analyses of the blood, particularly with reference to carbohydrate tolerance as affected by the administration of endocrine substances. Basal metabolism was determined. At times it was deemed necessary to extend special medical and laboratory consultation and social service surveys to the families of the patients. Often results of intensive work along some of these lines were negative, and the sole contribution to diagnosis was the elimination of a more or less remote possibility. One must expect to wash much gravel before "pay dirt" is struck.

FEASIBILITY AND ADVANTAGES

I have briefly sketched the diagnostic clinic idea as applied to mental retardation. The idea is so simple and so logical that it is surprising it has had such a limited application. There are several questions which may be fairly asked by physicians, trustees of hospitals, legislators and the lay public, who must foster and encourage the plan if it is ever to be put into general operation. In the first place, is it feasible? The question of the location of such a clinic would have to be determined by practical considerations, existing facilities, ease of access and distribution of population. Probably the most direct method would be the establishment of a diagnostic center in one of the institutions for mental defectives. Proximity to a large city would insure an adequate consulting staff. The laboratory facilities would have to be sharply reorganized. The intramural personnel should include, at a minimum, a scientific director, a pathologist with an assistant, a biochemist and a roentgenologist. To such a scientific center the mentally retarded child would be sent for intensive study. The ultimate object would be to make a competent diagnosis and to decide whether there was actual congenital deficiency which would call for institutional care; or, if the condition was capable of correction, the patient would be returned to the community after contact had been made with an agency which would supervise the details of treatment. Such agencies already exist, and it would only be necessary to broaden their scope. A further function of such a diagnostic clinic would be the examination of children referred to the various institutions for admission, and a survey of those already being cared for. This would constitute a most valuable and productive form of research.

What would be the cost? The initial outlay would be considerable. A suitable building would have to be erected. However, if this was planned in conjunction with a much needed new institution, the cost could be kept within reasonable limits. If the work was carried on at one, or at most two points, duplication in the matter of staffing, equipment and maintenance could be avoided. The entire expense would compare favorably with the amount involved in certain projects now being considered by various state legislatures.

Finally, is it really worth while? Entirely aside from altruistic considerations, it seems highly important for purely material reasons to reconstruct as many of these children as possible. If mental retardation is preventable and correctable, as it often appears to be, then it is entirely reasonable to assume that the wastage involved in a failure to recognize conditions which can be corrected must in the end be returned as a tremendous economic and social liability. There remains the question of our duty in this matter. The individual who is suffering from a physical ailment, such as typhoid fever, pneumonia, tuberculosis or appendicitis, be he ever so indigent and dependent, has at once the advantage of every resource of scientific and modern medical and surgical research. The spread of the psychopathic hospital idea will eventually insure the same advantage to the mentally sick. Is the child, who through no fault of its own is mentally handicapped in the stuggle for existence by the effect of some physical disease, to be denied a chance merely because such disease may be obscure and consequently difficult and expensive to discover?

4401 Market Street.

THE NONOPERATIVE DETERMINATION OF PATENCY OF FALLOPIAN TUBES

BY MEANS OF INTRA-UTERINE INFLATION WITH OXYGEN AND THE PRODUCTION OF AN ARTIFICIAL PNEUMOPERITONEUM *

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The determination of patency of fallopian tubes has hitherto been possible only by direct inspection and palpation obtained by laparotomy. Physical examination was wholly inadequate because it still left the question of patency a matter of speculation. This is especially true when, as in certain instances, the tubes are sealed tight at their fimbriated end, although no distention of the lumen is present. In other instances it is hard to diagnose occlusion of the tube due to hydrosalpinx when the walls are flaccid. Some tubes are closed by adhesions secondary to a peritonitis that arises outside of the gynecologic domain. No matter how clear the history, the question as to whether such a tube is patent or not is always a matter of doubt. The same holds true in cases in which the tube may be occluded by a tumor.

It is often not possible to distinguish whether a mass in either lateral fornix is due to disease of the tube or the ovary. Even in the presence of a bilateral mass, the tubes may nevertheless be patent despite suspicions directed against them. I have seen a patient who refused operation, although the surgeon assured her that she had pus tubes and would not only be sterile, but would remain an invalid. I have since established that her tubes are patent by the use of intra-uterine oxygen inflation. In her case the ovaries were undoubtedly at fault.

An accurate knowledge of the anatomic patency of the tubes is admittedly important in formulating prognosis and therapy of female sterility. If we are aware that a patient is sterile because her fallopian tubes are closed, plastic operations on the cervix, curettage, dilatation and opotherapy will obviously be useless. Indeed, the disease in the tubes is often clinically manifest after an operation on the cervix, as evidenced by a rise of temperature, pain, tenderness and swelling to one or both sides of the uterus developing within a short time after the operation. The patient may in all innocence charge this to the surgeon, when in reality it is simply a lighting up of an old latent infection.

* From the Second Gynecological Service and the Roentgen-Ray Department of Mount Sinai Hospital.
* Read before the Section on Obstetrics, Gynecology and Abdominal Surgery at the Seventy-First Annual Session of the American Medical Association, New Orleans, April, 1920.
* Owing to lack of space, this article is abbreviated in THE JOURNAL by the omission of several illustrations. The complete article appears in the Transactions of the Section and in the author's reprints.

The impossibility of fecundation in unsuccessful cases is due to obstruction in some portion of the tube, either at the uterine ostium, along its lumen, or at the fimbriated end. In the presence of a small cornual polyp blocking the uterine insertion of the tubes, or occlusion by salpingitis isthmica nodosa, hydrosalpinx or some malformation within the tube lumen (complete spurs, blind canals, etc.), any operation on the lower uterine portion must result in failure.

INCIDENCE OF STERILITY DUE TO DISEASE OF THE TUBES

It is well to remember, as Giles states, that practically 11 per cent. of female sterilities is due to tubal disease. In women under 24 years of age it is higher, reaching 14.4 per cent. Add to these 4.4 per cent. of cases due to blocking of the fallopian tubes by peritonitis, and we have an average incidence of 15 per cent. of cases of sterility due to pathologic tubes. For convenience we will not include tumor formations and malformations. It will then be seen that one out of six or seven women owes her sterility to closed tubes.

Here it may be mentioned that, in certain cases in which no gross physical abnormality can be elicited by examining the woman (2 per cent. of cases) and the potency of the male partner is established by the finding of live spermatozoa in the cervix and fundus uteri, a congenital atresia of the tubes or of some part of the lumen may be the real cause of the sterility. One naturally hesitates to subject such a woman to an exploratory laparotomy, so that a method whereby patency of the tube could be demonstrated without surgical means is eminently desirable.

Fig. 4.—Pneumoperitoneum: 250 c.c. of oxygen injected into the peritoneal cavity by way of the uterus and fallopian tubes. Diaphragm visible on the right side, not on the left. Slight downward displacement of the liver.

INTRA-UTERINE OXYGEN INFLATION AS A METHOD OF DIAGNOSIS

This I believe has been effected by the combination of oxygen with fluoroscopy and roentgenography. It is possible to determine whether the tubes are patent or otherwise by inflating the uterus with oxygen and in normal cases filling the peritoneal cavity with a measured quantity of oxygen. The artificial pneumoperitoneum establishes definitely the patency of the fallopian tubes. In a preliminary report I pointed out that the peritoneum tolerates the oxygen introduced by way of the uterus and fallopian tubes equally as well as by direct abdominal puncture. There is no doubt, however, that the result is the same whether the peritoneum is filled with oxygen through the abdominal wall by puncture or through the uterine cavity without puncture. For general abdominal diagnosis at least a liter to a liter and a half of gas is necessary. For the specific purpose of establishing the fact of open fallopian tubes the amount of oxygen need not exceed 300 c.c., and in the last of my cases tested by this method about 150 c.c. would be the average volume used.

In one case from Dr. H. Lilienthal's service I injected oxygen by way of the fallopian tubes for the diagnosis of a possible perinephric abscess complicating an operation for acute perforative appendicitis. An abdominal sinus at the site of the appendix incision was proved to communicate with the peritoneal cavity because most of the oxygen escaped through it. Bubbles of gas were seen to form through the moisture at the sinus opening, and this leakage prevented the formation of an enclosed pneumoperitoneum.

The small volume of oxygen has the advantage of enabling us to examine the patient in the office without the necessity of her going to bed for twenty-four hours or more. Symptoms of phrenic irritation are decidedly less, and the patients may go about their daily work. When a greater amount of oxygen is injected, the patient is more comfortable in a moderate Trendelenburg posture. This causes the oxygen to rise to the pelvis, and the excursions of the diaphragm are less hampered by the column of oxygen.

In the first patient in whom I injected oxygen through the uterus I did not measure the quantity but allowed it to pass into the peritoneal cavity till a moderate amount of visible distention resulted. The fluoroscopic and roentgenographic pictures were the same as described by Stein and Stewart, who introduce the oxygen through a trocar or needle thrust into the abdominal wall. This patient was allowed to go home one hour after the examination and advised to lie down in a bed with the foot elevated. She was reexamined at the end of the third day, and a small amount of oxygen was still present below the diaphragm. The estimated amount she must have received was from 2 to 2.5 liters.

In the next thirty-two cases of sterility examined by intra-uterine oxygen inflation it was endeavored to establish several points: (1) the tolerance of the patient for the method as a diagnostic procedure; (2) the possible danger of infection; (3) the danger of embolism; (4) the diagnostic reliability of the findings and interpretation, and (5) the minimum volume of

oxygen necessary to produce the pneumoperitoneum which could be seen by fluoroscopic examination.

1. *Tolerance of the Patient.*—The patients stood the examination with very slight discomfort. At most it was like the pain produced in some patients by the introduction of a uterine sound. Nervous women complained more from fear than actual pain, because the vast majority of the patients made no complaint during the injection. The passing of the oxygen into the peritoneal cavity is painless. Uniformly there is some sense of pressure about the diaphragm within five or ten minutes, and slight "sticking" sensations in one or both shoulders. A half liter of oxygen causes very moderate symptoms. A liter of oxygen is followed by greater epigastric oppression and shoulder pains. When more than a liter is used, the symptoms are proportionately increased. When from 100 to 200 c.c. are injected, the symptoms are very slight and do not interfere with the patient's daily routine.

2. *Possible Dangers of Peritoneal Infection.*—There are no pelvic symptoms after the gas inflation. In no case was there evidence suggestive of peritoneal irritation. Not a single one of the symptoms characteristic of peritoneal infection was noted. There was no nausea or vomiting, pains, rigidity or tenderness, or rise in temperature or pulse rate. The patients were all closely observed. They were followed through three or four menstrual periods to note any late sequel of the oxygen test.

3. *Possible Dangers of Embolism.*—In no instance were there symptoms suggestive of air embolism. This question gave me some concern in first contemplating the method. By actual experiment on the dog I found that the animal tolerated 350 c.c. of oxygen introduced directly into the leg vein without any symptoms attending the injection or following it. The rate of oxygen flow was the same as employed in my sterility patients. As 350 c.c. is the very maximum amount required, I felt that the accident of embolism from oxygen could be disregarded. I have since learned that a number of army surgeons use this method of intravenous oxygen injection for therapeutic purposes, especially in pneumonia.

4. *Diagnostic Reliability of the Findings and Interpretation.*—When an artificial pneumoperitoneum was produced, it was conclusive in proving the patency of the genital canal from the external end to the internal abdominal end. This, however, could result when only one tube was patent and the other closed, as well as when both tubes were actually patent. For practical purposes in the consideration of sterility it suffices that one fallopian tube is patent. Future observations may make it possible for us to draw definite conclusions on the question of unilateral or bilateral patency, and, if unilateral, which side is open or closed. At this time I am not prepared to present data on this point.

When an artificial pneumoperitoneum does not result from the intra-uterine oxygen inflation, the probability is that there is some obstruction in the genital canal above the internal os. It may be at the uterine ostium of the fallopian tubes, along their course, or at the fimbriated end. Whether this be by uterine cornual polypi occluding the opening as a ball valve or inspissated mucus in the tubal lumen, or agglutination of the plicae of the endosalpinx or a sealing over of the fimbria, the result will be the same. One negative result is not enough to establish nonpatency. In such an instance the test is repeated once or twice, a little more gas being used each time. If in the repeated tests the oxygen fails to pass through, we may conclude that the patient is sterile because of this mechanical blockade. Occasionally, however, when the stenosis operates like a ball valve, as in the case of a polyp at either uterine horn, the greater pressure by the increased gas volume may succeed in forcing the oxygen through, and then a pneumoperitoneum would result. In such an event, however, the test would still have a certain diagnostic value and might serve to indicate the proper therapeutic measure to be adopted to overcome this difficulty. Inspissated mucus at the uterine end of the tube would have the same effect, and here, too, the negative result is significant of a mechanical cause of sterility.

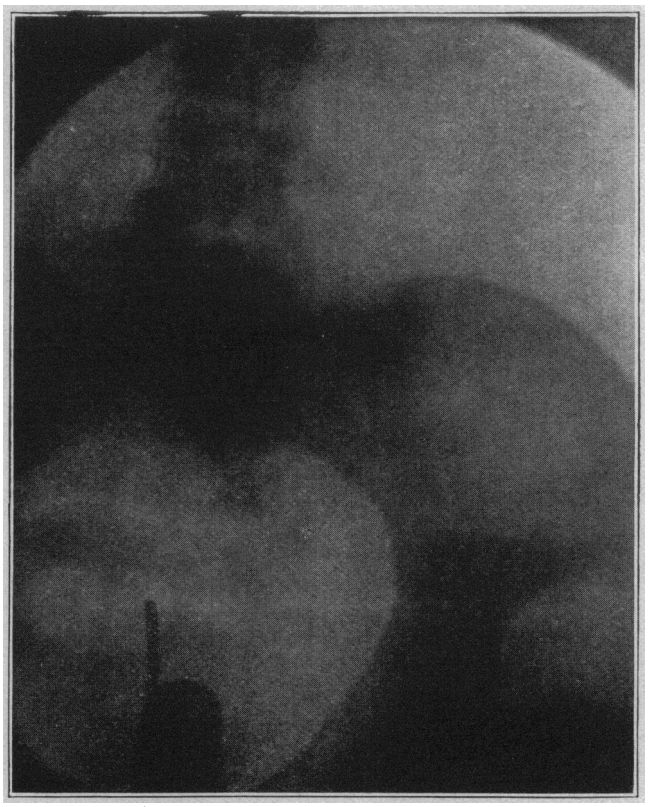

Fig. 7.—Case of ablated tubes. Bilateral salpingo-oophorectomy two years before. Speculum and intra-uterine cannula in situ. Large Thomas pessary also visible. Oxygen injected by syringe (40 c.c. used). Uterine cavity, transversely pear-shaped, plainly visible.

These results I was able to demonstrate on the extirpated uterus with adnexa attached. In one case [1] I had the opportunity to confirm by operation the clinical findings as obtained by the oxygen test:

This was a patient, aged 27, who had been married twelve years and had three children, the youngest of whom was 2 years old. Since the birth of the youngest child she believed herself pregnant twice; each time an abortion was performed. She complained of pains in the pelvis and prolonged menstrual flow. Examination by Dr. H. N. Vineberg, attending gynecologist, disclosed a moderate cystic enlargement of the right adnexa, which was slightly tender, the left side being apparently normal. The uterus was enlarged about

1. In another case, in which the condition was diagnosed as multiple fibroids, the oxygen failed to produce an artificial pneumoperitoneum. At operation both tubes were closed (double hydrosalpinx).

100 per cent. The temperature was normal, the pulse, 80. A diagnosis of diseased adnexa on the right side was made. As inflation of this uterus under a pressure of 190 failed to produce an artificial pneumoperitoneum, I felt that the left tube was also diseased and closed. Laparotomy in this case, performed six days after the oxygen injection, revealed an old standing pelvic peritonitis; both tubes were closed at the fimbriated end, that on the right side being moderately distended, while the left tube was but slightly swollen. They were both embedded in adhesions, in which the ovaries were also slightly involved. The inflation with oxygen was attended by no pain or discomfort. There had been no fresh lighting up of the process. The patient made an absolutely uneventful recovery from the operation.

While I should not advocate the use of this method in frank inflammatory conditions, this one experience has a definite value, in demonstrating its safety of application. On the specimen removed by operation I was able to repeat the oxygen injection and to corroborate the findings both as to the intra-uterine pressure and as to patency. When the pressure reached 190, the oxygen began to regurgitate through the external os. By tightening the latter around the cannula, the pressure rose to 210 and then fell slightly as the gas escaped along the sides of the instrument. This greater pressure failed to force the oxygen through the tubes or to distend them.

In order to see whether the stream of oxygen bubbles might force infective material into the peritoneal cavity, I opened the clubbed end of one of the pus tubes and repeated the oxygen injection in the same way as before. Again the same findings; no pus escaped into the basin of water into which the tube was immersed. The explanation for this is that the intramural portion of the tube lumen, normally only about 1 or 2 mm. in diameter, becomes plugged in pathologic conditions with pus or mucus. In addition, the swelling of the endosalpinx as well as that of all the coats of the tube results in practically obliterating the lumen of the tube and shutting it off from the uterine cavity. While in certain rare cases a large hydrosalpinx or pyosalpinx drains into the uterus, in the majority of cases the uterine end of the tubes remains occluded and resists the usual pressure to which the oxygen is subjected in testing for patency. When the fimbriated ends are clubbed, there is absolutely no danger of forcing them open. It requires many times the pressure necessary for the practical application of the method. Besides, the external os acts as a safety valve, allowing the oxygen to escape as soon as a certain pressure is reached.

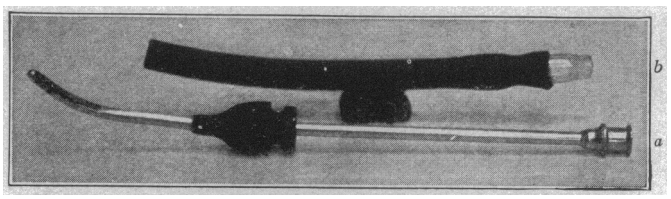

Fig. 9.—*a*, Keyes-Ultzmann cannula perforated at the tip by several small apertures with urethral rubber tip for obturation of the external os of the cervix; *b*, a piece of rubber tubing with glass connecting tube originally used in the apparatus (this is not absolutely necessary).

As far as introducing infective material from the uterine cavity into normal tubes and thence into the peritoneum is concerned, several factors make that highly improbable. One is that the cavity of the body of the uterus is in most cases free of infection. Pus or mucus, if present, is more likely to descend from infected tubes. When the uterine discharge is frankly purulent, the method is not to be used. Against this theoretical objection is the practical fact that in none of the seventy cases has there been such an occurrence.

In the nonpatent cases one may also use thorium or bromid as a control. The citrate thorium solution or sodium bromid solution may be injected into the uterus, and under obturation the roentgenogram may be made. I did this a few times in the earlier experiments, but have been able to dispense with it in my later work.

TECHNIC

The technic of the procedure is very simple. The instruments needed for the intra-uterine injection are (1) a metal cannula (Keyes-Ultzman type) perforated at the tip by several small apertures (Fig. 9); (2) a tenaculum (bullet) forceps; (3) a uterine sound; (4) a dressing forceps; (5) a bivalve vaginal speculum (Graves type), and (6) an oxygen tank connected with a water bottle. The rubber stopper is perforated at three points through which bent glass connecting tubes pass into the bottle; one of these glass tubes connected with the oxygen tank dips down below the water level. The two other glass tubes dip down for 1 or 2 inches, and do not reach the water level. One of these is attached by rubber tubing to a mercurial manometer and the other is attached in the same way to the metal cannula. In order to determine the volume of oxygen gas released from the tank, it is allowed to pass through the water bottle in a stream of discrete bubbles. These should not exceed 300 per minute. The actual amount per minute can then be measured by displacing an equivalent quantity of water from a graduated bottle into another.

It will then be seen that, for example, the gas displaces from 200 to 250 c.c. of water per minute. The same rate is then maintained in the intra-uterine injection. The water bottle that is connected with the oxygen tank contains hot boiled water or some mild antiseptic solution.

The cervix is exposed by means of the speculum; the vagina is carefully wiped clean and the cervix is cleansed dry and painted with tincture of iodin. If there is any uncertainty regarding the direction of the uterine cavity, it may be determined by passing the sound. The cervix is steadied with tenaculum forceps grasping its anterior lip. The oxygen, which has been released from the tank and regulated, is now allowed to pass from the water bottle through the glass and rubber connecting tubing to which the metal cannula is attached. By pinching the rubber tubing near the cannula one can make sure that all the joints are air tight. The mercury immediately rises in this case. If there is some leakage between the oxygen source and the cannula, the pressure will be negative. This is a very important point to be observed. Having made certain of the pressure, the air valves in the manometer are opened and the catheter is then inserted into the uterine cavity to a point well beyond the internal os. This is done so that there is no immediate escape back along the cervical canal and out into the vagina. The rubber urethral tip, placed ordinarily from 1½ to 2 inches away from the cannula tip, is then fitted into the external os, insuring better obturation. This is not essential in the nulliparous intact cervix, but is required in the irregular patulous external os resulting from previous operations or from lacerations attending childbirth. The air valves are now closed. Within a few

seconds after the oxygen enters the uterine cavity, the pressure as noted in the mercury manometer will rise; within from one half to three quarters of a minute in the patent cases the mercury reaches its maximum point. It then fluctuates for a few seconds or drops rather sharply from 10 to 30 points, maintaining the last level more or less for the rest of the time. There may be a slight audible escape of oxygen from the external os in the cases of patent tubes, but as a rule there is none till the cannula is removed, when slight regurgitation is present.

In the nonpatent cases, the pressure usually rises steadily for three quarters of a minute to a minute or longer, and then drops sharply as the gas regurgitates into the vagina. As the time required for sufficient oxygen to pass into the abdomen where it can be detected by fluoroscopic examination is one and a half minutes, the cannula is not withdrawn till this time limit is reached. If the pressure reaches 200 mm. in one minute, it is well to open one of the air valves (needle valve) to prevent it from mounting higher. In all our patent cases this high level was not reached.

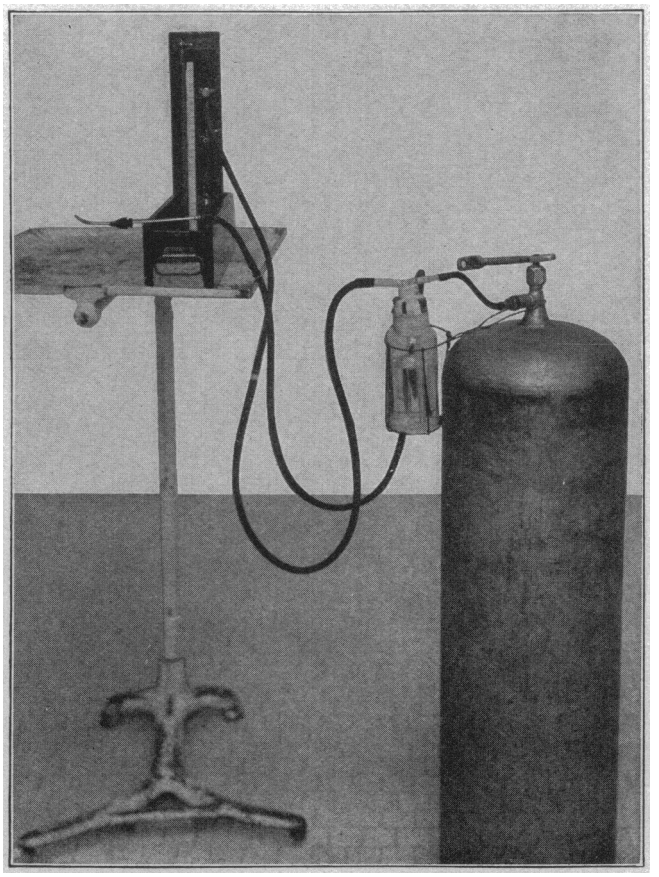

Fig. 10.—The apparatus set together. The same rate of flow of oxygen as previously determined by displacing water is maintained before and during the intra-uterine oxygen inflation. The mercurial manometer may be of the standard type, as illustrated here, or it may be of the Tycos type, and can then be inserted directly into the rubber stopper of the water bottle.

The intra-uterine gas pressure has been a valuable adjunct in checking up the time required for the gas to pass through the tubes and reach the peritoneal cavity. In our earlier cases we had decided on a three-minute interval as being necessary. In that time from 750 to 850 c.c. were released from the oxygen tank. We had no way of telling when the gas actually passed through the fallopian tubes. The symptoms were naturally accentuated. The pneumoperitoneum was excessive. A liter of oxygen was not necessary when a quarter of a liter was just as valuable for the purposes of establishing the fact of patency. With the manometer attached to the water bottle we can decide, knowing the rate of flow beforehand, how much we wish to inject into the abdomen. From the moment the pressure falls, we allow the gas to flow for from one-half to one minute, and can estimate the quantity used with reasonable accuracy, allowing for an error of 50 c.c., which for practical purposes is unimportant.

Various types of pressure devices were tried to estimate intra-uterine gas pressure. The mercury manometer of the standard type was finally adopted. For this advice I am indebted to Dr. Arthur J. Bendick, associate roentgenologist to Mount Sinai Hospital. This was particularly important, because of the theoretical possibility of air embolism resulting from too great pressure which might force the oxygen into the blood vessels. In none of the first group of cases, in spite of the absence of accurate control, did such an accident occur. It has been clearly demonstrated that oxygen, as used in this method, does not cause embolism.

In the first group, ten patients were reexamined two or three times because they had had minimal amounts of oxygen. Most of these were found to have patent tubes when a sufficient volume of oxygen under pressure was injected. When the pressure test was adopted, it became unnecessary to repeat the examination in the negative cases except when in a nervous patient it had to be interrupted. This happened in one case; and on reexamination the patient, being reassured, submitted to the complete test. She then proved to have patent fallopian tubes. It is a good rule to repeat the test at least once in the nonpatent cases in order to check up the result of the first examination.

In the positive patent cases, the pressure need not exceed 40 mm. The average pressure is from 60 to 80; occasionally the pressure rises to 100 or more before the oxygen will pass through the uterine ostium of the fallopian tubes. When the pressure reaches 150 or more, the likelihood is that the tube lumen is closed completely or stenosed, but not necessarily in every case. A pressure of 200 is tolerably certain to be due to closed tubes. *Fluoroscopy, however, should always be employed to check up the partially stenosed cases, as sometimes oxygen will succeed in escaping into the abdomen, though the pressure required to force it in is comparatively high.*

While the pressure gage as studied in the second series of thirty-seven cases is an excellent indication of patency of the fallopian tubes, it is well always to examine the patient with the fluoroscope. It occasionally happens that with the greater pressure a slight amount of gas succeeds in entering the peritoneal cavity and reaching the subphrenic space on the right or left side, where it can be detected by the roentgen ray.

In the positive cases, that is, when the tubes are patent, the oxygen will be seen as a clear space below the diaphragm, most often on both sides, but occasionally on one side only. The space varies, depending on the volume of oxygen injected. In the average case in which from 150 to 250 c.c. is used, this clear

space below the diaphragm varies between one-quarter to 1 inch in depth. The diaphragm appears as a transverse septum above the dense liver shadow on the right side and over the pale stomach margin on the left. It is unmistakable, and is readily seen when the patient breathes deeply. In all our cases in which we have made roentgenograms the finding was always confirmatory. Stout patients require a somewhat greater amount to allow for the density of the abdominal wall.

The whole examination is complete within five minutes. When the minimum volume of oxygen has been used, that is, from 100 to 150 c.c., the symptoms are negligible. There is the slightest discomfort around the diaphragm, and slight sticking pains referred to one or both shoulders. The patient dresses herself and is able to go home with comfort, and performs her duties as though she had had a simple cystoscopy. When, however, more gas has been used, the symptoms may be somewhat annoying. In such cases it is well for the patient to lie down for a few hours on reaching home, with the foot of the bed elevated (moderate Trendelenburg posture).

In the negative cases, that is, when the tubes are occluded, no artificial pneumoperitoneum results. These patients have no discomfort after examination, and have none of the referred pains in the shoulders or about the diaphragm.

In none of the cases are there pains in the pelvis following the intra-uterine oxygen injection. A little bloody oozing for a few minutes follows a withdrawal of the cannula, particularly in cases just before or just after the menstrual period. It is well, therefore, to make the examination about ten days after the menstrual period.

RESULTS OF EXAMINATION

Altogether seventy cases were examined by the method of intra-uterine oxygen inflation; thirty-three without the control of the manometer, and thirty-seven with the manometer. In the first group various quantities of gas were used to establish particularly the minimum amount required to produce an artificial pneumoperitoneum without, however, the annoying symptoms which would destroy the usefulness of the method as a diagnostic aid. Various types of sterility cases were tested. Some were primary sterilities, the marriage dating back from one to twelve years or more and in which no operations were performed either to relieve the condition or for tubal, ovarian or uterine disease. Some of the patients had had one or several curettages for the relief of sterility; some for alleged miscarriages. A few had had one child and became relatively sterile for a number of years. A few cases in which it was definitely known that one or both tubes were ablated on account of pyosalpinx were used as controls to check up the diagnostic value of the method. A few patients had had plastic operations on the cervix for the cure of primary sterility.

INDICATIONS FOR THE APPLICATION OF THE METHOD

The method is indicated:

1. In all cases of primary sterility in which all factors except that of tubal disease may be excluded. Here it has a definite prognostic as well as diagnostic value.
2. In cases of primary sterility in which the patient is known to have passed through a pelvic infection of gonorrheal origin.
3. In cases of primary sterility in which the patient had peritonitis of appendicular origin.
4. In cases of relative sterility in which the patient had a pelvic infection following childbirth or abortion, particularly when induced.
5. In cases of one child, sterility without the definite history of pelvic infection.
6. In cases in which it had been necessary to remove one whole tube and part of another for hydrosalpinx or pyosalpinx (conservative surgery).
7. After unilateral ectopic pregnancy to determine the patency of the residual tube.
8. After cases of salpingostomy for the cure of sterility of tubal origin to demonstrate the success of the operation which was calculated to effect open tubes.
9. After sterilization by tube ligation to test the patency of the tied or severed tubes.
10. After multiple myomectomy to make certain that at least the uterine ostium of the tube has been left intact.

CONTRAINDICATIONS

The method is not to be used in the presence of any acute subacute pelvic infection, nor in the presence of purulent diseased bartholinian glands, urethra, vagina or cervix.

FINDINGS IN SEVENTY CASES IN WHICH EXAMINATION WAS MADE FOR PATENCY OF FALLOPIAN TUBES

First Series: Cases examined without pressure control				33
A. Absolute sterility			25	
(a) Patients previously operated on		8		
Tubes proved patent	5			
Tubes proved nonpatent	3			
(b) Patients not previously operated on		17		
Tubes proved patent	10			
Tubes proved nonpatent	7			
B. Relative sterility			8	
(a) Patients previously operated		4		
Tubes proved patent	1			
Tubes proved nonpatent	3			
(b) Patients not operated on		4		
Tubes proved patent	3			
Tubes proved nonpatent	1			
Second Series: Cases examined with pressure control				37
A. Absolute sterility			10	
(a) Patients previously operated on		8		
Tubes proved patent	2			
Tubes proved nonpatent	6			
(b) Patients not operated on		5		
Tubes proved patent	5			
Tubes proved nonpatent	0			
B. Relative sterility			27	
(a) Patients previously operated on		15		
Tubes proved patent	12			
Tubes proved nonpatent	3			
(b) Patients not operated on		12		
Tubes proved patent	9			
Tubes proved nonpatent	3			

The causes of sterility are too often obscure and undetermined. It appears, however, that at least the mechanical factor of patency should be possible of determination in most cases. The method of intra-uterine oxygen inflation with the production of an artificial pneumoperitoneum obviates the necessity of surgical exploration and is especially serviceable in the obscure cases.

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ABSTRACT OF DISCUSSION

DR. JOHN O. POLAK, Brooklyn: Dr. Rubin suggests a most ingenious method to establish the patency of the tubes. It is, of course, along the same lines as the introduction into the uterus and tubes of argyrol under pressure, and the use of thorium. I have used both these methods and have discarded them, as they gave very little information, except pictorial. I am not convinced that it is a safe procedure to inflate the uterus and tubes under the pressure necessary to introduce

oxygen into the peritoneal cavity by way of the tube and produce pneumoperitoneum. Again, the irritability of different uteri must be considered. In some women simple manipulation of the cervix or the introduction of anything into the cervix will cause most severe uterine reaction and no one has ever told us how to select the individual case. That of itself would prohibit the general use of this method, although it certainly has very many apparent advantages. When sterility exists, we can do a great deal by a proper investigation of the forces that produce sterility. Among 687 sterile women examined, 400 had tubal disease. In many of these cases of one-child sterility, the woman denies infection, yet she has had a parametritis, a pelvic peritonitis and a perisalpingitis. It is only in the straight gonococcal cases, without any mixed infection, that regeneration is possible. In sterility the two chief causes outside of the male, are endocervicitis and the infections involving the tube either from the inside or the outside. We can follow that up very well by the aspiration of the ejaculated semen at different periods after copulation and at different locations, and if we find living spermatozoa in the uterus, it is reasonable to suppose the existence of a tubal or ovarian condition which justifies abdominal section. With such a history it would be safer to do abdominal section than to inflate the tubes or uterus with gas.

DR. ISADOR C. RUBIN, New York: The objections raised by Dr. Polak are not unknown to me. These were the very objections we had, but they were overruled by actual experimentation. About the irritability of the uterus, the vast majority of these patients tolerated the method very well. One very nervous woman could not stand the method on first trial, but she did on second trial. The method is no more of a procedure so far as the tolerance of the patient is concerned than is cystoscopy. The bladder is no more irritable to the introduction of a cystoscope than the uterus is to a sound. Of course, there are cases in which you will not use that method, but even in these cases the method is absolutely safe. Of the safety of the method I am thoroughly convinced. I do not recommend it in cervices pouring out pus, or when there is much fever, nor when there is pelvic infection. There are cases in which it is impossible even to go in for the spermatozoa, because the method is not tolerated by the uterus. As soon as the inflation reaches the point where the pressure overcomes the tight slit in the uterine end of the tube, the pressure drops from 60 or 80 to 40 or 30 or even 20. The amount of pressure required is not so enormous. It is surprising how much the uterus can stand. The cervix acts as a safety valve. I feel that the method has a scope.

Tumor removed from Patient L. N.

Paid Dispensary Service.—The time is coming, and may not be far distant, when hospital staff physicians will receive compensation for their professional services to so-called free patients, not because they have not given their best service in the past, but because the public demands a greater service than doctors are able to give freely and at the same time earn their livelihood. The patient who, by reason of circumstances, is obliged to seek free medical advice is entitled to the best treatment that can be provided, not alone for his own sake, but for the sake of the community, which is thus spared the danger from spread of disease, and from the necessity of caring for dependent individuals.—Lucy C. Catlin, The Hospital as a Social Agent in the Community.

THE USE OF SATURATED SALT SOLUTION INTRAVENOUSLY DURING INTRACRANIAL OPERATIONS

PRELIMINARY REPORT *

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It is a fundamental principle of intracranial surgery that if a dura is under tension above the normal it must never be opened until the pressure has been reduced. Such a condition is encountered in traumatic cases in which there has been contusion and laceration of the brain, and in cases of brain tumor. If the dura is opened in such cases without reducing the pressure, the brain cortex often ruptures and very serious damage may result. The method we have practised for a good many years to reduce this pressure has been to withdraw cerebrospinal fluid. Whenever possible the fluid is removed by ventricle puncture, as removing it from the spinal meninges is a dangerous procedure attended by a considerable mortality in this type of case. In fracture cases the ventricle puncture offers no difficulty, and one is virtually always able to reduce the pressure; but in tumor cases, especially those above the tentorium of the cerebellum, this may be impossible, as the ventricle may be compressed and contain no fluid. Under such circumstances, up to the present time we have been obliged to open the dura while still under tension, and serious trouble has resulted frequently from the protruding brain.

Recently Weed and McKibben described the result of experiments on animals when saturated salt solution (35 per cent.) was injected intravenously; they found that as a result of the dehydration of the tissues the brain shrank in volume. They also observed no untoward effects on their animals. The method seemed to offer a means of reducing cerebral edema, a very common accompaniment of even the most gentle manipulation in the intracranial cavity.

In a recent tumor case (I. N., Surgical No. 8704) presenting marked pressure symptoms, a right sided subtemporal decompression was undertaken. The patient was in no condition to stand an attack on the tumor itself. The dura, on being exposed, was found enormously tense. Puncture into the inferior cornu of the right ventricle resulted in a dry tap. Ventricle

* At the meeting of the American Neurological Association in New York, June 2, Dr. Harvey Cushing presented a paper on experiments in the use of saturated salt solution for reducing brain volume. This paper had been written before that meeting but had not been sent to the publishers.