

On the Ætiology of Prolapse of the Uterus.

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1. INTRODUCTION.

A physician without any special experience of gynæcology must preface his paper on a difficult topic in a specialist Quarterly with an explanation if not an apology.

A clinical case presented problems for solution which could not be resolved by the highly practical English approach to prolapse epitomized in Simpson's formula. The Continental authors seemed to lend assistance but there was no recognized way of uniting their work to the English teaching—in a word, the whole ætiological question had to be re-surveyed. The survey here given makes no pretence of being practical in the sense of being immediately useful. It is, if anything, too theoretical, but it merits consideration as an attempt to connect some work on the Continent with English views in a way that has not been done before.

It seems to the "outsider" that gynæcology, in common with many other branches of medicine, lacks an organized, or if you will a philosophical, attitude in its ætiological tabulations; these lists of causes get longer and longer as the experience of generations of teachers adds further details from the bedside, operating theatre or mortuary, but they do not get more intelligible.

2. SIMPSON'S FORMULA FOR THE ÆTIOLOGY OF PROLAPSE.

Simpson's approach is to a high degree practical, but from a theoretical aspect is a mere agglomeration without internal cohesion, and does not make the ætiological, apart from the therapeutic, problems more intelligible. Simpson divides the factors into active and passive, the former anatomical, the latter with no obvious relation to one another except clinical convenience; thus he speaks of faults in the perineum, vaginal walls, ligaments, pelvis, as passive; enlargement of the uterus or neighbouring organs, increase of suprapelvic pressure, tumours, improper dress, long continued muscular exertions, and so on, as active.

No one could question the completeness of this list of factors in the sense that, when faced with the immediate need to advise a patient desiring treatment, the physician has to run over all the causes in his mind and decide upon which of these to rectify. It

embodies the practical English bedside method of teaching, but it takes no account of the interesting, if somewhat theoretical, investigations of Burger, Flatau, Halban, Heyneman, Kupferberg, Menville, Spiegel and others. These Continental authors, as we shall see, have something to say on prolapse which is seldom mentioned in the English literature, but it does not seem inaccurate and must therefore be organically woven in, to make any ætiological formula complete.

3. A GENERAL ÆTIOLOGICAL FORMULA.

The need for a general ætiological formula is not felt so long as the view of disorder is dominated by a search for factors which can be remedied by operative or other forms of treatment. For example, the discovery of Koch's bacillus followed by his researches on tuberculin tended to deflect the attention of investigators for a time from wider, if less concrete, views of the ætiology of tuberculosis, and operations on Mackenrodt's ligament (Tweedy and others), though not brilliantly successful, played a part which Mackenrodt himself would probably have deplored—the operation on the ligament, not the position of the ligament in an ætiological evaluation, became decisive in assigning its place in an ætiological table. By this method such tables are likely in the course of years to grow longer and more detailed without having any direction or focus.

The lack of a general ætiological formula to include all possible causes for any branch of medicine drove a worker in another field (psychopathology,² in which the ætiological complexities are as great as those in gynæcology) to devise one for his own branch which can be used in all. Assuming that ætiological factors can vary quantitatively as well as qualitatively, and that they can combine to produce their effect, he divided them into four groups: (i) Predisposing or Constitutional, (ii) Specific, (iii) Contributory, (iv) Inciting. *Predisposing Factors* are those in the absence of which the effect would never come about, but which alone, no matter to what degree they may be present, are incapable of bringing about the effect if the specific factor is lacking. The *Specific Factor* is one which is never absent when the effect takes place, and which in the required quantity or intensity can bring about the effect only if the predisposition is present as well. *Contributory Factors* are not necessarily present every time and are unable to produce the effect alone but co-operate with predisposition and the specific factor to make up the ætiological formula. The *Inciting Factor* is that which immediately precedes the effect. Since the predisposing and specific factors are both present in every case, it is

necessary to distinguish them; in brief, it may be said that the former has the quality of long duration and little alteration in its condition, whereas the latter corresponds with an indispensable cause that has more recently come into action, and further, the specific factor, though it may be found in a number of other conditions, has a specially close relation to the disease in question.

Example : *Pulmonary Tuberculosis.*

Predisposing Factor : Constitutional.

Specific : Koch's Bacillus.

Contributory : Everything that lowers resistance.

Inciting : An infection such as a cold.

4. APPLICATION OF GENERAL ÆTIOLOGICAL FORMULA TO PROLAPSE OF THE UTERUS.

Applying this formula to the ætiology of prolapse, the argument that I put forward is that in the ætiology of prolapse there is :—

A predisposing factor, which is constitutional,

A specific factor, which is an increase of intra-pelvic pressure,

Contributory factors, which include a variety of phenomena themselves requiring subdivision and classification.

Inciting causes. As this ætiological factor presents no difficulty I propose to dismiss it at once. An inciting cause, the simplest example being an unexpected fall,³ usually immediately precedes the onset of the disorder.

A constitutional factor is present in all patients having prolapse in small or great degree, but no amount of predisposition causes the uterus to descend or protrude unless the intra-pelvic pressure is raised, so that the intra-pelvic pressure is the specific factor. Conversely, if the intra-pelvic pressure is raised to the maximum of which that individual is capable, prolapse will not occur unless there is some constitutional defect. To take an example : In case of pelvic mal-development (with spina bifida and other abnormalities) the predisposing cause may be at the maximum, the pelvic floor may be a thin sheet of tissue and the suspending structures only threads, but there is not necessarily prolapse; if in these cases the new-born child merely coughs or cries or is held in the vertical position the intra-pelvic pressure will be raised and prolapse will result at once. Conversely, if the pelvic floor and suspending tissues are constitutionally very strong, no amount of coughing or straining or lifting weights, or long hours of heavy work every day or anything else of the kind, will bring about prolapse.

As to contributory factors : if the supporting or suspending structures are weakened by accidents in childbirth from being

unduly stretched or torn, we may say that the accident has *contributed* to the prolapse; conversely, if the genital tissues undergo subinvolution at the puerperium or become lax at the climacteric prolapse will not occur unless the patient "strains." In the virginal and other obscure cases, which present so much difficulty to some authors,⁴ we shall have to investigate our contributory factors with special care.

5. CONSTITUTIONAL FACTORS.

(a) *General Considerations.* Assuming that the predisposing factor is constitutional, we may ask (i) whether the defect is a general one of the bony and soft parts of which prolapse is one feature, or (ii) whether the constitutional weakness affects only certain (supporting) tissues, so that though all viscera drop the pelvic viscera manifest the disorder earlier, or (iii) whether there is a genital factor, a special organ-inferiority of the genital apparatus of which prolapse is only one symptom (this awaits demonstration, but it is a possibility to be considered), or (iv) whether the constitutional factor is of a nervous character, a defect in reflex tone.

I do not see how an answer can be given to these questions at the moment, their utility residing rather in a direction they give to thought; but examining our material it seems that we can do something with constitutional factors though it may only be to grade them. This formula has the merit of including all the constitutional elements which have been mentioned in the literature and leaving it an open question how far they may be present in any given case.

(b) *Extensive Defect of the Pelvic Apparatus.* Turning first to the cases of extensive defect of the pelvic apparatus, we find cases of congenital prolapse, though these are rarities.⁵ It is nearly always associated with spina bifida,^{6,7} and the defects of the visceral supports are considerable.

(c) *Lesser degrees of Abnormal Development.* The next "grade" in congenital defect, or lesser degrees of abnormal development, range from defects such as occult spina bifida,⁸ slight diminution of pelvic tilt and diminution in the size of pelvis to imperceptible variations that may be reckoned as practically normal.

The evidence for the frequency of intermediate degrees of abnormality is not very precise. In 680 cases examined by Flatau⁹ it was found that the normal inclination was 45-50°, but that in cases of prolapse the tilt was only 38-45°. The lesser tilt in prolapse, he says, was particularly constant.¹⁰ He associated this with a mild degree of Infantilism (Infantilismuskomplex of Mathes) and

thought that the more nearly vertical position of the pelvis in these cases increased the effect of intra-abdominal pressure.¹¹ Paramore¹² puts the matter the other way about; he regards the pressure as the agent in producing descent of the organs from the infantile abdominal position to the pelvic adult position, and the reflection of the forces of impact when the child coughs or strains as the cause (among others presumably) of the straight sacrum becoming curved. If this argument is pushed a little further, infantilism is seen as a sign of a diminished tendency to react to external forces—an argument for which there is much to be said.

Another infantile feature which may persist is a more or less vertically disposed uterus halfway between anteversion and retroversion. It is sometimes assumed¹³ that the uterus does not descend unless there is this direction of the uterine axis; if, therefore, the organ is already in this position (infantilism) prolapse would be more likely to occur. No body of evidence has been adduced that uteri which descend have maintained this position since infancy, and it has been shown¹⁴ that the uterus can descend although it had not first assumed the vertical position.

Another anomaly of the pelvis which has been associated with prolapse and constitutional factors in the ætiology of prolapse is the configuration of the bony pelvis. Menville¹⁵ and Macnaughton Jones¹⁶ noted abnormal width of pelvis, and Burger¹⁷ found a correlation between it and too small a tilt. It is difficult to judge the importance of this element. One would think a broad pelvic aperture might favour uterine prolapse in virgins because it would allow more rise and fall of the uterus with variations of intra-abdominal pressure and so would require stronger uterine support, whereas in diminishing the chance of accident at childbirth (laceration of levator ani) its tendency would be against post-parturient descent.

(d) *Introducing the Notion of Quantity.* It will be seen that there is a more or less continuous series beginning with a few rare cases of congenital prolapse associated with grave pelvic defect and progressing probably to a much larger number with some discernible but slight anomaly. This introduces the element of quantity into the ætiological formula, that is to say, we have to attempt to assess the amount of each factor in the combination which brings about prolapse. It is in accord with probability that the cases in which the factor is almost exclusively congenital should be rare, and that those in which there is an ætiological conglomeration should be the most frequent. Similarly in the case of the factor next to be considered we should, on grounds of probability, expect to find those cases in which the factor of enormous amounts

of work, acting almost in isolation, has caused the prolapse are relatively few, whereas hard work plus some slight pelvic anomaly would be more frequent. The advantage of introducing a quantitative factor, if only implicitly, is that it should lead to a fresh survey of the cases illustrating each ætiological factor in order to assess the better the importance of each element, *e.g.*, if the influence of childbearing and hard work is the same in a given group the incidence of the prolapse should, other things being equal, vary with the pelvic anomaly (tilt or what not).

6. SPECIFIC FACTOR : INCREASE OF INTRA-PELVIC PRESSURE.

It is at once obvious, if the formula is applied carefully, that the only ætiological factor, other than the constitutional, which is never absent, is increase of intra-pelvic pressure. We have now to consider some of the situations producing this increased pressure.

(a) *The factor of work.* Setting aside all other considerations, let us consider the work factor so far as possible in isolation. I have searched the literature in vain for statistics that show among women who are of the same age and have gone through the same experiences in childbearing a greater incidence of prolapse among the heavy industrial and domestic occupations than in the light ones. The following figures are given less as a basis for deduction than to show the difficulties to be overcome in using the statistics and some errors to be avoided. Goljanitzki¹⁸ records that out of 566 women who came to the Health Commission of the Moscow Health Department for various disorders other than gynæcological 138 (24.3 per cent.) also had prolapse of the uterus. These 138 with prolapse of the uterus were classified according to occupation, but the ages of the individuals were not mentioned nor whether parous or nulliparous. The percentages were as follows: Housewives 23; "Dailies" (domestics) 21; "Generals" (domestics) 12.6; Washwomen 9.8; Tailoresses 9.4; Hospital Charwomen 6.5; Spinning Trade 4.2; Teachers 2.9; Seamstresses 2.9; Women Clerks 2.1; Women Commissionaires 1.4; Dental Technicians 0.7; Nurses 0.7; Farm Girls 0.7. Leaving out the question of age or assuming for the moment that it is not important, let us make some contrasts:

Spiegel argues from the fact that the percentage in housewives was 23 and in teachers was 2.9 that the hard work of the housewife predisposes her to prolapse. This may be true but the evidence shown does not support such a contention since, as there are probably ten housewives to one teacher, the proportional incidence (assuming the likelihood of both to visit the clinic at the same stage of the disability or the discomfort to be equal) works out against his view:

Housewives to teachers as 23 per cent. to 29 per cent. Wergasowa's 82 cases are Petit bourgeoisie 11 per cent.; Servants 1.25 per cent.; Factory hands 1.25 per cent.; Peasants 86.5 per cent.; or Hard work to Petit bourgeoisie as 9:1 (roughly the proportion of the population in Russia). The work factor is important but so far as I know there are no properly weighted statistics to demonstrate it, since the authors giving those that have been mentioned above take no account of the necessary corrections.

(b) *The factors of straining at stool, winter cough, chronic bronchitis*, need only be mentioned to be dismissed, as they obviously lead to increase in the specific factor.

(c) Tumours and ascites are mentioned in the literature as occasioning increase of intra-pelvic pressure, but it may be noted that the former act more by increasing the strain on the supporting and suspending tissues, whereas the latter acts truly by increase of the specific factor.

7. CONTRIBUTORY FACTORS.

(a) *General Note.* It may not be amiss to recall just what the contributory factors are—they are weaknesses which are incapable of producing prolapse alone, even when they occur in conjunction with constitutional weakness or mal-development, if a specific factor, hard work, winter cough, or bronchitis, be absent; or conversely, if the person has a cough, or works at heavy labour, but the constitutional endowment is good enough, there will be no prolapse, no matter what contributory factors are present. In other words, stretched ligaments, perineal tears or old age can only contribute to the effect—the prolapse—if something else is at fault in the organism as well.*

(b) *Weakness of Supporting Tissues.* The arguments which have been put forward by those who lay the greatest stress on the weakness of these tissues as the main ætiological factor in prolapse are simple to a degree, namely, that the viscera, a more or less compact and freely moving mass and relatively incompressible¹⁹, when subject to pressure from the parietal muscles are liable to escape by hernia when the resistance to the retaining walls is

*Many gynæcological authors have taken sides in a controversy on the relative importance of the suspending versus sustaining systems to the exclusion or depreciation of work, admittedly theoretical, on the constitutional and 'specific' aspects of the ætiology. Perhaps this division is due to the taking a stand on anatomical localities, so to speak, rather than on a scientific ætiology. This paper is written to put forward a functional, or so to say, biological aspect, admittedly theoretically and therefore, perhaps, not so much prejudiced by sites of election for operative interference.

diminished. Diminished resistance in the uro-genital hiatus is countered chiefly by the levator ani; weakness of this muscle accounts fairly satisfactorily for prolapse among aged and hard-working women much damaged by confinements, but does not account for "problem" cases, namely, virginal and nulliparous. The levator ani is by no means a weak muscle. Dickenson,²⁰ inserting a sort of dynamometer into the vagina past the edges of the levatores with the pelvis relaxed and the patient in the Sims position, recorded a force of compression equal to from 1-2 pounds, but when the muscle was in voluntary contraction the instrument registered 11-12 pounds. Some patients were found registering 27 pounds (hooked forefingers, he remarks, by way of comparison, can pull about 20 pounds). A large levator ani, he says, may be found in the following groups: (1) muscular women, *e.g.*, young domestics; (2) erotic women; (3) women with a wide pelvis;* (4) patients with painful lesions such as fissures about the vulva and anus.

If attention is concentrated for the moment on the hypothesis that rupture of the perineum is the most important factor in weakness of the perineum, we are struck by the fact that we meet with the elements of our ætiological formula once more, *viz.*, the *constitutional factor* in relative smallness of outlet, the *specific factor* in relative disproportion of size of "passage and passenger," and the *contributory factors* in mal-presentation and the like. This recurrence of factors within the ætiological formula is found in many diseases, *e.g.*, in tuberculosis the constitutional diminished resistance to infections (whatever that may be) favours both the contributory pulmonary disorder and the more important ravages of tuberculosis. For reasons that will be given later it is more convenient to consider the factor of traumatism to the pelvic floor under Age Factors than to consider them here.

(c) *Weakness of Suspending Apparatus.* The arguments that have been adduced by those who lay chief ætiological stress on the suspending apparatus are by no means so simple as those put forward on behalf of the supporting tissues.

(i) *Anatomical.* The size, constitution and arrangement of the tissues suggest that they have an important suspensory function, but, as Elliot Smith²¹ points out, the uterus is supported by the parametrium as a whole, not by the constituent elements isolated

*This suggests a contradiction between authors. A wide pelvis and a strong levator ani occurring together would tend to sustain the pelvic viscera and therefore prevent prolapse, whereas Menville regards a wide pelvis as associated with a tendency to prolapse. Dickenson is probably nearer the truth, as he is a careful observer.

by arbitrary and misleading dissections. (See also below, § 7, c, vii.)

(ii) *Absence of the Pelvic Floor Muscles.* Bumm²² quotes a case in which there was an operative defect in the pelvic floor on account of carcinoma of the vulva, a case of complete rupture of the perineum produced surgically—there was no descent of the uterus. He attributed the absence of prolapse of the uterus to the suspension of the uterus by its ligaments.

(iii) *Laxness of the Pelvic Floor without Prolapse.* Fothergill²³ noted “extreme laxity of the perineal muscles” without descent of the pelvic viscera and held that “in cases of complete rupture extending into the rectum it is quite exceptional to find uterine prolapse.” Theilhaber²⁴ found that those with the greatest rupture of the perineum do not have the greatest prolapse of the uterus. He recalls the percentage of the patients who have ruptured perineums (20 of all parous women, v. Winckel; 34.5 in primi-gravidæ plus 9 in subsequent deliveries, Schroeder) and asks if this is so why so few want treatment for prolapse. In 153 cases which he examined 50 had perineal defect and only 19 had prolapse; of these seven had long-standing perineal rupture. He does not assess the degree of perineal defect and fails to distinguish between tears of the fourchette and lacerations of the levator ani, but his point is clear and well made.

(iv) *Higher Correlation between Small Tears and Prolapse than between Large Tears and Prolapse.*²⁵ This would appear to argue strongly for the ligament theory were it not for the fact that by no means all lacerations of the levatores ani are accompanied by correspondingly important tears of the skin. The explanation is that the muscles are divided, in the case of perineal slits involving the rectum, at their tendinous insertions, while the muscle fibres themselves escape laceration.

(v) *Pelvic Diaphragm may be Healthy.* Moritz²⁶ describes a post-mortem in which two-thirds of the uterus protruded at the vulva, the parametrium was stretched to two ribbon-like bands, thin and scanty, and yet the musculature of the pelvic diaphragm was well developed, healthy and normal. This case is an extreme example of the importance of the suspending group and the insufficiency of pelvic floor strength alone.

(vi) *Cervix not resting on Pelvic Floor at all.* This opinion is held by Fothergill to be true usually in the case of virgins.²⁷

(vii) *Inflammation of Tissues surrounding Suspending Group as a Treatment for Prolapse.* Parsons' operation²⁸ (strengthening the utero-pelvic bands by producing inflammatory reactions) does intentionally what gynæcologists do inevitably and often unwittingly.

tingly when operating on the parametrium. The importance of contraction of cicatricial tissues after inflammatory reaction is seldom mentioned in the literature and yet it must play a considerable part in the therapeutic effect.

(viii) *Tightening up of Ligaments in the Treatment of Prolapse.* A curative operation²⁹ has been devised to remedy a tear in Mackenrodt's ligament. The therapeutic effect is probably mainly, like that of Parsons' operation, indirect, *i.e.*, on contraction of the parametrial cicatrices, indeed Moritz³⁰ holds, on the evidence of specimens, that efficient colporrhaphies even are successful only because they tighten up the parametrium.

(c) *Age Factors.*

(i) *The age factor in isolation.* It is often said that prolapse is more frequent in women at middle age than at any other time, but little or no work has been done to isolate the "age factor." Spiegel's figures³¹ will again be used, not as a basis for deductions so much as to illustrate a method.

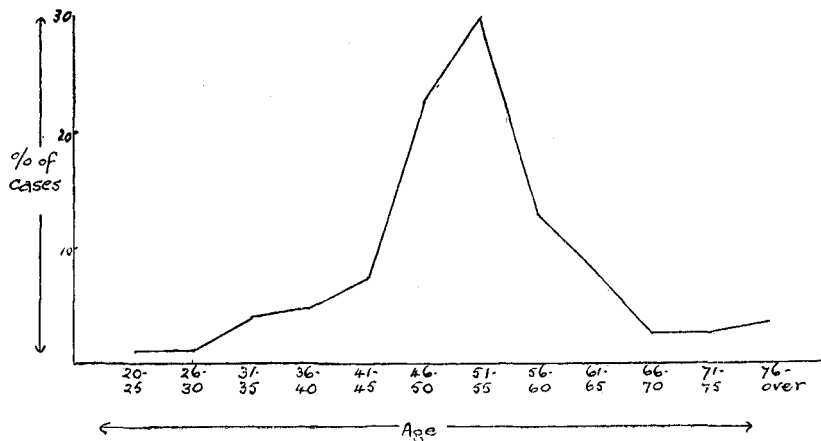
17.5 per cent. of the cases occur in women between 15 and 40.

65 " " " " " " " " " " 40 and 60.

17.5 per cent. " " " " " " " " over 60.

It would be an error to say that the proportional incidence of prolapse in persons over 60 and between 15 and 40 is the same because the proportion of women over 60 in Russia is about 8.1 per cent. as against the 38.5 per cent. between 15 and 40. The probability of a person between 15 and 40 having prolapse compared with the probability of a person over 60 is thus as 1 to 4 approximately (0.46 in women between 15 and 40; 3.62 in women between 40 and 60; 2.05 in women over 60).

Plotting percentage of cases against the ages we get :



Andrew's³² figures show a mean age of 40.7, the largest number of cases being treated between 30 and 40 years of age. Both tables show a sharp rise in the middle period of life. Further comment must be reserved for the next two paragraphs.

(ii) *Prolapse in Relation to Childbearing.* It is to be noted that in Spiegel's figures only about ten per cent. of the prolapses occurred during the childbearing years (20-40). If these figures are reliable it would seem that the influence of the traumata of giving birth does not manifest itself at once. I have not found this point mentioned in my perusal of the literature, nor am I able to say what the curve of the case percentage (in which this factor is paramount) would be if plotted against the years intervening between injury and onset of the prolapse. But the fact of an interval confirms the classification of ruptured perineum and stretched ligaments as contributory not specific factors.

(iii) *Prolapse in relation to Work.* It is probable that as age advances the cases on the whole do less rather than more work and so the strain put upon the suspending and supporting structures due to work diminishes. One would therefore expect less tendency to prolapse with advance in years (assuming for the moment that the work factor was paramount) unless the patient weakened locally from an unknown cause or was weakened locally by the traumata mentioned above.

Until we have age and status statistics of persons in the same occupations the effect of this factor cannot be accurately estimated*

(e) *Other Contributory Factors.* This category is only a pigeon-hole in which to file factors unfortunately still unanalysed. Pozzi³³ laid great stress on elongation of the cervix, subinvolution is a factor supported by many,³⁴ also ill health and insanitary surroundings,³⁵ and starvation.³⁶

8. PRECIPITATING FACTOR.

The feature of a factor in this class is its immediate temporal association with the result—prolapse. The only event that occurs to the mind is an unexpected fall. To judge from the literature, a fall appears to be excessively rare as an ætiological factor able to act in isolation.

**Constitutional Endowment.* One cannot tell if a patient is endowed with a constitutionally strong pelvic visceral sustaining apparatus until it is put to the test, but if there is anything in the Infantilisimus theory of Mathes or in Flatau's Pelvic Tilt hypothesis, useful deductions might be made from the percentage of cases of prolapse occurring at the different ages in persons having the same pelvic tilt or other signs of constitutional abnormality.

9. BRIEF DISCUSSION OF THE ÆTIOLOGICAL FORMULA APPLIED TO PROLAPSE.

Three things may be said in favour of the ætiological formula here put forward, first, that it *co-ordinates* factors which were not before brought together; secondly, it adds the notion of *quantity* to the various factors in a more prominent way than has been done before; thirdly, whereas Simpson's table directs attention in the main to anatomical localities where the ætiological factors were to be found and serves as a rapid guide to treatment, this formula lays more stress on defects in *function*, and may help to theoretical comprehension those who wish to co-ordinate the many and diverse ætiologies of prolapse of the uterus.

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Fig. 1.
Half of the tumour showing the appearance of cut surface
in fresh condition.

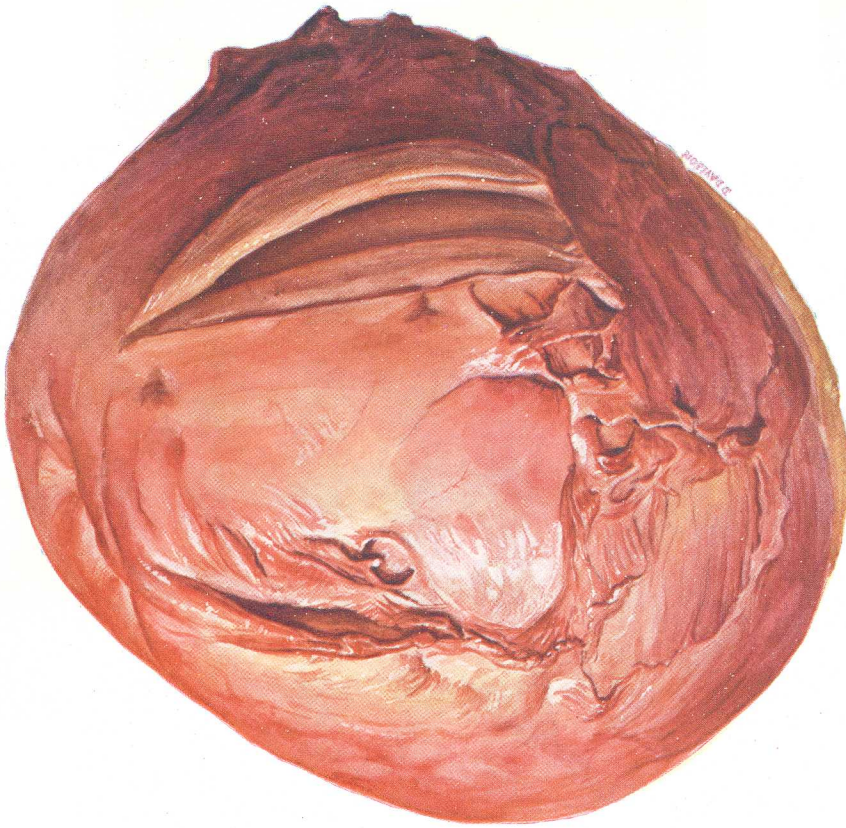


Fig. 2.
Cavity of the uterus opened through the anterior wall.