

dentists and their friends. Under the erroneous impression that he is doing a service to the dental profession, he is, I submit, proposing a great disservice to the public. After mentioning the circumstance that one of our licensing bodies has recently made a course of instruction in anæsthetics an essential part of the dental curriculum—a circumstance which many, I believe, regret, but one which, after all, hardly obliges the recipients of such instruction to administer anæsthetics when they pass out into practice—he proceeds to suggest that dental students should be instructed, at general hospitals, in the administration of ether and chloroform, and that chloroform, if administered by certain methods, is a safe anæsthetic. Now I feel compelled to put on record my most emphatic protest against such mischievous doctrines. That the medical boards of our general hospitals would sanction the instruction of dental students in chloroform administration for dental operations I very much question, particularly when the conditions of dental practice to which I have just referred are borne in mind. Personally I should regard such an event as retrogressive and in the highest degree dangerous to the public. Everyone who has ever administered chloroform for an operation within the oral cavity knows perfectly well that it is in these very cases that it is difficult or impossible to apply the percentage methods upon which Sir Victor Horsley lays so much stress. Although I may appear to depreciate the work now being done by the dental profession I have no such intention. I simply condemn certain antiquated and dangerous systems under which they are compelled to do that work—systems that short-sighted persons, under the impression that they are furthering the interests of existing dentists, would like to see perpetuated. After the evidence I have laid before you it is, I submit, clear that the advocates of dentists administering general anæsthetics must, under present circumstances, also be the advocates of single-handed anæsthetising and operating, and if we are, in this twentieth century, to encourage dentists to administer chloroform and then operate, I fail to see that our profession is doing its duty to the public in attempting to reduce the present mortality from anæsthesia.

Having dealt with one of the two main objections which have been advanced against the General Anæsthetics Bill I come to the other objection—namely, that the Bill does not propose any legislative protection against local anæsthetics. This omission was largely due to the difficulty experienced in drawing any hard-and-fast line between the comparatively harmless methods of producing localised analgesia and the more dangerous methods of securing this condition by the injection of cocaine and allied drugs into the tissues of the body. After further consideration on the subject, however, it has been found possible to correct this omission and to modify the General Anæsthetics Bill in the direction indicated. It will be seen that by the subjoined Draft Bill general anæsthetics are, as before, placed in the hands of registered medical practitioners, and that local anæsthetics are placed in the hands of registered medical or registered dental practitioners.

#### MEMORANDUM.

The object of this Bill is to protect the public, as far as possible, against deaths arising directly or indirectly from the action of anæsthetics—a class of drugs or substances employed for producing either generalised or localised insensibility during surgical, medical, obstetrical, or dental operations, acts, or procedures.

The three following facts indicate the need for this legislative protection: 1. Anæsthetics are for the most part powerful poisons. 2. They are constantly being used upon a vast and increasing scale throughout the country. 3. A considerable and increasing number of fatalities are annually taking place in connexion with their administration.

The promoters of the present Bill are of opinion that the solution of the problem of reducing the number of deaths wholly or partly referable to anæsthetics is to be found in a careful study of the circumstances and symptoms which have attended the deaths hitherto recorded. Such a study seems to them to indicate that anæsthetics, when employed for the above-named purposes, should be administered only by certain persons. This Bill therefore proposes to make it a penal offence for any person other than the persons herein specified to administer for the purposes above mentioned either any general anæsthetic or any local anæsthetic by the means described.

#### ANÆSTHETICS ACT, 1912.

An Act to Regulate the Administration and Employment of Anæsthetics.

Be it enacted by the King's Most Excellent Majesty by and with the advice and consent of the Lords Spiritual and Temporal and Commons in the Present Parliament assembled and by the authority of the same as follows:—

1. Any person other than a legally qualified medical practitioner

registered under the Medical Acts who shall wilfully administer or cause to be administered to any other person by inhalation or otherwise any drug or substance whether solid, liquid, vaporous or gaseous and whether pure or mixed with any other drug or substance with the object of producing a state of unconsciousness during any surgical, medical, obstetrical or dental operation, act or procedure, or during childbirth, shall be liable on conviction before a Court of Summary Jurisdiction for such offence to a penalty not exceeding £10 and in the case of a second or subsequent conviction to a penalty not exceeding £20, provided always that a person shall not be liable to a penalty under this Section if in conducting such administration he was acting under the immediate direction and supervision of a legally qualified medical practitioner, or if the circumstances attending the administration were such that he had reasonable grounds for believing and did believe that the delay which would have arisen in obtaining the services of a legally qualified medical practitioner would have endangered life, or if having been registered under the Dentists Act 1878 before the passing of the present Act he conducted such administration for a dental operation, act or procedure.

2. Any person other than a legally qualified medical practitioner registered under the Medical Acts who shall inject, insert, or introduce or cause to be injected, inserted or introduced into any tissue or tissues of the body of any other person through a puncture, incision or other breach of surface any drug, medicament, or substance, whether solid or liquid, and whether pure or mixed with any other drug, medicament or substance with the object of producing a state of localised insensibility to pain without unconsciousness during any surgical, medical, obstetrical or dental operation, act or procedure or during childbirth shall be liable on conviction before a Court of Summary Jurisdiction to a penalty not exceeding £10 and in the event of a second or subsequent conviction to a penalty not exceeding £20, provided always that a person shall not be liable to a penalty under this Section if in attempting to produce or in producing such localised insensibility he was acting under the immediate direction and supervision of a legally qualified medical practitioner, or if being registered under the Dentists Acts 1878 he attempted to produce or did produce such localised insensibility for the performance of a dental operation, act or procedure or if being a *bona-fide* student in dental surgery or dentistry and acting under the immediate direction and supervision of a person registered under the Dentists Act 1878 he attempted to produce or did produce such localised insensibility for the performance of a dental operation, act or procedure.

3. The expression "Court of Summary Jurisdiction" in this Act shall have the same meaning as in Subsection 11 of Section 13 of the Interpretation Act 1899. In Scotland it shall mean any Justice of the Peace and also the Sheriff. The expression "the Medical Acts," shall mean the Medical Act 1858 and any Acts amending the same passed before the passing of this Act.

4. This Act may be cited as the Anæsthetics Act, 1912.

The main principle laid before you this evening, that of restricting the use of general anæsthetics to medical practitioners, has been endorsed by the Medico-Legal Society, whose valuable services in connexion with this proposed legislation I am glad to have the opportunity of acknowledging. The principle would also appear to have been endorsed by the Section of Anæsthetics of the Royal Society of Medicine, although when the matter came up for consideration by that section there were, I regret to say, certain members present who could not see their way to support the principle. Reforms such as those I have indicated naturally require time for their consideration, and I look forward with confidence to the day when all members of our profession will see the necessity of some such scheme as that which I have had the honour of laying before you this evening.

## ON CERTAIN B. COLI INFECTIONS.

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It has been recognised for several years that in some cases the kidneys act as filters through which the body can free itself of the various organisms which produce diseases, and that bacilli and cocci may be eliminated through the urinary apparatus without giving rise to any definite lesion in that tract. To quote a well-known instance, typhoid bacilli may be found in the urine many years after an attack, the host being otherwise healthy. Occasionally, also, tubercle bacilli may be found in the urine of a person affected with tuberculosis of the lungs or other organs, there being no symptoms referable to the urinary system and no lesion being found there subsequently. This is also true for certain cases of pneumococcal and staphylococcal infections. Among the organisms which are found in the urine those belonging to the bacillus coli group occur with great frequency. This condition of bacilluria has attracted considerable attention during the past years and recently several papers have appeared on the subject.<sup>1</sup> These contributions have rather tended to

<sup>1</sup> Bruce Clarke: Clinical Journal, February, 1908. L. S. Dudgeon: THE LANCET, Feb. 29th, 1908, p. 616. C. R. Box: THE LANCET, Jan. 11th, 1908, p. 77.

differentiate a condition of colon bacilluria as a separate entity, whereas the condition ought to be regarded as only a phase of the infection in which separate stages of varying degrees of severity may be recognised: 1. A stage in which there is the passage of pus in the urine which may be either intermittent and obviously derived from a pocket or abscess cavity, or be continuously present, probably indicating a more widespread infection of the urinary tract. 2. A milder stage in which, as a rule, there is a continuous passage of the bacilli into the urine, but without the presence of pus or cells derived from the epithelium lining the tract. 3. A condition in which there are intermittent discharges of bacilli without cells—i.e., some specimens of the urine will contain no organisms, while others will be found to be loaded. The symptoms correspond in severity, and in the milder forms there may be nothing to call attention to the condition.

The route by which these organisms gain access to the urine is still the subject of controversy, but the view that it is by way of the urethra, and so by direct extension, seems to be most improbable. It should be remembered that the *B. coli* is a constant inhabitant of the intestine, and it has been shown that organisms can pass through the apparently intact wall without leaving any detectable lesion, and this is facilitated by any condition which produces obstruction to the onward passage of the intestinal contents. It is hardly a matter of surprise, then, that a history of constipation is usually found in these cases, or that a large proportion of them should occur in women.

In the cases where pus is being passed there will be no difficulty in recognising the condition, as the cloudiness or deposit, or both, will at once arouse suspicion, but in examining the specimen from an individual who is passing only the bacilli the following points should be noted. 1. As a rule, the urine is rather paler than would be expected from its specific gravity. The specific gravity shows no peculiarities of itself, but on account of the pallor of the specimen the high urinometer reading comes as a surprise. 2. The urine is acid in reaction, often strongly so. 3. The specimen is not clear and translucent. A kind of haze is present throughout the whole column of the urine. In some cases a cloud, or even a small deposit, of mucus forms at the bottom of the vessel. A slight haze, such as has been indicated above, is frequently present in normal urine and to detect these cases of bacilluria the following simple method can be adopted. A small piece of filter paper is folded in the usual manner and moistened by allowing some water to filter through it into a clean test-tube. This serves two purposes—the filter paper is rendered less pervious and inspection of the filtrate in the tube shows whether the test-tube is clean or not. This latter point is important, as a dirty tube will give the impression of cloudiness in the contained liquid. A small quantity of urine is then filtered into the test-tube. The filter paper allows bacteria to pass through, but holds back most of the other substances which give rise to turbidity; however, red and white blood corpuscles, fat, and occasionally certain fine precipitates do pass through. A warning is here necessary with respect to urines which deposit urates. If such a urine is filtered while it is warm the paper will hold back the urates which are already precipitated, but as the filtrate cools more will be thrown out of solution and will give rise to a haze in the test-tube. This is, of course, immediately dispersed by heating, but it is simpler to cool the urine before filtering as a part of the routine.

When the urine filters clear, there is no appreciable quantity of *B. coli* present. If, however, the filtrate is cloudy, the next procedure is to put a drop of the urine on a slide, apply a cover-glass, and examine with the microscope. It is not necessary to use a 1-12th oil immersion lens, for the bacilli can be easily seen by the aid of a 1-6th inch objective and a No. 3 eye-piece. It is advisable to cut down the light in the first instance in order to find the focus, after which as much light as is desired can be admitted. If the *B. coli* are present they will be seen either as round bodies or as short rods, according as they are floating end on or lengthwise, and they can further be seen to be moving briskly. This is in contrast to the appearance presented by cocci or other substances not endowed with the power of locomotion. In the latter case the small bodies may show some movement, but there is no change of position. Some confusion may arise temporarily from the presence of currents in the specimen, but the movement is then in one direction only,

whereas the *B. coli* move continuously and in various directions. The application of a little heat will often increase the motility of the bacilli, and it will also be found that the rapidity of movement varies in different specimens. Should the haze not have been due to this condition, the cause will be discovered at the microscopic examination. Two further steps are advisable but not essential. In the first place a large loopful of the urine may be taken by means of a sterilised platinum needle and gently rubbed over the surface of an agar tube, which is then incubated. At the end of 24 hours or less there will be a plentiful growth, which is opaque and white. The margins of this growth are usually markedly crenated in outline. The second investigation consists in making a film either from the deposit found on standing or preferably from the centrifuged deposit. The film is allowed to dry, fixed by heat in the usual manner, and then stained by Gram's method and counterstained with carbol-fuchsin or neutral red. The *B. coli* are decolourised by Gram's method and take up the counterstain—i.e., are seen to be stained red by this method. The urine is best examined as soon as possible after it is passed, directions being given that the parts should be cleansed carefully before micturition; if necessary, and more especially in women, a catheter specimen should be obtained. This method of examination of the urine is also of value in the isolation of the organism for the treatment of certain cases of infection where the discharge proceeds from some site other than the urinary tract, is obviously contaminated, and from which it would take some time to isolate the organism. Two of these cases will be mentioned later.

If urine is examined in this manner a surprisingly large number of specimens will be found to contain the *B. coli*. Most of these occur in women, and some pathologists go so far as to say that in the female this condition is of no importance; certainly there may be no associated symptoms of disease unless constipation is considered as such. At times, however, there will be headache, slackness, and general malaise. Confinement to bed may cause the passage of the bacilli. To illustrate the absence of symptoms the following instance may be quoted. While examining the urines of several young men for another purpose, in order to obtain a normal standard, one specimen was found to be teeming with these organisms. The individual was in perfect health at the time, and although specimens have been repeatedly examined since the bacilli have never again been found. At the Evelina Hospital for Children during a period of six months the urines have been carefully examined with regard to this point, and *B. coli* was passed in appreciable quantity in 6 out of 145 cases. In two of these there were no special symptoms, in two others there was an associated condition which might have been described as "febricula," and in the remaining two the symptoms were more severe.

As illustrating the correlation of symptoms with the intermittent passage of organisms the following case is of interest. A girl, aged 14 years, is one of my out-patients at King's College Hospital; she suffers severely from intermittent attacks of headache and general malaise, and is, besides, a typical case of postural albuminuria. The attacks last for a day or two, and during these periods large numbers of *B. coli* are found in the urine, but they are not present in the intervals. At these times the albumin is also in larger quantities and may even be present in the specimen passed on rising. Regulation of the bowels alone has not prevented the attacks. There seems to be a direct relationship between the passage of bacilli, the quantity of albumin, and the symptoms. Neither pus, epithelial cells, nor casts have been found. Under treatment directed against the *B. coli* the headaches and associated symptoms are diminishing, the bacilli are less frequently found, and the quantity of albumin is becoming less.

The passage of *B. coli* may occur in persons who are suffering from other conditions and may aggravate the original disease. This was the case in two individuals suffering from pulmonary tuberculosis and in a third case of miliary tuberculosis. In the two former patients there was a rise of temperature with sickness and diarrhoea, which had not been present before and which subsided with the disappearance of the abnormal urinary condition. In the third case no difference in the symptoms was produced.

In the next two cases the symptoms pointed mainly to the kidney as being the organ affected. The first is that of a

lady, about 60 years of age, who had for three weeks attacks of pain referred to the region of the right kidney, associated with feelings of general malaise and on two occasions with slight rigors. There was some blood in the urine, at times sufficient to be recognised with the naked eye, and in addition a considerable number of motile organisms, which on examination were found to be of the *B. coli* variety. No rise of temperature was recorded. The right kidney was palpable and at first slightly tender. Treatment directed against the urinary condition has been successful in relieving her and in getting rid of the organisms from the urine, and there has been no return of the symptoms during the past eight months. The second case was that of a nurse who three months previous to being seen had some frequency of micturition, which yielded at the time to treatment by large doses of potassium citrate. On the first day on which she was seen the temperature was 103° F., the tongue was dry and brown, and some delirium was present at night. From the third to the sixth day she had pain in the right loin, with considerable swelling and tenderness of the right kidney. During these first six days the urine contained at times many different organisms, with pus, blood, and epithelial cells, while at other times there were fewer cells and *B. coli* in pure culture. The patient was examined under an anæsthetic by Sir W. Watson Cheyne, who detected a cervical polypus. This was removed on the seventh day of her illness by Dr. Eardley Holland. The urine continued to contain the bacilli, but the pus cells gradually disappeared. The presence of this septic polypus explained the varying condition of the urine, which at times was contaminated by the vaginal discharge. The temperature came down to normal on the tenth day, but the kidney remained enlarged and tender for a further period of 14 days. Rapid improvement followed treatment by vaccines, and at the end of two months she was in better health and weighed more than she had for several years previously. A few bacilli were still present in the urine, and it was not until the expiration of three months that they finally and permanently disappeared. During this period treatment was also largely directed against the constipation, which had been rather marked. Both these patients complained of pain in the region of the kidney, and in both that organ was enlarged and tender. In the second case the attention was at first directed to the bladder, but the pain in this area was probably due to the polypus and disappeared on its removal.

The following is a case of quite a different character, but it illustrates the advantage of examining the urine for *B. coli* and of utilising the same when found. A young married woman, the subject of chronic constipation, was in the seventh month of pregnancy. For two months she had been suffering from a recurrent discharge of pus, mucus, and blood from the rectum, accompanied by severe pain and tenesmus. The motions were, however, passed without pain and formed. There was an evening temperature reaching 101° F. with occasional rigors, and she was steadily losing ground. The pus from the rectum contained many and various organisms. The urine drawn off by catheter contained *B. coli*, but no pus cells. Her medical attendant diagnosed ulceration of the lower part of the large intestine and was able to detect some of the ulcers by rectal examination, though there was no induration round them. A surgeon was called in, and, diagnosing a pyosalpinx opening into the rectum, performed laparotomy. The pelvic organs were found to be normal except that the sigmoid flexure was markedly congested. During the night following the operation the patient was delivered of a seven months child, which only survived for a few days. During the next four days the temperature remained between 102·5° and 103·5°, the patient being in the "typhoid state." An injection of 30,000,000 of the dead organisms prepared from the culture derived from the urine was given. This was followed by marked improvement in the general condition of the patient and by a fall in the temperature to between 100° and 101°. The injection was twice repeated at intervals of a week, each time with great improvement. Rectal irrigation produced a most beneficial effect and was responsible for the ultimate cure of the patient, although a temporary relapse occurred after an interval of three months.

Another case in which the urine was employed for the purpose of isolating the organisms is the following. A young man, aged 20 years, developed an attack of appendicitis. It was considered desirable to operate immediately,

and an abscess was opened and drained. As the patient's condition did not clear up satisfactorily a second operation was undertaken for the removal of the appendix. A week later the wound was looking perfectly healthy and there was practically no discharge, but the temperature varied from 101° to 103° F. He was pale, anæmic, restless, and had wasted considerably. A culture taken from the wound was found to be sterile, probably owing to the antiseptics employed in the dressings. The urine, however, contained *B. coli*, and a pure culture was obtained from which a vaccine was prepared. The first injection produced much general improvement, with a fall in the temperature to 98·8°, which, however, was not maintained, but was succeeded on the fifth day by a rise to 102°. A second injection was given seven days after the first and with a similar improvement, and following the third inoculation after a similar interval the temperature became and remained normal.

The three following cases illustrate a condition of caseation of varying extent due to this organism.

A patient, aged 35 years, had been complaining for two years of lassitude and weakness. During this time she had been chronically constipated and had been troubled with piles and occasional rectal discharge. For one year there had been pains in the pelvic region and right flank which increased in severity during the menstrual periods. She lost weight considerably and began to have an evening rise of temperature. The pain eventually became so severe as to prevent her getting about at all. Examination showed that the pelvic organs were matted together, and the condition was diagnosed as due to tuberculous peritonitis confined to the pelvic region. It is not recorded whether *B. coli* were present or not in the urine. Laparotomy was performed, and the uterus was found to be bound up with the posterior wall of the bladder and a coil of small intestine in a mass of caseous material. The mass was removed as freely as possible. I was asked to estimate the opsonic index to tubercle and to treat the patient for this condition. The tuberculo-opsonic index, however, proved to be normal on four different occasions. Examination of the urine demonstrated the presence of numerous *B. coli*, sometimes with and at other times without pus. A careful examination of the microscopical sections of the material removed showed that there was no structure suggesting tubercle. Extensive caseation was present, but everywhere throughout this formation were numerous short bacilli, which did not stain by Gram's method and were not acid-fast. Under general treatment and by vaccines of *B. coli* derived from cultures from the urine she is now well and at work. During the first 12 months after the operation there were periodic attacks of pain followed by the passage of stitches in the urine with small masses of inspissated pus. These attacks have ceased during the past year and the urine is now free from *B. coli*. A sinus following the operation communicated with the bladder and allowed the passage of urine for the first three months, and remained in an indolent condition for a year, but is now soundly healed. In this case there was a period of nine months during which bacilli were intermittently passed.

The following case also shows this tendency of the *B. coli* to form indolent caseous masses. A young girl, who had two years' previously been in King's College Hospital under the care of Dr. Nestor Tirard for tuberculous peritonitis which had completely resolved, was readmitted with some obscure pelvic trouble. There was an ill-defined swelling to the left of the middle line reaching to within 2 inches of the umbilicus. Per vaginam the uterus was normal in size but was fixed. The tumour was attached to the left side and fundus of the uterus. A fixed mass was also felt in Douglas's pouch on the right side. Treatment was directed against constipation and she was sent to a convalescent home for three weeks. On her return she was operated on by Dr. John Phillips. A large mass was found attached to the small intestine, great omentum, and left ovary and tube. This was removed and proved to be an inflamed broad ligament cyst. A similar but smaller cyst was found on the right side and was also removed. Dr. W. d'Este Emery reported that they were of a chronic inflammatory nature and almost certainly tuberculous. Nine days later the stitches were removed, the wound being quite healthy. She was transferred to my care at the Hospital of St. John and St. Elizabeth six weeks after the operation. There was still a temperature

ranging between 100° F. in the evening and normal in the morning. The laparotomy wound was soundly healed but rather painful. Shortly afterwards a swelling formed in this area accompanied by considerable pain and increasing induration. In the course of a week the skin over this swelling became gangrenous and sloughed. On removal of this superficial slough a mass of caseous material was seen which gradually separated out, leaving an ulcer about 1½ inches deep. Microscopically it consisted of granular structureless material containing numerous Gram-negative bacilli. A pure culture of *B. coli* was obtained from it. The urine was acid and contained numerous *B. coli*. Under treatment the ulcer healed in the course of six weeks with the exception of a small sinus which even now, nine months after operation, discharges a small quantity of blood-stained fluid at the times of the monthly periods. With this exception she has done remarkably well, and six months after the operation was able to walk several miles a day. This case, like the preceding, shows the chronic and indolent nature of these sinuses left by a *B. coli* infection. In both cases the organism was easily obtained from the urine and a vaccine thus obtained was used in the treatment. The sinuses in both cases were sterile, as shown by inoculation of a culture tube.

In the third case the infection gave rise to a condition which was mistaken for a malignant pelvic tumour. A woman, aged 50 years, was admitted into the Italian Hospital, under the care of Mr. T. P. Legg, complaining of inability to pass urine. Examination showed a tumour which extended from the pubes to the umbilicus. Per vaginam this was felt to be of an elastic consistence. A diagnosis of an ovarian cyst or a fibroid of the uterus pressing on the bladder was made. There was no rise of temperature. A large quantity of urine was drawn off by catheter; it contained neither albumin nor sugar, but unfortunately it was not examined for the presence of organisms. The tumour still persisted after catheterisation. Laparotomy was performed and the uterus and ovaries were found to be normal, but displaced downwards and backwards by the tumour, which was of a dark-red colour and covered by peritoneum, with many large vessels coursing over the surface. It was then seen to be connected to the upper wall of the bladder, and in view of the size (3 × 3 inches approximately) and of the hardness of the structure it was thought to be a new growth arising from the bladder; no attempt was made to remove it. Three days later the temperature rose in the evening to 103° F. and became hectic (normal to 103°) for several days. She then passed a considerable quantity of pus, accompanied by large flakes of lymph, in the urine. The tumour was found to have disappeared, but from time to time it re-formed and emptied itself, eventually disappearing entirely. From the urine a pure culture of *B. coli* was obtained. A year afterwards the patient was perfectly well, and nothing was to be felt either per hypogastrium or per vaginam. Turbid urine is still passed occasionally, the turbidity being due to *B. coli*, and no pus cells are to be found on these occasions. Vaccination was adopted in the first instance, but has not been persevered with.

These three cases have all occurred in women, but the infection is not confined to them. A man, aged 30 years, was sent to me by Mr. F. Burghard with a history of recurrent attacks of fever and general malaise associated with pain in the region of the left kidney. At these times he has much pus in the urine, but in the intervals there are only *B. coli* and no pus cells. He is also improving, and the attacks are becoming less severe in intensity, but not in frequency under treatment by vaccines obtained from the organisms which he is passing.

The following case is not so clear, though suggestive. A child, aged 9 months, was admitted under my care at the Evelina Hospital from Dr. H. C. C. Mann's out-patient department. She had been quite well up to three months before admission, when she developed an attack of bronchitis, with occasional discharge from the right ear. This discharge had been last noticed three days before admission, on which date there had been some sort of a fit, but a reliable account of it could not be obtained. In the interval several more fits occurred, and slight right-sided internal squint was present. The parents had lost three children from convulsions. The child had been correctly fed and there was nothing to suggest congenital syphilis. Nutrition was good. There was slight head retraction with marked irritability and general cutaneous hyperæsthesia. Kernig's sign was

present and a questionable left internal squint. The knee-jerk was obtained on the left side, but not on the right. There was also a perforation of the right membrana tympani. Lumbar puncture produced 16 cubic centimetres of clear fluid, containing no cells, and from which no growth was obtained from inoculation on to suitable media. The cerebral symptoms were relieved by this lumbar puncture. The urine contained large quantities of *B. coli* and a few pus cells, and was very acid in reaction. Calmette's tuberculo-ophthalmic reaction was negative. The temperature ranged between 99° and 103° F., and the pulse from 140 to 150. No alteration in the condition occurred, and the child died on the eleventh day after admission. Post mortem nothing abnormal was found, and cultures from the spleen, heart blood, and kidney remained sterile. The course of the case suggested an acute toxæmia, and the only pathological condition detected was the presence of bacilli in the urine.

In treating one of these cases it is necessary to discriminate between the severe and milder types of case. Because the bacilli are found in the urine it is not necessary at once to rush to vaccines, and even in the more chronic forms where vaccination will be the best remedy it is inexpedient to neglect all other measures and rely on this alone. Many such cases must have occurred in the past when the condition was less well recognised and must have recovered, and no doubt many cases of unexplained febricula may have been instances of this condition. Therefore each case ought to be treated according to the severity and duration of the disease. The milder forms will yield to the well recognised treatment of an ordinary febrile attack, a hot bath, a mercurial purge, rest in bed, and reduced diet. Should the condition not clear up at the end of a week or ten days, then the sooner more radical measures are adopted the more likely is the condition to resolve. It should be remembered that the *B. coli* is an inhabitant of the intestine and in cases of constipation flourishes to a marked degree. Therefore it is important to promote a fairly free evacuation of the bowels daily. Without such an evacuation all other treatment will be unsatisfactory. In the second place it is well to give some intestinal antiseptic to hinder the growth of the organism, such as creasote or small doses of calomel (1/20th of a grain) after each meal. This latter drug in such doses has in my hands proved fairly satisfactory, but some prefer to try to replace the *B. coli* with a lactic acid bacillus by means of artificially soured milk. Seeing that many of the preparations of lactic acid organisms contain no living bacilli this is less certain than it appears. The *B. coli* flourishes in an acid medium; it is therefore advisable to alter the reaction of the urine, which should be rendered alkaline by the administration of the drugs usually employed to this end, to which urotropine in 5 or 10 grain doses may be added. This relieves the patient of many unpleasant symptoms and hinders the proliferation of the organism. The urine should be tested from time to time to see that enough alkali is being given, and it is sometimes advisable to give rather more than the usual dose the last thing at night. This will often be successful in procuring a good night's rest without the employment of anodynes.

Should this treatment not be successful in diminishing the numbers of the micro-organisms in the urine and relieving symptoms it is advisable that inoculation should at once be resorted to. It is undoubtedly best to employ a vaccine prepared from the organism which is attacking the patient, and a vaccine can easily be prepared in the course of three days. Inoculations should be given every seven or eight days. The initial dose for an adult of 50,000,000 of dead organisms (estimated according to the method advised by Sir Almroth Wright) will be comfortably tolerated. The second dose should be half as much again, and so on. It is also advisable to have a fresh vaccine prepared each month, better results being obtained than when the same vaccine is employed continuously. This may be explained on one or two grounds. Either the vaccine loses some of its potency or the organism is able to develop power to protect itself from the antibodies produced by the host as a result of the vaccination. It will be remembered that this latter occurs in the case of trypanosomes against which atoxyl is administered. Whichever explanation is correct, the fact remains that greater improvement takes place when the vaccine is freshly prepared every month.

It must always be remembered that the condition, when



once well established, is very refractory, and it is well to start treatment early and to carry it out energetically. The general health must also be seen to and any abnormality should be rectified.

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## A CRITICAL REVIEW OF SOME CASES OF PERFORATION OF STOMACH AND DUODENAL ULCER.

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IT has been my lot within a period of nine months (from March to December, 1908) to deal with 13 cases of perforation of the stomach and duodenum. Some of the cases, indeed all of the cases, were interesting and instructive from some point of view, and I hope that the publication of the abbreviated history in each case will be helpful. For the abstract of the history, and for the trouble taken in working up the details of this paper, I am indebted to my former house surgeon, Dr. F. C. Macaulay.

The gastric cases are taken first, and though counted as 10 in number might be regarded as 12 perforations, for the first case was operated upon for perforation on three separate occasions. Though no perforation was discovered at the first operation, in view of the subsequent history (see Case 1) I think it more than probable that some leakage had occurred. The site of the ulcer on the second and on the third occasion was different. They were both situated, however, close to the pylorus, the second occasion on the anterior wall, and the third on the posterior wall. At the third operation no trace could be found of the previous ulcer on the anterior wall.

That it is possible to have an ulcer so eroding the coats of the stomach or bowel as to give rise to symptoms and signs suggestive of perforation, and yet on examination reveal no macroscopic evidence of leakage, I have no doubt whatever. In Case 9 the sudden and severe onset, accompanied by pronounced rigidity and tenderness of the epigastrium and followed by such profound collapse, certainly suggested leakage, and yet, though the ulcer was discovered and the serous coat was carefully examined, no actual hole was seen. I remember on another occasion examining with Dr. A. Johnston, then of Ruchill Fever Hospital, a case of suspected perforation in a man suffering from enteric fever. Neither of us had any doubt that a perforation had occurred, and though in several of the ulcers the dividing line seemed to be no thicker than tissue paper no visible point of leakage was discovered. In both of these cases there was some free fluid in the abdominal cavity, and the serous lining of the bowel was slightly injected. Is it possible that by osmosis an infection of the peritoneal cavity could be brought about, the serous coat over the site of the ulcer becoming, if not dead, so non-resistant as to act like a piece of soaked parchment? It is not infrequent to find in the previous history the record of an attack of pain severe enough to suggest leakage, and one has, unfortunately, known patients lulled into a sense of security by the belief that their present seizure of pain, though more severe, would pass off like the last and refuse operation until it was too late.

Ten of the cases were gastric and three duodenal.

*Age and sex.*—The ages ranged from 16 to 72 years. The average age over all was 37·7 years. The average age of the gastric cases was 36·8 years, of the duodenal cases 41 years. Of the 10 gastric cases only 3 were in females whose average age was 19 years. The 3 duodenal cases were in men.

*Onset.*—In 12 out of the 13 cases the onset might be said to be instantaneous; in one (Case 12) the onset was more or less sub-acute. In the majority no food had been taken for some time previously, and the time of perforation was oftenest in the late hours of the evening or in the early morning. Case 4 created a considerable amount of interest, owing to the fact that he was seized while dressing for his marriage. He collapsed, but rallied somewhat and went through the service, only, however, to be snatched from the arms of his bride and handed over to the care of the surgeon. In the by-going it might be mentioned that the

young bride accepted the position with that stolid indifference and apparent want of feeling which is said to be so characteristically Scottish.

*Previous history.*—In eight (Cases 1, 3, 5, 7, 8, 9, 10, and 13) there was definite history of pain after food and other gastric symptoms; in the remaining five (Cases 2, 4, 6, 11, and 12) no history of previous gastric trouble was obtained. The occurrence of gastric symptoms previous to the onset is of considerable diagnostic value. Some of those who stated that they had had no previous stomach trouble admitted afterwards to having at times had feelings of discomfort which they had attributed to flatulence. But the point to note particularly is that a patient's statement as to the previous absence of stomach symptoms does not preclude the possibility of ulcer, nor does it preclude the possibility of the acute symptoms being those due to perforation (Case 12).

*Pain.*—It is almost considered a surgical axiom that in all cases of severe abdominal crises the pain is first of all referred to the epigastrium—solar plexus, and after some time to the particular seat of origin, to the appendix, to the gall-bladder, to the stomach. In every case of this series pain was a prominent feature, but was quite impossible to define except that it was severe, "doubled him up," "made him cry out," &c., and was equally difficult to locate apart from surface tenderness. The patients were so ill that speaking was an additional agony and as little as possible was said and indeed asked. In six cases, however, the pain was definitely referred to the epigastrium, in other three the pain began around the umbilicus, remaining there in one (Case 13, duodenal) and in the other two becoming epigastric later. In two the pain was felt in the shoulders as well as in the abdomen—both gastric—so that in 9 out of 13 cases the pain was referred to the upper part of the abdomen.

*Vomiting* subsequent to the onset was stated to have occurred in seven cases (Cases 1, 3, 4, 5, 6, 12, and 13). In three it was stated that no vomiting had occurred (Cases 2, 7, and 10). In three vomiting was a prominent symptom before the onset of the acute attack (Cases 1, 3, and 8). The vomit subsequent to the onset was "stomach contents"; in one case it was "coffee grounds."

*Collapse* was a prominent feature in most of the cases, depending upon the length of time since the onset. It was definitely stated to be present in every case to begin with, but passed off gradually in some cases quicker than in others—e.g., in Case 2 and in Case 8.

*Appearance* in most cases was indicative of severe pain; the patient looked very ill; the face was pale with malar flush.

*Flatus per rectum.*—The length of time subsequent to perforation was so short comparatively that the non-passage of flatus was less important as indicating peristaltic paresis. In two cases flatus was definitely stated not to have passed since onset.

*Respiration.*—The earlier the case was seen the more likely was the breathing found to be thoracic in type and the more averse the patient was to take a deep inspiration. In five cases the respirations were stated to be wholly thoracic; in three the abdomen was said to have moved slightly; in the others no reference was made to the character of the respirations.

The *temperature* varied from 97° to 100·8° F. The temperature depended upon the length of time that had elapsed since the perforation.

The *pulse* varied from 70 to 138 per minute, also evidently dependent upon the length of time since the onset. A gradually increasing pulse-rate is significant.

*Abdomen.*—Distension was definitely present in four cases (Cases 6, 8, 10, and 13); the longer the time the greater the distension.

*Rigidity of the abdominal wall.*—This is a sign of much importance. With one exception (Case 10) it was present in every case. In 11 of the cases the rigidity was general, in two it was epigastric, but in every case it was more evident over the stomach. In one case (Case 12) the main rigidity was found on the right side; in another the contraction of the recti was visible (Case 7). The earlier the case the greater was the rigidity. In the only case where it was stated to be absent nearly 60 hours had elapsed from the time of onset and the general peritoneal cavity was found to be shut off.

*Tenderness, abdominal, on palpation* was present in every case with one exception (Case 2) and in that case there had