VAGINAL CYTOLOGY IN LATE PREGNANCY AND AT TERM

by

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Introduction

Vaginal cytology can be utilised in various pregnancy conditions as a fairly reliable diagnostic aid (Lemberg-Siegfried 1955, Pundel and Lichtfus 1955, Lichtfus 1959). In cases where the patient does not remember the date of her last menstrual period or has conceived during a period of amenorrhoea, it may be difficult to assess the exact duration of gestation by clinical examination alone. Under such circumstances the risks of inducing labour prematurely or delaying it more than is desirable are very real. Any simple method that can help in assessing the duration of gestation would be very useful in avoiding such difficulties. It was therefore decided to study the vaginal cytology in late pregnancy, at term and during labour to establish whether there is a characteristic smear pattern of these phases, also to find out if it can be used to establish whether the pregnancy is at term or postmature and also if placental insufficiency can be detected in time to prevent foetal anoxia in utero.

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Material and Method

One hundred and fifteen pregnant women attending the antenatal clinic or admitted to the Queen Mary's Hospital, Lucknow, were selected for this study. The cases were divided into the following groups:

(i) Control group: 50 (a) First trimester 15, (b) Second trimester 15, (c) Third trimester 20.

(ii) Late-pregnancy group: 36th-40th week—34.

(only those patients who were sure of the date of their last menstrual period and whose pregnancy was otherwise normal were included in this group).

(iii) 1st stage of labour (before rupture of the membranes) 44 cases (19 of these were common to group 2).

(iv) Post-maturity 6 cases.

Besides the routine history and clinical examination, history of vaginal bleeding in early months of pregnancy and its hormonal treatment was recorded carefully. Cases with evidence of inflammation in the cervix or vagina were excluded from this study.

In the 1st, 3rd and 4th group patients only one smear was examined in each case, while in group 2

smears were examined at weekly intervals from 36th week onward till the patient went into labour. Nineteen patients from this last group were also studied during the first stage of labour. Material for cytology was obtained by means of a wooden spatula from the mid portion of the lateral vaginal wall under direct vision using a dry speculum. This was quickly spread on a glass slide and immersed in the fixative (95% ethyl alcohol) for at least half an hour. Staining was done by Papanicolaou technique. A total of 239 smears were thus examined, but only 225 were considered fit for final evaluation, the rest being rejected for a variety of reasons.

All the smears were examined for the following features:

(i) state of the general cell population which gives an idea of the amount of cellular exfoliation.

(ii) presence or absence of navicular cells which are characteristic of pregnancy.

(iii) degree of clustering and clumping of the cells.

(iv) extent of the folding of the cellular border.

(v) determination of maturation index (Frost 1955).

(vi) presence of Döderlein bacilli and cytolysis.

(vii) degree of leucocytosis, presence of bacterial infection and mucus.

(viii) Any other abnormality e.g. presence of parabasal cells.

Group I: Table I summarizes the cytological findings in the 1st, 2nd and 3rd trimesters (except the last four weeks) of pregnancy.

With the advance of pregnancy there was a rise in the percentage of navicular cells (33% in the 1st trimester to 90% in the 3rd trimester). Percentage of cells showing folding of cellular border also rose (73.3% in the 1st trimester to 95% in the 3rd trimester). Döderlein bacilli were present in only 6.66% of smears in the 1st trimester as compared to 40% of smears of the 3rd trimester. Leucocytes and other bacteria also showed a rise. Fig. 1 shows a characteristic smear of the 1st trimester while Fig. 2 illustrates heavy growth of Döderlein bacilli producing cytolysis in the 3rd trimester, which is a common finding.

Group II: Table 2 sumarises the cytological finding in the last five weeks (36th-40th) of pregnancy.

It is apparent from Table II that during the 36th, 37th and 38th week the smear pattern was the same as in

TABLE I

	1st Trimester	2nd Trimester	3rd Trimester
Mean Maturation Index	0/90/10	0/93/7	0/94/6
Navicular cells	33 %	80 %	90 %
Clustering of cells	93.33%	100 %	100 %
Folding of cellular border	73.33%	73.3 %	95 %
Döderlein bacilli	6.66%	33.3 %	40.0 %
Cytolysis	13.33%	20.00%	20.00%
Leucocytes	Nil	26.6 %	35.00%
Other bacteria	6.6 %	Nil	15.00%

TABLE II

Incidence of characteristic changes seen in smears of last 5 weeks of pregnancy

Cytogical Characteristics of Smears	INCIDENCE IN PER CENT AT				
	36th week	37th week	38th week	39th week	40th week
Presence of Navicular cells	77.77	63.33	70.66	82.14	68.75
Clustering of cells	100.00	100.00	96.77	100.00	100.00
Folding of cell borders	94.44	96.66	96.77	96.42	93.75
Döderlein bacilli	44.44	36.66	35.48	25.00	18.75
Cytolysis with and without Döderlein bacilli	33.33	33.33	25.80	28.57	18.75
Döderlein bacilli with cytolysis	27.27	33.33	45.16	46.42	75.00
Leukocytosis	38.88	33.33	45.16	46.42	75.00
Bacteria	22.22	10.00	9.67	21.42	37.50
Mucus	5.50	6.66	9.67	7.14	12.50
Mean Maturation index	0/95/5	0/94/6	0/94/6	0/93/7	0/92/8

the 3rd trimester. This is referred to as "prior to term" smear by several workers. Sixteen out of 34 cases (47%) showed a persistence of "prior to term" type of vaginal smear till the end of pregnancy. Only 11 out of 34 (32.35) showed a change from "prior to term" smear to "at term smear" in last two weeks of pregnancy. This was characterised by a fall in the percentage of cells showing folding of cellular border and a marked reduction in the Döderlein bacilli and cytolysis. There was a marked increase in the incidence of leucocytes (38.8% in 36th week as compared to 75% in the 40th week), as well as the bacterial flora (other than Döderlein bacilli) and mucus. Maturation index revealed a rise in the ratio of superficial cells in the 40th week (mean MI at 36th week was 0/95/5 and 40th week 0/92/8). The rate and time of appearance of these changes were variable. Seven cases (20.6%) showed an abrupt change whereas 4 cases (11.8%) showed a gradual change over a period of 10-18 days. In the remaining 7 cases cytohormonal evaluation could not be done because of severe degree of cytolysis (in 4) and presence of inflammation (in 3). Fig. 3 represents "at term" type of smear.

Group III: Forty-four cases in the 1st stage of labour before rupture of membrancs were studied by single vaginal smear. Nineteen of these were those who were being followed by weekly smears in the last five weeks of pregnancy. Table III summarizes the findings of this group. The smears in this group mostly presented a dirty appearance because of presence of mucus, increased leucocy-

TABLE III

Cytological findings in 44 cases in 1st stage of Labour

(i)	Mean Maturation Index	0/93/7
(ii)	Navicular cells	84.1%
(iii)	Clustering of cells	40.9%
(iv)	Folding of cellular border	93.2%
(v)	Döderlein's bacilli	6.8%
(vi)	Cytolysis	18.2%
(vii)	Leucocytes	75 %
(viii)	Other	59 %

tosis and bacterial invasion. (Fig. 4). The most characteristic changes seen were marked reduction in cell clustering (40% during labour compared to 100% in "at term" smears), Döderlein were absent in all other groups.

Group IV: Post-maturity: only six patients were studied in this group. In all, pregnancy had lasted more than 14 days (ranging from 16-22 days) beyond the expected date of delivery. Single smear was examined in each case. Five smears presented a clean background and only one showed cytolysis and Döderlein bacilli. Navicular cells were seen in four cases. Special feature was an abnormal rise in the percentage of superficial cells in the smear (mean maturation index 0/90/10). Parabasal cells, which are indicative of placental insufficiency were not seen in any case. Fig 5 shows a smear of a patient 20 days postmature.

Discussion

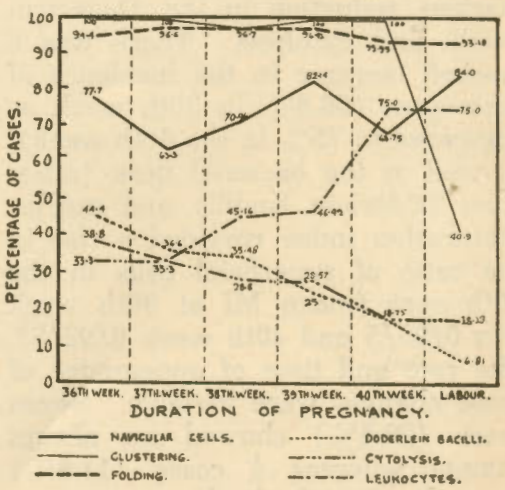
Considerable controversy exists as to the pattern of vaginal cytology at the end of pregnancy. Lemberg Siegfried *et al* (1965) and Kamnitzer (1959) have reported that they consistently found characteristic changes at term, the "at term" smear being characterized by an increase in the ratio of superficial cells in the maturation index, reduction in the number of Döderlein bacilli and cytolysis with an increase in leucocytes and bacterial flora (other than Döderlein bacilli).

Lichtfus and Pundel (1959) and Thanevala *et al* (1966) have also described similar changes. Liuz Montalvo-Ruiz *et al* (1957, 1959) on the other hand found difficulty in consistently demonstrating such changes or correlating them with the subsequent outcome of pregnancy. Our study has revealed that such characteristic changes are only present in the last two weeks of pregnancy in approximately one-third of cases (11 out of 34). In 47% of cases the characteristic 3rd trimester smear remained unchanged right upto the onset of labour, while in the remaining 20% of cases cytohormonal evaluation was not possible because of severe inflammation and/or marked cytolysis.

Graphs 1 and 2 illustrate the findings in the smears during the 36th, 37th, 38th, 39th and 40th weeks.

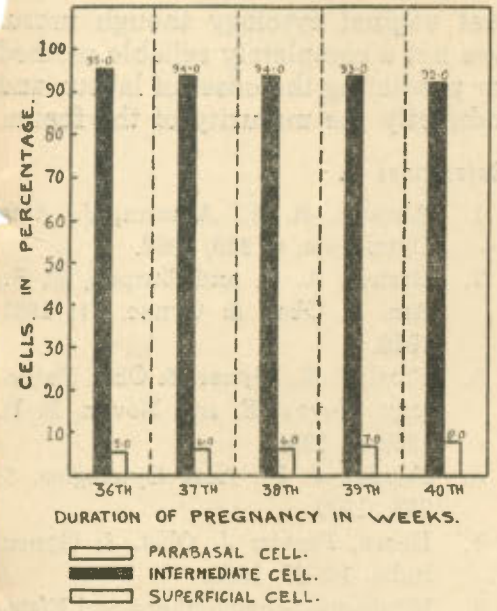
Of the 19 cases in which a comparative study of smears from the last week of pregnancy and during early labour was carried out, only 14 smears were considered fit for deter-

Graph I showing changes in cytological characteristics of vaginal smears in last five weeks of pregnancy and labour.



Graph I

Mean maturation index of vaginal smears of late and 'at term' pregnancy.



Graph II

mining the maturation index, the remaining being rejected on grounds of cytolysis and inflammation. Nine of these 14 (64.27%), showed "prior to term" type of smear and 5 showed "at term type" of smear before labour. In all the 9 cases showing "prior to term" smear, labour set in spontaneously within 3 to 8 days of the last smear contrary to the contention of Barnes and Zuspan (1959), Pundel (1959) and Leeton (1963) who have stated that when the vaginal smear showed the picture of "prior to term" type, spontaneous labour did not start for at least another 5 days in 95% of patients.

In the 5 cases who showed "at term" smear, labour set in spontaneously within 4 to 7 days in 4 cases, and on the 10th day in the fifth. Pundel (1959) and Leeton (1963) have reported that when the smear showed "at term" changes spontaneous labour could be predicted within 5 to 7 days, with accuracy of over 90%. In this series of patients in whom spontaneous labour set in within 5 to 7 days of the last smear, only 4 out of 14 (28.67%) showed "at term" changes. On the other hand in 9 cases, where the last smear showed "prior to term" changes, spontaneous labour set in within 3 to 8 days of the last smear examination. The birth weight of the babies born in this group ranged from 5 lbs. 9 oz to 7 lbs. 2 oz. so it could be concluded that the labour was at term although the smear pattern was that of "prior to term" type. The birth weights of the babies of the 5 patients whose last smear showed "at term" type of changes were in no way different from those of "prior to term" group and ranged from 5 lbs. 12 oz. to 6 lbs. 12 oz.

The present study confirms the findings of Abrams and Abrams (1962) and Heera (1966) that there was no temporal relationship between the onset of labour, and the period of occurrence of "at term" changes.

The practical significance of a "prior to term" is that if labour is induced in a patient with such a smear, the chances of success are few, because successful induction of labour is best in cases showing "at term" type of smears. (Pundel, 1961; Hindman, Schwalenberg and Efstation, 1962, and Leeton, 1963). In cases where duration of pregnancy is uncertain either because the patient is not sure of the dates of the last menstrual period or has conceived in

a period of amenorrhoea, vaginal cytology may prove helpful in determining the period of gestation, though not in all cases.

The number of cases studied for postmaturity in our series is too small to draw any conclusions. Pundel (1959) and Licthtfus (1959) have emphasised the importance of the appearance of parabasal cells in the vaginal smear in cases of postmaturity. The presence of these cells is considered to indicate regression of the hormonal activity of the placenta, which in turn suggests risk of foetal anoxia.

Parabasal cells were not seen in the six cases studied by us. Medical induction resulted in normal delivery in all six cases within ten days of taking the last smear. There was no evidence of foetal anoxia.

Summary

(1) Vaginal smears from 115 pregnant women were studied for establishing a smear pattern of pregnancy, "prior to term", and 'at term'.

(2) Thirty-four patients were studied by weekly smears from 36 to 40th week of pregnancy. Only 11 (32.35%) of these revealed a change from "prior to term" to "at term" smear in the last two weeks of pregnancy.

(3) Forty-four patients, including 19 of the above 34 were studied in the first stage of labour before rupture of the membranes to establish the cytological pattern of early labour.

(4) Six cases of postmaturity (16-22 days beyond E.D.D.) were also studied. Parabasal cells frequently reported to indicate placental insufficiency were not seen in the present series.

(5) In conclusion, it was found that vaginal cytology though useful was not a completely reliable method for predicting the onset of labour and indirectly the maturity of the foetus.

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Figs. on Art Paper II-III