

The Blood Sedimentation Test. Its Application in Gynæcology.

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LABORATORY tests have so increased in number in the past few years, that one hesitates to emphasize yet another. Much has been written about the blood sedimentation test in America and on the Continent, but it has never become popular in this country, in spite of the fact that its clinical efficiency is proved by results, and the simplicity of the test makes it a useful aid to diagnosis.

In the very early days of medicine it was recognized that sometimes when blood was allowed to stand, it separated into two component parts, an upper clear layer and a lower opaque red layer. As early as the second century, Galen described the "Crusta Phlogistica" and demonstrated these two layers. In later years it was well known to the Barber Surgeons that blood let off from certain patients settled more quickly than in others, and this, when it occurred, was regarded as a matter for self-congratulation, indicating that without venesection the patient would certainly have gone downhill. Pauum,²⁸ however, many years later, warned against repeated venesections in patients whose blood showed a "Crusta Phlogistica," since this might be caused by blood-letting itself. (It has been recently shown that increased sedimentation occurs in severe anæmia). In 1771, Hewson¹² studied the phenomenon, and John Hunter,¹⁵ twenty years later, in his "Versuche über das Blut" (1791), recorded the fact that the speed of sedimentation varied in different specimens of blood. He further pointed out that the blood from an inflamed part did not differ in this respect from blood drawn from an unaffected part, thereby proving the phenomenon to be of general, rather than of local significance. In many medical works of the 18th and 19th centuries, other observations were made on the "Crusta Phlogistica," or the "buffy coat,"

but the subject was studied in a desultory fashion only, and as the humoral doctrines were relegated to the past, the question was shelved. In 1918, attention was again focussed on the subject by Fahreus,^{4,5} who pointed out that if citrated blood from a pregnant woman was allowed to stand, the corpuscles would rapidly settle down to the bottom of the tube. Further, he demonstrated that the rate of settling increased as the pregnancy advanced, and he suggested this as a test for pregnancy. To substantiate this claim further, he carried out a large number of experiments, and while he failed to prove his point, he contributed much useful information to the literature.

About 1920,^{17,18} numerous papers began to appear on the subject, especially in Germany, where Linzenmeier and Westergren³⁶ inspired respectively a large series of investigations. Later, America followed suit, and in recent years almost every American journal made some mention of the blood sedimentation reaction. It has been used as a test in a great variety of ailments, from bone disease to the psychoses, and numerous papers were published on the subject which, while raising many points of interest, perhaps tended to obscure the real significance of the reaction. In America the test has become as much a part of the routine of the hospital ward as a blood count.

In this country it has not been taken up to any great extent, its use being at present confined almost entirely to tuberculosis clinics. While it has definite limitations, and while I do not support it with quite the enthusiasm of the American workers, there is no question as to its value in certain cases.

The present series of tests was carried out in the gynæcological wards of the Glasgow Royal Infirmary at Professor Hendry's instigation, and the results of the investigation led to the adoption of the test as a routine in these wards.

Technique.

Numerous methods and modifications of the test have been described, and this has led to much confusion in the comparison of results. Linzenmeier¹⁸ places the citrated blood in graduated test tubes, and watches the sedimentation of the corpuscles until a certain mark in the tube is reached, expressing his result in the time taken to reach this mark. Westergren,³⁶ on the other hand, using longer graduated pipettes, notes the length in a given time of the column of serum above the sedimenting corpuscles, expressing his result as a *sedimentation rate*, as opposed to Linzenmeier's *sedimentation time*. Other modifications have been described, based for the most part on the above techniques, and while each

claims some advantage, there is little to choose between them. The great drawback of this diversity of methods is the difficulty of comparing the results of different workers. Nevertheless the principle holds good no matter what be the method employed, and once a standard has been arrived at by any method, a broad comparison of results is possible.

The method I have used is a modification of that described by Morriss,²⁶ and is based on the Westergren technique. Its chief advantage is the simplicity of the apparatus, which can be collected in any laboratory, and the ease with which the test can be carried out. The apparatus consists of ordinary serological pipettes of 1 c.c. capacity graduated in hundredths, rubber tubing of a diameter which will accurately fit the pipettes, screw clips, some test tubes, a rack which will hold the pipettes in an upright position, an accurately graded 2 c.c. syringe with hypodermic needle, and a solution of sodium citrate (3.8 per cent). The pipette is fitted for use by rolling on to its upper end a 3 to 4 inch length of rubber tubing on which is fixed a screw clip. This simple device assures an air-tight closure of the tube, allows of accurate adjustment of the column of blood in the tube, and prevents the column from falling, without employing the special racks devised for this purpose.

The solution of sodium citrate (0.4 c.c.) is drawn up into the clean dry syringe, and then with ordinary precautions a cubital vein is punctured, and the blood allowed to flow directly into the syringe containing the citrate solution. The needle is withdrawn when the syringe is filled accurately to the 2 c.c. mark, and the blood and citrate solution at once emptied into a clean dry test tube, and thoroughly mixed by inverting the tube several times. The tube may now be set aside until convenient, though in these tests I have never allowed it to stand for more than half-an-hour. The contents of the tube are again thoroughly mixed, and the clip having been loosened, the blood is drawn into the special pipette until the top of the column of blood coincides exactly with the zero mark, when the clip is screwed tight. The pipette is then allowed to stand vertically at room temperature, and the rate of sedimentation noted by reading off at intervals the volume of the clear column of serum above the corpuscles. The result is expressed in percentage of the total column of blood in a given time, and can be read off directly from the graduated pipette. In my first three hundred cases, readings were taken at intervals of ten minutes for charting purposes, but latterly I have found that half-hourly readings are sufficient, the important points for comparison being the one hour and two hour readings.

Sources of Error.

Certain sources of error must be avoided.^{8, 14} All apparatus should be absolutely clean and dry. The pipettes used should be of constant bore, otherwise comparison of results in any series is not accurate. The syringe should be accurately graduated. It must be carefully cleaned, and dried with alcohol between each test, and before drawing off the blood, should be rinsed out once or twice with citrate solution. The tubes of blood should be kept at room temperature, otherwise variations in results may be obtained. Lastly, the citrate solution should be renewed every few days, as old solutions give unreliable results.

Causation.

When the citrated blood from a normal individual is allowed to stand the corpuscles separate from the serum very slowly, usually taking some hours to show any very definite drop. On the other hand, in certain conditions the separation is rapid, so much so, that in some cases one can actually see the clumps of corpuscles sedimenting, and within an hour separation may be complete. The cause of this phenomenon is still not yet clearly understood. While rate of sedimentation of particles in a physical suspension can be calculated accurately by formula the matter is less simple when applied to blood, which is a suspension of corpuscles in plasma. Various factors have been considered as important. An increased fibrinogen content²¹ certainly favours more rapid sedimentation, as does an increased globulin content^{13, 23, 31} of the blood. Increased viscosity was at first thought to delay sedimentation, until it was proved that by favouring the agglutination, and hence diminishing the surface tension of the corpuscles, it was a factor rather in the production of an increased sedimentation.²¹ Cholesterol is said to hasten sedimentation, and other lipoids producing changes in the surface tension of the corpuscles have been cited as factors.²¹ It has been suggested that the changes may be produced by specific ferments similar to those playing a part in the Abderhalden reactions. Further, the cell volume of the blood, viz. the size and number of the corpuscles, must be taken into consideration.³² Hôber,¹³ Schwyzer,³⁴ Fahraeus and others²⁷ investigated the electrical charges of the corpuscles, and showed that diminished electrical repulsion leading to agglutination of the corpuscles was the most important factor in the process. While there are still definite gaps in our knowledge of the subject, the situation as understood at present is well summarized by Wells,³⁵ who states that "increased sedimentation depends on an alteration in the chemical and physical properties

of the blood whereby agglutination of the corpuscles takes place. This agglutination in turn depends on an altered protein content of the blood. Red blood corpuscles are negatively charged particles, and their mutual repulsion will be decreased by positively charged proteins in the serum, of which fibrinogen and globulin are the most important. Hence, if the proportion of fibrinogen and globulin be high as compared with albumin, the electro-positive protein in the blood is increased and sedimentation is more rapid."

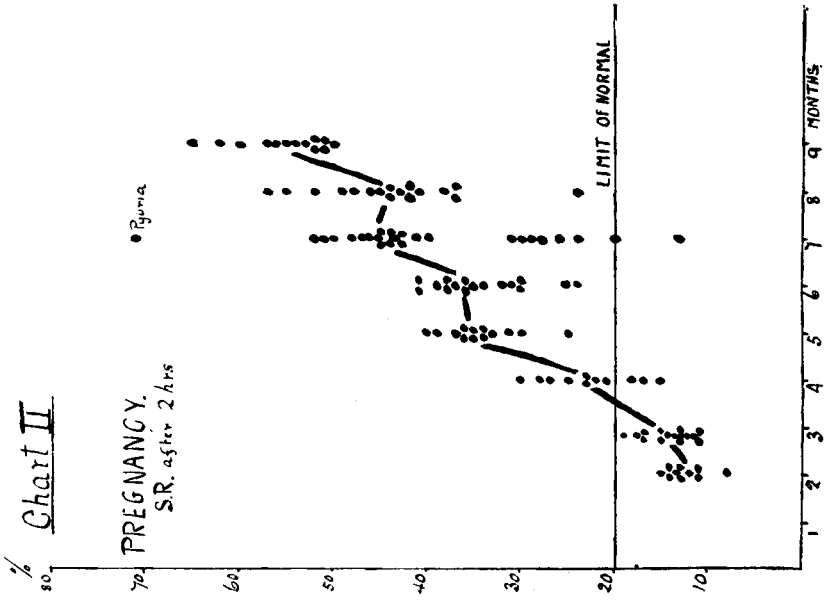
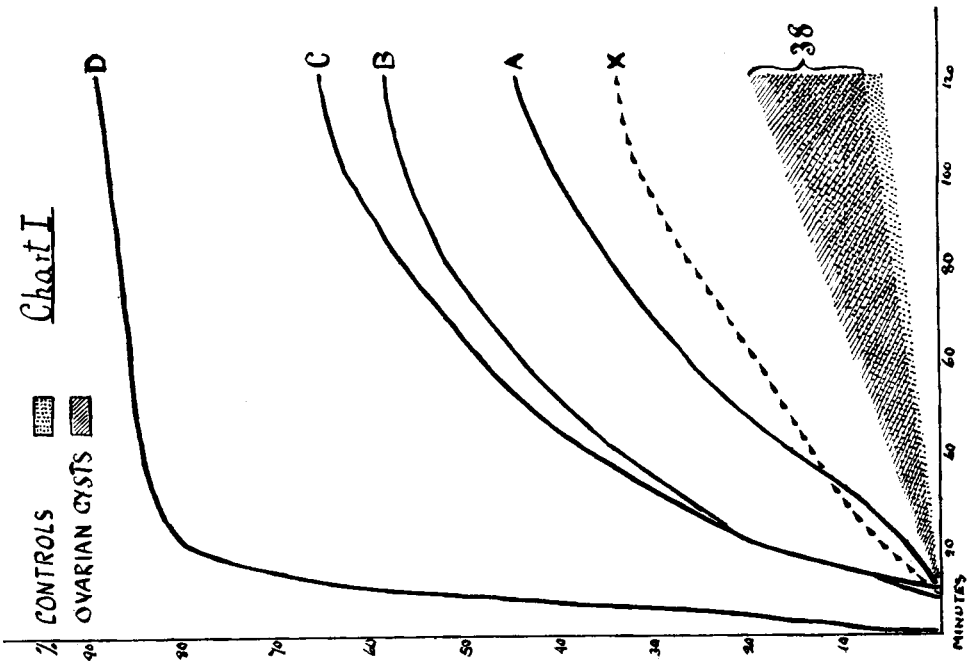
It is obvious that numerous factors have to be taken into consideration, and that a team of experienced bio-chemists and physicists is necessary before this most complicated subject can be entirely elucidated.

Application of the Test.

As already indicated, the test has been widely applied in medicine, surgery and gynæcology. It has been extensively used in tuberculosis, where it has proved an accurate index of the progress of a case; in cardiac disease where it indicates early an infective process; in pneumonia, arthritis, appendicitis, and many other conditions. It is used chiefly for the early detection of an inflammatory lesion, and one enthusiast goes so far as to say that the "test never lies," the interpretation alone being at fault. This non-specificity of the test is perhaps its chief disadvantage, though it gives rise to less confusion than one might expect. It is a delicate reaction, and reveals the activity of a lesion when the general disturbance may be slight or absent. It is a more trustworthy indication of the intensity of a pathological process than the temperature, pulse rate or leucocyte count. In most of my cases the white count was also determined, and while without exception a rapid sedimentation was present when the leucocyte count was raised, in the greater number of cases the sedimentation rate was raised while the white count was normal. In some cases the sedimentation rate remained high for weeks after the temperature, pulse rate and leucocyte count had reached normal limits.

In gynæcology, the test has a definite sphere of usefulness. The pelvis produces surprises even to the most experienced gynæcologist, and in the case of doubtful swellings in the pouch of Douglas, or in seemingly uncomplicated tumours, an abnormal blood sedimentation may be invaluable in helping to clear up the diagnosis or in putting the surgeon on his guard for some complication he has missed clinically.

I have carried out the test in some 700 cases, of which 533 were gynæcological. The medical and surgical cases I shall not con-



sider further as the numbers in each group are too small to give results of any importance. Table 1 shows the types of case investigated. In the greater proportion, especially in the infective group, the test was carried out on repeated occasions so that the course of the disease could be determined.

TABLE 1.
Types of Cases Investigated.

Controls	...	...	...	...	...	60
Pregnancies :	Intrauterine	...	...	...	...	113
„	Ectopic	...	...	...	...	34
Ovarian cysts	...	...	...	...	...	43
Fibroids	...	...	...	...	...	52
Carcinoma	...	...	...	...	...	31
Inflammatory :	Acute	...	...	...	...	162
„	Quiescent	...	...	...	...	58
Total						553

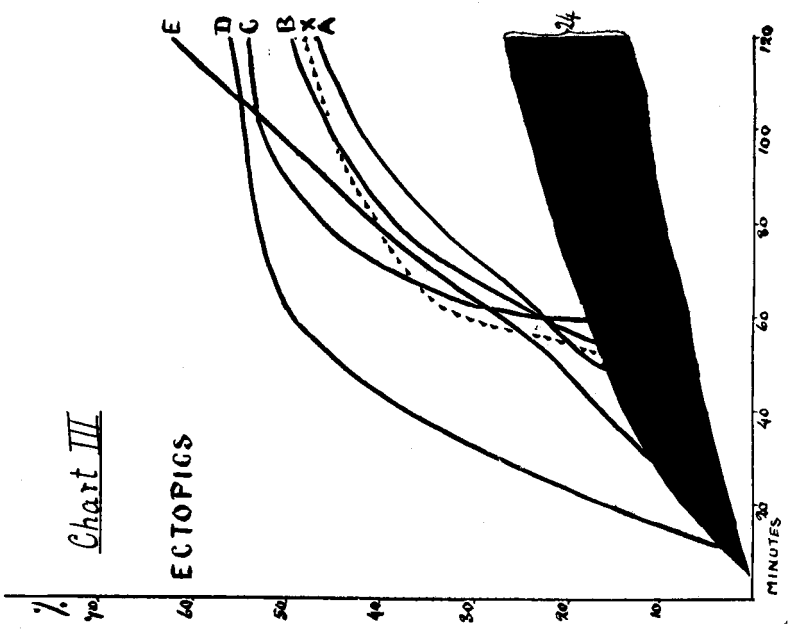
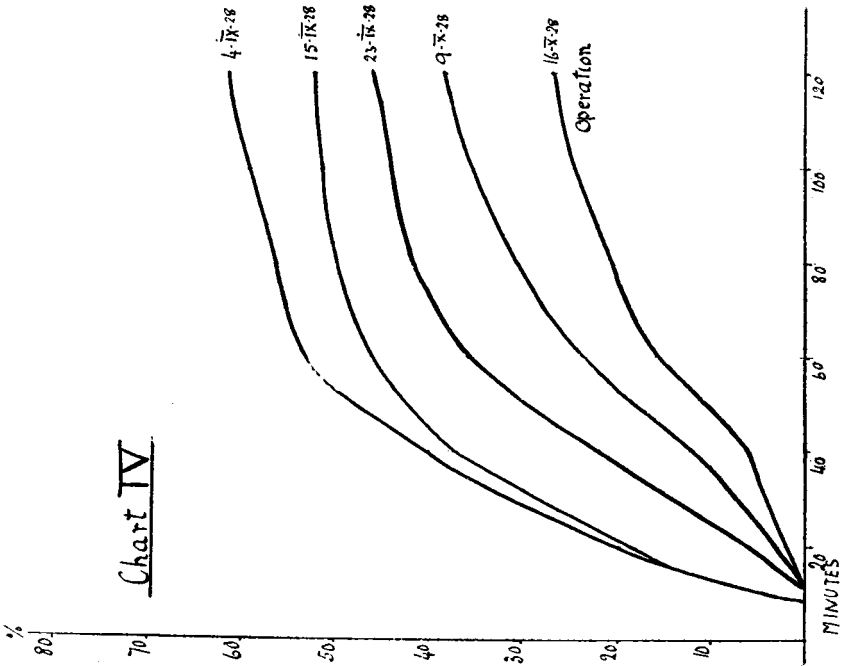
Controls. (60 Cases).

As it was necessary to establish a normal standard, the sedimentation rate was tested in 60 healthy individuals. It is well known that sedimentation is more rapid in children than in adults, and in women than in men so that, as I was working in female wards, all my controls were done on adult women, in order that my results might be comparable. Chart I (dotted area) shows the limits of normality, i.e. from 2 per cent to 7 per cent in one hour, and from 6 per cent to 18 per cent in two hours. The dotted area includes all the curves of the 60 normal cases.

Fifty of these cases were tested on the first day of menstruation as well as in the inter-menstrual and pre-menstrual period, and while in some cases a very slight increase in the sedimentation rate was noted, in a large proportion there was no change, and in a few the rate was decreased. For all practical purposes, therefore, one may say that menstruation has little effect on the results of the test.

Intrauterine Pregnancy. (113 Cases).

While as an indication of pregnancy Fahreus' test has definitely failed, the findings during pregnancy are of interest. (Chart II). One hundred and thirteen cases were examined at various stages of pregnancy. Twenty-five were at the second or third month, and of these only one showed an increased sedimentation rate. Of the remaining 88 cases in the later months, only five showed a sedimentation rate of 20 per cent or under after two hours, all the rest being definitely increased. Apparently after the formation of the placenta, certain factors, be they changes in

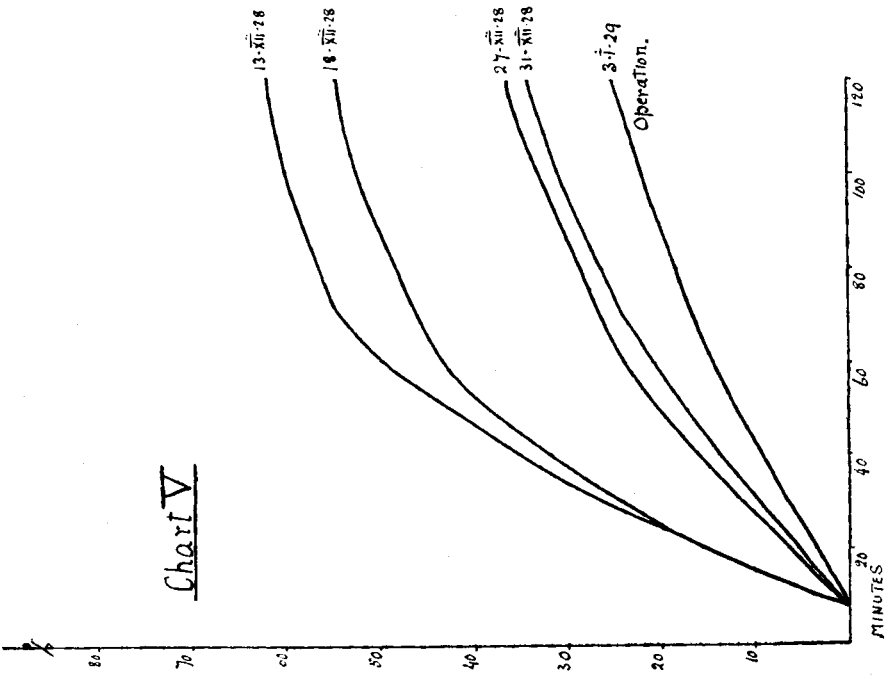
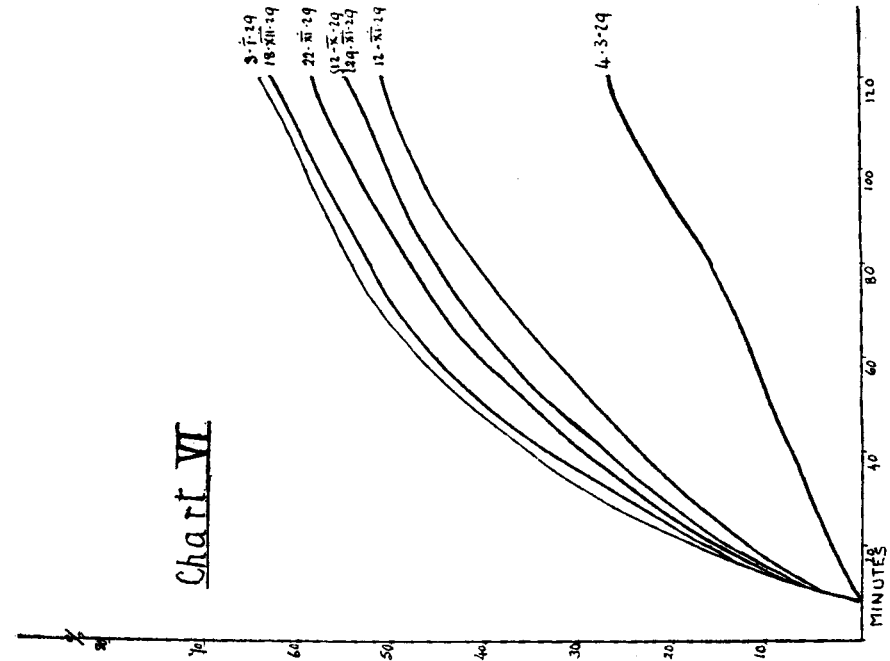


the protein content of the blood, the cholesterol content, or the circulation of hormones, come into play, which alter the physical and chemical properties of the blood, and thereby increase sedimentation. These factors as shown by the chart are more evident as pregnancy advances, for, broadly speaking, the sedimentation rate increases with the age of the pregnancy. This may have some bearing on the question of the toxæmias of pregnancy, though I have not found the sedimentation rate to be more rapid in cases of albuminuria than in normal cases at the same stage of pregnancy. I have only had one case of eclampsia, and in that patient there was no undue increase in the rate, although in eclampsia the globulin and fibrinogen content of the blood is said to be raised. The one very rapid sedimentation rate in this group was in a case of severe pyelitis at the seventh month, with a swinging temperature, in which an inflammatory condition was superimposed on the pregnancy.

The results, therefore, agree with those of other workers who find no increase in sedimentation in the early months, but a definite change as the pregnancy continues.

Extrauterine Pregnancy. (34 Cases).

Thirty-four cases of extrauterine pregnancy occurred in the series. From the aforementioned results, one would expect that, these being cases of early pregnancy, the results would be similar to those in the early months, viz., near normal values. Twenty-four cases, or 70.6 per cent, showed only a slightly increased sedimentation rate, and it was hoped that here was a help in the diagnosis between an inflammatory swelling and an ectopic pregnancy, in certain difficult cases. The test is undoubtedly of value in coming to a conclusion, but it is not infallible. It is well known that an inflammatory process is often concurrent with the pregnancy and further, a large amount of blood clot in the peritoneal cavity seems to increase the sedimentation.³³ Of the 34 cases, 10, or 29.4 per cent, showed an increased rate (Chart III). Of these, two cases (B and C) showed the sac to be definitely infected (confirmed microscopically), two cases (A and D) had an old-standing pelvic hæmatocœle with adhesions and considerable irritation of the peritoneum, and one case (E) had a pelvic peritonitis at operation, and her convalescence ran a most disturbed course for some days, until she discharged pus freely *per vaginam*, after which she slowly improved. Five cases, or 14.7 per cent (indicated collectively by the dotted line), could not be explained satisfactorily. These all had moderately increased sedimentation rates, and the findings in no way tallied with the results. Their convalescence ran a



straightforward course. There is one point which may be worth noticing in the curves of these cases, *viz.* that with one exception the rate up to one hour is not much increased, but that sedimentation occurs fairly rapidly between the one and two hour readings. This contrasts with the usual inflammatory curve which has a rapid initial rise with little change during the second hour (Charts IV and V).

While the last five cases mentioned rather shook our faith in the efficacy of the test as an aid in differential diagnosis, on the whole, taken with a careful history and accurate clinical observations, it is well worth considering, and if the sedimentation rate is rapid, at least a temporary delay in operation is advisable.

In this connexion I should like to cite one case. Mrs. B., *aet.* 31, was admitted with a history suggesting an ectopic pregnancy. On palpation a tender unilateral swelling was found. Her general condition was good, and the temperature and pulse were normal. Her leucocyte count was 10,000 per cubic millimetre with a predominance of polymorphonuclear cells; the sedimentation rate was 45 per cent in one hour, 62 per cent in two hours. Despite this definite increase, the abdomen was opened, and free blood in the pelvis seemed to confirm the diagnosis of ectopic pregnancy. The left Fallopian tube was found to be distended with blood, and the diagnosis seemed still more certain. On microscopical examination, however, evidence of pregnancy could not be found. The tube wall showed chronic inflammatory changes, with a super-imposed acute lesion which had caused marked congestion of all the vessels, and which was presumably responsible for the hæmatosalpinx. The increase in the sedimentation rate was justified.

Inflammatory Lesions. (220 Cases).

It is in this group that the blood sedimentation rate proves to be of greatest value. With few exceptions, gynæcologists are agreed that a pelvic inflammatory lesion is best treated conservatively in its acute and subacute stages, and that operative interference, if necessary, should only be carried out when the lesion is quiescent. When is this quiescent stage reached? The temperature usually settles within the course of a few days, the pulse rate comes down, the leucocyte count is normal, yet operative treatment may not be safe. Some surgeons state that laparotomy may be considered ten days after the temperature has settled, but there are many cases which still run a subacute course after the general disturbance has ceased. Blair Bell pointed out that at this stage a vigorous bimanual examination may cause a rise of

temperature and pulse rate with a general feeling of malaise, and suggested that this method be used as a test of activity or chronicity. But when is one to know that the surgical trauma of tissues may not light up to vigorous activity an infection seemingly quiescent to bimanual examination? Here the blood sedimentation shows itself to be a most delicate indication of the activity of the lesion. Long after all symptoms, general or local, have disappeared, it may still indicate that the safety point has not yet been reached. As resolution proceeds, as the pelvic swelling diminishes, and the uterus gradually regains its mobility, the sedimentation curves steadily fall, till they may reach almost normal limits. It is interesting to note, however, that when a pus sac of any size exists, the sedimentation rate does not reach normal, though it may fall from a very rapid to only a moderately increased rate.

Three typical cases may be quoted, and these could be multiplied indefinitely from the series. Case 1 (chart IV) had a bilateral pyosalpinx. She was admitted in the acute stage, gradually responded to treatment, and, showing a fall of the sedimentation curves, was operated on successfully after six weeks in the wards. Case 2 (Chart V), a bilateral salpingo-oöphoritis, was likewise treated conservatively. The sedimentation curves steadily fell, and her symptoms having long since disappeared, a radical operation was performed four weeks after admission. Case 3 (Chart VI) was of a less satisfactory type. Admitted with a frequent pulse rate, a raised temperature, and signs of toxæmia, her symptoms rapidly disappeared with treatment. Her sedimentation rate, however, did not fall, and every now and then, often after a pelvic examination, she would show a slight general disturbance, and a slight rise of temperature. Finally, after nearly two months in the wards, she was dismissed in moderately good health, although she still had a large ill-defined pelvic swelling, and a rapid sedimentation. She was kept under observation, and two months later her pelvic organs were found to be in a much more satisfactory condition, and the sedimentation rate was definitely reduced. Operation was not necessary.

Considering the whole group, there were 220 cases of pelvic inflammation. Fifty-eight had a normal sedimentation rate on admission: of these 23 were mild cases of pelvic inflammatory mischief which required merely local medication or some minor manipulation. As was to be expected, these cases gave no trouble. The one exception was a patient who had a curettage performed for irregular hæmorrhage; five days after operation she developed a pelvic cellulitis, in spite of the fact that the sedimentation rate was normal before operation.

The remaining 35 quiescent cases were submitted to laparotomy. Among these 19 had conservative operations, in which the uterus, with the whole or part of the adnexa, was retained. In the remaining cases, the pelvic organs were removed by total or sub-total hysterectomy. Only one of this group had any post-operative complication, this being merely a mild sepsis of the wound.

TABLE II.
*Analysis of Chronic inflammatory Cases.
Sedimentation rate Normal.*

Treatment	No. of Cases	Result Satisfactory	Result Unsatisfactory
Medical or Minor Surgical	23	22	1
Major Surgical			
Conservative	19	19	0
Radical	16	15	1
Total	58	56	2

Coming to the more interesting group of acute and subacute lesions, 162 cases were investigated. Table III indicates the sedimentation rate, which I have divided into "normal" (below 15 per cent), "increased" (15 per cent to 30 per cent), "rapid" (30 to 45 per cent), and "very rapid" (over 45 per cent), taking the reading after one hour as the standard.

TABLE III.
Analysis of Acute Inflammatory Cases.

Treatment.	Normal below 15%	Increased 15% - 30%	Rapid 30% - 45%	V. Rapid over 45%	Total.
Conservative ...	—	21	41	26	88
Operation after Conser- vative.	on admission	11 ¹ died	30	16 ^{xxx}	57
	at operation	25 ¹ died	27 ^x	5 ^{xx}	
Operation only ...	—	9 ^{xx}	4 ^{xxxx}	4 ^{xxx}	17
x indicates patients who had a disturbed convalescence.					162

Eighty-eight cases were treated purely conservatively, 67 of which had a "rapid" or "very rapid" sedimentation. There were 20 cases of pelvic cellulitis, of which 17 came in the "very rapid" group. The results in these 88 cases justified the adoption of conservative methods. In 61 cases, the sedimentation rate settled down steadily as in the cases above quoted, and the symptoms completely subsided. Five cases required colpotomy for the evacuation of pus, and improved thereafter. Sixteen cases improved as regards symptoms, but the sedimentation rate did not settle to any great extent, (Chart VI), though when some of these cases were seen later, the rate was found to be nearing normal limits. Four cases were dismissed improved, but returned later with a recurrence of symptoms, and the sedimentation rate being suitable, underwent operation. Two cases did not improve, and left the wards against advice.

Considering next the more important group requiring operation, those treated conservatively before laparotomy numbered 57. Treatment consisted in rest, efficient elimination, hot douching, and radiant heat, and its duration varied from ten days to six weeks. The sedimentation rate before treatment is shown in the Table, *viz.* 11 cases below 30 per cent in one hour, 30 below 45 per cent, and 16 over 45 per cent. After treatment there were no cases with a sedimentation rate of over 45 per cent, and all the rates had improved. A disturbed convalescence is indicated by a cross (×). One patient had a swinging temperature for several days and was only relieved when a profuse purulent discharge appeared *per vaginam*. A second showed signs of pelvic peritonitis, and gave anxiety for some days. These two occurred in the "rapid" group. A third case with a sedimentation rate of under 30 per cent at operation developed a mild sepsis of the abdominal wound. There was one death, and as this is the only death in the series, it is unfortunate for statistical purposes that it should have occurred in the quiescent group with a normal sedimentation. The patient died four days after operation, and post-mortem examination revealed a mild pelvic peritonitis.

In this group then, consisting of 57 patients, four, or 7 per cent, had some post-operative disturbance.

The results in the next group are striking. Of 17 cases operated on with an "increased" or "rapid" sedimentation, and without previous conservative treatment, nine, or 52.7 per cent, gave trouble after operation, and only eight, or 47 per cent, had a straightforward convalescence. Of the nine cases, one developed a septiciæmia and was in hospital for four months; one had gross sepsis of the abdominal wall; one developed phlegmasia ten days after

operation; one required a colpotomy to evacuate pus which formed post-operatively, and the remainder had a definitely disturbed and prolonged convalescence.

Taking the results together, of the 13 patients operated on with a sedimentation rate of over 30 per cent, nine, or 69.2 per cent, gave trouble after operation, whereas, in the large group of 61 cases operated on with a sedimentation rate of under 30 per cent, only four, or 6.5 per cent, caused any anxiety. Surely this is a strong indication that in hospital wards in particular, where one sees so much of this type of case, the result of the blood sedimentation test should be given serious consideration, and when contra-indicated, an abdomen only opened after the pros and cons of the situation have been carefully weighed.

A case in point, not included in this series, occurred recently in the wards. An unmarried girl of 24 was admitted with dysmenorrhœa as her only symptom. There was no pre-menstrual pain. On examination, she was found to have a large firm swelling extending from the pelvis above the symphysis pubis on the left side. It was inseparable from the uterus, and it was not tender to palpation. No abnormality was detected on the right side, but the left ovary could not be felt apart from the tumour. Her general condition was satisfactory, though she had an old valvular lesion of the heart. The sedimentation test was not carried out. With a tentative diagnosis of uterine or ovarian neoplasm, the abdomen was opened under spinal anæsthesia. The tumour was found to be a large pyosalpinx, and a mild salpingo-oöphoritis was present on the right side. The congested appearance of the pelvic organs suggested that the lesion was subacute. Total hysterectomy with bilateral salpingo-oöphorectomy was performed, and the peritoneal cavity drained vaginally and abdominally. The patient was critically ill for ten days, and a foul purulent discharge from abdomen and vagina necessitated her isolation. Had the sedimentation test been known beforehand, in all probability the inflammatory condition would have been suspected, the operation postponed, and her convalescence, therefore, would have been more satisfactory.

Ovarian Cysts. (43 Cases).

Forty-three cases of ovarian cysts were investigated including three cases of simple fibroma, which I have classified in this group. Thirty-eight of these, of which eight were cases of torsion of the pedicle, had a sedimentation rate within normal limits, viz. 8 per cent to 19 per cent in two hours. (Chart I). Four cases had an increased rate, and are worthy of consideration.

Of these, one (Case A) was found to have an infected adherent friable cyst. A second (Case B) had a large abdominal swelling very tender to palpation—the sedimentation rate was so rapid (59 per cent in two hours) that operation was delayed. With conservative treatment the rate showed a steady decrease week by week, but the abdominal swelling, while it lost its tenderness, did not decrease in size. After six weeks, when the sedimentation rate had dropped to 26 per cent in two hours, the abdomen was opened. An ovarian cyst was found on each side, the left having become infected and converted into a pus sac. The abscess ruptured during the course of the operation, but convalescence was quite undisturbed.

The third case (C) was found to have free hæmorrhagic fluid in the peritoneal cavity, foul-smelling and obviously infected with coliform organisms. The ovarian cyst had ruptured, only a little fluid remaining within its cavity. Its wall was necrotic, and the peritoneum and cyst wall were acutely infected.

The fourth case (D) was a fibroma of the ovary. The patient was admitted with a history suggesting torsion of the pedicle. The temperature was normal, but the pulse rate was high and the patient very ill. The abdominal tumour certainly needed attention, but there was consolidation at the bases of both lungs, and operation was delayed. The sedimentation rate was very rapid. The patient died on the following day, and post-mortem examination confirmed the presence of a twisted fibroma. The cause of death, however, was a bilateral lobar pneumonia, which was in the stage of grey hepatization.

The findings in these four cases certainly justified a rapid sedimentation rate. Of the 43 ovarian cysts, one only, (x) shown by the dotted line (Chart I) caused an increased sedimentation rate for no obvious reason.

Therefore, if a case of ovarian cyst be found to have a rapid sedimentation rate, some inflammatory complication, local or general, should be suspected.

Fibroids. (52 Cases).

Fifty-two cases of fibroids were examined, and the results are comparable with the findings in the ovarian cyst group. As one would expect, a straightforward fibroid is not likely to give rise to an increased sedimentation rate, but as these tumours may predispose to an adnexal infection, one may suspect such a complication if the sedimentation rate is raised. Occasionally degeneration in the tumour also causes an increased rate. Of the

52 cases, nine showed an increased sedimentation, and of these eight had a concomitant inflammatory lesion in an active state. The remaining case with an increased rate showed a large fibroid which had undergone advanced necrosis.

One of the above cases may be mentioned. Mrs. B. was admitted with a diagnosis of multiple fibromyomata. Her temperature was slightly raised on the day of admission, but fell the following day. Her sedimentation rate two days later was found to be very rapid, 51 per cent in one hour, 59 per cent in two hours, but the leucocyte count was only 8,400. As the diagnosis of fibromyomata was obvious, and the pain she complained of seemed to be due to pressure of a large posterior fibroid in the pelvis, operation was decided upon. The diagnosis of fibromyomata was certainly correct, but in addition a subacute pelvic peritonitis was present, with a bilateral pyosalpinx. The presence of infection rendered the operation, a supravaginal hysterectomy with bilateral salpingo-oöphorectomy, an extremely troublesome one owing to the increased vascularity. The patient's convalescence was very stormy; in spite of drainage she developed gross sepsis of the abdominal wound, and later a white leg on the left side. Had operation been delayed until the sedimentation rate had diminished, this tedious convalescence might have been avoided.

Carcinoma of Cervix. (31 Cases).

While the sedimentation rate in these cases is of interest, it does not appear to me to be of any great practical value. I cannot agree with several of the German workers^{9, 10} who state that with a careful technique the cases may be accurately classified, and the prognosis based on the result of the test. The sources of error for so fine a differentiation seem too numerous, and the personal equation of the worker too obvious to set so much store by the result. Further, in cases of cancer, other factors which may influence the sedimentation rate play a part. The growth is frequently infected, particularly in surface growths and there is often a profound anæmia which will certainly disturb the result of the test.

Of 31 cases examined, only one, an early case of squamous carcinoma of the cervix, showed a normal sedimentation rate. The remainder were mostly border-line cases, and showed an increased sedimentation rate broadly proportionate to the degree of involvement. How much of this increase can be attributed to secondary pyogenic infection is difficult to ascertain, because almost all the cases were cervical, and, therefore, almost all

infected. The results were of no value as regards prognosis or treatment.

Such then is a summary of my findings. Like most other laboratory aids to diagnosis the blood sedimentation test will never supplant clinical judgment, but considered with a careful physical examination and an accurate history, it will lead to a finer diagnosis. In estimating the result of treatment, it is of undoubted value when carried out repeatedly on the same patient. In hospital gynæcological wards at least, the test should become a routine before abdominal operation, for in many cases it puts one on the alert for something unexpected and may save the patient a difficult and tedious convalescence, or even an unnecessary operation.

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