may be made, knowing the total red cell count, of the mean corpuscular volume of the red cells in the sample.

Anticoagulant.—A mixture of ammonium and potassium oxalates causes no shrinkage of the red cells, and must be used if heparin is not available (Wintrobe and Landsberg, 1935). A 2% solution containing 4 parts of potassium oxalate and 6 parts of ammonium oxalate is made up: 0.5 ml. of the solution is added to a series of test-tubes; the tubes are then dried in the oven, and can be stored ready for use.

Blood.—5 ml. of blood taken from a vein with a dry syringe, and without compression, is added to a test-tube containing the dried oxalate and immediately mixed by inversion to ensure solution.

Haematocrit Tube.—The Wintrobe tube is 11 cm. long, with 2.5 mm. bore, and is graduated with a centimetre and millimetre scale 10 cm. in length. The closed end of the tube has a flat bottom. The tube is filled with blood to the 10-cm. mark by means of a capillary pipette. The Wintrobe tube is then centrifuged for half an hour at 3,000 revolutions a minute if the usual clinical centrifuge available in this country is used. The degree of packing is controlled by the centrifugal force, which is dependent upon the velocity and the radius. The majority of clinical centrifuges in this country do not have a speed greater than 3,000 revolutions a minute, and most have a radius of 4.5 in. It is wise, where possible, to check the speed with a revolution counter. Experiment has shown that no further packing occurs if the time of swinging in such a standard centrifuge is increased beyond half an hour. Admittedly, a greater degree of packing occurs if a more powerful centrifuge is employed, but it may result in some deformation of the red cells. A centrifuge that is used for the first time should always be tested to determine that no further packing occurs if the tubes are swung for longer than half an hour. All determinations should be made in duplicate.

1. To determine the volume of packed cells, both red and white, the upper level of the whole cell column is read. It has been shown (Gregerson and Schiro, 1938) that after centrifuging normal blood approximately 4% of plasma still remains among the packed red cells, which means that of the packed-cell volume about 5% is plasma. This observation was, however, made only upon normal blood. It does not appear justifiable to apply such a correction automatically to all blood samples until further data are available. It is therefore suggested that at present no correction in the volume of packed cells be made to allow for retained plasma.

2. To estimate the total volume of red cells, in order to determine the mean corpuscular volume, the lower level of the white cell layer is read. Again for reasons given above, it is probably wiser at present to ignore the plasma retained in the packed cells. If the correction were introduced it would alter all values at present accepted for the normal mean corpuscular volume.

SUMMARY OF THE RECOMMENDATIONS OF THE SUBCOMMITTEE

The Subcommittee is unable to recommend any colorimetric or photometric method for accurate haemoglobin estimation. It finds that there is need for an accurate colorimetric or photometric method that measures total haemoglobin. Iron estimations on washed red cells are recommended as the best available check on total haemoglobin estimation.

Venous blood drawn without stasis is preferred for haemoglobin and haematocrit estimations.

The form of Haldane-Gowers haemoglobinometer recently standardized by the British Standards Institution (B.S. No. 1079-1942) is recommended for clinical haemoglobinometry. All colour standards, whether obtained commercially or specially prepared (see II B and C), should be checked by the N.P.L. Care should be taken to discard any standards that fade or show alteration of tint.

The standard colour defined by the N.P.L. in B.S. No. 1079-1942 is recommended as an *interim* basis of standardization. The Subcommittee finds none of the proposed 100% standards acceptable. It considers that the most satisfactory basis of standardization would be a knowledge of the total haemoglobin content of the bloods of normal men.

Where CO gas is unobtainable the Sahli haemoglobinometer must be used. It should be standardized as suggested.

Red cell volume estimations should be made in Wintrobe's haematocrit tubes spun at 3,000 r.p.m., in the Hearson's

centrifuges available in this country, till no further packing occurs. The lower level of the white cell layer is read. As anticoagulant, heparin or a mixture of ammonium and potassium oxalates is used.

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* These are references on the physical aspects of colorimetry and photometry
 † These references are extensively quoted in the section on haemoglobinometry in Peters and van Slyke's *Quantitative Clinical Chemistry*, **2**, 661.

CAESAREAN SECTION IN DYSTOCIA

BY

L. G. HIGGINS, F.R.C.S.

The object of this paper is to suggest that the operation of Caesarean section involves less risk than difficult vaginal delivery, and that the indications for abdominal delivery may be considerably extended with advantage to mother and child.

Personal Series

My personal experience is derived from the series of 220 cases briefly analysed below. These include all operations performed since 1931. Before that date records are incomplete, and early cases cannot be included except to remark that there has been no maternal death among them. The later cases fall into two groups, as follows:

GROUP 1.—157 Elective Operations; 4 Notifiable Pyrexia (2.5%); Foetal Mortality 5%; No Maternal Mortality

Indication	Cases	Maternal Morbidity	Infant Mortality
Placenta praevia ..	20	0	2
Grave toxæmia ..	12	1 Pleurisy and bronchitis	3
Breech ..	21	1 Pyelitis on 12th day	0
Disproportion ..	88	1 Pyelitis on 9th day	1 prem. (error of date)
Repeat C.S. ..	16	1 uterine sepsis on 16th day (haem. strep. present)	1 anencephalic 1 died in 24 hours

A patient is classed as morbid if the temperature rises to 100.4° F. on two occasions in one day of the puerperium.

In all these cases the operation was performed before the onset of labour or when pains had been present for less than six hours. In a large number of such patients the lower uterine segment is imperfectly developed, and in a majority of these cases a vertical "low classic" incision was used, which is truly cervico-isthmial. As a rule the incision just encroaches upon the isthmus, and up to one inch of active muscle is divided. The scar is almost entirely in inactive muscle, well away from the bowels and omentum, and in my experience it heals cleanly without the formation of adhesions.

GROUP 2.—63 Operations Late in Labour; 8 Notifiable Pyrexia (13%); Foetal Mortality 4.7%; No Maternal Mortality

Maternal Morbidity		Infant Deaths	
Not morbid, 55		2 (failed forceps)	
Morbid, 8 (3 chest, 5 genital infections)		1 premature	

All the pyrexial cases settled quickly with sulphonamides, and in no case was a positive blood culture demonstrated.

This group may be analysed slightly differently, as follows:

48 failed trial of labour: 3 pyrexial, no foetal death.
15 emergency cases: 5 pyrexial and 2 slightly morbid but not notifiable; 3 babies died.

Nearly all these were cases of disproportion without other disability. In all instances labour had been in progress for longer than six hours. In such cases the lower uterine segment is well developed, and a transverse retroperitoneal incision can be and was employed.

In order to assess the value of Caesarean section it is necessary to estimate the risk to mother and baby. Crude maternal mortality figures are of little value. Many authors have pointed out that the mother is often suffering from some grave complication, by which the outlook is already prejudiced. It is therefore equally meaningless and misleading to quote any mortality rate for "Caesarean section" without the most careful analysis. In a healthy mother the risk is affected chiefly by the operative technique and by the influence of labour. These factors may be considered separately.

Operative Technique

This is of the utmost importance. There is now a great body of statistics which go to prove that the lower uterine segment operation is relatively free from some of the most serious risks associated with the earlier high "classic" incision. The following examples may be quoted:

	Type of Section	No. of Cases	Maternal Mortality
Matthews and Acken (1939) ..	Classic	743	3.9%
Barrett (1939)	Lower	264	1.9%
	Classic	235	4.6%
	Lower	620	2.1%

The former authors report no deaths from sepsis following their 264 "low-flap" operations at the Methodist Hospital, Brooklyn, although many patients were potentially infected. The remarkable control over sepsis achieved by the low cervical technique is now well known. In spite of the fact that this method is usually employed after several hours of labour, with possibility of infection, the incidence of subsequent uterine rupture is greatly diminished, and post-operative obstruction is probably less common. Matthews and Acken concluded that "in the low-flap operations the fatal cases were attributable to the operator." The advantages of this method were stressed by Munro Kerr and Eardley Holland in 1921, and since then many analyses of series of cases have been reported from continental Europe and from America. Among recent authors who have investigated this point may be mentioned Arnot (1936); Quigley (1940); Phaneuf (various articles); King (1940); Feiner (1936); Campbell (1938); and DeLee (various articles). In all these articles the superiority of the low cervical approach is emphasized, and there is now an overwhelming mass of evidence in favour of a low operation. In the following remarks the high classic operation is not considered further, and the low cervical incision is always implied unless the opposite is expressly stated.

The conclusion is that it is no longer possible to justify the general use of the high classic incision, and statistics based upon this operation do not represent the best results obtainable.

Elective Operations

In cases of dystocia the outlook after Caesarean section is profoundly influenced by the onset of labour. It is convenient to consider, first, elective operations upon healthy mothers, performed before the onset of contractions or very early in labour; and, secondly, those cases in which the operation is performed after many hours of labour, when signs of obstruction are more or less well marked.

In practice the coexistence of a healthy baby and a healthy mother who requires Caesarean section occurs principally in

those cases showing such marked disproportion that trial of labour is not considered worth while. Cases also come into this group in which the presence of a breech presentation is the main indication. In patients who have had previous Caesarean section the risks may be somewhat increased by the presence of adhesions, but in such secondary elective sections there should be no risk of previous infection, so I have included these cases in the series below, to show the minimal maternal mortality rate under favourable conditions.

	Total Cases	Maternal Deaths	Cause of Death
Individual series:			
Evers (1934)	27	0	
Bailey (1934)	65	0	
Marshall (1939)	101	0	
Higgins (now reported)	125	0	
Hospital series:			
Glasgow Maternity Hospital, 1934-40	279	1	Shock following spinal anaesthetic
Queen Charlotte's Hospital, 1934-9	48	0	
Matthews and Acken (1939)	77	0	
St. Mary's, Manchester, 1934-8 ..	105	1	Second operation. Haemorrhage from adhesion
Croydon, 1937-8	41	1	Pulmonary embolus
	868	3	

The only cases included in this table are those in which the operation was performed before the onset of labour or after not more than six hours of labour. It is unfortunate that the total number of cases is so small, but few series are sufficiently well analysed to be included. On the results given, the maternal mortality rate is just over 1 in 300. In each fatal case the cause of death bears little relation to the type of operation. In my opinion Schumann (1939) was justified in concluding that "the elective operation carries with it a fairly negligible risk." He suggests that the maternal death rate in elective cases should be comparable to that of interval appendicectomy. The evidence I have been able to collect and my own experience both support this view.

The conclusion reached is that Caesarean section at the time of election is associated with a much lower maternal death rate than is usually supposed. Probably the risk should not be greater than that associated with any simple laparotomy.

Potentially Infected Cases

The effect of labour upon the incidence of sepsis has been investigated by many authors. Although some confusing results are reported there seems to be little doubt that the maternal morbidity rate begins to rise when labour has been several hours in progress. In this respect the bacteriological investigations reported by Harris and Brown (1927) are most interesting. These authors made cultures of the freshly opened uterus in a series of 50 sections. Their results suggest that in most cases the uterus is no longer sterile after six hours of labour, and that infection is not prevented by intact membranes. The duration of labour pains seems to be of greater importance than the condition of the membranes, and several authors have referred to this. The difference in outlook before and after the onset of labour is well revealed by the figures of Marshall and of my own series analysed below:

Clean Cases. (In Labour for Less than 6 Hours)

	No.	Morbidity	Infant Mortality
Marshall	101	14%	2.0% (2 cases)
Higgins	125	1.8%	2.4% (3 cases; 1 anencephalic)

Doubtful and Contaminated Cases. (In Labour Longer than 6 Hours)

	No.	Failed Forceps	Inductions	Over 40 hrs. in Labour	Maternal Morbidity	Infant Mortality
Marshall ..	70	5	15	18	30%	4.2%
Higgins ..	63	4	7	19	13%	5.0%

Cases with minor infections—offensive lochia, etc.—are not included. There was no maternal death in either series.

These figures, and the many similar series now published, show clearly the rise in the maternal morbidity rate and in

the infant death rate that is associated with prolonged labour. In practice, with reasonable care, quite extended labour can be allowed, and I have dealt with cases in which pains had been present and the membranes ruptured up to 5 days. The danger of Caesarean section under these conditions is often exaggerated. On the other hand, when the patient is exhausted, when the vagina is dry and the uterus irritable, and when the position is prejudiced by repeated vaginal examinations, attempted forceps delivery, and vaginal lacerations, a stormy puerperium is likely. Even in such cases delivery can often be completed by section with less trauma than by any other method, and the scope of the operation is not always realized. In an early paper Green-Armytage (1931) has drawn attention to the value of the lower-segment section in place of difficult destructive operations.

The conclusion here is that, when labour becomes obstructed, Caesarean section may be employed as a rescue operation with brilliant success. Nevertheless every effort must be made to prevent a clean case drifting into the potentially infected category by not deferring intervention too long.

Forceps Delivery

In many doubtful cases the attendant will have to decide between the alternative of delivery by forceps or by Caesarean section. In moderate dystocia the conditions under which forceps delivery is thought to be indicated vary rather widely in different schools, as does also the individual outlook. The following tables, compiled from the published records of large maternity hospitals, may be taken to represent the average risk to mother and child of delivery in this manner under good conditions.

Maternal Mortality (Forceps Delivery), 1931-9

Hospital	Booked Cases		Emergency Cases	
	Total	Deaths	Total	Deaths
A	674	10 (1.5%)	559	22 (3.9%)
B	968	5* (0.5%)	182	4 (2.2%)

* This figure does not include 3 booked cases submitted to craniotomy, in two of which forceps were tried; in one of these the mother died.

It appears that the average maternal mortality rate may be taken as about 1%. Since the mortality associated with low forceps is very small, most of the fatal cases must occur after the relatively uncommon and more difficult operations of high forceps and mid-forceps, in which, therefore, the mortality must be high.

Persistent Occipito-posterior Positions (Forceps Delivery), 1931-40

Hospital	Total Cases	Maternal Deaths	Foetal Deaths
A	177	3 (1.7%)	22 (12.4%)
B	325	2 (0.6%)	47 (14.5%)
C	375	9 (2.4%)	72 (19.2%)

This table is compiled from "booked" cases only, and emergency admissions are not included. The figures serve to show the risks of the more difficult forceps operations. Delivery by forceps may be possible, but unless the foetal head descends below the level of the ischial spines there will be a high maternal and foetal mortality rate. This point has been emphasized by Dodek (1931); and if the foetal head is in an unfavourable position vaginal delivery is a serious undertaking. The average maternal death rate of over 1% for difficult forceps deliveries does not compare at all favourably with the "operative maternal death rate" of about 0.4% for Caesarean section, which represents an alternative method of delivery for this type of case. The high foetal mortality rate after difficult forceps delivery is very striking.

Infant Mortality (Forceps Delivery), Booked Cases only, 1931-9

Hospital	Total Forceps Deliveries	Associated Infant Deaths
A	674	89 (13.2%)
B	968	133 (13.7%)

In emergency cases with obstructed labour the foetal mortality rate is very high. In hospital A, among 559 such cases delivered by forceps, the foetal mortality was 145 (26%).

These results cannot be considered satisfactory. It must be remembered that Caesarean section was introduced to save the child, and the operation should be considered in all cases where delivery by the vagina is likely to be hazardous. If this is kept in mind the mother will benefit, as it is scarcely possible to damage the baby seriously without causing injury to the mother at the same time.

The Elderly Primipara and Forceps Delivery

These patients constitute a special category of dystocia for which forceps are often required. In such cases vaginal delivery is an anxious procedure, and the risks for mother and child are certainly increased. Nixon (1931) has shown the high incidence of breech and persistent occipito-posterior positions after the age of 40, and in his series he found the incidence of forceps deliveries to be at least twice as common as in younger women. In another series, analysed by Lossel and quoted by Munro Kerr (1937), the forceps rate rose to 33%. The influence of these conditions upon the infant mortality rate has been carefully studied by the latter author, who gives the following table, with 185 patients in each group.

	Age 20-30	Age 30-35	Age over 40
Forceps rate	4.3%	26.0%	33.5%
Foetal mortality	2.7%	9.5%	13.0%

In the presence of apparent disproportion a trial of labour becomes less and less likely to end successfully as the age increases after 30. This procedure is not really suitable for elderly patients, and most obstetricians would agree that elective Caesarean section should be employed with much greater freedom than in the case of younger women. Attention must be focused not upon the occasional patient who delivers herself with ease but rather upon the greater number in whom labour will be unexpectedly slow and difficult. Unless the presentation is really favourable, few would encourage the middle-aged primipara to attempt vaginal delivery. An occasional unnecessary section does little harm, but one too few will mean a disaster.

The conclusion is that in the presence of dystocia, when vaginal delivery is possible but difficult, the use of forceps is associated with definite risk to the mother, and the outlook for the child is bad. Delivery by Caesarean section should be more often used in these cases.

Discussion

The figures given above for forceps delivery go to prove that even slight disproportion has a very serious effect upon the outlook for both mother and child. In the presence of dystocia, when labour is often prolonged, the use of forceps carries an obvious practical and theoretical drawback, because delivery cannot be completed until the cervix is fully dilated. When the head ceases to advance, this may never occur, and in other cases the first stage may be prolonged and the mother may develop fatigue before dilatation is complete. With fatigue will come increased possibility of infection and all the dangers of retained placenta and post-partum haemorrhage, while the baby may not survive. It cannot be disputed that a healthy woman is sometimes allowed to drift into a dangerous condition in this way while actually under the observation of her medical attendant. All such cases demand immediate delivery, without aggravation of the tendency to shock which is so often present. Under such conditions it is difficult to see the object of waiting until vaginal delivery by forceps is possible. Even if the infant is born alive the dystocia must be overcome by stretching or tearing of the maternal soft parts. The birth of a second child may be easier, but the mother has paid the price in her damaged pelvic floor. It is better to realize that when labour departs from the normal pattern the process becomes pathological, and delivery is not necessarily normal because it is vaginal. Indeed, it may be easier to repair a cut in the abdominal wall than a laceration of the pelvic floor. In all such cases it seems to me that the trauma to the mother is less and the outlook for the child is much improved if delivery is accomplished by Caesarean section.

Late Maternal Morbidity

Although the immediate maternal morbidity associated with forceps delivery is appreciable, it is probable that the late

sequels are of even greater social importance. A difficult vaginal delivery produces great trauma, and it is easy to damage the mother's pelvic floor to a degree which can never be repaired. I have painful recollections of cases, thought at the time to be quite successful, in which difficult vaginal delivery was effected. Three months later the mother was still tired, listless, and drooping, with backache, leucorrhoea, and a dribbling bladder, spoilt as a wife and as a mother, and unable to enjoy the child fortunately born alive. It is scarcely possible to assess the frequency of sequels of this kind, but undoubtedly they are common. The late Prof. Blair Bell (1931) estimated that each year 60,000 women are more or less seriously crippled by childbirth, and a large proportion of the graver damage must occur at difficult forceps extraction. Such cases show a strong contrast with those delivered by Caesarean section, who are remarkably free from late morbidity. Indeed, it is encouraging to see how quickly the latter regain their original figure and carriage.

Rupture of the uterine scar at a subsequent pregnancy or labour may be classed with late maternal morbidity. In a recent textbook (Browne, 1939) the incidence of this accident is estimated at 4% in the case of high classic operations. There is little doubt that this figure is based upon old statistics, and at the present day the accident appears to be less frequent. As a sequel to lower-segment operations, subsequent rupture of the scar is certainly most exceptional. Discussing this point, Marshall (1939) stated that 50 cases had been recorded at that time, of which only 5 followed the transverse incision. It seems probable that, with modern technique, the possibility of rupture of the scar may be almost ignored. Marshall remarked that no case had occurred in the practice of the Liverpool Maternity Hospital or in DeLee's clinic at Chicago, and I have been unable to discover a record of such a case in a long series of clinical reports recently examined.

The Sterile Labour

Consideration of the infant morbidity will introduce the important psychological effects of the fruitless labour. The mental shock of losing an infant, especially if it is the first one, may remain throughout life. It is often a factor in causing dread of childbirth, with nervous tension and thwarted ambition, drifting steadily towards a childless and hypochondriac middle-age. It is impossible to gauge the incidence of this unfortunate sequel, but I am sure that it is far more common than many suppose. In my opinion it is of the greatest importance, if only for psychological reasons, that the first baby should be born strong and healthy. The prospective patient attends the maternity hospital in order to have a healthy infant, and she expects difficulties to be overcome, so that she will survive her confinement with full vigour for her maternal responsibilities. The loss of a healthy baby in a healthy mother must mean a serious breakdown in obstetrical care.

The presence of dystocia, therefore, should no longer be accepted as a legitimate reason for a raised infant mortality rate.

Trial of Labour and Obstruction

In normal patients a spontaneous delivery under good conditions is associated with a minimal maternal mortality rate of considerably less than 1 in 1,000, and it is probable that really low forceps, with the foetal head below the level of the ischial spines, may almost be classed with this group. Before the onset of labour there can be no absolute distinction between normal and abnormal cases, and in spite of the assistance given by radiography the available methods for the detection of dystocia are notoriously unreliable. In a series of 6,500 deliveries analysed by Alice Maxwell (1927) dystocia occurred in less than half the cases with recognizable pelvic contraction, while more than half the total cases of dystocia appeared when no pelvic abnormality could be detected. A small experience will show that in every woman the first labour is always a trial, and it is surprising how often difficulties arise when they are not expected. On the other hand, it is well known that many young patients with slight disproportion will achieve an easy spontaneous delivery. In such cases the maternal risks are not increased and the infant mortality rate shows only a slight rise, an extra risk which must be taken. In an average series showing clinical disproportion, it may

be supposed that a spontaneous delivery will occur in about half the patients. Bailey and Williamson (1927) analysed such a series of 676 cases with great care, and recorded a spontaneous delivery in 66%. No method of operative delivery could give results comparable with those obtained by normal labour, and it is therefore of the greatest importance to refrain from interfering unless this is really necessary for the safety of the mother or child. The object of a trial is to encourage a normal spontaneous or low forceps delivery, in which cases the results are good. A difficult vaginal delivery is not worth while, and the results for both mother and baby are inferior to those of Caesarean section. Excluding purely technical faults, a damaged baby following a forceps extraction is usually evidence of an error of judgment in choosing vaginal delivery. The dangers of unexpected dystocia may be illustrated by the following series of 16 cases of disproportion taken from a clinical report for 1938 of a well-known teaching hospital. All these occurred in booked cases which showed no evidence of pelvic contraction.

- 8 cases of spontaneous delivery, including one case with P.P.H. which required manual removal of the placenta and two blood transfusions.
- 1 case of forceps delivery.
- 1 case of delivery by forceps after perforation.
- 3 cases of craniotomy.
- 3 cases of Caesarean section after many hours of labour. One of these went septic. One baby was stillborn and another died.

Altogether 6 babies were stillborn or died, while of the mothers 2 developed puerperal pyrexia and 3 puerperal sepsis. Clearly the results would have been better if every woman in this series had had a Caesarean section before the onset of labour.

In managing a test of labour it is important to avoid allowing the condition of the mother or baby to deteriorate before making the decision to perform section. The investigations of Harris and Brown, referred to above, suggest that labour for six hours is relatively harmless, and, in practice, awaiting the onset of labour will help to exclude the possibility of premature delivery. At the end of this time it is usually possible to decide whether a normal vaginal delivery can be expected. In longer trials which end in Caesarean section the morbidity rate will tend to rise. Arnot (1936) found the test of labour the biggest causative factor in producing serious pyrexia, and there is little doubt that there is a strong temptation to allow the test to continue too long. In certain cases it is only too easy to allow the patient's outlook to become prejudiced. This must be avoided, although the introduction of the sulphonamides has done so much to improve the treatment of pyrexia. It is an unfortunate drawback to delivery by section that the operation is safest before the onset of contractions or very early in labour, at a time in some cases when the necessity for section cannot be foretold with certainty. It would be of very doubtful benefit to the patient to deal with every potential difficulty by Caesarean section, and in order to avoid this the attendant must feel a challenge implied to achieve normal delivery in every doubtful case. In proportion as the operation becomes safer, the tendency to employ it more freely must increase. Indications may be extended in scope, but they remain fundamentally the same, including only those cases in which delivery by any other method would involve increased danger to the mother or child. At the same time, the results of elective section are now so good that only the smallest margin of error can be allowed in trial of labour, and no bad effects for mother or baby must occur or the whole object of the procedure will be frustrated.

Summary and Conclusions

A personal series of 220 cases of Caesarean section by the lower-segment technique is reported and briefly analysed. A consideration of this and other reported series suggests that the maternal mortality rate in this operation should not exceed 1 in 300.

The consequences of forceps delivery are considered and the unsatisfactory results for mother and baby are pointed out. In view of the encouraging results of Caesarean section, the legitimate indications for forceps delivery require careful review.

The outlook towards Caesarean section should be completely readjusted, and the operation must be used much more freely

in serious dystocia to avoid the maternal and foetal morbidity often reported.

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SOCIAL ASPECTS OF ALLERGY

BY

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Only very recently has proper attention been paid to the environmental factors, in occupations and in home surroundings, which are concerned in the onset and course of disease. Apart from the so-called occupational diseases, the environmental factor is more or less in the foreground in a number of conditions—e.g., certain groups of malignant growth or infections like pulmonary tuberculosis—and it is particularly evident in the group of conditions now classified as allergic diseases. My own observations are based on the examination of more than 1,000 cases of bronchial asthma and other allergic complaints during the last 14 years. Of these, 522 are asthmatics observed in Germany from 1928 to 1932, 365 of them employees seen under the German national insurance scheme; and 489 were cases observed in England since 1934. Of the latter 268 were hospital patients—103 seen at the Westminster Hospital up to 1938, and 165 examined since 1938 at various (17) L.C.C. hospitals.*

Asthma and Other Allergic Conditions in Occupations and Military Service

Most frequent, and of the greatest clinical and social importance, are the allergic complaints of the respiratory tract (bronchial asthma, rhinitis including certain forms of sinusitis, and polypi) and those of the skin (eczema, dermatitis, urticaria, and Quincke's oedema). Rarer and perhaps less well studied are alimentary diseases such as spastic colitis and other spastic conditions of the digestive tract or bile ducts, migraine, and a number of others. In the Services serum sickness and allergy to prophylactic or therapeutic inoculations have to be considered as possible complications.

In all allergic conditions intrinsic (often constitutional) and extrinsic (mostly allergic) factors play their part. Their role is of varying importance not only in each of the conditions and in every patient but also because they change in the same patient at various periods of life.

As the *intrinsic*, predisposing, constitutional factor—endocrine, metabolic, or anatomical—is often inherited, allergic

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complaints run in families in more than 50% of the cases, according to my observations, and frequently follow the patient during a long period of his life. He may suffer either from one or from more than one of these conditions at varying periods. Allergy is itself a normal body reaction and defence mechanism like immunity, and actually represents the state short of and antecedent to immunity in which increased sensitivity precedes the greater resistance provided by the immunity. Only when this sensitivity remains and becomes a feature of definite clinical illness are we entitled to speak of the condition as "allergic disease."

The *extrinsic* factors—the allergic irritants—are incorporated (1) by inhalation (aerogenous), (2) by ingestion (enterogenous), (3) by touch through the skin (dermatogenous), or (4) by parenteral inoculation. Intrinsic allergic irritation may be caused by resorption of bacterial proteins from focal infections, bronchiectasis, or tuberculous infections. On the other hand, there are definite extrinsic irritations which do not act as allergens but as auxiliary predisposing factors—e.g., SO₂ gases in the air in certain industrial areas. It is still doubtful whether urticaria acts as an allergen or in the same way as the SO₂, preparing the mucous membranes for an irritability to allergens.

Allergens are mostly of protein nature, but definite chemical compounds are known to become allergens through the formation of protein compounds in the body, as in the case of group-specific chemical antigens (Landsteiner). The allergen does not always produce clinical signs at the place of entry (reflex or trigger area)—e.g., it may be ingested and cause urticaria in the skin or asthma in the respiratory tract. The allergy often starts with a sensitivity to *one* allergen or to a few allergens that spreads to others if not treated. A patient may have a seasonal hay-fever at first and then become sensitive to moulds or dust: the monovalent allergy becomes polyvalent.

Sutherland (1942a, 1942b) recently stated that the "extrinsic" cases of asthma are suitable for military service and can be easily cured by desensitization. These were obviously cases in the monovalent phase of the condition. The "intrinsic" cases are in his opinion not fit for military service. These are the cases in which the threshold of parasympathetic irritability has been lowered by a longer duration of the allergic condition or in which constitutional factors or focal infections are in the foreground. I (Fraenkel, 1934a, 1934b) have reported that, contrary to an old belief, asthma and tuberculosis of the lungs do not exclude each other: a form of active tuberculosis appeared "masked as asthma" in 4% of my asthma cases. In 16% of my asthma cases an old or productive pulmonary lesion was found.

I have stated previously (Fraenkel, 1937a, 1940) that *prognosis* in asthma depends on the following factors: (1) whether organic changes complicate the condition as a contributing cause of or as a sequel to the asthma—e.g., bronchiectasis, chest deformity, pulmonary tuberculosis or other infections, emphysema, or heart failure; (2) whether the family or personal history reveals a preponderance of constitutional factors; and (3) whether the allergen is easily avoidable or can be immunized against by a course of desensitization. *Mutatis mutandis*, this applies to prognosis in other allergic conditions. House allergens are the most common, but in England the damp climate is responsible for sensitivity to moulds in more than 50% of asthmatics (Fraenkel, 1938, 1939), and, by infection of the respiratory tract, for frequent bacterial sensitivity to the germs of the common cold. In many instances I have isolated the same types of mould from the patient's house allergens and from his sputum and used them for skin tests and desensitization. The moulds most often found positive in skin tests were sporotrichum, cladosporium, penicillium, aspergillus, mucor, and monilia types, and they are probably responsible for the intolerance to certain rooms, houses, or localities experienced by many asthmatics.

Clinical Investigation

This conception makes it necessary in every case to take a very careful history, which comprises a special inquiry into family and personal allergy, and also into occupational and personal aspects of the patient's life apart from the ordinary medical history. Investigation into all signs of parasympathetic irritability, local and blood eosinophilia (polyps, nasal secretion,