EMERGENCIES IN GENERAL PRACTICE**UTERINE INERTIA**

BY

CLIFFORD KENNEDY, M.B., F.R.C.S.Ed., F.R.C.O.G.*Consultant in Obstetrics and Gynaecology, the Royal Infirmary, Edinburgh*

In recent years there has been a tendency to recognize in disordered uterine action an increasing number of separate and distinct clinical entities. It is perhaps not unnatural that this should be so when it is remembered that writers have described a complete atonia of the whole uterus, body and cervix, or, alternatively, a state of spasm which may affect the upper and lower poles at the same time. Again, an inefficient upper segment may be associated with increased tone in the middle and lower zones and with an associated resistance to dilatation of the cervix. And there are further variations of the types just mentioned.

It is not surprising, therefore, that attempts to arrange these disorders in their respective and appropriate groups have become more comprehensive, and for that very reason perhaps more confusing. The following classification is suggested:

1. *Inertia: Hypotonic (Uterus and Cervix).*
2. *Incoordinate Action (Uterus):* (a) hypertonic inertia, (b) normotonic inertia, (c) asymmetrical contraction, (d) constriction-ring dystocia.
3. *Incoordinate Action (Cervix):* cervical achalasia.

Such a division may represent an over-simplification of a highly complex and controversial subject, but there has been a tendency to over-elaborate and to give to minor clinical manifestations undue regard and emphasis, even to the extent of labelling them as quite separate conditions; those less obvious disorders are merely a stage of a more generally accepted form of disordered action. That is why "colicky" uterus and "spurious" labour have been omitted from the classification, for it is thought they are phases of, or at any rate incapable of being separated completely from, hypertonic inertia. Under the term "cervical achalasia" is included primary rigidity of the cervix, in the belief that it may be possible in the majority of cases to differentiate clinically one from the other. Secondary cervical rigidity has been deliberately omitted from the list because it is felt that here the problem is a mechanical difficulty rather than a neuromuscular upset.

Normal Uterine Action in Labour

Several writers using the tokodynamometer, with the receptors placed over the fundus, middle uterine segment, and lower uterine pole, have recorded the relative strength of the uterus at different levels. The resulting charts show a gradient of contractibility from above downwards—sometimes referred to as fundal dominance, gradient of activity, or uterine polarity. There has been much argument in recent years about the role of the cervix in labour. Nixon, Karlson, and Sauter believe that the cervix is able to contract, and the last two maintain that the cervix dilates in labour through contraction of its own muscular tissue; the more synchronous these contractions are with those of the uterine body, the quicker does the cervix dilate. This new conception is hard to accept. It is preferred rather to hold to the old view that the part played by the cervix in normal labour is entirely passive, and recent research gives strong support to this hypothesis. If such were not so, uterine polarity would have little or no place in labour.

Definition and Types of Uterine Inertia

In this article it is not proposed to discuss "secondary" uterine inertia, which may result from mechanical obstruction, and should be referred to as "uterine exhaustion," but rather to concentrate on the so-called "primary" inertia. This latter condition is difficult to define but might be described as a prolonged labour, in the absence of cephalo-pelvic disproportion, where the delay is the result of weak and infrequent or, on the other hand, disordered uterine contractions. It is urged, therefore, that when a lack of advance and slow cervical dilatation are evident at the end of 12-18 hours the patient should at once be labelled "inertia" and thereafter investigated and treated as such.

Three forms of inertia exist: hypotonic inertia, normotonic inertia, and hypertonic inertia. The first and last are the more important and more frequent varieties. Hypotonic inertia is characterized by a loss of tone in both upper and lower segments. It is therefore a true inertia with feeble activity of the uterus as a whole. In the hypertonic form, the commonest inertia, there is an increased tone and resistance to dilatation of the lower uterine pole associated with weak action of the upper segment. This is referred to as reversed polarity, and, although the condition comes within the ambit of inertia, it is more suitably classified as an example of incoordinate uterine action.

Aetiology

The aetiology is uncertain and must include many factors. There is a general consensus of opinion that primigravidae are more often affected than multiparae and that freedom from difficulty in subsequent labours indicates the temporary nature of those conditions as they may affect the uterus or its innervation. Because it is realized that in most cases the frequency and intensity of uterine contractions are influenced profoundly by the pressure of the presenting part on the lower segment, malposition, malpresentation, and deformed or contracted pelvis are said to predispose. It is probable that a lack of normal stimulus to the cervix and pelvic plexus may in such cases affect the upper segment by the nervous route. Indeed, a high presenting part may indicate incomplete lower-segment formation and may be a timely warning of impaired uterine action. Some maintain that the condition is encountered more often in the elderly primigravida, and that advanced age therefore plays a part, or where rupture of the membranes has occurred before or in the early stages of labour. The short and obese patient who shows masculine characteristics is more liable to fall victim to inertia. Extensive damage to the uterine wall, as in accidental haemorrhage, may prevent efficient contraction of the uterine muscle, but fibroids and underdevelopment are not in themselves adequate cause. Hydramnios and multiple pregnancy are said to be quite often associated with inertia, but I believe that this is not so, because the premature and short labours which characterize both conditions do not suggest any loss of tone. The third-stage bleeding which may follow a twin delivery is due not to inertia but rather to the mechanical difficulty in separating and in expelling the larger placenta.

The extent to which hormone activity may provoke or influence these disorders has inevitably excited speculation. Oestrogenic principles circulating during pregnancy are in an inactive state, and this suggests the existence of some mechanism which is protective in so far as the hormone is prevented from sensitizing the uterus prematurely. If such

be true, it may be that some cases of inertia are due to a persistence of this mechanism and any oestrogenic hormone given will be inactivated and rendered useless. Csapo and others have, however, provided a new approach to this subject. They have shown that the contractions of voluntary muscle depend very largely on the presence in the muscle of a fibrous protein complex called actomyosin and of a high-energy substance adenosine triphosphate (A.T.P.). This actomyosin-A.T.P. complex is present in the myometrium just as in striated muscle. It is thought that the main function of certain electrolytes and enzymes is the breakdown of these phosphates. In this way energy is released and restored to the contracted actomyosin, which is able to relax in a charged state ready for another contraction.

Compared with the non-pregnant uterus, the uterus just before labour has a relatively high actomyosin concentration and in labour this is much higher in the upper segment than in the lower. This is as it should be if the theory of uterine polarity be correct; indeed, it may go a long way towards explaining the difference in function of the two uterine poles. It has been shown further that oestrogens are responsible for the development of the biochemical contractile system of the uterus—actomyosin, high-energy phosphates, and the rest—and in pregnant rabbits the hypothetical curve of active oestrogen bears great similarity to that representing actomyosin concentration and A.T.P. activity. Progesterone, too, plays a part in that it modifies the energy-giving part of the contractile system by redistribution of the potassium ion through an alteration in permeability of the cell membrane.

It is believed, however, that fear is one of the most important causes of inertia. The patient has been terrified by the unknown ordeal which lies ahead, and by keeping this fear to herself she may have lived for months in a state of suppressed anxiety. It is probably true that there is nothing more difficult to assess than the mental attitude of the woman to her forthcoming labour, and it is often the woman who is casual and outwardly unperturbed by what lies before her, determined not to give way to her fears or to confess to them, who becomes the victim of inertia.

No one can describe with absolute certainty the nerve supply of the uterus and its function. It is accepted that the uterus, under appropriate conditions, can contract as an isolated organ. It is therefore difficult to understand the functions of its nervous connexions. Few now believe in the presence of an intrinsic nervous plexus, which was formerly thought to co-ordinate the actions of different parts of the uterus. There is, however, a rich supply of sympathetic (adrenergic) nerves which travel via the superior hypogastric plexus (presacral) nerve and the inferior hypogastric plexus. The motor fibres of those nerves appear to be largely inhibitory, in so far that contractions elicited by their stimulation mainly affect the lower segment. It is also said, although some doubt it, that the uterus receives a parasympathetic (cholinergic) supply from the second, third, and fourth sacral nerve roots, and that this also reaches the uterus via the inferior hypogastric plexus and the paracervical ganglia. Stimulation of these nerves is said to cause a contraction of the detrusor muscle of the upper segment.

According to this concept, the parasympathetic brings about evacuation of the uterus, whereas the sympathetic tends to prevent it, good uterine action depending on a balance between the two. It may be that sympathetic stimuli cause an increase in uterine tone while parasympathetic stimulation has the opposite effect. If uterine tone is reduced, then uterine contractions would increase in amplitude and efficiency. If, on the other hand, there is no parasympathetic supply to the uterus, efficiency must depend on a balance between the inherent muscle activity under the control of hormonal factors and the sympathetic nervous system. If the substance of this be true, there is the possibility that fear, acting on the sympathetic, maybe through adrenal stimulation, brings about a "tightening-

up" process in the region of the lower segment and circular fibres of the internal os area. Adrenaline *B.P.* consists of adrenaline and noradrenaline, and it has been shown that a solution of adrenaline will, in very low dosage, inhibit uterine action while noradrenaline stimulates it. It is possible that the pattern of uterine activity can be considerably distorted by some upset of balance between the two, and it is suggestive that the adrenaline level in the blood is raised in women showing a severe degree of uterine inertia.

This whole question is a very difficult one. For instance, the patient who is afraid and has a troublesome first labour should have a greater fear and even more difficulty in a subsequent confinement. This rarely happens and shows that fear is not the only factor involved. Again the division of the uterine wall into longitudinal and circular fibres is obviously incomplete when no account is taken of the oblique middle layer, the thickest of all. Likewise the variable response which the uterus gives to stimulation of the sympathetic under different conditions invalidates any general conclusion concerning the function of that part of the autonomic nervous system.

There is one further point. Three years ago Dr. T. L. Adamson and I carried out a clinical investigation into certain problems relating to uterine inertia. This showed, what some writers have denied, that the incidence of primary dysmenorrhoea was higher in the inertia group (28.3%) compared with the control group (16.6%).

Clinical Picture

The clinical picture naturally varies with the type of inertia, but it is true to say that a fairly accurate diagnosis can be made by the bedside of the patient without resorting to the tokodynamometer or other "backroom" method of assessment. The patient with hypotonic inertia has little or no pain, but when pain does occur it is felt mostly in the abdomen and only slightly in the back—in other words, the pain distribution of normal labour. It may be difficult to say definitely that labour has started, and certainly may come only with a very slow cervical dilatation, a "show" or rupture of the membranes. The patient's general condition remains good, there is no distress or tiredness, no elevation of the pulse or temperature, and not enough discomfort to cause the patient worry or any appreciable loss of morale, at any rate in the earlier stages. After 24 hours the bladder and colon may become distended, the result of an associated atonia.

With hypertonic inertia the picture is very different. Here part of the uterine wall is in spasm, and as a result the intrauterine pressure is raised. In normal labour this pressure between first-stage contractions is 5–6 mm. Hg, but where the uterine contractions are colicky the resting pressure may be raised to 15–18 mm. Hg or more. In other words, the interval pressure approaches the level of pain production. Constant pain is therefore one of the main features, this pain being present and becoming aggravated before a contraction is evident and remaining after the contraction has passed off. The contractions are intermittent and infrequent. Backache, which may have been present for several days before labour began, and which persists during labour, denotes a resistance to dilatation of the lower pole and gives the patient more distress than the abdominal discomfort. Cervical dilatation is slow. The desire to "bear down" in the first stage, a feature which is often quite disconcerting, is thought to be due to spasm of the pelvic colon or rectum. Little advance is made, and in time the patient becomes conscious of this. Her morale deteriorates, she begins to worry, she becomes more tense, and the vicious circle is complete. Eventually she becomes exhausted and the pulse and temperature rise.

Maternal and Foetal Risks

Badly chosen and ill-timed operative obstetric procedures—"heroic obstetrics" of which more will be said later—are responsible for severe trauma to the mother's soft tissues. Shock and haemorrhage may follow and have even greater significance in the woman already tired from

prolonged labour and depressed by a lengthy anaesthetic. Too much delay in deciding on the correct method of treatment and too many examinations and manipulations predispose to infection. The increased incidence of post-partum haemorrhage, retained placenta, and manual removal of the placenta must ever be borne in mind.

In prolonged labour there is also the chance of infection of the amniotic sac, with intranatal or neonatal death. Injury or death to the foetus may result from birth trauma or from uterine spasm: as already stated, when the uterine contractions are colicky, the resting intrauterine pressure is raised and is in fact often higher than the blood pressure in the placental sinuses. Such asphyxia may occur even with intact membranes.

Remote Prognosis and Prophylaxis

According to Holmes, about one-third of the women who have experienced uterine inertia deliberately avoid a further pregnancy. It is generally accepted that inertia does not often recur in subsequent labours, and that uterine efficiency improves with each pregnancy. This improvement would seem to depend largely on the degree of cervical dilatation reached in the previous labour. If half dilatation has been attained the probability is that efficient uterine action will be the rule.

Prophylactic treatment includes advice regarding mental and physical relaxation; exercises are not of much avail. Great attention should be paid to inquiring into and discussing any points about which the patient may be anxious. She should be reassured as far as is possible. It is important, too, although difficult to carry out always in hospital practice, that the patient should, during the antenatal period, get to know and trust the doctor who is to manage her confinement.

Treatment

It is of first importance that the patient with inertia should be dealt with in hospital. She should be transferred there if after 12-18 hours of labour she has made little or no advance. It is realized that a patient may have a "stuttering" type of labour for 12 hours or so and then suddenly true labour becomes established and she is soon delivered. Despite that a time limit is required and it is better to err on the safe side. There is no place for the treatment of inertia in the home if hospitalization is possible.

As soon as hospital is reached three things are done: (1) The physical and the mental conditions of the patient are assessed; (2) any mechanical factor such as malposition, disproportion, etc., is confirmed or excluded; and (3) the type of inertia is determined on clinical grounds; the tokodynamometer, if one is available, should take second place to clinical judgment.

It is of primary importance that each case should be considered on its own merits; it is therefore impossible to lay down a hard-and-fast scheme, but whichever type of inertia is present the general rules of any prolonged labour should be observed. Fluids and carbohydrates should be given freely, the bladder and rectum be emptied regularly, the pulse and temperature watched carefully, and every effort made to support morale. The patient should not be left unattended for too long.

Hypotonic Inertia

The following plan of management is recommended:

- (1) Allow the patient up during the day.
- (2) Sedatives at night may range from a mild barbiturate, such as butobarbitone "soneryl," 3 gr. (0.2 g.), to morphine, $\frac{1}{4}$ gr. (16 mg.).
- (3) Test the urine for acetone after 12 hours and four-hourly thereafter. If the test results are positive, 1,000 to 1,500 ml. of 5-10% glucose should be given intravenously.
- (4) Castor oil, 2 oz. (60 ml.), an enema, and a hot bath may be of advantage on the second day.
- (5) If labour has been allowed to drag on so long, prophylactic sulphonamide, 1 g. thrice a day, and penicillin,

250,000 units twice a day, may be indicated on the third day, or before that if the membranes rupture early.

(6) When labour advances to a certain stage—half dilatation of the cervix—malposition may be corrected or the membranes may be ruptured with good effect.

(7) There is a small place only for "heroic obstetrics"—for example, cervical incisions or manual dilatation of the cervix with subsequent forceps extraction, when the head is very low in the pelvis.

Two further points require special mention:

(8) If the uterus is hypotonic a pitocin drip infusion may be started at any time (30 drops a minute of a solution made up of 10 units of pitocin per litre of 5% glucose). This is a much safer method of administering pitocin than by injection, where there is not the same control; the infusion can be stopped at any moment and so the risk of maternal and foetal injury is minimized.

(9) The place of caesarean section is an important one. If the patient is an elderly primigravida, if the membranes have been ruptured for 24 hours or more, if the patient has been in labour for 36 hours, if there is evidence of maternal or foetal distress, or if more conservative treatment has failed, section must be given very serious consideration.

Hypertonic Inertia

The same general rules as above obtain here, with the following additions:

- (1) The patient is best kept at rest.
- (2) Intense medication with morphine, pethidine, or other analgesics is essential. Pethidine, given in a dose of 100 mg. at three to four-hourly intervals up to a maximum of 400 mg. or intravenously (Jeffcoate has given as much as 800 mg. in 24 hours), is best throughout the day, and morphine at night.
- (3) Even more stress should be laid on detection and correction of acetonuria.
- (4) Labour should not be allowed to proceed so long as to necessitate the administration of sulphonamides or antibiotics.
- (5) Here the uterus is already in spasm and the tone high, so a pitocin drip infusion is contraindicated.

Two final points should be stressed:

(6) In the last three years and in specially selected cases, dihydroergotamine has been used. This has a sympatholytic effect and brings about a striking relaxation of the cervix. It reduces uterine tone without paralysing the uterine musculature and without interfering with normal contractions and rhythm. (The "strong and incessant contraction" described by Moir has not been noted. It is true, however, that as the basal tonus is lowered the amplitude of the contractions is increased.) As already stated, fear produces an overactivity of the sympathetic, with a resulting inhibiting effect on the mechanism of labour, and the use of dihydroergotamine depends on this assumption. The drug has no effect on the inactive uterus, and therefore has no place in hypotonic inertia. It is advised that dihydroergotamine be given when the cervix is 5 to 6 cm. dilated. The dose recommended is 0.25 mg. administered by intramuscular injection. The action of the drug is often seen in about half an hour, but two hours may pass before the maximum effect is appreciated. A similar dose may be repeated with safety in four hours, as the action of the drug wears off within that period of time. Some writers condemn the use of dihydroergotamine.

(7) Caesarean section must again be considered for the indications already described. In hypertonic inertia, however, the morale and general condition of the patient deteriorate more rapidly and section may be demanded therefore at an earlier stage of labour.

Next article on Emergencies in General Practice.—
"Acute Retention of Urine," by Mr. Alec W. Badenoch.