VAGINAL CYTOLOGY AS A VALUABLE AID TO PREDICTION OF ONSET OF LABOUR

by

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A pregnant woman is understandably eager to know the expected date of her confinement. To her, the knowledge may mean nothing more than social convenience or satisfaction of personal curiosity. But to her obstetrician, the precise due date is often of paramount importance, especially when he is planning an elective caesarean section or is forced to induce labour. The time-honoured method of calculating from the date of last menstrual period is universally employed. Yet Brews found Naegele's method giving an accurate prediction of the onset of labour to within 8 days in approximately 2 out of 3 cases. Barnes and Zuspan find that relying on the date of last menstrual period alone the correct delivery date, within 14 days, could have been predicted in only 38.5 per cent. In our country, the patients attending the general hospitals are very often unable to give the date of the last menstrual period. Assessments based on the fundal height are, at best, less reliable than those calculated from the date of last menstrual period. Very few women care to remember the date of quickening. Clinical antenatal impressions of the foetal size are notoriously unreliable. In the experience of Barnes and Zuspan clinical estimations of foetal weight prior to the delivery were in agreement (± 240 gms.) in only 59 per cent. Radiological study would indicate with reasonable accuracy whether or not, the foetus is near term but it needs a very high standard of technical perfection and great experience. Hormonal assays, especially if carried out serially, would indicate if the patient would be, or even should be, delivered within a few days. But they are not easily available to most obstetricians even in the teaching hospitals. With the growing knowledge that vaginal cyto-

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logy faithfully reflects the hormonal status of the patient, it was but natural that vaginal cytology was employed for the prediction of the onset of labour. Many excellent studies have been reported on the subject. Our experience with vaginal cytology in the prediction of the onset of labour is presented here.

Material and Method

Eighty patients in their last month of pregnancy were taken up for this study at random. Vaginal smears from these patients were studied, every 7 days whenever possible, until delivery. Aspiration smears were collected from posterior fornix by means of a curved glass pipette with usual precautions, immediately fixed and later stained by Papanicolaou's technique. The smears were classified into 'before term' smears and 'at term' smears according to the criteria mentioned in Table I (See Figs. 1 and 2). 'At term' smears are characterised by a marked diminution of cell clusters, the appearance of an increasing number of isolated and flattened cells and a rise in the number of superficial cells. These criteria are similar to those employed by other workers like Lichtfus, Pundel and Lichtfus, Barnes and Zuspan, etc.

TABLE I

Criteria used for typing of smears

Criteria	Before term	At term	Inflammatory
Cell clusters	++	+ or 0	+
Isolated cells	+	++ or +++	+
Superficial cells	<10%	>10%	>10%
Deep cells	few	few	>10%
Leucocytes	0	+	+++
Red blood cells	0	0	+
Mucus	0	0	+

A 'before term' smear was interpreted to mean that delivery would not take place within the next 5 days whereas an 'at term' smear indicated that labour was imminent and that the patient would deliver within the next 5 days. In no case was an 'at term' smear found to change into 'before term' smear. The last available smear prior to delivery was used for correlation with the date of delivery. But in case of 'at term' smears if the earlier smear happened to be 'at term' smear, the earlier one was used for correlation with the date of delivery.

Results

In 4 patients smears showed disintegrated and distorted cells, many deep cells, and a large number of leucocytes (see Fig. 3). These were interpreted as inflammatory smears (Table I) and were excluded from further evaluation.

Of the remaining 76 patients 55 showed 'before term' smear. Only 10 (i.e. 18.2 per cent) of these 55 delivered within 5 days of the collection of smear whereas the remaining 45 or 81.8 per cent delivered later than 5 days after the smear was collected (Table II). Twenty-one patients showed 'at term' smear. Of these 17 or 80.9 per cent delivered within 5 days, whereas 4 or 19.1 per cent delivered after 5 days.

Thus out of the total number of 80 patients, vaginal cytology could accurately predict the onset of labour in 62 or 77.5 per cent. If the 4 patients with inflammatory smears are excluded the percentage of ac-

RESULTS II

Results

Before term smear			At term smear			
Delivered within 5 days	Delivered after 5 days	Total	Delivered within 5 days	Delivered after 5 days	Total	Inflammatory smear
10 (18.2%)	45 (81.8%)	55	17 (80.9%)	4 (19.1%)	21	4

TABLE III

Correlation between menstrual history and date of delivery

		Number of patients	
Grossly irregular periods		5	29
Did not know L.M.P.		24	
Regular periods	Delivered within 7 days of the expected due date	31	51
	Delivered more than 7 days before expected due date	3	
	Delivered more than 7 days after expected due date	11	

curate prediction amounts to 62 out of 76, i.e. 81.6 per cent.

Let us compare these results with the prediction of the onset of labour by Naegele's rule in these same 80 patients (Table III). Twenty-four patients could not recollect the date of their last menstrual period. In these 24 and in 5 others who had grossly irregular periods (i.e. in 36.25 per cent in all) the due date could not be worked out by Naegele's rule. Vaginal cytology accurately predicted the onset of labour in 25 or 86.2 per cent of these 29 patients. It would be seen from Table III that of the remaining 51 patients only 31 or 60.8 per cent delivered within 7 days of the calculated due date. Of these 51 patients 4 showed inflammatory smears, while in 40 i.e. 78.4 per cent vaginal cytology could predict the onset of labour accurately.

Discussion

In 1952, Rodrigues-Lima and Kamnitzer demonstrated the colpocytologic changes preceding the clinical onset of abortion and labour. In 1953, Kamnitzer described the decrease of proliferation of the vaginal epithelium during the 9th month and the sudden smear changes which take place sometime before clinical onset of labour. At the International Congress of Gynaecology and Obstetrics, in 1954, Lemberg-Siegfried and Stamm reported changes in the vaginal cytology 'at term' which gave a more than 90 per cent correlation with the date of expected confinement. DeNeef states unequivocally that vaginal smear permits the fixing of a date of delivery within a range of 2-5 days in 90 per cent of the cases and that no artificial induction of labour should be attempted as long

as the vaginal smear is not 'at term'. Lichtfus found that out of the 315 cases with 'before term' smears only 3.12 per cent delivered within 5 days while out of the 390 cases with 'at term' smears 92 per cent delivered within 5 days. The experiences of Nyklicek and Riotton *et al* are in confirmity with those of Lichtfus and Pundel.

But there are many workers who think otherwise. Montalvo-Ruiz found that only 13 per cent of the 1350 vaginal smears taken within 5 days of labour showed 'at term' smear. He concludes that vaginal cytology cannot be employed to predict the proximity of labour. Soule found that the relation between cytologic maturity and spontaneous active labour was less correlative than the relationship between history or foetal size and spontaneous active labour. Abrams and Abrams failed to notice any cellular alteration that might enable prediction of date of delivery. Hindman *et al* do not feel that cytological changes are sufficiently frequent or sufficiently distinctive to permit reliable recognition of a term pregnancy smear pattern. Barnes and Zuspan found 75 per cent accuracy in the prediction of the onset of labour by vaginal cytology but conclude that this degree of accuracy makes it unlikely that the test will be employed routinely. Luz states that cytological changes are not necessarily an indication that normal labour will start and/or continue.

In our series of 80 cases vaginal cytology could accurately predict the onset of labour in 77.5 per cent. Our accuracy is similar to that of Barnes and Zuspan. Calculations based on the date of last menstrual period could accurately anticipate the onset of labour in only 31 out of these 80 i.e. in 38.75 per cent. A comparison between these two figures is obviously very unfair since in a large number of patients the date of last menstrual period was not known. The great usefulness of vaginal cytology when the date of last menstrual period is not known goes undisputed as can be seen in our 29 cases where Naegele's rule could not be applied. In the 51 cases where Naegele's rule could be employed it gave an accuracy of 60.8 per cent. This can be compared with 81.6 per cent accuracy of vaginal cytology among the 76 cases where it could be employed. This difference between their accuracies is significant ($p < 0.02$). One can conclude, therefore, that vaginal cytology is more reliable for the prediction of the onset of labour than Naegele's rule.

The real value of vaginal cytology, however, lies in those cases where induction of labour is contemplated. As emphasized by Leeton vaginal cytology predicts the time of biological term rather than chronological term. 'Prior to term' smear indicates biological immaturity and hence in such a pregnancy labour would not be readily induced. On the other hand 'at term' smear indicates that the foetus is ready to be born either spontaneously or on induction, irrespective of the chronological term. In these cases labour would be readily induced. Leeton says that 'prior to term' smear is the most unfavourable prognostic smear in relation to a successful induction. Lichtfus and Pundel warn against induction of labour unless the smear

shows 'at term' picture. Thus, if the vaginal smear is routinely studied before undertaking induction of labour and induction withheld as long as the smear shows 'before term' pattern, many unnecessary and fruitless inductions would be avoided. The advantages of this policy would be obvious in cases of so-called postmaturity.

Many authors have described a 'post term' or 'post-partum' smear. This smear is characterised by numerous round or oval parabasal and intermediate cells with nuclear and cytoplasmic hypochromatism. The eosinophilic and karyopyknotic indices are high and there are leucocytes in the smear. This smear is interpreted to mean foetal distress and to indicate that continued intrauterine existence is hazardous for the foetus. Lichtfus, Pundel and Wood *et al* advocate immediate termination of pregnancy in such cases to salvage the foetus, irrespective of the chronological term. We had no case with 'post-partum' smear.

The nomenclature employed to describe the different patterns of vaginal smears is as diverse as are the opinions held about the utility of vaginal smear in the prediction of labour. Lichtfus and Pundel use the terms 'before term' smears, 'at term' smears and 'post-partum type' smears. Nyklicek employs the terms, shift to the right and shift to the left the former indicating transition from prior to term in the direction of 'at term', while the latter indicating post-partum type smears. Luz feels that post-partum smear type is an unfortunate name for a cytological picture which is observed antepartum and prefers to call the post-partum type smears as hypotrophic smears. Some others choose to refer to post-partum smears as pregnancy regression type smears. Riotton *et al* designate 'prior to term' smears as 'advanced pregnancy' smears.

There is a controversy about the method of collection of smears too. Pundel feels that posterior fornix smears are valueless and dogmatically insists that smears be made from scrapings from the lateral vaginal walls only. Luz finds vaginal aspiration smears very satisfactory and so does Kamnitzer. We are in agreement with them.

There is also a dispute about the cause of the cytological changes observed. Majority opinion favours the view that vaginal cytology represents the hormonal regression preceding the onset of labour. Luz, however, interprets the cytological modifications as a consequence of mechanical alterations caused by cervical effacement and not as a result of hormonal changes. In this connection it is interesting to note Lichtfus's observation that parity, anatomical condition of the cervix and prenatal engagement of the head in primiparae have no influence on vaginal cytology.

It is interesting to note that Taylor found comparable changes in the cytology of urinary sediment prior to the onset of labour. He attributes these changes to the fall in the levels of oestrogens.

Summary

(1) Our experience of vaginal cytology in the prediction of onset of labour is presented.

(2) Vaginal cytology is superior to

the calculations based on the date of last menstrual period in the prediction of the onset of labour.

(3) Vaginal cytology is invaluable when induction of labour is contemplated say, in cases of postmaturity, toxaemia of pregnancy, chronic nephritis, Rh incompatibility, etc.

(4) It can be very useful when elective caesarean section is to be undertaken on patients who cannot give the date of the last menstrual period.

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Figs. on Art Paper VII