to make sure no fragment is left behind. The series quoted includes two cases of haemorrhage, in both of which suprapubic cystotomy had to be performed, and in one an extraperitoneal rupture was found to exist. Both these recovered. Here also the suprapubic cases are the worst and cannot be quoted for purposes of comparison.

III.—Cases operated on by Mr. A. K. Dalal, F.R.C.S., also at the Jamsetjee Jeejeebhoy Hospital, from November 29th, 1921, to March 22nd, 1924.

	Cases.	Deaths.
Litholapaxy ...	13	0
Suprapubic lithotomy ...	8	0
Perineal lithotomy ...	1	0

IV.—Cases operated on by Lieut.-Colonel A. J. Vernon Betts, M.B., at the Civil Hospital, Nasik, from November 1st, 1922, to October 31st, 1923.

	Cases.	Deaths.
Litholapaxy ...	58	0
Perineal litholapaxy ...	3	1
Suprapubic lithotomy ...	5	0
Perineal lithotomy ...	0	0

This is taken as a typical civil hospital with a fairly active surgical practice. The series is a small one because these are the only results for which he can personally vouch.

V.—Cases operated on by Lieut.-Colonel A. Hooton, I.M.S., at the Agency Hospital, Rajkot, from December 5th, 1920, to March 23rd, 1923.

	Cases.	Deaths.
Litholapaxy ...	94	2
Perineal litholapaxy ...	5	0
Suprapubic lithotomy ...	15	0
Perineal lithotomy ...	1	1

This also is taken as a typical civil hospital with a fairly active surgical practice.

Perineal lithotomy still has its uses (contrary to the dictum of some of the textbooks), though the occasions are not frequent. Encysted stones, or abscess associated with them, about the neck of the bladder, call for one or other of the perineal operations.

A METHOD OF DETERMINING THE PATENCY OF THE FALLOPIAN TUBES BY X RAYS.

BY

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The investigation of certain cases of sterility involves an examination of the Fallopian tubes in order to ascertain whether they are patent. It was felt that the present

(Figs. 1 and 2). A simple apparatus (made by Allen and Hanburys) was devised for the introduction of bismuth or barium emulsion into the uterine cavity (Fig 3). The point we wish to emphasize is that the emulsion is merely dropped into the uterine cavity and is not forced in under pressure. An anaesthetic is not necessary.

The question how the particles find their way into the tubes naturally arises. The observations that better shadows are obtained if the patient has had an anaesthetic (with the accompanying post-anaesthetic retching and vomiting), and that Bond placed the particles in the vagina and not in the uterus, suggested the possibility of aspiration being the motive power, though the original conception was that the ciliated epithelium swept the particles up. To settle the point certain experiments

FIG. 1.—Shows shadow in uterine cavity and distal portions of tubes and amniotic extremities. (A normal case.)

FIG. 2.—Shows shadows similar to Fig. 1. A normal case, ten hours after barium introduction.

methods of testing this patency are unsatisfactory, in that they are all open to the objection of causing an increased intrauterine and intratubal pressure, in cases in which, from their very nature, it is anticipated that organisms may be lurking in the uterus or the tubes, and that it would therefore be safer to employ some method of investigation which does not depend upon creating a positive intrauterine or intratubal pressure.

A method suggested itself to one of us (E. W.) after reading of Bond's experiment of the recovery, at a laparotomy, of coloured particles from the peritoneal cavity of rabbits, after their previous introduction into the vagina. If particles opaque to x rays be substituted for coloured particles, a radiogram should indicate their passage through the tube. A method was tried in which particles of barium sulphate were insufflated into the cervix uteri, and x-ray photographs were taken twenty-four, forty-eight, and seventy-two hours later. Several cases of normal multiparous women were thus investigated. The photographs did not give a shadow sufficiently dense to be really satisfactory, and at Dr. Russell Reynolds's suggestion an emulsion of barium sulphate was tried, and gave good results, particularly when general anaesthesia was employed

were performed upon animals in which bismuth emulsion was introduced into the vagina alternately with and without ligature of the Fallopian tubes.

These experiments showed that the particles do not find their way up the Fallopian tubes unless there is a free communication between the tube and the peritoneal cavity. This suggests that a purely mechanical factor, such as aspiration, is more likely to be responsible than anything in the nature of ciliary activity. If the tubal ostia are patent, the emulsion travels from the uterus to the tube, and therefore, if the shadow is seen in the tube at all, it indicates patency of that tube. In the course of seventy-two hours the whole of the bismuth or barium has disappeared. In no instance have any after-effects been complained of by the patients.

Another point worthy of mention is that the shadow in the body of the uterus gives a much more accurate estimation of the size of the uterine cavity, in cases of infantile uterus or other maldevelopment, than does bimanual

FIG. 3.—Syringe and cannula.

examination; the latter only reveals the gross size of the uterus, which may be masked by the presence of a fibroid or an unduly thick wall.

We have used the method to determine the patency of a tube after salpingostomy for tubal mole (impossible by the other methods if the opposite tube is patent), and also in a case which proved to be an instance of a double uterus. The value of the method as an aid to diagnosis in other difficult cases is obvious.

We believe also that the demonstration of the passage of particles from the uterine cavity to the fimbriated extremity of the Fallopian tube throws some light on the origin of ascending infections of the genital tract, and perhaps also on that of endometrioma of the ovary and the deposit of fragments of exfoliating endometrium on the pelvic peritoneum and surface of the ovary.

In conclusion, we wish to express our thanks to Dr. Eden and Dr. Cuthbert Lockyer for permission to investigate cases in the hospital.

THE HEART IN CHRONIC TOXAEMIA.

BY

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DURING the examination of patients suffering from infective arthritis and fibrositis, an attempt has been made to estimate the degree of involvement of the heart and arterial system in this form of chronic toxæmia. These types of cases can very frequently be traced to a local focus of infection, which most usually arises in or around the teeth, tonsils, or nasal accessory sinuses, but may later involve the colon, gall bladder, etc. Less frequently the source of infection is in the uro-genital tracts.

This paper is concerned principally with those streptococcal infections associated with cases classified as "rheumatic," or more properly "infective." No attempt has been made to include hearts poisoned—first, by acute diseases such as rheumatic fever, typhoid fever, dysentery, or malaria; secondly, by endogenous means, as, for example, excessive thyroid action or chronic kidney disease; thirdly, by an exogenous poison such as alcohol; or, lastly, by syphilis. Toxins may influence any property of heart muscle, altering its rhythm, excitability, conductivity, contractility, or tonicity. They act chiefly on those tissues which govern rhythm through stimulation of the accelerator nerves, causing sinus tachycardia, and also on the tonicity of the muscle; to a lesser extent they influence the excitability, and to a still smaller the conductivity and contractility. They may directly affect the tissue of the heart by their local action, or organisms in other parts of the body may affect the heart by their toxins. From the fact that they are set free within the body in varying quantities their effect on the heart will also vary in degree from time to time. Apparently in streptococcal infection of low virility extending over many years, the heart does not become profoundly poisoned as in Graves's disease or chronic nephritis, where myocardial degeneration is common.

That the heart has partaken of the general toxæmia may be established by physical examination.

1. *Palpation*.—Estimate first the position of the apex beat. In many cases it is found in the nipple line or outside it. Secondly, note its character. It is often diffused and rather feeble and slapping; if it is the latter, it has to be differentiated from mitral stenosis, where the left ventricle is unfilled, or from myocardial degeneration, where the left ventricle is weak. There is no left ventricular hypertrophy, except when aortic incompetence, increased blood pressure, or chronic Bright's disease exists as a complication.

2. *Percussion*.—By careful percussion the left border of the heart can be found to have moved outwards, measuring more than $3\frac{1}{2}$ in. from the mid-sternal line. Increase in transverse diameter may therefore amount to $1\frac{1}{2}$ in. to 2 in., denoting myocardial weakness. The poisoned muscle fibres having lost their tonicity, there is an increase of pressure from a larger flow of blood into the heart during diastole, and an incomplete emptying is the result; in this way dilatation of the left ventricle takes place.

3. *Auscultation*.—Particular attention is to be paid—

(a) To the character of the first sound at the apex. It may be muffled and distant, or it may be short and sharp, or actually it

may be loud. If it is short and sharp, it must be remembered that the muscle may be inflamed, fatigued, or degenerated.

(b) To the absence or presence of a murmur. In the early stages no murmur is audible; later, when dilatation takes place, a mitral systolic murmur can be heard—that is, a murmur of relative incompetence, due to stretching of the circular muscular fibres around the auriculo-ventricular valves. This murmur is soft, diminuendo in character, and is not conducted beyond the mid-axillary line. It is louder after inspiration and on lying down, disappearing on full expiration, cessation of respiration, and with exercise.

The toxic heart is a large heart with relative increase in the oblique diameter, and its long axis is horizontal. It is soft and atonic, with the transverse diameter measuring more when lying than standing. On examination by x rays it is seen to move up and down in the manner of a concertina, and its size, determined by percussion, can be verified. It is a heart of low efficiency. On standing up after resting, the normal difference of rate of 7 to 15 beats a minute is markedly increased. On exercise, the heart unduly accelerates, and returns slowly to normal; often several minutes elapse before it has regained its original rate; this should be accomplished in two minutes. During exercise the blood pressure sometimes fails to rise with the pulse rate, or even may actually fall.

SYMPTOMS.

Certain general symptoms which are associated with any form of toxæmia may be present—for example, loss of weight and of the feeling of well-being. The skin is often yellow, and may present a papular rash. There is often some mental depression and irritability of temper. Vasomotor and nervous instability is prominent, and hence tremulousness, precordial pain, palpitation, breathlessness, giddiness, exhaustion, faintness, cold feet and hands, numbness, local sweating and flushing, dermatographism, or myotonic irritability may appear. Morning anorexia, nausea associated with gastro-intestinal disturbance (for example, offensive stools and flatulence), intestinal stasis and chronic constipation, headache and derangement of the endocrine glands, and sleeplessness are sometimes present. Night symptoms are frequent.

Taking particularly those symptoms most often present the commonest are:

1. *Palpitation*.—Tachycardia often makes its appearance at an early stage of the infection, and its severity bears some relation to the degree of toxæmia. An increase of 10 to 50 beats a minute represents the usual extent of the heart's acceleration. Quite frequently the symptom passes unnoticed by the patient. It is a sinus tachycardia.

2. *Breathlessness* on even slight exertion, such as going upstairs or climbing a moderate incline, is a common complaint.

3. *Exhaustion* is a troublesome symptom which causes patients more discomfort than increased effort.

4. *Precordial Pain*.—Pain is referred to an area situated usually below the left nipple, and is commonest in women. It must be looked upon as a vasomotor neurosis, or secondary angina caused by the circulation of toxins which increase the excitability of the nervous system and sensitivity of the reflex arc, so that mild stimuli are sufficient to produce an exaggerated impression. The pain is more usual when the patient is resting and in the evening. The attack may be precipitated by emotion or other reflex cause. Hyperalgesic areas of skin and referred pain follow the usual paths as in primary angina.

The Condition of the Arterial System.—Although admittedly in many cases systolic blood pressure is found considerably raised, yet more frequently sphygmomanometric readings are distinctly lower than normal. In 43 cases observed the following were the results:

Systolic Blood Pressure.				Cases.				Cases.			
				Cases.							
Between 180 and 190	...	1		Between 130 and 140	...	9		Between 120 and 130	...	10	
" 170 " 180	...	4		" 120 " 130	...	10		" 110 " 120	...	8	
" 160 " 170	...	4		" 110 " 120	...	8		" 100 " 110	...	6	
" 150 " 160	...	0									
" 140 " 150	...	1									

William Russell has drawn attention to the fact that, irrespective of the pulse wave, arteries contract and relax, due to the fibres of the muscular coat being placed transversely. This variation in size indicates the degree of hypermyotonia and hypomyotonia, and is determined by