

On Pelvic Inflammations in the Female.

Being the Ingleby Lectures for 1907, delivered at the University of Birmingham, May 9th and 16th.

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LECTURE I.

Introductory.

THE Ingleby Lectures were established in connexion with Queen's College, Birmingham, in the year 1876, and were intended to promote "the advancement of Obstetric Medicine and Surgery including Diseases of Women and Children, being a branch of Medical Science in which Dr. John Tomlinson Ingleby acquired considerable reputation."

Dr. Ingleby practised in Birmingham from the year 1816 until his death at the end of January, 1845. The writer of an eloquent and appreciative obituary notice tells us that death resulted from pneumonia, for which it is interesting, as showing the difference between the treatment of inflammations then and now, to note that blood was taken to the amount of a pint from the arm, leeches were applied to the head, followed by a blister and a cathartic of colocynth, and small doses of calomel at short intervals. Two days after the acute onset of the pneumonia the patient was seized with intense headache, for which affusions of cold water were used, followed by leeches to the side of the head, and other remedies; delirium followed, and the patient died on the 5th day from the onset of the pneumonia. Post mortem examination disclosed pleurisy on the right side and meningitis. The writer in his summary states that "from the beginning to the end the case was clearly one of metastatic gout, altering its features with the several organs it visited, but uniformly distinguishing itself by the characteristics of specific inflammation." In the light of present day knowledge it is probable that the cause of death was a terminal infection by the pneumococcus.

Dr. Ingleby completed his 50th year shortly before his death, "a victim to the undue devotion to study and to the duties of his immense practice."

He was the first specialist in Obstetric Medicine in Birmingham.

and lectured on Midwifery when the Medical School was first formed in this City in 1828. He was one of the original members of the still flourishing Medical Benevolent Society, and it is good evidence of the esteem in which he was held by his professional brethren that, as I am informed by Mr. Haslam, he was appointed President of the Society in 1836. As an author on Obstetric subjects Dr. Ingleby was without a provincial rival, and his writings, as Dr. Cullingworth has remarked, were evidently the outcome of close personal observation and of sound judgement, and appear to have fairly reflected the best opinions and the best practice of the time. Among several papers by Dr. Ingleby published in the *Edinburgh Medical and Surgical Journal*, is one in relation to the subject of these lectures in Volume 49 for 1838, in which he relates several epidemics of puerperal fever which occurred in Birmingham in the years 1828, 1833, and later. In this paper the author insists upon the great contagiousness of the affection, and recognizes the fact that erysipelas and puerperal fever may be due to the same morbid poison. He refers to the then recent researches of Dr. Robert Lee on the morbid anatomy of puerperal fever.

At that time scientific knowledge of pelvic inflammations was rudimentary, and it was not until the second half of the century that a deeper insight began to be obtained into the nature of inflammations in general and those of the uterine appendages in particular. After Dr. Lee's researches, the next important work appears to have been that of Bernutz and Goupil, who, in 1857, first made known to the profession that gonorrhœa frequently gives rise to severe inflammations of the uterine appendages and pelvic peritoneum. In 1872, Noeggerath, in an epoch-making paper, emphasized with some pardonable exaggeration the widespread and disastrous effects produced by gonorrhœa on the female pelvic organs. In 1879 the gonococcus was discovered by Neisser. About this time the development of modern surgery began to pave the way for a fuller knowledge of these affections, and among the earliest workers in this field the name of our late fellow townsman, Lawson Tait, stands conspicuous. In the early eighties Tait, on many occasions, brought before the Pathological and Obstetrical Societies papers on, and specimens of, pyosalpinx removed by operation from patients in whom they had been the cause of grave persistent illnesses.

Like all other leaders of men, Lawson Tait not merely drew to himself a large following of disciples and believers, but excited among the more conservative members of the profession a determined opposition. He was not long in gaining support from the patho-

logical side. In 1884 Dr. J. K. Fowler read a paper before the Medical Society of London in which he related 15 cases of diseases of the uterine appendages occurring in the post mortem room at the Middlesex Hospital in the preceding 3 years. In at least seven of the cases death had resulted from the condition, in several of them from ruptured pyosalpinx; while testimony to the severe and long continued exhausting illness which may result from pyosalpinx is found in the fact that two of the patients died with amyloid disease of the viscera. Three years later, Lewers at the Obstetrical Society related his observations on 100 post mortem examinations of female patients at the London Hospital; he had found pyosalpinx in 5 of the cases, hæmatosalpinx in 4, and hydrosalpinx alone or combined with pyo- or hæmatosalpinx in 8. A few years later, in 1892, Cullingworth read a paper at the same Society on the value of abdominal section in certain cases of pelvic peritonitis, based on a personal experience of 50 cases; and since this time it has been universally recognized by the profession in this country that surgical treatment is not only justifiable, but of the greatest value in certain inflammations of the uterine appendages.

Formerly pelvic inflammation could only be studied at the bedside and in the post mortem room. Now, abundant material is provided by the numerous operations performed for these affections, and frequent opportunities are afforded for comparing the results of clinical examination with the actual conditions present in the diseased organs. In the investigation the aid of the microscope, of chemistry, and of bacteriology is invoked, and in the last few years a further great impetus has been given to the research by the development of bio-chemical methods. At the present time a case of pelvic inflammation demands not merely the use of all the time honoured methods of clinical examination, subjective and objective, but calls for the employment by specially skilled observers of chemical and bacteriological methods of determining the characters of the blood, of the discharges, and of fluids and tissues which may be removed either during the life or after the death of the patient.

At a large General Hospital, such as the one to which I have the honour to be attached, abundant opportunities are presented of studying pelvic inflammations in the female in all stages and degrees of severity. Among the out-patients in the special department for diseases of women are seen the slighter cases that are amenable to simpler methods of treatment. Here one patient in every eight is affected by inflammation of the pelvic peritoneum or cellular tissue or of the uterine appendages.

In a consecutive series of 8,714 special cases of diseases of women seen by me, 1092=12·5 per cent., applied for treatment for these affections. The diagnosis of the various conditions observed was as follows:—

Acute pelvic cellulitis	70
Subacute or chronic pelvic cellulitis	43
Acute inflammations complicating pregnancy...	4
Acute pelvic peritonitis	258
Suppurative pelvic peritonitis	4
Tuberculous pelvic peritonitis	27
Chronic pelvic peritonitis	131
Salpingitis	86
Salpingo-oöphoritis	217
Oöphoritis	223
Adherent retroversion of the uterus	29
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	1092

These headings represent merely working clinical diagnoses, and as in the great majority of the patients recovery, partial or complete, has taken place without the opportunity of actually inspecting the affected organs, it has not seemed necessary or even useful further to analyse the cases upon this occasion.

In the post mortem room we are able to see the end result of the affections in the worst cases, and for this purpose I have examined the records of 1487 consecutive autopsies on females that have been made in the Birmingham General Hospital from 1891 until the middle of the year 1906. The notes vary much in value according to the attention paid to the pelvic organs by the pathologist for the time being, but abundant evidence is afforded of the frequency and gravity of the affections we are considering. Secondary affections of the Fallopian tubes of merely pathological interest are frequently observed, as in cases of perforative peritonitis from various causes, where the resulting exudation invades the open fimbriated extremities; in patients dying from tuberculous affections, in whom the tubes and pelvic peritoneum are frequently involved; and in women dying of cardiac diseases, in whom catarrhal salpingitis is common. Cases in which death is directly brought about by diseases arising in the generative organs are also common enough. The affections may be fatal in the acute stage from septicæmia, pyæmia, or peritonitis; or in the later stages from rupture or perforation and peritonitis, or from intestinal obstruction. The most frequent cause of death in the earlier stages

is puerperal infection, and in the present series are included 22 such cases. One patient died from thrombosis of the inferior vena cava arising from a pelvic peritonitis. In four patients acute gonorrhœal peritonitis, and in one gonorrhœal pyæmia, caused death. The fatal issue may result after a long period had elapsed, sometimes many years after the originating infection. Thus fatal peritonitis was caused by rupture of a pyosalpinx in seven instances, and of an ovarian abscess in two; while saprophytic infection of an old tuberculous pyosalpinx led to the death of another patient. In 17 cases intestinal obstruction was set up by bands having one end attached to the uterus or its appendages; in 5 of these there had been previous operations on the pelvic organs, in the other twelve none. In 2 cases it is noted that hydronephrosis had arisen from pressure on the ureters by pyosalpinx. One of these cases was of peculiar interest; it occurred in a rickety child of $2\frac{1}{2}$ years, who died of gonococcal peritonitis; the tubes contained thin pus and the pathologist observes that "it is evidently their pressure that has caused narrowing of the ureters and hydronephrosis." The pus in the tubes contained diplococci, mostly intra-cellular, not taking Gram's stain. Seven patients died from infection by the pneumococcus, and in six of them it is distinctly stated that the uterus and appendages were healthy; three, however, had been recently delivered, so that it would appear that the puerperal state in some way predisposes to infection by the pneumococcus, but that the invasion does not take place by way of the pelvic organs.

In this account of post mortem observations on pelvic inflammations in the female I have purposely omitted any reference to the examinations made upon patients dying after gynæcological operations. The cases of intestinal obstruction and of ruptured pyosalpinx referred to came to my surgical colleagues in the ordinary course of emergency operations, and the information gained from autopsies on my own patients have been used in the analysis of in-patient cases.

The most acute and severe cases of pelvic inflammation that apply for help are admitted for in-patient treatment, in most instances by operation. In a certain proportion, after further observation, operative treatment is not considered necessary or is rejected. For the present purpose 38 such cases are not considered, because conclusions to be of service should, in my opinion, be based not merely upon clinical observation of patients, but also upon a careful investigation at operation or post mortem examination of the diseased organs.

For the purpose of these lectures I have analysed the notes of every case of inflammation of the uterine appendages and of the pelvic peri-

toneum and cellular tissue that has come under my care for operation in the in-patient department of the General Hospital up to the end of 1906; in most of the cases the necessary surgical treatment has been carried out by myself, but in a certain number the operations have been performed by my colleague, Mr. Hewetson, and by the Resident Surgical Officers. All my private operations until the same date have been included in the analysis. The total number of cases is 307, in which are included 6 of puerperal pyæmia and 41 of suppuration of the pelvic cellular tissue.

PELVIC CELLULITIC ABSCESS.

Of the cases of extraperitoneal abscess one which had existed since the previous labour and had opened into the vagina was complicated by pregnancy; in another patient a small abscess formed between the layers of the outer part of the broad ligament after an abortion; and in a third persistent suppuration of the connective tissue surrounding the supra-vaginal cervix followed upon an operation for removal of the appendages performed elsewhere. All the other cases were puerperal, and with two exceptions were operated upon within three months of labour. In one patient who was very ill with a third attack of acute lateral cellulitis, 5 years had elapsed since the last labour, with which the history clearly connected the abscess. The other exception occurred in a patient $2\frac{1}{2}$ years after the last labour; there was no leucocytosis; through a sub-peritoneal incision curdy matter in which was a calcareous nodule was evacuated; the pus contained small diplococci growing feebly on agar, and staining by Gram's method, but no tubercle bacilli could be found; 2 months after the operation there was still a mass behind the uterus, probably caused by a pyosalpinx. The situation of the abscess in these extraperitoneal cases was in the lateral connective tissue in 31, in the connective tissue behind the uterus in 8, and between the layers of the broad ligament in 2, both verified by abdominal section. In 5 of the cases an exploratory laparotomy was performed, and in every instance disclosed adhesions of the appendages on the side affected, varying from a few loose membranes to dense brawny induration.

INTRAPERITONEAL ABSCESS.

Among the remaining 260 cases of pelvic inflammation there were 41 cases of intraperitoneal suppuration, of which 12, associated with pyosalpinx, will be considered in that connexion. Of 12 other cases in which a posterior vaginal incision was made, in 6 the appendages were made out to be adherent and enlarged; in the other 6 the appen-

dages could not be definitely recognized. 17 cases treated by abdominal incision and drainage included one where the uterus had been perforated in curetting for an incomplete abortion, and 4 in which the origin of the pus could not be made out with certainty. In a 6th patient the whole pelvis was filled by a dense, hard, inflammatory mass, containing small disseminated collections of pus, and the relations to the organs could not be made out. The other cases occurred in parous patients, and had probably originated in the appendages. Of the whole number of 41 intra-peritoneal abscesses 18 certainly, and 11 others with great probability had originated in affections of the uterus or of its adnexa. Of the remaining 12, suppuration had been caused by infected ligatures or infection at a previous operation in 5, and in several the pathological relations were obscure.

Excluding puerperal pyæmia and cellulitic abscess, and subtracting 12 cases of pelvic abscess, some of them of doubtful origin, it appears that of 260 cases of pelvic inflammation in the female treated by operation, 248 originated in the uterine appendages. Of these 151 were for suppurative conditions, and 97 for catarrhal or non-suppurative; the affections may be classified as follows:—

Catarrhal salpingitis and oöphoritis	...	...	...	60
Ovarian hæmatoma	...	...	...	11
Hydrosalpinx	...	...	...	26
Pyosalpinx	...	...	...	80
Pyosalpinx with ovarian abscess...	...	...	...	17
Pyosalpinx with pelvic abscess	...	...	...	12
Ovarian abscess without pyosalpinx	...	...	...	14
Pelvic abscess originating in the uterine appendages	17
Tuberculous appendages	11

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PATHOLOGY.

Inflammation is the name given to the reaction of the tissues to the irritant effect of an injury, mechanical, thermal, chemical or bacterial. In the pelvic organs inflammation is occasionally seen as the effect of mechanical or chemical irritants. Hæmorrhage into the peritoneum from tubal gestation sets up a surrounding and limiting adhesive peritonitis without the aid of micro-organisms; and a similar non-spreading simple peritonitis arises for instance in twisting of the pedicle of an ovarian tumour, or of a pedunculated uterine fibroid. Certain cases of so-called catarrhal inflammation of the tubes as of other organs are put down to supposititious causes which

merely serve as a cloak for ignorance; most of them probably depend on the action of germs, the mildness of the resulting changes being explained either by attenuation of the organisms or relative immunity on the part of the host. At any rate the so-called catarrhal cases shade imperceptibly into the purulent group, and it may be stated with confidence that severe and especially spreading inflammation depends upon bacterial causes. The tendency is constantly to trace more and more cases of all kinds of inflammation of the uterine adnexa as of other organs in the body to the action, recent or remote in time, of living germs. In recent cases living organisms can always be demonstrated by suitable methods, but after a certain time the germs tend to die; after they are dead their bodies disappear, so that pus which has existed for some months is frequently sterile both in films and cultures.

It is necessary to distinguish between the time of implantation of pathogenic germs in the genital canal and that of their further spread either higher up the canal or into the tissues; a considerable period, amounting often to years, may intervene between these two occurrences.

By far the most common opportunities for the introduction of virulent organisms are afforded by parturition and sexual intercourse. Much less frequently in these days of aseptic surgery infection takes place directly as the result of operations or examinations, carried out by dirty fingers or instruments. All these opportunities of infection occur practically without exception in women in the full vigour of adult life. In infants and young children the usual mode of infection by germs is direct inoculation by means of towels and clothes that have been defiled by specific discharges from other persons.

Among the conditions that favour the upward spread of organisms already present or just implanted in the lower genital tract are parturition and abortion, menstruation, and injuries produced by rough examination or by operations such as forcible reduction of an adherent retroversion or curetting in the presence of a chronic salpingitis or peritonitis. The acute exanthemata also play a part, and it is probable that some cases of chronic pelvic inflammation in virgin adults may have originated in an attack of scarlet fever or measles in childhood. Puberty and the climacteric also appear to have some influence. At the former epoch tuberculous affections of the generative organs not uncommonly begin, and at the latter inflammatory conditions of these organs that may have been dormant for years are apt to take on renewed activity.

The micro-organisms that have been proved to act as causes of pelvic inflammation are of many varieties. Chief among them are the streptococcus pyogenes, the gonococcus and the tubercle bacillus. Among others the staphylococcus pyogenes aureus and albus and the bacterium coli commune are fairly common, while the pneumococcus and the bacillus aërogenes capsulatus are also sometimes seen. Micro-organisms spread into the interior of the body along different avenues varying to a large extent with their functional vital characteristics. Two main types may be distinguished, illustrated best by the streptococcus pyogenes and the gonococcus. The latter has occasionally been found penetrating deeply into the tissues, but its usual mode of spreading is by continuity along the surface of the mucous membranes, that is to say it spreads upwards through the uterus, along the Fallopian tubes and so to the peritoneum. The streptococcus pyogenes, though it appears occasionally to spread in the same way, far more frequently invades the tissues, penetrating into the tissue spaces and finding its way along the lymphatic or blood vessels. In many cases it extends through the thickness of the uterine wall into the close and abundant plexus of lymphatics that lies immediately under the peritoneum and, penetrating the peritoneum, sets up a peritonitis, very frequently diffuse and spreading. In other cases the streptococcus, extending outwards through the uterine wall, gains the ovarian or uterine plexus of lymphatics and gives origin to a lymphangitis. By this route inflammation may spread along the lymphatics into the hilum of the ovary, and set up oöphoritis, without a complicating salpingitis. In other cases, usually less rapid and certain in their course, the streptococcus invades the large veins which, plugged with blood clot, are present in considerable numbers at the placental site. Thence thrombosis extends, either remaining limited to the veins in the uterine wall or extending into the ovarian or uterine veins between the layers of the broad ligaments. Portions of the resulting blood clot may be carried to the lungs and other organs or tissues of the body, giving rise to pyæmia.

When the streptococcus spreads along the lymphatics or the veins the neighbouring cellular tissue participates more or less widely in the resulting inflammation. Thus the organisms may give rise to a peritonitis or cellulitis; but neither affection is as a rule pure, peritonitis being always accompanied with inflammation in the sub-peritoneal connective tissue, and cellulitis, as I have had occasion to observe in 5 exploratory laparotomies, being practically

always accompanied with more or less exudation or adhesion in the over-lying peritoneum.

When the body is infected by germs, barriers of different kinds are set up locally to arrest the spread of infection. Among the earliest changes observed in inflammation is the effusion of lymph, giving rise in the solid tissues to a soft, boggy swelling known as inflammatory œdema. Soon the lymph coagulates, the serum draining away in large quantities through the lymphatics or in some cases of peritonitis being collected in loculi, while a solid fibrinous network is deposited in the tissues or on the surface of the peritoneum giving rise to brawny hardness. This exudation of sero-fibrinous material forms the first line of defence. At the same time as it is forming in many, but not in all cases of infection, phagocytes hurry in crowds to the field of danger, where they enter into active warfare with the invading germs. As the fight goes on a third barrier is erected by the formation of a layer of granulation tissue, either on the invaded surface or around collections of dead leucocytes, necrotic tissue, and weakened or dead micro-organisms that result from the conflict. At the same time as these changes are proceeding at the seat of invasion, all the tissues and functions of the body become profoundly disturbed as a result of absorption into the circulation of poisons from the living organisms or from their dead bodies and of the response made by the blood and tissues in the formation of anti-bodies of many kinds. The blood is altered, leucocytes being increased in number and red corpuscles diminished and deteriorated. The temperature of the body is usually raised, but in the worst cases becomes sub-normal and remains so until death ensues. The circulatory, nervous, respiratory, gastro-intestinal, hepatic, and all the other functions of the body partake in the widespread disturbance.

The host may succumb or may be able at any point to put an end to further invasion. In the worst forms of puerperal infection death may result in 24 to 48 hours; in such a case no inflammatory action may be observed; the walls of the uterus at the seat of invasion contain large numbers of germs, usually streptococci; and a few ounces of serum, usually blood stained, are present in the peritoneal cavity and teem with the germs. In mild cases a moderate amount of sero-fibrinous exudation with few leucocytes may suffice to put an end to the invasion; or there may be a considerable fibrinous or fibrino-purulent effusion, as happens more especially in pneumococcal, gonococcal and tuberculous infections. In other cases pus forms, often in large quantities, and may drain away from the producing surface or may be retained in irregular collections in the tissues or

in hollow organs. In still other cases, especially in infections by the bacterium coli or by certain varieties of saprophytic germs, considerable destruction of the tissues takes place, giving rise to sloughs or gangrene, and to the formation, in the organs, in the peritoneal cavity or in the cellular tissue, of collections of stinking, discoloured bloodstained putridity.

When the fight is over, the injuries remain to be repaired, and the débris to be removed from the field of battle. The repair and removal may be complete, but are often incomplete, or take months or years for their accomplishment. Repair takes place by means of newly formed fibrous tissue and epithelium. Serous exudations are usually absorbed but, under certain circumstances, may remain for many years or gradually increase, as in the case of hydrosalpinx and of certain ovarian cysts resulting from perioöphoritis. Fibrinous deposits become absorbed and are replaced by fibrous adhesions, which, in connection with the more movable abdominal organs, often become absorbed to a remarkable extent; in the neighbourhood of the less movable uterus and appendages absorption appears to be less notable. Small collections of dead leucocytes and fibrin in the tissues undergo fatty degeneration and become absorbed. A larger collection of pus may continue to act as an irritant and keep up surrounding inflammation until it reaches a surface and makes its escape. Or such a collection may remain quiet sometimes for many years; in this case the locality of the pus is always a place of lowered resistance, and it is liable on slight causes—such as the result of cold, of a blow, of a fall, or of over exertion—to break out into renewed activity. In other cases a collection of old pus gives rise to a condition of general ill health, presumably by the long continued absorption of small doses of toxin.

BACTERIOLOGY.

In twelve recent puerperal infections, micro-organisms were found in every case, the streptococcus being present in ten, in four in pure culture, and in the other six in association with staphylococcus pyogenes aureus and other varieties of germs. In 43 cases of subacute and chronic suppurative pelvic inflammation no germs were present on films or culture in 10. Streptococcus grew in pure culture in 10, and in association with other germs in 5. In 13 cases various forms of saprophytes were found, and in the remaining cases staphylococcus aureus and albus, pneumococcus and bacterium coli commune were observed.

Bacteriology of Recent Puerperal Infections.

Streptococci	...	...	...	...	4
Streptococci with staphylococcus aureus	...	...	...	...	2
Streptococci with other forms	...	...	...	...	4
Small stout bacilli	...	...	...	...	1
Saprophytes	...	...	...	...	1
					<hr/>
					12

Bacteriology of Cases of Subacute and Chronic Suppurative Pelvic Inflammation.

Sterile	...	...	...	...	...	10
Streptococci in pure culture	...	...	...	...	...	10
Streptococci with other germs	...	...	...	...	...	5
Staphylococcus aureus	...	...	...	...	...	2
Staphylococcus albus	...	...	...	...	...	1
Staphylococcus with pneumococcus	...	...	...	...	...	1
Bacterium coli	...	...	...	...	...	1
Various forms of saprophytes	...	...	...	...	...	13
						<hr/>
						43

INCIDENCE.

The age of the patients varied from 17 to 54. Only 7 were 20 or less; and of them 3 had tuberculous appendages, 2 had inflammations originating in childbed and one in gonorrhœa, while in the seventh case a fetid intra-peritoneal abscess of considerable extent and obscure origin suddenly made its appearance and rapidly increased in a girl of 18; rapid recovery followed upon a posterior vaginal incision, and the diagnosis therefore remained "pelvic abscess" simply. Eleven of the patients were 46 and upwards, and of these 5 were fifty or more; in each of the 5 a suppurative condition had probably existed for from 11 to 31 years and had then given rise to acute symptoms demanding operation. All the other 242 patients, more than 93 per cent., were between 21 and 45, that is to say at the age when they should have been at their best as active and useful members of society.

Among the 260 cases were 29 single and nulliparous patients. Such patients suffer from tuberculous affections with much greater relative frequency than parous women; of 13 patients with tuberculous affections, including one of hydrosalpinx and one with tuberculous suppurating ovary, 9 were single and 2 others sterile. Among the patients suffering from ovarian hæmatoma single and sterile women

also formed the great majority; of 11 such patients 4 were single and 5 married but nulliparous women. In the other groups of cases single women are relatively much less frequently found. Of 109 cases of pyosalpinx only 8 occurred in single women; of the 8, 4 were probably gonorrhœal and 2 were due to secondary infection by saprophytes of old tuberculous appendages; the origin of the pyosalpinx in the other two was obscure. Of 29 patients with intra-peritoneal pelvic abscess 5 were single and nulliparous; in one of these the abscess was due to suppuration around silk ligatures after a laparotomy performed elsewhere, one was due to suppuration of a hæmatocele two years after supra-vaginal hysterectomy had been performed elsewhere, and the cause of the other 3 was not satisfactorily made out. 21 out of 97 patients suffering from non-suppurative inflammations, and 34 out of 163 from suppurative conditions were sterile married women. Satisfactory clinical evidence of gonorrhœa was obtained in 48 cases. In 2 of the non-suppurative cases and 7 pyosalpinx cases the patients were syphilitic.

	Single.	Sterile.	Pluriparous. Last Pregn. Abortion.	Term.	Total
Salpingitis	3*	7	7	25	42
Oöphoritis and small cysts	0	3	5	10	18
Ovarian hæmatoma ...	4	5	—	2	11
Hydrosalpinx	1	6	7	12	26†
(Tuberculous.)					
Total...	8	21	19	49	97
Pyosalpinx, 17 with sup- purating ovary, 12 with pelvic abscess...	8	26	15	60	109
Suppurating ovary with- out pyosalpinx	1	1	0	12	14
(Tuberculous.)					
Pelvic abscess	5	5	6	13	29
Tuberculous appen- dages	7	2	—	2	11
Total...	21	34	21	87	163

CLASSIFICATION.

The most desirable classification of pelvic inflammations would be according to the germ which is present. In very many cases however it is not possible to make certain of the causative germ, more especially in the chronic cases, in which the microbes have died out, and left no distinctive trace of their action, as in many cases of puerperal and

* One after Pelvic Abscess.

† Including 3 in which operation was undertaken for other conditions.

gonorrhœal salpingitis. Moreover the same germ may give rise in different patients, or (in combination) in the same patient, to every degree of inflammation, serous, fibrinous, or purulent. From the clinical point of view it is customary and convenient to divide the cases into catarrhal or non-suppurative and suppurative, the latter including all cases where an amount of pus has been formed sufficient for detection by the unaided sight. In the catarrhal group are included many cases that really depend on invasion by known pathogenic organisms. This statement is based on the fact that the two groups shade imperceptibly into each other; on a comparison of the appendages in many so-called catarrhal cases with those of the less affected side in cases of suppuration; and on a consideration of the infinite variety in degree and extent of inflammation known to be caused by the same germ.

NON-SUPPURATIVE CONDITIONS.

The non-suppurative group includes hydrosalpinx and a heterogeneous and not entirely satisfactory collection of cases of catarrhal salpingo-oöphoritis. Among the catarrhal cases in my list are 42 in which salpingitis was the leading feature. The tubes presented all degrees of alteration; in some there were congestion and œdema of all the coats, usually with a small amount of accompanying pelvic peritonitis. In others great thickening and induration of the muscular and peritoneal coats with marked peritonitic changes; in others again there were universal adhesions to the surrounding structures with or without closure of the peritoneal ostium, but without distension of the lumen; and finally in two cases the process had resulted in atrophy, the tube and ovary forming a small densely adherent puckered mass, with shrunken broad ligament. The affection was bilateral in about two thirds of the cases. Catarrhal salpingitis appears to favour the occurrence of tubal gestation, in many cases of which more or less extensive old fibrous adhesions are observed about the pelvic peritoneum and appendages of the pregnant or opposite side; in a considerable proportion of the cases the tube on the opposite side to the pregnancy is converted into a hydrosalpinx.

A second group included 18 cases in which various changes in the ovary were the salient features.

Corpus luteum cysts	6
Graafian cysts	3
Small cystic ovaries	4
Widespread adhesions of ovaries ...	5

In this group the affection was bilateral in 4 and unilateral in 14. The Fallopian tubes showed evidence of catarrh in a few, and were adherent in several other cases. In 2 of the cases of cystic ovary there were no adhesions near the fimbriated extremity, but firm old membranes bound the middle of the tube to the ovary and back of the broad ligament. In one of these the patient was just recovering from an attack of acute pelvic peritonitis, the 5th that had occurred in $3\frac{1}{2}$ years, and in the other, chronic illness and neurasthenia had existed for 3 years, the illness in both patients dating from the last labour.

The frequent co-existence of small graafian and corpus luteum cysts with adhesions and other signs of old inflammation of the Fallopian tubes and pelvic peritoneum, suggests a causal connection between the two conditions, so that it seems preferable to include many of these small cysts with inflammations of the appendages, rather than with neoplastic formations.

The Fallopian tube may become closed at its fimbriated extremity either as a consequence of salpingitis, the inflammatory swelling of the muscular and peritoneal coats extending over and invaginating the fimbriæ; or as a consequence of pelvic peritonitis, the fimbriæ becoming plastered down on to the ovary or other neighbouring surface. It is frequently impossible to decide by which of these methods a particular tube has become closed. In 73 instances where this was possible, salpingitis had been the cause of the occlusion in 41, and peritonitis in 32. The two tubes of the same patient are not unfrequently closed by different methods, one by salpingitis and the other by peritonitis. When the peritoneal ostium has become closed, a tube may remain empty or may become the seat of a collection of fluids of different kinds, serum, pus, or blood.

HYDROSALPINX.

An occluded tube containing serous or watery fluid in greater amount than a drachm or two is called a hydrosalpinx. The amount of fluid varies from a few drachms to two or three pints, and the shape of the resulting tumour varies according to the amount of distension, being usually club or retort shaped in small and moderate sized cases, and banana shaped or globular in the larger ones. The fluid contained in the smaller varieties is serous; in the larger it becomes thinner and more watery. No germs are present in film or culture. In some cases there are few or no adhesions, but as a rule firm fibrous adhesions about the original site of the peritoneal ostium bind this part of the sac firmly to the surface of the ovary, the back of the broad ligament, and the side and floor of the pelvis. Hydro-

salpinx appears in its origin to be a result of catarrhal salpingitis and pelvic peritonitis, but when of long duration it acquires the characters of a retention cyst. In 5 cases of double hydrosalpinx in which the fluid amounted to 8 or 10 fluid ounces or more, the time taken in the accumulation had extended over many years, one, containing 3 pints of fluid, having probably existed for 18 years. A large proportion of my cases of hydrosalpinx was found during operations undertaken for other conditions. In tubal pregnancy the tube on the opposite side is often converted into a hydrosalpinx (9 in 62 cases); hydrosalpinx was present in association with uterine fibroids (6 cases), with large fibroma of the ovary, and in a few cases with large ovarian cysts; it was also found with prolapse of the uterus in 2 cases, and with pyosalpinx on the opposite side (5 out of 109). Certain accidents are occasionally observed in connection with hydrosalpinx. Axial rotation has occurred many times, and hæmorrhage into the contained fluid is not uncommon, especially in connexion with tubal pregnancy on the opposite side. As a rare occurrence the fluid escapes through the uterus in gushes from time to time—intermittent hydrosalpinx.

PYOSALPINX.

Pyosalpinx is the name given to a Fallopian tube closed at its peritoneal opening and containing pus. The condition usually arises as a consequence of inflammation spreading from the uterus directly into the tube, but may arise in peritonitis by extension of inflammation through the peritoneal ostium, as is frequently observed in tuberculous, and sometimes in puerperal, cases. Occasionally pyosalpinx on one side co-exists with hydrosalpinx on the other. A pyosalpinx usually forms an extensively adherent thick walled hard tumour, but occasionally (8 cases in 109) is less adherent, and contains a large collection of pus in a relatively thin walled cavity, thus to some extent resembling hydrosalpinx. The amount of adhesion varies greatly in different cases, but the omentum and some coils of small and large intestine are usually involved, in addition to the denser and more extensive adhesions to the ovary, the back of the broad ligament, the uterus, and the floor of the pelvis. Among my cases, pyosalpinx was bilateral in 55 and unilateral with normal appendages on the opposite side in only 18.

Bilateral in	55
With hydrosalpinx on opposite side.	5
With salpingitis on opposite side ...	20
Opposite appendages not noted ...	11
Opposite appendages normal ...	18

Pyosalpinx is frequently complicated by ovarian abscess (17 in 109) and somewhat less frequently by collections of free pus in the peritoneal cavity (12 in 109). The contained pus is found to be sterile in a large proportion, usually more than half the cases. In 13 of those included in my list the pus was sterile in 4, saprophytes or bacterium coli were present in 5, streptococcus, staphylococcus, pneumococcus, and the gonococcus was present in one each.

Bacteriology of Pyosalpinx.

Sterile	...	...	...	...	4
Streptococcus	...	...	...	...	1
Staphylococcus albus	...	...	...	...	1
Staphylococcus and pneumococcus	...	...	...	...	1
Gonococcus	...	...	...	...	1
Saprophytes	...	...	...	...	5

13

In addition to abscess of the ovary and intra-peritoneal abscess many other complications occur in cases of pyosalpinx. Hæmorrhage into the contained pus is not infrequent, and ovarian hæmorrhages are common. Rupture of a pyosalpinx not rarely happens as the result of straining or over exertion, as for instance in lifting weights. In other instances rupture occurs as the result of rough examinations or manipulations, as for instance in the forcible reduction of a retroverted uterus, or during the enucleation of a submucous fibroid; rarely, axial rotation of a pyosalpinx has been observed. Sometimes cicatricial contraction of the tissues at the base of a pyosalpinx leads to compression of the ureter with its consequences, dilatation and hydronephrosis, and tendency to suppuration of the kidney. Pyosalpinx is occasionally found in association with tubal gestation on the opposite side. I have myself operated on one such case, and have assisted in two others, one complicated by tubo-ovarian abscess, and the other by an acute gonorrhœal salpingitis. Complications on the side of the uterus are very common, more particularly in the form of chronic metritis and endometritis, the remains in many cases of the original site of infection from which the tube became secondarily infected. Displacements of the uterus are also common, and prolapse was present in 4 of my cases. Fibroids are not uncommonly associated with pyosalpinx, which adds a grave risk to the operation of hysterectomy. Pyosalpinx is less frequently seen in cases of carcinoma of the cervix. Pregnancy may supervene in a patient with a unilateral pyosalpinx, as happened in one of my cases, where rupture of the pyosalpinx and fatal peritonitis occurred at the sixth month.

OVARIAN SUPPURATION.

Abscess of the ovary may arise in a corpus luteum or in a graafian follicle, or suppuration may be disseminated irregularly through the stroma of the organ. The exciting micro-organisms may reach the ovary in at least two ways; the peritoneal surface may be infected by pus escaping from the open end of the Fallopian tube or forming in the pelvic peritoneum; or pyogenic organisms may extend outwards through the wall of the uterus and along the lymphatics to gain an entrance through the hilum of the ovary. The relation of the Fallopian tube to the suppurating ovary in my cases shows that at any rate in the sub-acute and chronic cases by far the most frequent route of infection is by way of the tube.

When infection takes place from the peritoneal surface a corpus luteum is most frequently the seat of suppuration. In all my cases of suppurating ovary, with one exception, the patient was parous, the interval between the last pregnancy and the date of operation varying from 3 months to 31 years. In 12 of the total number of cases of ovarian abscess operation was undertaken in 8 months or less after parturition. In 7 cases in which bacterial examination was made, in 4 the pus was found to be sterile while in the other 3 it contained streptococcus, gonococcus, and staphylococcus pyogenes aureus, each in one case.

Excluding from consideration suppuration of large ovarian cysts, I have operated on 31 cases of suppuration of the ovary, including one case of tuberculous suppuration of a solitary ovarian cyst equal in size to a duck's egg. In 18 of the remaining 30 cases suppuration had taken place in a corpus luteum, and in 12 apparently in graafian follicles, the abscess in these cases being solitary in 9 and multiple in 3. In one of the 30 cases the ovary was removed through a posterior vaginal incision, and the Fallopian tube was ascertained at a subsequent abdominal section to be inflamed and densely adherent at its outer end. In all the rest of the cases the Fallopian tube showed signs of inflammation, pyosalpinx being present in 17, while in the other 12 the tubes were inflamed without the production of obvious pus. In another case not included in this group the process of labour caused rupture of a moderate sized dermoid ovarian cyst on the right side, and at the same time rupture of an old pyosalpinx on the left side. The patient was admitted in a desperate state of septic peritonitis and died after operation from perforation of the sigmoid flexure of the colon where this had been adherent to the pyosalpinx.

TUBERCULOUS SALPINGITIS.

The tubercle bacillus rarely gains access to the Fallopian tube and pelvic peritoneum by way of the uterus and vagina. The usual routes are by way of the peritoneum or through the blood stream. The germs may be absorbed from the digestive or respiratory tracts and lodge in the bronchial, mediastinal or mesenteric glands, whence at a later period they may be carried to distant organs, and among others to the Fallopian tube or ovary. From the peritoneal cavity the tubes are frequently secondarily infected. Commonly enough miliary tubercles are seen scattered over the peritoneal covering of the tubes and broad ligaments, and fluid exudations in the peritoneal cavity convey germs through the open ostia of the tubes. Tuberculous peritonitis in the female is associated with salpingitis in 50 per cent. of the cases, and in most of these the tube is affected secondarily from the peritoneum. The genital tract may also be invaded by extension from other tuberculous organs, as for instance from the sacrum, rectum, or base of the bladder. When the generative organs are affected by tubercle the seat of the disease is by far most frequent in the Fallopian tubes (90 per cent.) and this appears to be due to the direct communication between the interior of the tube and the peritoneal cavity. Where the uterus is tuberculous, in the majority of cases the infection proceeds from the tubes by direct extension.

Of twenty patients operated upon by me for tuberculous peritonitis, in 11 it was ascertained that the Fallopian tubes were affected; in several of them the ovary also took part in the disease. In 3 cases it was observed after removal of the uterus that the endometrium was extensively involved.

HÆMORRHAGE IN CONNECTION WITH SALPINGITIS.

Effusions of blood are frequently observed in connexion with chronic inflammation of the uterine appendages. In hydrosalpinx, especially when it co-exists with pregnancy of the opposite tube, the fluid is often found more or less deeply tinged with blood. In pyosalpinx also, hæmorrhage may take place into the wall or contents (4 cases), or may be found in the corresponding ovary (21 in 109 cases). The most frequent situation of the ovarian hæmorrhage in these cases is in connection with the follicles, which are often seen surrounded by a red border one sixteenth of an inch or so in thickness, due to hæmorrhage in the tunica interna. The contents of such follicles may be clear, but more frequently consist of clotted blood.

Less frequently hæmorrhage occurs in connection with corpora lutea, either in the interior, or as sometimes happens forming a broad band around the periphery. Irregular interstitial hæmorrhages are less common. Similar ovarian hæmorrhages occur, but less often, in connexion with non-suppurative affections of the tubes; they were present in 5 out of 41 cases of catarrhal salpingitis. Occasionally as the result of severe salpingitis hæmorrhage may be more extensive, and escape into the peritoneal cavity to form a hæmatocele. Such cases appear to be far from common, and great care has to be taken to exclude the possibility of a tubal gestation having been the cause of the condition. I have only seen two cases of pelvic hæmatocele in which a careful examination made it highly probable that the originating cause was salpingitis. In one of these a married sterile patient of 39 had been losing flesh for twelve months, and was just recovering from her third attack of pelvic peritonitis. There were marked catarrhal salpingitis on both sides, and recent acute pelvic peritonitis. The other case occurred in a patient of 28, also sterile, who had had repeated attacks of inflammation for two years, and whose right tube was closed by peritonic adhesions, in which there were yellowish caseous collections probably tuberculous.

In 11 other cases grouped as inflammatory, I have seen hæmatoma of small and moderate size in the ovary of both sides in 5, and of one side in 6. All the patients complained of severe and long continued pains, most of them with acute exacerbations resembling attacks of pelvic peritonitis. In 5 of the cases the ovaries were densely adherent, although in 2 out of the 5 the tube was free and apparently normal. In 2 other cases, making 4 in all, the tubes appeared to be normal, and in the other 7 the tubes were either catarrhal or adherent; in one case there was recent acute pelvic peritonitis. In all the 11 cases the blood cyst in the ovary appeared to be the main cause of the patient's illness. The class of patient in whom ovarian hæmatomata were observed differed markedly from that in which the other forms of inflammation are seen, in that 4 of the patients were single, and 5 were married and nulliparous; the other two patients had each borne one child, one 9 and the other 22 years before operation; the age of the patients varied from 19 to 39. Three of the five married nulliparae were probably gonorrhœal.

SYMPTOMS AND COURSE.

The amount of illness and suffering produced by inflammation of the uterine appendages is out of all proportion to the mortality. The symptoms vary infinitely in severity. In a considerable number

of women the physical signs of these affections are found, so to say, accidentally and no pain or disturbance of function is present that can be attributed to the disease. In another large group of cases the patients apply for the treatment of sterility, and it is found that changes, often of considerable extent, are present without any history to indicate the origin of the disease. In many cases this apparently dates from childhood, when the pelvic inflammation may have passed through its acute stage without giving rise to symptoms so severe or localizing as to lead to its detection, or with symptoms that are masked by the presence of some graver affection, such as scarlet fever, measles, or some tuberculous affection of the lungs or peritoneum. Many of the cases of sterility, however, give a history of some disturbance of function, local pelvic pains or uneasiness, or other suspicious symptoms, dating from about the time of marriage, and in a considerable proportion of these patients signs suggestive of gonococcal infection are present. The onset of the affection may have been acute and more or less severe, following upon a labour or abortion. In many cases the disease starts insidiously. A not uncommon history is one of childbed followed by a red discharge of some duration and by a history of general weakness lasting for several months; afterwards such a patient may consider herself well for months or even years and then from slight or no obvious cause be seized with acute pelvic peritonitis. In such an acute attack the underlying condition of the uterine appendages is often found to be one that has most likely existed for many years and that can with great probability be ascribed to the last labour. In many other cases a patient with chronic disease of the appendages, even on the closest cross-examination, can give no indication of the time when the inflammation originated.

Chronic and persistent symptoms are usually present in different degrees of severity, often varied by acute exacerbations, and are specially liable to occur at the menstrual periods. Among the symptoms, pains of varying character and intensity are most frequent. These may be felt in one or both sides of the lower part of the abdomen, in the sacral region, round the hips, deep in the pelvis, or sometimes shooting down the thigh as far as the knee. Sometimes these pains are only noted at the periods, but generally they are more or less present in the intervals and are especially marked after work or exercise and are relieved by lying down. Dyspareunia is not uncommon. Frequently disturbances of menstruation are present, often due to complicating affections of the uterus, but in many cases apparently due to the inflammation of the appendages. In the early stages

and during acute exacerbations the menstrual discharge is frequently profuse and still more often prolonged, sometimes lasting for many weeks. In the chronic stage (and this is especially true of tuberculous affections) menstruation is often scanty and infrequent. In some cases puberty appears to be delayed in girls whose appendages have become diseased before that epoch, and in not a few of the women the menopause takes place early; in many others the menopause is postponed. Various discharges are complained of—mucous, serous and purulent. In some rare cases such a discharge may be profuse at intervals and result from intermittent hydrosalpinx or pyosalpinx. As a rule it depends on concomitant endometritis in which condition intermittent profuse discharges are also sometimes observed. The functions of the neighbouring organs, especially of the bladder, are frequently disturbed. Pain and frequency of micturition are complained of, especially at the menstrual period. Pain in defæcation is sometimes observed. Constipation is one of the most frequent symptoms, but occasionally rectal irritation is present and quantities of clear or inspissated mucus may be passed from the bowels.

In most cases, especially when local symptoms are present, disturbances arise in distant organs. These in many cases combine to form the clinical picture of neurasthenia, which often seems to depend on long continued and repeated pains, especially in women of neurotic or unstable temperament. In many instances, especially where collections of pus have existed for some time, a condition of toxæmia arises. Constipation often appears to have a marked effect in promoting such a condition. The patient becomes prematurely aged, is sallow, anæmic, worn and haggard; there is a certain degree of wasting; the hair is dull and dry, and becomes thin, the muscular tone is flabby, the appetite capricious or poor, the digestion impaired, the skin sometimes dry and harsh, the urine often diminished in quantity and loaded with urates. In not a few cases in the course of time, sometimes after many years, severe cachexia gradually develops, and the patient eventually dies of exhaustion or as the result of a terminal infection. Operation for pelvic inflammation in women reduced to the cachectic state is attended by considerable risk, and three of the deaths that have followed my operations for pyosalpinx occurred in such patients.

The symptoms, local and general, above described may persist for many years or may clear up after the adoption of appropriate treatment. In a considerable proportion of the cases intercurrent acute attacks of pelvic peritonitis are observed varying in number and severity. In many women one such attack is observed and with

proper care is not repeated; in others repeated attacks take place at short intervals, and in still others the latent intervals may be prolonged, even lasting for years. In patients who have suffered severely enough to call for operative treatment, a history of repeated acute attacks is very common. They occur in patients affected with non-suppurative conditions as well as in those with suppurative affections, but in the latter class they are more frequent and tend to recur at shorter intervals. Thus of 40 cases classed as catarrhal salpingitis, in half the number the patients gave a history of acute attacks, and of these 13, or one third of the whole number, had had 3 or more; of 19 cases of hydrosalpinx, in 8 there had been acute attacks, in 6 of them, or one third of all the cases, 3 or more; among 71 cases of pyosalpinx, 56, or about three-fourths, had had acute attacks, many of them having had 3 or more. In another group of cases the patient gave a history of an acute attack of pelvic peritonitis months or years before being seen and of having never been well since, while about an equal number had been affected with chronic, less severe but persistent symptoms from the commencement of the illness.

The acute attacks of pelvic peritonitis so frequently seen in these conditions, are common to them and to inflammation of the vermiform appendix, and without making a careful vaginal and rectal examination it is impossible to tell which of the two affections is present. Occasionally, as in three of my patients, one has to deal with a right sided pyosalpinx to which the inflamed appendix is closely adherent. The total number of cases in which I have found the vermiform appendix involved is 20; in one case the appendix was adherent to a hydrosalpinx, in 3 to simply inflamed and adherent appendages, and in 16 to suppurating tubes.

Inflammations of the uterine appendages in the female sex appear to a large extent to take the place that is occupied by inflammations of the appendix in the male. Thus in the seven years from 1900 to 1906 inclusive, 1086 cases of appendicitis were admitted into the General Hospital, of which only 364—or as nearly as possible one-third—occurred in the female sex.

There are many points of similarity in the pathology and clinical course of the two affections. In both the appendix and the Fallopian tube we have to do with a hollow muscular tube with narrow lumen lined by mucous membrane. Each communicates with a viscus from which noxious germs are able to obtain access. Under certain conditions such germs may give rise to inflammation of the mucous and other coats of the tube, and as a result the openings may be closed. In this way a collection of irritating material may take place in a

closed cavity where it may give rise to chronic pains or discomfort, or may remain entirely latent. From time to time, from slight causes or for no obvious reason, acute attacks of inflammation are set up, and as a result of such an acute attack the wall of the viscus may be perforated and peritonitis result. In appendicitis the intercurrent acute attacks appear to be much more apt to become diffuse or spreading, a tendency that is explained by the fact that the micro-organisms implicated differ from those usually found in cases of pyosalpinx. In appendicitis the germ most frequently found is the bacterium coli commune, while in cases of pyosalpinx this organism is not common, the condition depending in the great majority of cases on the gonococcus, streptococcus pyogenes, or on various saprophytic organisms. All these germs are relatively of lower virulence than the bacterium coli, with the exception of the streptococcus, which, as a rule, soon loses its virulence and dies out in a closed cavity.

A possible channel of infection of the Fallopian tube from the vermiform appendix, or *vice versâ*, is by way of the connective tissue in the appendiculo-ovarian ligament, but by far most frequently extension of infection from one to the other takes place by simple contact. In all my operative cases the appendix had become adherent in exactly the same manner as any other viscus that happened to be in contact with the tube and ovary at the time of acute inflammation. On examination afterwards the affection of the appendix has usually been limited to its peritoneal coat, and where the change has been more advanced the peritoneum and muscular coats have always been most affected, the mucous membrane being normal and the lumen empty. In some cases, however, the tube or ovary becomes affected secondarily to an appendicitis, as was shown by a case, seen in the post mortem room, of a girl of twelve, in whom a gangrenous appendicitis had set up an abscess in the right adherent ovary.

The intercurrent attacks of acute pelvic peritonitis are frequently called 'obstruction of the bowels,' 'inflammation of the bowels' or 'of the bladder,' sometimes 'typhoid,' and much too frequently of late years 'appendicitis.' The onset is most likely to take place at a catamenial period, but very frequently occurs in the interval between two periods. It is occasionally quite sudden, usually the result of an accident, such as a fall or a blow or of over exertion in straining or lifting; in many such cases the onset is accompanied with hæmorrhages into the pyosalpinx itself or into the ovary. Much more commonly the onset is not sudden but acute, pain in one or both sides of the lower part of the abdomen gradually increasing in the course of a few hours or of a day or two, until the patient is obliged to

give up work and go to bed. The pain is often attended by a feeling of nausea or retching, and sometimes it causes actual vomiting and occasionally a feeling of faintness. Not infrequently the beginning of the attack is marked by shivering, or even in rare cases by a distinct rigor. The temperature rises to 102° or 103° or even higher; the pulse becomes more frequent, often out of all proportion to the rise of temperature. Pain and frequency of micturition are commonly among the most serious complaints. Much less often there is rectal irritation, amounting sometimes to severe tenesmus and accompanied with the passage of abundant mucus, occasionally mixed with blood. The aspect of the woman soon alters, especially if she persists in getting about; her features become drawn, her countenance becomes pale, and she soon presents the appearance of a patient seriously ill. In many such cases a remarkable improvement in the symptoms and in the aspect of the patient follows rest in bed, even for a day or two. According to the severity of the symptoms cases are divided into simple acute pelvic peritonitis and septic peritonitis. In the former, the symptoms—pain, elevation of temperature, increase in the pulse rate and sickness—are all moderate in degree and promptly relieved by rest in bed. In the latter the aspect of the patient is bad, the pulse rapid, there is more or less frequent vomiting, the abdomen becomes distended, and the patient is sleepless and unable to take nourishment.

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On Pelvic Inflammations in the Female.

Being the Ingleby Lectures for 1907, delivered at the University of Birmingham, May 9th and 16th.

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LECTURE II.

DIAGNOSIS AND TREATMENT.

THE symptoms of which the patient complains serve merely to indicate the necessity for careful objective examination, on the result of which depend the diagnosis and, consequently, the treatment proper to be pursued. The examination involves a complete investigation in the first place of the condition of the pelvic organs and tissues, and in the next of the condition and functions of the rest of the body. The pelvic exploration includes inspection, palpation and percussion of the lower part of the the abdomen; vulvar and vaginal examination by inspection and palpation and sometimes by the use of the sound and speculum, rectal examination, and abdominal palpation with the help of a finger in the vagina and one in the rectum. In a case of pelvic inflammation in the female none of these methods should be neglected, and by their means it is generally possible to obtain fairly accurate information as to the nature of the condition with which we have to deal. Since the indications for treatment depend on the results of examination, it will be convenient to consider the two subjects together.

PUERPERAL PELVIC INFLAMMATIONS.

The puerperal state has been seen to be the commonest occasion for the origin of pelvic inflammations generally; of 260 cases, 176, or nearly two out of three, could with great probability be referred

to the last pregnancy, ending either at full term or in abortion. The symptoms of infection may arise early in the first two or three days, or later, in the second or third week. Frequently the symptoms are only observed when the patient begins to get up, towards the end of the second week, but it is probable that more careful observation at an earlier date would show in the great majority even of these cases some indication of abnormality in temperature, pulse, lochia, or other symptoms. The worst cases are those in which infection takes place during or soon after delivery; a chill or rigor with marked rise of temperature and the usual symptoms of fever occurs usually within 48 hours, attended sometimes with pain and usually with tenderness on pressure in the lower part of the abdomen. The lochia sometimes dry up; where the infection is due to saprophytes, the discharges become foul; in the worst cases of streptococcal infection they may be normal in naked eye appearance and amount, as well as in odour. On pelvic examination within the first two or three days after infection the vagina is hot and may be dry, the uterus is tender and flabby, and there is a general feeling of bogginess of the tissues; around the uterus nothing definite can be made out. The patient may die of acute toxæmia without developing more distinct local signs. At the beginning of the infection a leucocyte count is of importance in prognosis, a high percentage being of good omen, and a low one unfavourable. The early formation of a distinct inflammatory exudation is a favourable sign, as indicating the local resisting power of the tissues.

If the patient survives, the signs alter in the course of a few days as the local barriers to the spread of infection begin to be formed. From the sero-fibrinous exudation at first thrown out a deposit of fibrin takes place; the serum drains away or may accumulate in the peritoneal cavity, and especially in Douglas's pouch. The tissues in which fibrin is deposited are brawny and of board-like hardness, and from the shape and position of such a brawny tumour an inference can be drawn as to the part affected. In cellulitis the portion of the cellular tissue most commonly involved is that at the base of the broad ligament on one side, and here a more or less conical tumour forms with its truncated apex at the isthmus of the uterus, which is sometimes pushed towards the opposite side; and with its outer end or base spreading widely over the side and posterior wall of the pelvis, as well as upwards over the brim into the iliac fossa; the vaginal fornix is obliterated and the vaginal wall pushed downwards by the lower surface of the tumour, which is usually concave and extends low down on the side of the pelvis. Through the rectum

the brawny hardness may be felt extending backwards on the pelvic wall as far as the middle line, involving the utero-sacral fold and coming close to the side of the gut. Frequently at this stage the hardness extends to some extent towards the other side behind and in front of the supra-vaginal cervix, and the swelling may open up the layers of the broad ligament, the uterus being apparently embedded in the side of the tumour. The upper abdominal surface of the swelling is usually well defined, but tender.

If the peritoneum is the part affected the fibrinous deposit takes place on the surface of the serous membrane and in the connective tissue immediately below it as well as on the surface and in the walls of the organs in contact with it, especially of the large and small intestine and omentum. When the peritonitis extends above the brim of the pelvis a fixed tender hardness is felt in the lower part of the abdomen, the upper border of which is not well defined, partly by reason of the accompanying distension and muscular resistance, and partly because the upper border of the indurated tissue gradually shades off. The upper part of such a swelling is resonant on percussion, being formed of coils of intestine with thickened walls. On vaginal and rectal examination the whole pelvis is roofed in by a firm board-like hardness, from the middle of which the vaginal cervix projects downwards. From the cervix the hardness extends in curved surfaces, with the concavity downwards, to the sides of the pelvis, over which it spreads widely. Through the rectum it is made out that the tissues behind the uterus and above the vagina are hardened, and that the utero-sacral folds are frequently infiltrated and encroach on the lumen of the gut. Behind the upper part of the wall of the vagina a tongue-like process is commonly felt extending downwards in the recto-vaginal septum for some distance, usually ending below in a sharp border. All these changes as felt by the vagina and rectum affect the sub-peritoneal layer of connective tissue, that is to say they are the signs of a general pelvic cellulitis; but in such cases the further progress of the case shows that the cellulitis is secondary to peritonitis which constitutes the primary and principal affection.

In many cases an accumulation of serum takes place in the peritoneal cavity in one or several loculi and in this case the principal collection is found as a rule in Douglas's pouch. A tender fixed median supra-pubic swelling may extend as high as the umbilicus; the contour may be fairly well defined; percussion shows that the upper and lateral parts of the tumour are formed by adherent intestine, the lower portion above the pubes being dull. Internal examination shews that the cervix is pushed upwards and forwards

behind the pubes, and that a rounded, tense or yielding, elastic swelling extends downwards to a considerably lower level, filling the pelvis, and flattening the rectum against the posterior pelvic wall. On abdominal examination the body of the uterus can frequently be distinctly felt on the front of the tumour. Apart from the history such a tumour might contain serum, blood or pus. Blood would be found if the history was that of a ruptured tubal gestation. Under the conditions we are now considering (infection following parturition or abortion) the contents would be serum or pus, and the solution of the question as to which of the two is present has to be sought in the general condition of the patient and in the accompanying physical signs. Where the contents are serous the aspect and general condition of the patient are less grave; the temperature is raised, but is not so constant and not so high as in a case of suppuration; the consistence of the tumour is more elastic, like that of a thin-walled cyst. When suppuration has taken place there is as a rule a considerable amount of brawny hardness of the surrounding tissues, and the vagina and cervix are œdematous and swollen, and dark bluish in colour. A determination of the proportion of leucocytes present in the blood is often of value, although in the early acute cases a leucocytosis of 15,000 or more is frequent even when the exudation is merely serous. In suppuration the blood count may be no higher at first, but is more persistent, or shows a gradual increase.

When septic infection spreads by way of the veins the pelvic signs at first are those of an inflammation of the uterus, which remains tender and enlarged, usually flabby, of the consistence of wash leather, but later becoming harder. The tissues around the uterus remain soft, but it is often possible to make out small tender cords or nodules formed by the thrombosed veins. As the infection progresses repeated rigors occur with a rise of temperature to 103°, 104°, or higher, followed by remission; and these together with the slightness of the physical signs discovered on a careful pelvic examination are characteristic.

A late puerperal infection, that is to say one in which the symptoms first became marked towards the end of the second week or later, is usually due to pelvic cellulitis, to phlebitis, or to upward spread of a gonorrhœal infection.

In the early stages of puerperal infections the indications for treatment are :

1. To attempt to limit the entry and spread of the infecting organisms, and
2. To support the patient in her fight against the invasion.

The first indication is met by cleansing the uterus and vagina and by keeping the patient absolutely at rest, every movement appearing to favour the spread of organisms further into the tissues. The cleansing should be undertaken without the slightest delay on the first onset of suspicious symptoms, and is best effected by the use of the finger to explore the uterus and remove any portions of placenta or membranes that may be left behind, followed by a copious douche of many pints of salt solution or of some mild antiseptic; afterwards, the employment twice or three times a day of large vaginal douches of weak lysol or izal solutions is advisable. The use of the curette in these cases is to be deprecated on at least three grounds: it is impossible to tell when the uterus is empty; it is particularly easy in the soft condition of the uterine muscle to cause injury or even perforation; and finally by removing the superficial layers of the endometrium the barriers of fibrin and phagocytes are removed and fresh blood and lymph vessels are opened up for the free entry of germs.

The second indication, to support the patient in the struggle, is to be met by absolute rest to spare her strength; by nourishing diet, suitable to the state of the digestive organs, to keep up her strength; by quinine in large doses, as a general and nervine tonic, and for its effect in promoting leucocytosis; by sponging the skin with tepid water when the temperature rises above 103° ; by attention to the regular evacuation of the bowels; by the administration of alcohol in regulated doses or of hypodermic injections of strychnine when the use of these drugs is indicated by the state of the pulse, tongue, or skin; and by the relief of pain, in the first place by the application of heat to the lower part of the abdomen, and in the second by the administration of belladonna or morphia in the smallest possible effective doses.

In addition to these means, methods have been devised with the purpose of directly antagonizing the germs or neutralizing their toxins. Most of them have so far not advanced beyond the experimental stage. Of those to which I have given a fair trial may be mentioned antistreptococcic serum which has occasionally appeared to me to be of service in appropriate cases; and collargol in subcutaneous injections, or by inunction in the form of Credé's ointment, which has produced no obvious effect.

In the early stages of pelvic inflammation surgical methods are indicated when pus has formed, or where a tense elastic swelling is present in Douglas's pouch. In the latter case an incision by knife or scissors is made immediately behind the cervix and extended as

far as may be necessary to each side; the lateral portions should be inclined backwards, so as to make the whole incision convex forwards. When the fluid is evacuated the opportunity is taken to ascertain the condition of the appendages by bimanual examination. The cavity is afterwards packed loosely with iodoform gauze, and this is changed every second day. The relief afforded by this method of treatment is often marked and immediate; and the relief of tension appears to have a considerable effect in limiting the degree of the inflammation as well as its spread.

When pus has formed it should be let out at the earliest possible moment by the nearest route. Where it has collected in Douglas's pouch the posterior vaginal incision is used; for abscess in the lateral cellular tissue an incision one inch above and parallel with the middle two-fourths of Poupart's ligament is carried down through the tendon of the external oblique muscle and the transversalis fascia into the sub-peritoneal space. When the pus collects in a space in the peritoneal cavity above the pelvic brim an incision must be made directly into the abscess cavity. In any case great care has to be taken not to open up the general peritoneal cavity; the pus is removed by swabs or by gentle local irrigation, and the cavity freely drained by rubber tubes or gauze.

In the early stages of puerperal infection treatment by more radical operations offers little chance of success. Patients who are gravely septic bear anæsthetics and operations very badly. On the other hand recovery often takes place without the aid of surgery in cases that appear practically hopeless. Most of the patients operated upon under these conditions die, and it is open to doubt whether the few who survive do so because of or in spite of the operation. My own experience of removal of the uterine appendages with or without the uterus in 6 cases of recent puerperal septic and pyæmic conditions has not been such as to encourage me to add to it; in none of the patients was death prevented; while in at least three it was hastened.

The main indication is to let out pus, and afford drainage; care should be taken not to interfere with the protective barriers set up by nature, and especially not to be too vigorous in cleaning away fibrinous exudations and breaking down the adhesions that shut off the general peritoneal cavity.

GONOCOCCAL PELVIC INFLAMMATIONS.

In rare cases gonorrhœa may lead within two or three weeks of the infection to a virulent and spreading peritonitis. Much more

commonly the inflammation only spreads upwards into the tubes and peritoneum after the lapse of months, or sometimes even years. The relation of the infection to pregnancy and the puerperium is of peculiar interest not only from the scientific point of view, but from that of the practising obstetrician. In married women a severe vulvo-vaginal and cervical gonorrhœa is not very common; the great majority of infections are due to marriage with men in whom gonorrhœa of more or less ancient date has never been thoroughly cured. Some practitioners hold the opinion that gonorrhœa once acquired never entirely clears up, but this is undoubtedly a gross over-statement. In the circumstances attending marriage a gleet however slight is apt to become more virulent, and gonococci become implanted, usually in the cervix and in the urethra; the resulting catarrhal inflammations are frequently slight and attended by a trifling sense of local irritation, white or yellowish discharge, and some heat and frequency in micturition, all which symptoms may pass off in the course of a few weeks. If the patient conceives, the discharge and local irritation may become more marked, but are commonly supposed to be due to the pregnancy. When delivery takes place either in the earlier months or at full term, the gonococci find conditions favourable for their growth and development, and extension upwards into the body of the uterus, and thence into the Fallopian tubes and peritoneal cavity, is particularly apt to occur. This upward spread takes place gradually; at first the endometrium is invaded, as is shown by the lochia becoming more profuse and continuing to be bloody for a longer time than usual, and perhaps by a little local uneasiness, especially in connection with the bladder; after a few days the tubes become involved, but this only gives rise to a little uneasiness or dull aching pains in the sides of the lower part of the abdomen; finally the infection spreads into the peritoneal cavity and then, for the first time, the local pains become severe, and the temperature and pulse markedly raised. The apparent beginning of a gonorrhœal inflammation in the second or third week or even later after delivery is thus explained, the upward extension taking a certain time to develop.

The physical examination of such a case before the peritoneum is invaded may show thickening in the course of the Fallopian tubes, more easily observed in the inner part near where they join the cornua of the uterus. As a rule, however, attention is not called to the pelvis until the peritoneum is involved, and then the signs of a localized peritonitis are present with an amount of serous effusion into the cavity, and of induration of the surrounding tissues, varying

with the severity of the inflammation. In some cases puerperal gonorrhœal infection sets in suddenly with fulminating symptoms of peritonitis, but even in these cases the symptoms in the course of two or three days frequently undergo a remarkable change for the better at the same time as the local signs become those of a limited pelvic peritonitis.

The diagnosis of the gonorrhœal nature of a case of puerperal infection, as of gonorrhœa generally, depends upon the recognition of gonococci in the discharge from some of the infected surfaces; search has to be made in the secretions of the urethra and cervix, and in the lochia. The lochia, at first bloody, later become purulent or mucopurulent, often of a greenish colour. Other indications may be present. If pressure on the urethra from above downwards discloses the presence of opaque secretion, that is in itself suspicious, and the suspicion becomes more marked if Skene's ducts contain such secretion, even in minute quantity; sometimes these ducts are felt to be thickened, hard, and tender, and occasionally the whole urethral wall is thickened and indurated. Much less commonly the ducts of Bartholin's glands are inflamed and contain purulent secretion which can be pressed from them, or the orifices of the ducts are surrounded by a red areola; or the glands themselves are hard, tender and enlarged by inflammation. In the presence of any of these signs in connexion with the urethra or Bartholin's gland a presumption of infection by the gonococcus is raised, but remains merely a presumption, since the same changes may be due, though rarely, to other causes. The affection of the infant by purulent ophthalmia, which, in the great majority of cases, is due to infection by the gonococcus, may be an important indication of the nature of the case. The late onset of the infection in the puerperium, and the condition of the discharges, are also suggestive, but the diagnosis can only be made certain by the discovery of the gonococcus. In the early stages of the disease this is easy, the organisms being present in enormous numbers, but soon the gonococcus becomes crowded out by the growth of other germs, and after the lapse of a few weeks its detection becomes difficult or even impossible.

The treatment of a case of acute gonorrhœal peritonitis is conducted on the usual principles, with the addition of attention to the inflammation of the accessible portions of the tract, the vulva, vagina, and cervix. Where there is severe acute inflammation of this part of the tract, absolute rest in bed is indicated, together with the use of bland and unirritating douches. Even when the infection has not penetrated to the tube or peritoneum it is best in the acute

stage of gonorrhœa not to attempt any heroic measures to cut short the affection, such treatment rendering the upward spread of the disease more likely. When the acute signs subside, applications to the affected surfaces of a two or three per cent. solution of nitrate of silver may be made with advantage.

SUBACUTE PELVIC INFLAMMATIONS.

When an acute attack of puerperal, gonorrhœal, or other inflammation begins to subside, nature undertakes the task of clearing away the inflammatory exudation and other débris resulting from the struggle. In equal steps with the improvement in the local signs and general condition of the patient, absorption of the more recent exudation goes on, and gradually the signs of peritonitis, with its accompanying cellulitis, are replaced by those proper to the underlying condition of the tubes or ovaries, the uterus returning more or less completely to its natural position. Remains of hard, brawny exudations may persist for some time, most commonly on the side of the pelvis, on which in many cases of pyosalpinx a hard, uneven elevation is felt, widely spreading over the surface. Absorption of this exudation, and of the collections of serous fluid in the peritoneal cavity takes place with varying rapidity; sometimes a tumour of considerable size will disappear in the course of two or three weeks; in other cases the swelling subsides to some extent, but remains considerable for many months, and this appears to depend commonly on collections of pus in the ovary or tube.

The amount of recovery after an attack of severe inflammation is often surprising, and may be so complete that conception takes place promptly, and the patient may even pass through the resulting pregnancy with comparatively little disturbance. In a very large proportion of the cases, however, recovery is only partial, the organs and pelvic peritoneum remaining in a state of subacute or chronic inflammation, and the patient suffering more or less severely from the various chronic symptoms that have already been detailed, or frequently experiencing repeated acute attacks. In some cases these attacks gradually decrease in severity, and after the second or third there is no recurrence. Such a course has appeared to me to be more frequent after infection by the pyogenic organisms. A typical case of this kind was the following:—

B. J., aged 25, was admitted to the Birmingham General Hospital on the eighth day of labour with a retained placenta and pelvic abscess; the leucocyte count was 24,000, temperature 101°, the pulse 116. Pus, giving a pure culture of streptococcus pyogenes, was evacuated

by a posterior vaginal incision and the patient was discharged a month later. Three months after the labour she was readmitted with an acute attack of pelvic peritonitis. There was a mass chiefly in the right posterior quarter of the pelvis, temperature 100.8° , blood count 9,000, pulse 112. With rest in bed the attack promptly subsided. Three months later she was admitted with a third attack of acute pelvic peritonitis, attended with considerable exudation behind the uterus. The general appearance was good, temperature 98.4° , pulse 76, leucocyte count 11,700. Through a posterior vaginal incision serous fluid was let out, which gave a feeble growth of *staphylococcus albus*. Bimanual examination with two fingers through the incision showed that there was a small swelling about each set of appendages, probably due to matting. The patient made a good recovery and has remained well since. Here the streptococci died out completely in less than 6 months, and the successive attacks of acute pelvic peritonitis gradually diminished in severity.

In other cases the acute symptoms soon subside, the patient returning to work, and remaining fairly well, even for long intervals, and then on slight occasion developing a dangerous illness. Such a case occurred in a woman, M. D., aged 22, who had had a six months' miscarriage 15 months before admission, and had made a fair recovery. Three days before admission the patient was at work, in the course of which she made a sudden turning movement which appeared to cause something to give way in the lower part of the abdomen. On admission she was gravely ill, and was constantly vomiting; temperature 101° , pulse 132, leucocyte count 28,000. A double tumour was present in the posterior part of the pelvis; abdominal distension and rigidity prevented the determination of the upper border of the swelling. Eight days later the patient was very much better, temperature varying from 98° to 101° , pulse 100, leucocytes 17,000. The mass was now well defined, very much larger, and extended upwards to the umbilicus. Fourteen days later the swelling had nearly subsided into the pelvis, the temperature and pulse were normal, the leucocyte count 11,500. A diagnosis of double pyosalpinx was made, and 5 weeks after admission the abdominal radical operation was performed, both tubes being found distended with pus. A small collection of pus was also present in a pouch among the intestines at a little distance above the pelvic brim; this pus and that from the tube both gave pure cultures of *streptococcus pyogenes*. The patient made a slow, but otherwise satisfactory recovery, and was discharged to a convalescent home six weeks after the operation.

Treatment during the subsidence of acute symptoms has to be directed towards aiding the patient to get rid of the debris. For this purpose the most important means is prolonged rest, until the acute symptoms have completely passed off. If arrangements can be made for much of this rest to be taken in the open air the patient convalesces with greater rapidity. Nourishing diet suited to the digestive powers, careful attention to the excretions, and the administration of tonics, are the other important points in the general management of such a case. Means intended to promote absorption comprise the local use of copious hot vaginal douches, vaginal tampons saturated with glycerine, glycerine and ichthyol, with solutions of potassium iodide and vinum opii, or other agents. The application of iodine or of repeated flying blisters to the lower part of the abdomen are of less use. In many cases the local application of heat to the pelvis by means of an electric bath has appeared to me to be of decided service. In the more chronic cases the continuous administration of small doses of mercury and potassium iodide as recommended by Professor John W. Taylor deserves a trial. When the acute symptoms have completely subsided, gradually increasing exercise, especially driving and walking, are of service, and a change of air and scene is indicated. For some months it is advisable for the patient as far as possible to keep her bed during the menstrual periods, and at any rate to be careful to avoid at this time any form of over exertion, whether at work or exercise, and particularly to avoid "catching cold."

At any time during the months succeeding the acute attack the question of operation may arise, and I find that among my operations, 11 non-suppurative cases out of 83, and 29 suppurative out of 152 were operated upon within a year after labour or abortion. Among the suppurative cases pus in the ovary and pelvic abscess formed the most frequent conditions calling for early operation, 12 cases of pelvic abscess out of a total of 41, and 12 of suppurating ovary out of a total of 31 being operated upon in these circumstances. The principal indications for early operation are found sometimes in the persistence of severe symptoms of fever, pains, and general illness, and at others in the occurrence of repeated acute attacks of pelvic peritonitis following each other at short intervals. In such cases it is important to wait whenever possible until there is a strong probability that the pus has become sterile, a point to which I shall return later on.

THE CHRONIC STAGE.

In the chronic stage of pelvic inflammation, when active changes have long since ceased, the amount of local change varies enormously. In a large number of cases the only physical signs are those of adhesions, as shown by the immobility of organs which under normal circumstances are movable. The uterus is not unfrequently bound down in a position of retroversion by adhesions left after pelvic peritonitis, the adhesions being found most dense and abundant about the body of the uterus itself, the outer ends of the Fallopian tubes sometimes remaining free in cases where infection has spread through the wall of the uterus into the peritoneal cavity. Where the spread has been by way of the tubes the adhesions are most abundant and firm in the neighbourhood of the peritoneal ostium. The adherent ovary does not slip from between the fingers in bimanual examination, so that it is particularly easy to palpate. The position of such an adherent ovary varies; sometimes it is plastered on to the side of the pelvis, a considerable interval intervening between it and the side of the uterus. More often it is adherent to the back of the broad ligament at a lower level than natural, often close to the side of the uterus.

In many cases the signs of an old inflammation are more marked, and are to be found in matting together of the appendages to form a characteristic swelling, which is sometimes called the tubo-ovarian tumour. This tumour comprises the thickened Fallopian tube, ovary, and broad ligament, all of them adherent to each other, and the mass occasionally also adherent to other structures, especially the omentum, coils of intestine, and uterus. A vivid imagination may sometimes trace the thickened tube in its course round the ovary, which forms a small firm mass in the middle and lower part of the lump. Where there are adhesions to intestine the apparent size of the tumour often varies remarkably at different times, being larger when the adherent coils are distended, and smaller when care has been taken to empty them before examination. The tubo-ovarian tumour is uneven on the surface and on the whole rounded or oval in shape; the consistence characteristically varies from part to part, the ovary forming a firm part of the tumour, the tube usually feeling less firmly solid, and any cyst that may be present in the ovary or in connexion with the layers of the broad ligament forming a softer portion.

The mass is tethered more or less firmly by adhesions; there is tenderness, usually not very severe. In two-thirds or more of the

cases, the affection is bilateral, though usually the changes found differ on the two sides. A similar but smaller tumour may be present on the opposite side, or there may be merely the signs of an adherent ovary, or the uterus may be drawn over and adherent to the opposite side, in the absence of any obvious swelling in that situation. Examination by the rectum enables the size, shape, and consistence of the tumour to be determined more accurately, and its relation to the back of the broad ligament and to the uterus to be more clearly defined.

In other cases the tube is distended into a sac containing serum or pus. Hydrosalpinx forms a thin-walled cystic swelling; pyosalpinx a hard thick-walled tumour. In some cases where a hydrosalpinx is large the tumour forms a considerable swelling rising out of the pelvis into the lower part of the abdomen where it forms a more or less rounded, well defined tumour extending as high as or even higher than the umbilicus, not tender, and in this situation often possessing a certain amount of mobility. Bimanual examination shows that the uterus in the great majority of cases is on the front of the tumour, though occasionally it is found retroverted with the tumour lying above and in front. In the smaller cases the distended tube together with the ovary forms a mass varying in consistence from part to part, the ovary lying below in the midst of the tumour and feeling firm, while the dilated tube, softer and more yielding, curves round it. Where the hydrosalpinx has attained a greater size the outer end forms by far the larger portion, and it may sometimes be made out that the inner end attached to the cornu of the uterus is thickened to the size of a finger or so, and characteristically convoluted. The outer and lower part of the tumour is practically always densely adherent to the side of the pelvis or the back of the broad ligament, as is evidenced by lack of mobility. In the largest cases and in those where the uterus is retroverted the relation of the tumour to the uterine cornu is often difficult or even impossible of recognition. In a small number of cases a hydrosalpinx opens up the layers of the broad ligament and extends downwards towards the pelvic floor; in such cases the uterus is pushed forward and towards the opposite side and the physical signs are those of an intra-ligamentary ovarian cyst. In most cases of distended tube the appendages of both sides are affected, but as a rule not symmetrically. With a hydrosalpinx of fair size there may be found a smaller hydrosalpinx on the opposite side, or merely the signs of an adherent ovary, or of an ovary and tube thickened and matted together, or the uterus may be drawn over and adherent to the opposite

side in the absence of any obvious swelling in that situation. A hydrosalpinx is not tender on pressure. Any tenderness that may be present is due either to the condition of the ovary or to that of the pelvic peritoneum.

Pyosalpinx forms a hard, uneven and immovable tumour; the hardness depends on inflammatory thickening of the walls of the tube, and of the broad ligament and pelvic peritoneum as well as of the incorporated ovary. The consistence often varies at different parts; the pus tends to collect more in the outer, ampullary, portion of the tube, in which position there is accordingly often a softer and more yielding part. The mass is usually tender, though in chronic cases this sign may be entirely absent. The shape of the tumour is irregular and uneven. Occasionally it can be made out that there is a large, irregular, rounded tumour with a thickened firm prolongation uniting it to the cornu of the uterus. In the larger cases the shape is sometimes elongated and curved like that of a sausage or banana, and in the same cases the consistence, owing to the relative thinness of the walls and abundance of fluid contents is frequently softer and more cystic, sometimes resembling that of a hydrosalpinx.

The physical signs are bilateral in more than two-thirds of the cases, but as in the case of hydrosalpinx, so here, the signs are usually not symmetrical. Where two large tumours are present they frequently come into close contact in the middle line, but it is generally possible to make out that a large mass filling up the posterior portion of the pelvis is double, by feeling an antero-posterior groove on the lower surface, either through the vagina or much more easily through the rectum.

In the intercurrent acute attacks of pelvic peritonitis great variety in position is found in the physical signs; and these vary according as the peritoneum with its subjacent connective tissue is infiltrated and hardened (fibrinous peritonitis) or as collections of fluid form in the peritoneal cavity (serous peritonitis). The upper portion of the tumour is formed by adherent intestines and omentum, and consequently the upper limit feels ill defined on abdominal examination. As absorption takes place the induration diminishes irregularly, and gradually the physical signs of enlargement of one or both sets of appendages become marked. The induration tends to remain longest as a rule on the outer and posterior pelvic wall where it may often be felt as an uneven, broadly adherent firm plate between the outer end of a pyosalpinx and the pelvic wall.

In cases of pelvic inflammation, no matter to what germ the

disease may be attributed, it is of the greatest importance in deciding upon treatment to be able to diagnose whether pus has been formed. Help in making the diagnosis may be sought in the physical signs. In the early stages when, in the middle of hard, boardlike exudation, patches of softening make their appearance along with the general symptoms of suppuration, the presence of pus and its location become evident. In the presence of an acute intercurrent attack of pelvic peritonitis it is impossible to diagnose the presence of pus until the acute symptoms have passed off, and absorption of the recent inflammatory products has taken place. Then, if the case be one of pyosalpinx or of suppuration in the ovary, the resulting tumour is hard and nodular and usually firmly fixed by adhesion to the wall of the pelvis. If no pus be present the consistence is less dense and frequently thin walled, cystic portions may be made out, due usually to small cysts in the ovary or to hydrosalpinx. Much help is afforded by a leucocyte count in many cases, but this requires to be taken into consideration along with all the other symptoms and physical signs. The leucocyte count is merely a link in the chain of evidence, a strong one, no doubt, but still only a link. In acute intercurrent attacks of pelvic peritonitis the blood count is commonly found to be raised, being often 15,000 or more, even in non-suppurative cases. As the attack passes off, the blood count in such cases rapidly falls to normal. In suppurative cases, on the other hand, the count is sometimes observed to increase or to remain for a considerable time above normal. The location of the pus has a marked influence on leucocytosis, collections in the peritoneal cavity as a rule giving a higher and more persistent blood count than collections in closed cavities, as for instance in a pyosalpinx or suppurating ovary. The particular micro-organism present has also an influence. In attacks of acute gonorrhœal salpingitis the blood count is raised only to a moderate degree, usually not more than 14,000 or 15,000. In infection by the staphylococcus and streptococcus the blood count is frequently much higher. In tuberculous affections the number of leucocytes does not exceed, and often falls below the normal average; when it remains persistently high it points to the occurrence of a secondary infection by pyogenic or saprophytic organisms. In a doubtful case repeated estimation of the leucocytes is important and frequently enables us to form a correct opinion as to the presence of pus.

When pus has been formed it is of great advantage to know whether it still contains living organisms or not. Where these are still present it is better, whenever possible, to postpone radical operation and to content ourselves with opening and draining abscess cavities

in the peritoneum or cellular tissue. Pathogenic and saprophytic germs in closed sacs usually die out quickly, but the time taken in the process varies very greatly. Nine months has been suggested as the time after which one may reckon with reasonable certainty on pus having lost its virulence, but in many cases the germs disappear in a considerably shorter time than this. In some cases, on the other hand, they live much longer, and in one of the cases above related living streptococci were found in a pyosalpinx that ruptured fifteen months after its origin in parturition.

The presence or absence of fever is no certain indication though it has some importance; in the majority of cases in which fever is persistent germ-containing pus is present, and therefore it is better to wait unless there are symptoms of urgency. A high leucocyte count usually means the presence of virulent pus, and where present it is also better to put off operation. In many cases, however, leucocytosis is present in cases of suppuration where the pus is sterile.

The exploring needle may prove useful in obtaining pus from cases of pyosalpinx for the purposes of bacteriological examination, and when carefully used with aseptic precautions, the small puncture necessary is not likely to give rise to trouble. The puncture should be made through the vaginal fornix, after careful bimanual examination to determine the probable situation of the pus.

In chronic cases of pelvic inflammation it is frequently impossible to determine the germs which caused the condition, these having long ago died out. Where foul smelling pus is present the cause has been either some of the putrefactive organisms, or the bacterium coli commune, but even here the original cause of infection is often uncertain, because an old collection of pus may become secondarily infected by the bacterium coli penetrating through the wall of an adherent coil of intestine. This seems to be a not unfrequent occurrence in tuberculous pyosalpinx, as was proved in a recent case of my own, and as I believe happened in at least two other instances. Where the pus in a pyosalpinx is sterile, and has no disagreeable smell, it is often impossible to tell whether it owes its origin to the gonococcus, or to the streptococcus or other pyogenic organisms. In many cases, however, even in the most chronic class it is possible to obtain some assurance of the nature of the case. The gonococcus has the peculiarity of affecting many different parts of the genital tract, and the inflammation caused by it tends to persist indefinitely; frequently therefore evidence can be found in the state of the urethra, vulva, vagina, and cervix, which while stopping short of actual proof, nevertheless affords a strong presumption of the origin of the disease

of the appendages. Of 94 non-suppurative cases of all kinds, 20 showed fairly conclusive evidence of gonococcal origin; included in these figures were 8 cases of hydrosalpinx out of a total of 23. Of 152 suppurative cases, 45 were believed on the clinical evidence to be gonococcal. In all probability in a considerable proportion of the remainder the gonococcus had been the effective agent, but had left no trace behind, other than the diseased appendages. In a much smaller proportion of cases, 2 of the non-suppurative and 7 of the suppurative, evidence of syphilis was obtained, but it did not appear that this disease had given rise to the changes in the tube and ovary.

The treatment of chronic cases of pelvic inflammation depends partly on the physical signs that are present, and still more upon the course of the affection. In some cases the disease has run its course, leaving only adhesions about the organs, which give rise to no symptoms, the condition of the appendages being discovered so to speak accidentally; such cases require no treatment of any kind. In other cases the complaints and symptoms which make up the clinical picture of neurasthenia, are found in patients who have the signs of chronic adhesive pelvic peritonitis or salpingitis, and it becomes difficult to decide whether active treatment for the condition of the appendages is indicated. Often such patients complain more or less of pains in the genital zone, and of dysmenorrhœa, and a vicious circle is set up, the weak general condition of the patient, and especially of her nervous system, magnifying any pains that are present, and the local disturbance in its turn causing deterioration of the general strength. Such patients are frequently of a neurotic stock, and included among them are many highly intellectual young women, sometimes tall and thin, but often below the average size, and slim in proportion. Patients in the same group frequently have a floating kidney, and occasionally suffer considerable inconvenience from that cause. They are generally women in the twenties or early thirties, and I have not been able to discover what becomes of their complaints after the age of 40. In them surgical treatment is usually of little benefit. The disuse into which the term "chronic ovaritis" has fallen, has made it more and more difficult to label the cases, but has probably proved a gain to the patients. The condition appears to be due primarily to neglect of the elements of hygiene, to the want of proper exercise and fresh air, and to improper feeding. Often the teeth are defective, and as a result of all these causes the functions of digestion and assimilation become defective.

In another group of patients with signs of salpingo-oöphoritis the complaint is merely that of sterility. Sometimes in these cases

there is a temptation to suggest operation with a view to opening up the tubes. Before deciding upon such a course it is necessary to make sure that no trace of gleet remains in the cervix or urethra, and that there is none in the husband, otherwise the operation can hardly prove other than a failure. In the treatment of these cases there is no question of the ordinary routine treatment for sterility, that of dilatation of the cervix, and it is well to bear in mind that whenever there are physical signs however slight of old disease of the appendages, dilatation of the cervix is attended with very considerable risk.

In other cases in which there are physical signs of old inflammation of the appendages, chronic complaints of pain of moderate severity, of dysmenorrhœa, of menorrhagia, or of leucorrhœa are made. In these cases the usual treatment of the symptoms by medical means generally suffices, but in ordering and carrying out such treatment it has to be borne in mind that a fresh acute attack may easily be set up. Surgical procedures which are usually of minor importance, such for instance as dilatation or curetting, and strong applications to the interior of the uterus are generally to be avoided, and where considered necessary should be undertaken with even more than the usual precautions.

In patients who make their appearance for the first time during an intercurrent attack, it is often necessary to decide whether operation should be recommended at once, or whether medical treatment should be continued. Occasionally it may be necessary to operate at the height of an acute attack to endeavour to save the patient from imminent death. Usually the urgency is less, and experience has proved that where it is possible to postpone operation success is more easily and safely attained when the operation is performed at the end of an acute attack. It would appear that the patient's blood and tissues become protected, presumably by antibodies of various kinds, which are heaped up during the course of an acute attack; and that the immunity thus acquired diminishes with some rapidity after the acute attack has completely passed off. The decision to make it a general principle that operation should be undertaken after the patient has had a certain number of acute attacks, say, 1, 2, or more, is not as easy in these cases as it is in appendicitis. In the latter case we are dealing with an organ that is probably of no use to the economy, while in the former we have to do with organs which in addition to their own proper functions exercise an important influence on the whole of the body, so that it is desirable whenever possible to preserve them.

The decision to operate in a patient who suffers from acute attacks, must depend on the social position of the patient, as well as on the number and severity of the attacks. Where the severe attacks follow each other at short intervals, and there are marked signs of changes in the appendages, operation should be undertaken. Where the attacks occur at increasing intervals, and are becoming gradually less severe, and where the physical signs and symptoms in the intervals do not point to the presence of pus, *medical* treatment should be patiently persisted in.

OPERATIONS FOR PELVIC INFLAMMATION.

	Non-suppurative.		Suppurative.					
	Salpingo-oöphoritis.	Hydro-sal-pinx.	Pyo-sal-pinx.	Suppurating ovaries excluding 17 with pyo-salpinx.	Intraperitoneal pelvic abscess excluding 12 with pyo-salpinx.	Tuberculous appendages.	Total.	
<i>Abdominal Section.</i>								
Exploratory ...	—	—	2 (1)	—	—	1	3 (1)	
Removal of one set of appendages ...	24	6	28 (1)	5	—	3	66 (1)	
Removal of both sets of appendages ...	9 (2)	5	25 (4)	4	—	3 (2)	46 (8)	
Breaking down adhesions, ignipuncture, salpingostomy ...	19 (1)	3	—	—	—	—	22 (1)	
Incision and drainage of abscess ...	—	—	—	—	17	—	17	
Hysterectomy ...	3	4	49 (5)	4	—	3	63 (5)	
	55 (3)	18	104 (11)	13	17	10 (2)	217 (16)	
<i>Vaginal Coeliotomy.</i>								
Removal of one set of appendages ...	3	1	2	1	—	1	8	
Removal of both sets of appendages ...	—	—	—	—	—	—	—	
Resection of ovary ...	6	—	—	—	—	—	6	
Adhesions broken down, ignipuncture, salpingostomy, &c..	7	3	—	—	—	—	10	
Posterior vaginal incision ...	—	—	—	—	12 (2)	1	13 (2)	
Vaginal hysterectomy ...	—	1	3	—	—	—	4	
	16	5	5	1	12 (2)	2	41 (2)	

The numbers in brackets signify deaths following operation.

When operation has been decided upon in a case of pelvic inflammation, it is necessary to decide by what route, vaginal or abdominal, the operation should be done. Both routes have their special advocates who prefer one or the other in every case. Each, however, has its own sphere. Operations through the vagina are most useful in certain of the less severe cases in which intervention is indicated. Where the tube and ovary are moderately enlarged and are adherent chiefly to the uterus, so that they move fairly freely together, then operation through the vagina, preferably through the anterior fornix, is advantageous; but where the appendages are adherent firmly to the side of the pelvis, where there are wide-spread adhesions, or where the uterus cannot be brought down to the vulva, the abdominal method is by far preferable.

In 41 of my cases operations of various kinds have been carried out through the vagina. In 13 of these an incision for the evacuation of pus has been made, usually through the posterior fornix; two of the patients died, both being in a gravely septic condition at the time of operation. In several other cases a posterior vaginal incision was made by myself or others, and at a subsequent date when the affection of the appendages demanded it a second and more radical operation was performed. In 16 cases various conservative procedures were undertaken through the vagina, including salpingostomy, breaking down adhesions, ignipuncture and resection of the ovary. In 8 cases one set of appendages was removed by this route for inflammatory affections. In one case of double hydrosalpinx and in three of double pyosalpinx, all complicated by prolapse of the uterus, the vaginal radical operation was performed.

In 21 of the vaginal cases operation was undertaken for various non-suppurative conditions, and for the same group of affections, including hydrosalpinx, 73 of my operations have been performed by the abdominal route. The procedures here include the removal of one set of appendages in 30 instances; of both sets in 14, various conservative operations in 22; and the abdominal radical operation in 7, including four cases of large and very adherent hydrosalpinx. In the total number of 94 operations for non-suppurative conditions there have been three deaths. One of these was due to pulmonary embolism on the eighth day after operation, the patient with normal temperature and pulse rate having shown no previous symptoms of danger following the operation; the second death was due to anæsthetic gangrenous pneumonia, the pelvic condition as observed at the autopsy being normal, and the abdominal incision firmly closed. The third death was caused by peritonitis consequent on an oozing

of six or eight fluid ounces of blood from separated adhesions. At least nine of the patients operated upon for non-suppurative conditions of the appendages have subsequently borne children.

In the worst cases of suppurative affections the choice of operation lies between double oöphorectomy, the abdominal radical operation, and the vaginal radical operation. The vaginal operation has been largely practised by surgeons in France and Germany. In its favour the claims made are that shock is less, that the general peritoneal cavity is not interfered with, that drainage is more direct and efficient, and that there is no abdominal scar to give rise later on to ventral hernia. Many surgeons, however, begin the operation by removal of the uterus, and one of the great objections lies in the possibility of removing a fairly healthy uterus and of afterwards discovering that one set of appendages is still serviceable. A further and still more serious disadvantage is that adhesions, more especially when they are intestinal, are much more difficult to treat by this route, and that the repair of a torn viscus is difficult or impossible. The immediate mortality of the vaginal radical operation has not exceeded five per cent. in the hands of the best operators, but lacerations and fistulæ, both intestinal and urinary, have been more frequent than when operation is undertaken through the abdomen. Of the abdominal operations, removal of the two sets of appendages is the older, and has had an extensive trial. The abdominal operation has in the first place the great advantage of enabling us, before proceeding to remove any of the organs, to make a complete examination, and to determine how much it is necessary to do. In many cases the actual condition of the organs is found, on opening the abdomen, to be decidedly less serious than it appeared to be from clinical examination, so that it is frequently possible to save one set of appendages. On the other hand, it not infrequently happens that, although signs have been chiefly observed about one set of appendages, the other tube and ovary are so severely damaged as to render their removal advisable. In the next place, adhesions can be separated by the aid of sight as well as of touch, and if intestine, bladder, or ureter is torn, the necessary steps for the repair of the injury can be at once undertaken in the most convenient way and under the most favourable conditions.

My abdominal operations for suppurative and tuberculous affections include three exploratory incisions with one death, which occurred in a profoundly septic case with perforated pyosalpinx and adhesions so dense that it was impossible to separate them. Thirty-six times the removal of one set of appendages was carried out with one death

from septic peritonitis. In 32 cases both sets of appendages were removed with six deaths. In two of these cases the operation was undertaken for tuberculous appendages, and was followed by the development of faecal fistula and death from gradual exhaustion. Of the other four fatal cases, in one the patient was desperately ill with septic peritonitis following the rupture of a pyosalpinx in labour; in a second the woman was wasted and cachectic, apparently as the result of chronic toxæmia; the other two died of septic peritonitis.

In dealing with cases of pyosalpinx by the old method of operation a stump of half an inch or so in length of diseased tube was left on the uterine cornu, and from this stump a certain degree of infection was common, giving rise to suppuration around ligatures and consequent sinus formation, and sometimes to fairly extensive and dense peritonitic adhesions. An improvement on this method of treating the pedicle has been made by cutting out the uterine portion of the tube, leaving a wedge-shaped depression that can be easily sutured together. But after the removal of both sets of appendages for suppurative affections the uterus, instead of quietly undergoing atrophy, has often been the source of severe pains and various discharges, so as to render its removal advisable at a later date. In many cases it is found that the uterus is universally adherent, that it is enlarged, and that both cervical and corporeal endometria are in a state of chronic inflammation. Such a condition of affairs is, of course, frequently to be expected since infection usually spreads into the tubes and pelvic peritoneum by way of the uterus. Moreover, it has yet to be proved that the possession of a uterus devoid of appendages, especially when that uterus is more or less diseased, is an advantage to its possessor. The suggestion has been made, based on no evidence, that by leaving the uterus the symptoms of the menopause are modified and that possibly the uterus provides an internal secretion in the same way as the ovaries are supposed to do. The question of the correct operative treatment of severe affections of both sets of appendages is still unsettled, but the above considerations have induced many surgeons, myself among the number, to undertake the complete removal of the uterus along with the appendages in cases where these are found to be hopelessly disorganised.

Among my own operations to the end of 1906 are included 53 of the abdominal radical operation for ordinary suppurating affections of the appendages, and 3 for tuberculous disease. Five deaths followed, a mortality of nearly nine per cent.; of the three tuberculous cases the uterus was affected simultaneously with the tubes in two;

in the third the tuberculous tubes and left ovary were removed through an anterior vaginal incision, and six years later the tuberculous uterus and right ovary were removed by the abdominal route. The methods of operation employed include supra-vaginal as well as total abdominal hysterectomy. The supra-vaginal method was employed in 15 cases with 3 deaths. One of the fatal cases occurred in an alcoholic patient; a second in a fat woman with a fibroid weighing $3\frac{3}{4}$ pounds, complicated by a pyosalpinx containing 4 or 5 fluid ounces of thick, yellow pus; the pyosalpinx had caused constriction of the ureter an inch and a half above the bladder, and consequent hydronephrosis. In the third case the patient was ill, dusky, and emaciated, and died of general peritonitis. In the remaining 41 cases the complete operation was done, the cervix being removed along with the rest of the uterus and appendages. Two deaths followed the operation, a mortality for this method of rather less than five per cent. One of the fatal cases occurred in a feeble, emaciated, and cachectic woman of 33, who had been seized with an acute attack of septic peritonitis three weeks before the operation; the only labour had taken place $12\frac{1}{2}$ years before, and there had been no previous severe attack, though the woman had never been well; death from suppurative peritonitis occurred six days after the operation. The other death occurred in a woman of 54 whose only pregnancy occurred at the age of 23; 31 years later abdominal pains began and a tumour was discovered two months before operation; the patient had been wasting for a year. On admission she was desperately ill with furred tongue, foul breath, pulse 136, and signs of cardiac dilatation. Death occurred nine hours after the removal of a fibroid uterus together with a large suppurating ovarian densely adherent in the pelvis.

The total abdominal operation is in most cases not much more difficult to perform than the supra-vaginal, and presents two great advantages. In the first place a frequent source of subsequent trouble is removed; the blood supply of the cervical stump is very apt to be interfered with to some extent in the supra-vaginal method, and the consequent interference with nutrition leads sometimes to a certain amount of necrosis, often permitting infection of the cut surfaces and pus formation. In the second place the removal of the cervix permits free drainage to be provided into the vagina where this is considered desirable. On the other hand the removal of the cervix has no corresponding disadvantages; the only argument for its retention is that it forms part of the pelvic floor, but experience has

shown that this is not a whit less capable of supporting the superincumbent viscera after it has been deprived of the cervix.

LITERATURE.

The literature of pelvic inflammation in the female is copious. Many important papers are contained in the London Obstetrical Transactions, in the British Gynæcological Journal, and in the Journal of Obstetrics and Gynæcology of the British Empire, while in the last two are also to be found numerous short abstracts of papers published in full elsewhere. Among the German sources of information the chief are the large text-books on Gynæcology edited by Billroth and Luecke, and by Veit; A Martin's exhaustive *Handbuch der Krankheiten der weiblichen Adnexorgane*; von Winckel's *Handbuch der Geburtshülfe*, Bd. 3, Tl. 2; Döderlein and Krönig's *Operative Gynäkologie*; and Menge and Krönig's *Bacteriologie des weiblichen Genitalkanals*. In most of these works there are extensive lists of references. In Allbutt, Playfair, and Eden's *System of Gynæcology* are articles on Gonorrhœal Infection by Hellier, and on Pelvic Inflammation by Cullingworth, to each of which is appended a carefully selected list of important contributions. The last named author, in addition to several other important contributions to the subject, published in 1895 a small book entitled *Clinical Illustrations of the Diseases of the Fallopian Tubes and of Tubal Gestation* (3rd edition, H. J. Glaisher, London, 1902) which contains excellent and characteristic drawings of many of the changes found in pelvic inflammation.