throughout the 20-year period, and the ratio of 19 to 1 was substantially maintained, though there were wide fluctuations from year to year. The rise in 1940-1 and the fall in 1942-3 are seen to be confined to males. In females the general trend of the pre-war years was maintained. This finding is somewhat surprising in view of the great changes which have taken place, especially since 1939, in the habits and working conditions of women.

Age Distribution (3 Main Hospitals; 20-year Period)

The general characteristics of the age distribution are at once apparent from Fig. 6, which shows the 7,156 cases of our series arranged in 5-year groups. To obtain the true incidence at different ages a correction must be applied, to allow for the diminishing numbers in each age group in the population as age advances. The results are given in Fig. 7, which shows (for both sexes and for males) the incidence rate per 100,000 living in each age group. It will be seen that the incidence reaches its maximum between 35 and 45 years and falls only slowly thereafter.

An interesting feature is the sudden increase in the frequency of perforation at adolescence. Perforation in childhood is rare: in our series (exclusive of the few cases which may have been treated in the Royal Hospital for Sick Children) there was one perforation at 8, one at 11, and one at 12 years. From age 13 to age 19 there is a truly remarkable increase, the numbers observed at successive single years of age being 1, 6, 16, 32, 44, 86, 101 (see Fig. 8).

The age distribution did not remain stable throughout the period. Between 1924 and 1943 the mean age rose by some $3\frac{1}{2}$ years, the rate of increase being fairly uniform. The rise is doubtless due in part to the increasing mean age of the population in the area served: this does not, however, appear to be the whole explanation, and the question is being studied further.

In males and females the age distribution is dissimilar. It will be seen from Fig. 6 that the mean age of males is 3 years less than the mean age of females. Analysis shows that it is extremely improbable that a difference of this magnitude has arisen by chance. Nor is the difference to be explained by a discrepancy in the population served, for the mean ages of adult males and females in the population are almost equal. We believe, in consequence, that there is a small but nevertheless a real difference in age incidence in the two sexes.

(To be concluded in next week's issue)

EPISIOTOMY

BY

J. D. S. FLEW, M.D., M.R.C.O.G.

During the training of the medical student and pupil midwife in the labour ward much stress is laid upon the prevention of perineal tears, and to a great extent their skill at delivery is judged on the results obtained by them in this direction. Whilst agreeing that, in general, an intact perineum is better than a torn one, this statement needs qualification and consideration before it can pass unchallenged. Lubin (1932) has stated: "It is presupposed that a patient without a lacerated perineum fares better than her more unfortunate sister in so far as puerperal morbidity, comfort, future pathology, and disability are concerned." The damage incurred by the patient in order to maintain the integrity of her perineum must be considered.

Disadvantages of a Torn Perineum

What are the possible disadvantages of a torn perineum? The greatest is a complete tear through the sphincter and mucous membrane of the rectum, so that the patient is left with a recto-vaginal cloaca, incontinent of flatus and faeces. This is a disaster, and the repair of a complete tear a major surgical operation, upon which depend that patient's future comfort and happiness, for without complete rectal control she will be forced to segregate herself. Even if the operation is "almost successful," so that she has sphincter control restored but is left with a recto-vaginal fistula, she will be miserable and

remain a social outcast until at a subsequent operation that fistula is repaired.

A patient whom I saw in 1937 illustrated this condition. She had a complete perineal tear at the birth of her first baby, four years previously. This had been sutured, but she was left with a recto-vaginal fistula, which had defied three attempts at repair, after which her advisers had told her that nothing further could be done for her, but that in time the fistula might close spontaneously.

For four years that woman had been afraid to associate with others. She has never been to a neighbour's to tea or asked anyone to her house. If she became constipated, flatus escaped through the fistula; at other times the vagina was always contaminated by faecal matter. No coitus had occurred since her confinement, and as the result of all these facts her mental condition had deteriorated, and at times she had considered suicide.

I admitted her to University College Hospital, and, using silver wire sutures, as first advocated by Marion Sims for vesico-vaginal fistula, successfully closed the fistula and a most miserable period in that patient's life.

There can be no argument against the statement that a perineal tear involving the rectum must be avoided at all costs. Tears which do not reach the rectum are less serious, but they involve the risk of sepsis, they need to be repaired, the sutures are uncomfortable during the 7-10 days in which they are *in situ*, and if good apposition is not obtained (by no means always easy) the patient may be left with a painful scar, which at times results in dyspareunia.

These facts are good evidence in favour of guarding the perineum from injury, but do they justify the enthusiasm of many labour-ward sisters and other teachers of midwifery, as a result of which their pupils come to regard their task as one in which the three essentials are to leave a live baby and a living mother in whom the perineum is intact?

In order to prevent perineal laceration the second stage of labour is often grossly lengthened. The mother is subjected to unnecessary pain and the foetus to prolonged pressure. The perineum is stretched so that it becomes of tissue-paper thickness, but it remains intact. True, the baby may be in white, asphyxia or even dead, the mother distressed, the uterus exhausted so that post-partum haemorrhage is more probable since it has been working hard to overcome the resistance of the perineum, augmented by the strong hand of the anxious accoucheur. Nevertheless, we repeat with pride: "The perineum is intact."

Aetiology of Prolapse

What is discovered if cases subjected to such treatment are followed up? In any gynaecological clinic approximately 25% of the multiparous patients attend on account of symptoms referable to prolapse, and of the same group admitted for operation the figure is nearer 50%. Do these cases occur because of perineal tears? No. Many cases of unrepaired complete tear of years' standing have no prolapse at all, whereas by prevention of perineal rupture, especially in primigravidae, many cases of prolapse are unwittingly caused.

Koster (1935) states that the uterus cannot be supported by any structures at the base of the broad ligament, nor by any structures attached to it. He maintains that the muscles closing the pelvic aperture are the true uterine supports, and that once these are damaged the intra-abdominal pressure, especially when raised as in straining, coughing, etc., causes descent of the uterus. This would indicate that the uterus is pushed downwards from above rather than pulled downwards from below.

Mengert (1936), however, states that it is doubtful if the pelvic floor affords any support to the uterus, and bases his opinion on experiments performed on eight cadavers. A weight of 1 kg. was attached to the cervix in each case and various structures were divided. No uterine descent occurred until the lower third of the broad ligaments and upper two-thirds of the paravaginal tissues were divided. Then there was an average uterine descent of 10.5 cm., in spite of the fact that the pelvic floor was intact in all cases.

Here are two diametrically opposite opinions—and does not the truth lie between the two? Surely the uterus is supported from below by the pelvic floor and suspended from above by such structures as the cardinal and utero-sacral ligaments? Of these, the support from below is the more important, and whether the uterus can descend or not depends

primarily upon the integrity of the pelvic floor. Mengert's theory would explain those cases of "vault prolapse" which may occur in nulliparous patients and which account for only a small proportion of the total number of cases. Koster's theory must be criticized because of the statement that the uterus is pushed downwards by coughing, straining, etc. Certainly this may aggravate the condition, but is it the primary factor?

One has but to see a few cases of prolapse to realize that a cystocele and rectocele occur low down the vaginal wall, within an inch of the introitus, not high up about the vaginal fornices. This sagging of the vaginal walls tends to pull the uterus downwards, since they are attached to the latter about the level of the internal os. Furthermore, the damage to the vaginal supports allows the bladder in front and rectum behind to protrude into the lumen of the vagina, covered only by the lining of the latter. The protruding viscera then keep apart and further separate the damaged vaginal supports, and the condition is a true hernia of bladder and possibly urethra in front, and rectum and anal canal behind.

The symptoms of which patients complain are, in the main, referable to these herniae rather than to the actual position of the uterus, and the term "prolapse of the uterus" is a misnomer which in most cases should be discarded for the term "vaginal hernia"; or, should the term "prolapse" be retained, it should be regarded primarily as prolapse of the vaginal wall rather than of the uterus.

During the puerperium not only does the uterus involute but the vaginal and uterine supports undergo the same process. Sepsis is said to be an important factor in causing subinvolution of all these structures, and overstretching and tearing of deep-seated fibres is equally important in preventing the utero-vaginal supports from regaining their previous tone and returning to approximately their previous length. Already it has been mentioned that sepsis may gain entrance to the pelvic cavity via the torn perineum; more commonly it does so via the placental site or torn cervix. In the majority of first labours, when the presenting part meets the pelvic floor a trickle of fresh blood can be observed, indicating damage to soft parts. If, after delivery, the labia are separated and the vagina inspected in a good light, a ragged torn area can often be seen on the commencement of the posterior vaginal wall, even when the perineum is intact. Should the perineum be torn, then this area would doubtless be incorporated in the repair; if it is not, how often will this wound alone be repaired? Here is another site for the entrance of infection—an important factor in the aetiology of prolapse.

These facts should make us pause to consider whether our management of the second stage of labour needs revision, and if our enthusiasm for maintaining the integrity of the perineum is always justified. Salmond and Dearnley (1935), considering this question, gave it as their opinion that episiotomy may be an important factor in the prevention of prolapse. That this opinion has not received more serious consideration is possibly due to the fact that, even in those cases in which episiotomy has been performed, it has been carried out too late in labour for the patient to reap its main advantages.

Management of the Second Stage of Labour

Every primigravida incurs some degree of permanent damage to her pelvic floor during her delivery per vaginam, and while gynaecologists have spent much time and thought in perfecting operations to cure the resulting symptoms, comparatively little has been done by obstetricians in devising methods by means of which the damage would be reduced to a minimum. There is much truth in the statement that gynaecologists live by obstetricians' errors.

In 1742 Sir Fielding Ould, in his *Treatise on Midwifery*, suggested the possible advantage of perineal incision, but the first favourable notice came in 1799 from Michaelis, who advised incision in the median line. The name "episiotomy" came later from Carl Braun, who, however, did not consider the operation necessary or desirable. In 1892 Küstner, and in 1896 von Ott, advocated median episiotomy; and Stahl of Chicago in 1895 practised and published the same advice, stating that "it aids, as no instrument can, in preserving that life and

body of both foetus and mother." DeLee (1915) advocated a medio-lateral perineal incision as a tension release, to hasten termination of the second stage of labour, in the interest of the child, and laid more than usual emphasis on its advantage to the mother in the conservation of pelvic integrity.

The necessity for some kind of treatment in many cases has therefore been recognized for 200 years, yet in modern textbooks of obstetrics, although episiotomy is mentioned, but little practical advice is given concerning the exact way in which it should be carried out and the cases in which it should be performed.

In 1918 Pomeroy went so far as to advocate cutting and reconstructing the perineum for every primigravida. This would seem to be going to the extreme, for its practical result would be that an incision would be necessary in the majority of multiparous patients as well, since the old scar would usually rupture. This might well be the lesser evil.

The indications for episiotomy must now be considered. Broadly speaking, in any case in which the perineum seriously delays the birth of the presenting part, or in which there is the need for intravaginal manipulation or forceps delivery, in all primigravidae and some multiparae, an episiotomy should be performed. These cases must now be reviewed in detail.

What should be regarded as "serious delay" in the birth of the presenting part? Actual time is of but little value in assessing this without also taking into consideration the strength and frequency of the pains. In the majority of cases in which the presenting part has been on the perineum for half an hour episiotomy is indicated; and earlier if there is foetal distress or undue maternal distress, or in spite of good frequent pains the presenting part is making but little advance. Should the perineal skin start to split superficially before the head is crowned, then a tear is inevitable unless prevented by a timely incision.

A word concerning foetal distress: forceps are frequently considered necessary on account of this. How often are the delay in preparation for forceps delivery, the anaesthetic, and trauma to the foetus, however slight, the final blow in extinguishing the last spark of life? An episiotomy and fundal pressure are quicker and less injurious to the foetus. Often, when the head is on the perineum, these methods will suffice and should be practised more frequently. Berliand (1932) advocates episiotomy strongly in all cases in which the foetus is known to be premature, in order to prevent cerebral haemorrhage.

I well remember my pride, as an obstetric house-surgeon, conducting 15 consecutive forceps deliveries in primigravidae without a single perineal tear or episiotomy. Now I shudder to think of the danger to which those babies were subjected and of the damage, then hidden and unseen, which those patients suffered. Delivery of a primigravida by forceps is an absolute indication for episiotomy. A breech delivery in a primigravida is another absolute indication, both for the delivery of the after-coming head and for any intravaginal manipulation, such as the bringing down of an extended leg. How difficult this manœuvre can be! With the lower uterine segment gripping the manipulating hand, the latter soon becomes cramped and the perineum forgotten. How galling, when at last the foot is successfully produced outside the vulva, to find the perineum gaping, torn perhaps into the rectum! The spontaneous delivery of a persistent occipito-posterior, "face to pubes," a face presentation, and any case in which there is a narrow pubic arch should be placed in the same category. If a patient who has previously had a colpoperineorrhaphy performed be delivered per vaginam then episiotomy is essential.

The difficult operation of suturing a torn cervix will sometimes be facilitated by an episiotomy, but the manual removal of the placenta and bimanual compression seldom of themselves call for episiotomy: the already stretched birth canal will easily admit the cone-shaped hand.

These cases comprise the commonest in which gross damage is likely to occur to the genital tract, and therefore those in which episiotomy is most indicated—a formidable list, capable of extension.

The actual moment at which the episiotomy is to be performed is often difficult to decide, but it must be remembered

that this operation is being done in order to minimize the damage to the unseen utero-vaginal supports, in addition to preventing a visible perineal laceration, and, as stated by Gusman (1932), it is useless to wait until the perineum is of but tissue-paper thickness, for by then the former damage has already been incurred. There is no doubt that the majority of episiotomies are performed too late in labour to benefit the patient to the fullest extent. In a suitable case the episiotomy should be carried out as soon as perineal bulging is marked. Far better perform this too early than too late; for the disadvantages of the former are slight, of the latter gross.

Now that the rules of the Central Midwives Board have been altered so that a pupil midwife has to undergo a year's training and obtain two certificates before she can practise as a midwife, should she not receive instruction in performing episiotomy during the latter six months of her training, and, when qualified, be permitted to perform it, if and when she considers it necessary? Must her patient's genital tract be permanently damaged because "medical aid" cannot be obtained immediately? The suturing of the wound should certainly be left to a medical officer; thus the case would become notified, and any midwife who abused this operation would soon be detected.

Before describing the actual operation, certain points concerning the anatomy of the perineal region must be considered.

Points concerned in the Anatomy of the Perineal Region

A complete description of the anatomy of the perineal region need not be given here, but there are certain anatomical relations which need emphasis because of their practical importance (Fig. 1).

The first concerns the blood supply. The superficial and transverse perineal arteries which supply this area arise from the pudendal artery in the anterior portion of the ischio-rectal fossa and, becoming superficial to the superficial perineal muscle, pass medially to anastomose with the corresponding vessels of the opposite side. Thus, apart from a few twigs from the inferior rectal artery, the perineal blood supply arises at its lateral borders and passes medially. During pregnancy the blood supply to this area is increased, and the amount of erectile tissue around the vagina is augmented; thus any tear or incision in this region may bleed profusely.

FIG. 1.—1a, Internal pudendal artery. 1b, Inferior haemorrhoidal artery. 2, Bartholin's gland and duct, the latter looping downwards. 3, Spongy tissue, greatly augmented during pregnancy. 4, Median raphe.

The second concerns the muscles. These are attached to a median raphe, and the fibres run medially and backwards. When these muscles are incised the medial portion will therefore retract backwards, and when repairing such an incision care must be taken to pull the median portion upwards before inserting the sutures, otherwise correct apposition will not be

obtained. In addition, the external anal sphincter extends approximately one inch from the anal margin, and therefore any incision lateral to this will not involve this muscle.

Finally, a word concerning Bartholin's duct. This is about 2 cm. in length, opening into the groove between the labium minorum and the hymen. Its course is U-shaped, with the

FIG. II.—1, Lateral (incorrect). 2, Medio-lateral (correct). 3, Median. 4, Author's method.

loop downwards, so that an incision of the perineum which does not start strictly in the midline runs the risk of dividing this duct.

The above anatomical points should be remembered when performing an episiotomy.

Technique of Episiotomy (Fig. II)

Since this is such a slight operation, easily performed, it is generally described in the textbooks in a few lines, augmented by a diagram, often inaccurate. Four types of episiotomy have been used: the median or perineotomy, in which the incision is confined strictly to the midline; the medio-lateral, in which it starts at the fourchette and extends laterally; the lateral, where it starts on the lateral vaginal wall and extends towards the ischial tuberosity; and, lastly, multiple small incisions around the vaginal orifice. To-day only two of these are in general use—the median and the medio-lateral, the latter now being termed "lateral episiotomy." It is here that the diagrams in many textbooks are at fault, for the incision is often shown starting to one or other side of the midline.

The old lateral episiotomy has been abandoned on account of the danger of haemorrhage. Finkelstein (1939) describes such a case, in which episiotomy had been performed prior to forceps delivery, and in which the haemorrhage from the incision was so great that delivery had to be postponed. Doubtless the erectile tissue around the vagina had been opened up in this case. Had the incision begun truly in the midline, perhaps this massive haemorrhage would not have occurred. Incision commencing away from the midline places Bartholin's duct in danger. Should this be cut, a Bartholin's cyst may subsequently develop, thus providing more work for the gynaecologist; and the loss of one of the ejaculatory systems is a serious matter, for an abnormally dry introitus may cause difficulty at subsequent coitus.

In all cases, therefore, it is essential that the incision starts strictly in the midline; and from the anatomical facts already mentioned it would seem advisable to continue in this direction. By so doing the blood is but little disturbed, there is no risk of

damaging Bartholin's duct, and good apposition is most easily obtained. The obvious danger of this method is that, should the opening still be insufficient, the resulting tear will be directed through the sphincter towards the rectum, thus bringing about the major disaster that must be avoided; and who can always be certain that the central incision will be adequate? Gillis (1930), describing 500 consecutive cases of median episiotomy performed by him, stated that extension into the rectum occurred in 8 cases (1.6%). Thus even in skilled hands there is a definite danger of this happening, which danger will increase markedly with a less experienced operator. It is in order to avoid this danger that the lateral episiotomy of to-day is so widely used. Starting in the midline, it extends laterally towards a point midway between the anus and the ischial tuberosity. A large incision can be made, and even if extension occurs there is no risk of rectal involvement.

Personally, I attempt to combine the advantages of both median and lateral episiotomy. A blunt-pointed curved pair of scissors are used, and the incision made in the midline, until it reaches a point 1 in. from the anterior margin of the anus. The scissors are then directed towards the ischial tuberosity and the incision completed with the curved portion. In this way the sphincter is avoided, and, should the incision extend, there is no rectal involvement.

In rare cases, in which even a large lateral incision seems inadequate, Taylor (1937) and others advocated bilateral episiotomy. This should never be done, for in this way almost the whole of the blood supply to the perineum is cut, since it comes from the lateral borders; and personally I have seen two cases of severe perineal sloughing result from this operation. Both these were clean cases, performed in hospital, and are the only serious complications I have seen resulting from episiotomy itself.

Already it has been stated that episiotomy should be practised more frequently, and earlier in the second stage, than it usually is. Whenever it is done it should be performed at the height of a pain, for then the tissues are stretched and it is easier to see exactly where the incision is being placed. Furthermore, sensation in the part is then dulled: even if no anaesthetic is being used—a rare occurrence—the operation does not seem to be unduly painful, and the Junker or "gas-and-air" apparatus can make the patient oblivious of the fact that the tissues are being incised; or the incision can be made very satisfactorily under local analgesia. Whatever incision is being adopted in manipulative cases, it is advisable to "iron out" the vagina with the well-lubricated hand before making the incision, and in all cases essential to divide the whole depth of tissue in the wound, and not merely to incise the skin.

Results

In 135 consecutive primigravid private patients delivered per vaginam I find the following results:

Normal delivery without episiotomy, 63 cases	46.7%
Episiotomy performed in 72 cases	53.3%
Of the episiotomy cases 52 had a normal delivery, and therefore the total normal delivery rate (115 cases in 135) is	81.1%
Among the remainder, all of which had episiotomy performed, there were 17 forceps deliveries	12.6%
The remaining 3 cases comprised 2 extended breech and 1 perforation of a hydrocephalic head	

The relatively low forceps rate for primigravidae in private practice I attribute almost entirely to the episiotomy rate of over 50%.

Apart from the case of hydrocephalus, all the babies were alive and well, with the exception of one delivered by forceps, which died on the sixth day from pneumonia. Post-mortem examination showed no cerebral haemorrhage. Of the 72 episiotomy cases, 2 (2.8%) had symptoms referable to vaginal hernia 6 months later; but these were slight, and improved with palliative treatment, whereas of the 63 cases of normal delivery without episiotomy, 5 (8%), one of whom had colporrhaphy performed, had the same symptoms.

Apart from these figures the average "tone" of the vaginal walls was much better in the former group than in the latter.

A patient always thanks her doctor if she has no stitches in the puerperium. Instead, should she not thank him because she has?

Summary

The disadvantages of a torn perineum are discussed and compared with the disadvantages of unseen damage that may occur as a result of keeping the perineum intact.

In order to minimize all these disadvantages early episiotomy is advocated, and the cases in which episiotomy should be performed are stated.

The relation of injury sustained during labour to prolapse and vaginal hernia is discussed.

Certain perineal anatomical points of practical importance in performing episiotomy are mentioned.

The methods of performing episiotomy are described.

Figures are given which indicate that patients on whom early episiotomy is carried out are less prone to pelvic damage than those in whom the perineum remains intact.

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RAPID REPLACEMENT OF FLUID IN HAEMORRHAGE AND SHOCK

BY

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Although numerous papers on the effects of transfusion of the human subject with blood and blood substitutes have appeared in the last five years very few refer to the hazards of overloading of the circulation with fluid. Black (1937) states that 20 minutes should be taken in introducing 600 c.cm. of blood, otherwise an acute dilatation of the right side of the heart may be encountered; while Brennan (1940) suggests that 500 c.cm. of plasma in 20 minutes may be considered rapid. Marriott and Kekwick (1940) state that 568 c.cm. of blood in 30 minutes is usual, and distinguish between this rate of infusion and that desirable in debilitated patients (1 c.cm. per lb. wt. per hour), in whom, according to Murphy, Grill, and Correll (1940), injection of relatively small amounts of fluids by vein causes increase in the venous pressure and slowing of the circulation. De Gowin and Hardin (1940) gravity-fed from 5 to 40 c.cm. of fluid a minute to their cases with success. Dealing with battle casualties, Whitby (1942) states that failure to restore blood volume is a much greater danger than pulmonary oedema from necessary massive transfusion (experience of 150 cases), while Kilduffe and DeBailey (1942), quoted by Drummond (1943), have given 650 c.cm. in 3 minutes, and the latter says he may have to give 568 c.cm. in 15 minutes, without ill effects. Sharpey-Schafer and Wallace (1942) deal specially with the question of possible overloading of the circulation from rapid infusion of fluid in man. Of 10 subjects with normal cardiovascular apparatus given up to 2,000 c.cm. of serum at a rate of 54–100 c.cm./min., 5 developed headache or constriction of the chest; 3 had slight changes in the T-wave of the electrocardiogram, their pulse rates increased slightly, and the haemoglobin fell by 3.3 to 23.3%. If the haemoglobin fell markedly there was a rise of venous pressure, with an increase in the diastolic size of the right heart, but no pulmonary oedema. In 9 cases which had a venesection of 740–1,100 c.cm. (approximating to battle casualties) followed by infusion of 1,500–1,800 c.cm. of 0.9% saline at a rate of 88–138 c.cm./min., or an infusion of 700–2,000 c.cm. of serum at a rate of 6–140 c.cm./min., the most striking effect was vasodilatation, with reddening of the face and engorgement of superficial veins. Unless enough time had elapsed for the haemoglobin to fall considerably, no rise in venous pressure followed infusion until at least 1,000 c.cm. of fluid had been given.