus is more or less permanently impacted in the cystic duct the gall-bladder becomes distended with mucous fluid—a mucocoele—and forms an abdominal tumour. As infection is prone to occur in such a closed sac and give rise to a severe, even gangrenous obstructive cholecystitis, operation should be undertaken to anticipate such a serious complication. As the result of inflammation a calculus impacted in the cystic duct may produce a diverticulum and pass into it so that the lumen of the duct is restored.

The passage of a calculus into the *common bile-duct* sets up spasm and biliary colic, but not very infrequently a stone is found in the common duct without any history of colic; in such cases the ducts may have been previously dilated by calculi, so that a later stone passes more easily and when lying in the duct increases in size by deposition from the outside. Acute biliary colic is one of the most severe forms of pain; it is like angina pectoris with which it is sometimes confused, as on the one hand the pain of biliary colic may spread to the cardiac area, and on the other hand anginoid pain may be abdominal; it is worse than the pangs of child-birth and demands the hypodermic injection of morphine. When a calculus obstructs and remains impacted in the common bile-duct jaundice occurs and may be deep, but in course of time the duct dilates above the site of the impaction and the calculus becomes loose, so that bile trickles through and the jaundice recedes. Infection of the duct very commonly follows and gives rise to the characteristic intermittent hepatic fever, in which there are influenza-like and ague-like attacks of fever, pain, increased jaundice, rigors, and sweating. There is a leucocytosis in the attack but not in the intervals. The gall-bladder is not enlarged, and this is important in the differential diagnosis from obstruction of the common bile-duct by malignant disease—for example, carcinoma of the head of the pancreas in which the gall-bladder is greatly and palpably enlarged; this is Courvoisier's law. The

liver gradually enlarges and, as it is improbable that the calculus will pass into the duodenum, it is important that operation for removal of the stone from the common bile-duct should be undertaken before extensive damage to the liver results and renders operation at a later date dangerous from the risk of hepatic insufficiency.

In the *ampulla of Vater* a calculus may obstruct both the lower end of the common bile-duct and Wirsung's duct of the pancreas. When a small calculus blocks the orifice of the biliary papilla and does not obstruct the opening of Wirsung's duct of the pancreas it diverts the bile into the pancreatic duct with the result that necrosis followed by hæmorrhage—acute hæmorrhagic pancreatitis—results. But all cases of acute hæmorrhagic pancreatitis do not depend on a gall-stone in this position, and Archibald¹⁵ has shown experimentally that spasm of the circular muscular fibres in the biliary papilla can dam the bile back out of the duodenum so that it runs into the pancreatic duct.

Infection of the ampulla of Vater readily spreads to the pancreas and sets up chronic interlobular pancreatitis, which, however, rarely injures the islands of Langerhans sufficiently to cause glycosuria.

INTESTINAL OBSTRUCTION.

Gall-stones may cause acute intestinal obstruction in several ways; in rare instances acute obstruction is due to extremely vigorous peristalsis causing volvulus of the small intestine, and acute paralytic dilatation of the duodenum due to local peritonitis around the gall-bladder has been recorded.

A gall-stone which passes down the dilated common bile-duct is not large enough to cause mechanical obstruction of the bowel, but several calculi thus passed may together cause obstruction, and it is believed that calculi may remain in the intestines for a considerable period and while there increase in size by the deposit of phosphates, or of magnesium carbonate when taken medicinally for long periods, and thus eventually become large enough to obstruct the ileo-cæcal valve. A rough calculus, although comparatively small, may set up so much spasm of the intestine as to produce obstruction. In the great majority of cases, however, mechanical obstruction of the intestines is due to a gall-stone which has ulcerated out of the gall-bladder into the bowel, usually into the first part of the adjacent and adherent duodenum, for if the calculus ulcerates into the transverse or hepatic flexure of the colon it may pass comparatively readily through the bowel, though impaction at the anus may give rise to trouble. The time of this ulceration may be marked by pain and tenderness over the gall-bladder in cases in which symptoms of obstruction do not follow at once.

¹⁵ Archibald, E.: Surg., Gyn., and Obstet., 1919, xxviii., 529.

Intestinal obstruction due to a gall-stone is rare, but in 1914 Wagner¹⁶ collected 334 cases. The patients are usually fat women over 50 years of age, females being five times more numerous than male sufferers. The onset is sudden with vomiting, and at first pain and collapse are not prominent. The intestine, though obstructed, is not strangulated, as in a hernia, and since its vascular supply is unimpaired, paralytic distension does not occur, at any rate unless and until peritonitis supervenes. As the calculus travels down the small intestine the severity of vomiting diminishes. Without a history of gall-stones, and this is often absent, a correct diagnosis is very difficult; the gall-stone

¹⁶ Wagner, A.: Deutsche Ztschr. f. Chir., Leipzig, 1914, cxxx., 353.

has very seldom been felt before operation which, however, should be undertaken soon, as few patients operated on after the fourth day survive. The patients are not good subjects for operation, and of Wagner's 334 collected cases, 161 were operated upon with 62 per cent. mortality and 173 were not operated upon with 46 per cent. mortality. It has been urged, especially in the past, that medical measures only, such as morphine and atropine, to diminish spasm and so favour the onward passage of the gall-stone, should be employed; but although at first sight Wagner's figures suggest that operation is more fatal, it must be remembered that this procedure is often adopted late when the chances are much against recovery.

THE PREVENTION OF PUERPERAL SEPSIS.*

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It is a fact only too well known to all of us that the mortality from causes connected with child-bearing is still high in this country, and that recent years have seen very little if any improvement in this respect. Of all the individual causes of puerperal mortality sepsis is the most important on account of the high proportion of the total mortality-rate which is due to this cause. I shall in a few moments show you some charts on the epidiascope demonstrating these and other points. I also want to show others which call attention to the remarkable seasonal variations and occasional irregularities which occur in the mortality curve of sepsis, as these have their bearing upon the question of causation.

When I began to consider how I might best present the subject of prevention to your notice it became clear that I could not avoid saying something about causation also, for we cannot achieve success in prevention without first having clear ideas of the cause of the disease which we wish to combat. If puerperal fever were due, like the acute specific fevers generally, to a specific organism, the problem would be a relatively simple one, but unfortunately it is not so, and there are still a good many gaps in our knowledge.

A study of the mortality statistics of puerperal sepsis will serve to show how complex this matter is, and even if it does not at present throw any definite light upon the problems of causation, certain facts emerge which suggest that the liability to this particular form of infection is to some extent influenced by factors the nature of which we can only at present vaguely surmise.

* An Address delivered to the Fellowship of Medicine on May 18th, 1925.

FIG. I.—This table (from Dame Janet Campbell) shows that during the 17 years 1907–23 the total mortality-rate has been practically stationary,

FIG. I.

MATERNAL MORTALITY OF CHILDBIRTH

YEAR		NUMBER OF DEATHS PER 1000 BIRTHS
1907	DEATH OF ONE MOTHER TO 261 BIRTHS	3.83
1908	" " 280 "	3.57
1909	" " 271 "	3.70
1910	" " 281 "	3.56
1911	" " 272 "	3.67
1912	" " 265 "	3.78
1913	" " 270 "	3.71
1914	" " 253 "	3.95
1915	" " 254 "	3.94
1916	" " 259 "	3.87
1917	" " 273 "	3.66
1918	" " 282 "	3.55
1919	" " 243 "	4.12
1920	" " 243 "	4.12
1921	" " 270 "	3.70
1922	" " 263 "	3.80
1923	" " 260 "	3.81

3.83 in 1907 and 3.81 in 1923. The year 1919 to 1920 showed a marked rise, to which further reference will have to be made.

FIG. II.—Shows the variation in the total mortality during the same period in the form of a graph.

FIG. III.—This chart is an analysis of the figures for the year 1923 to show the local variations in the mortality from sepsis, as well as the total mortality. It will be noticed that as we get away from the great industrial centres such as Birmingham and Manchester to the agricultural counties, the total mortality falls to a considerable extent, while the mortality from sepsis is reduced to a strikingly low figure, about one-third of that found in the two industrial centres. The proportion of the total mortality which is due to sepsis is also shown in this table.

FIG. IV.—I am enabled to show this chart by the kindness of Dr. Stevenson, of the Registrar-