

# EVALUATION OF VAGINAL CYTOLOGY IN THE PREDICTION OF ONSET OF LABOUR AND RESPONSE TO INDUCTION OF LABOUR

by

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Studies have shown that vaginal cytology during normal pregnancy follows a definite pattern with a change at term. However, on the degree of this change and on whether cytology is a suitable method for the prediction of onset of labour and response to induction, there are conflicting reports. In 1953, Kamnitzer and in 1955 Lemberg-Siegfried and Stamm found characteristic changes. Pundel (1959), in a very large and impressive series comprising 713 patients, has emphasized the accuracy of vaginal cytology in the prediction of onset of labour. Others, i.e. Barnes (1956), Zidovsky (1961), De-Neef (1964) have published smaller series which are essentially in agreement with the above authors. On the other hand, Abrams and Abrams (1962) have found it to be of a very limited value. Luz (1959), Ruiz (1959), Hindman (1962), Samuel D. Soule (1964), Weid (1965 and 1966), Nieburgs

(1965) and Heera (1966) also find that colpocytology has only a limited value.

With an improvement in perinatal mortality as a result of better obstetrics, attention is now focused on saving the baby by removing it from an unhealthy environment without increasing the hazard of prematurity. If vaginal cytology could help in accurately predicting whether pregnancy had reached biological term and whether it would respond to induction, it would provide a more scientific, economical and simple method than those which exist to date in the management of cases of placental insufficiency.

Vaginal cytology was studied in 168 smears of 126 normal pregnant patients in the last 3 months of pregnancy, under the following groups.

Group I—28 to 32 weeks of pregnancy.

Group II—33 to 36 weeks of pregnancy.

Group III—37 to 41 weeks of pregnancy.

One hundred and forty-one smears in 118 normal patients whose pregnancies later terminated in spontane-

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ous delivery of a live baby weighing between 2250-4000 grams were studied to see if the onset of labour could be predicted (Ninety-four with single smears and 24 with serial smears). Thirty-five labour smears were also studied. In each case the smear-delivery interval was noted.

Response to induction of labour was studied in 34 cases. Of these 18 were for toxæmia, 14 for post-maturity and 1 each for diabetes and Rh iso-immunization. Vaginal smear was taken within 48 hours before induction in each case. All the inductions were carried out after the 37th week of pregnancy.

Medical induction was done in 7, stripping of membranes in 8 and artificial rupture of membranes in 19, of which 6 were also given syntocinon drip. Successful induction included cases where the induction-delivery interval was 24 hours or less, partially successful where the induction-delivery interval was over 24 hours and unsuccessful where caesarean section was resorted to because of failure of induction.

The smears were taken from the right lateral vaginal vault under vision, and stained with the Papanicolaou's stain.

The smears were evaluated qualitatively using degree of desquamation and quantitatively using Karyopyknotic Index (K.P.I.).

#### Desquamation

The terms according to Osmond Clarke were used. Three types of smears were observed to describe the degree of desquamation.

I. 'Clumped' pregnancy pattern—sheets of *cyanophilic* cells arranged

in big clusters which occupied almost the whole of the slide. The cells were predominantly of the navicular type with folded edges and dark blue vesicular nuclei. Superficial cells, either *cyanophilic* or acidophilic, with pyknotic nuclei were also present. The background was clean. Döderlein bacilli, with or without accompanying cytolysis, were also found (Fig. 1).

II. 'Partly discrete' pregnancy pattern—clusters of cells and discrete cells in more or less equal proportion were present. The size of the clusters was smaller than those of the above group (Fig. 2).

III. 'Discrete' pregnancy pattern—in this discrete cells predominated and were mostly of the navicular and intermediate cell type. Two types of pattern could be distinguished. In one, the cells were discrete and scarce with an overwhelming admixture of white blood cells and mucus; in the second type the cells were discrete and scarce with few white blood cells and a little mucus (Fig. 3).

K.P.I. was evaluated by examining the slides under oil immersion lens and counting 200 cells.

#### Results

Thirty-two (22.7%) of all the smears were cytolytic and the frequency of this type of smear remained constant in the last 30 days of pregnancy and in labour (Fig. 4).

The distribution of the smear types in each of the three months of the last trimester is shown in Table I. The clumped and partly discrete smears from 76% of the total in Group I, falling to 53% in Group II

and to 34% in Group III suggesting that as pregnancy advances discrete smears increase in number (Table 1).

Statistically  $X^2=21.17$ ,  $P=0.001$  which is highly significant.

The distribution of the K.P.I. in the last trimester is shown in Table II. This Table shows that K.P.I. does not change much in the three groups. However, as 25 (45.56%) out of 54 patients in Group III delivered within 5 days of taking the smears it is quite possible that the effect of impending labour may have affected the distribution (Tables 2, 3).

Statistically this is not significant.

Table III shows the distribution of the K.P.I. and smear type according to the smear-delivery interval excluding the cytolytic type. It is noticeable that at labour or within 5 days of labour, the discrete smear formed 77%, while it only formed 61% within 10 days and only about 30% for more than 10 days of labour. These percentages are not high enough to provide an accurate assessment of impending labour. Also there is no difference whether the smear is taken within 5 days of labour or in labour. It is seen that the K.P.I. of over 10 is slightly more common within 10 days of labour (30%) than over 10 days of labour (7%).

#### *Serial smears*

Two to four serial smears were taken weekly in 24 cases from the 36th week of pregnancy onwards. In 5 cases it remained cytolytic and in 3 it changed into the cytolytic pattern. Thus, cytolytic smears formed 33.3% of the total smears near term. The pattern changed into

the discrete type in 10 cases (41.7%) in 0-10 days of labour and in 3 cases (12.5%) 18-21 days prior to delivery. Thus the change into the discrete type occurred in a total of 13 out of 24 cases (i.e. 54.2%). In 3 cases, 12.5%, it remained partially discrete or clumped till delivery.

Next, a comparison was made between 'at term' (discrete) smears and the expected date of delivery, as worked out by the Naegele's rule to see which method was more accurate as regards the prediction of the due date as shown in Table IV. The relationship between a laboratory adjunct and clinical history is seen to be almost the same.

Induction of labour was carried out only when the smear showed a discrete or a cytolytic pattern (Tables V, VI and VII). Of the 20 inductions in the discrete type of smear 19 (95%) were successful and 1, (5%) partially successful. Of the 14 cytolytic smears 8, (57.14%) were successful, 5, (35.72%) partially successful and 1, (7.14%) unsuccessful.

The induction was successful in 14 (77.8%) out of 18 cases of toxæmia and in 11 (78.6%) out of 14 cases of prolonged pregnancy. In both conditions the result of induction was much better in the discrete type (91% and 100% respectively) than in the cytolytic type (57% successful).

Six partially successful and one unsuccessful inductions were all following artificial rupture of membranes, with or without syntocinon drip, which is considered the most efficient method. Thus, the result of induction

TABLE I  
Desquamation as studied in group I, II and III

Group	No. of smears		Clumped %		Partly discrete %		Discrete %		Cytolytic %	
	No.	%	No.	%	No.	%	No.	%	No.	%
I	25	13	52	6	24	3	12	3	12	12
II	36	11	38.56	8	22.22	7	19.44	10	27.70	10
III	64	12	18.75	10	15.62	32	50	10	15.63	10

TABLE II  
Distribution of Karyopyknotic Index in 3rd trimester

Group	K.P.I. 0-10		K.P.I. 11-20		K.P.I. 21-30		Average K.P.I.
	No.	%	No.	%	No.	%	
I	24	95.45	1	4.55	.....	.....	5.75
II	26	76.92	6	23.08	.....	.....	8.21
III	54	83.3	7	13.0	2	3.7	6.34

TABLE III  
Distribution of K.P.I. and of smear type according to smear-delivery interval excluding the cytolytic type

Smear delivery interval	No. of smears		Clumped %		Partly discrete %		Discrete %		K.P.I. 0-10		K.P.I. 11-20	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Labour	26	2	7.7	4	15.3	20	77.0	15	57.7	11	42.3	
Less than 5 days	26	2	7.7	5	12.2	19	73.1	18	69.2	8	30.8	
6-10 days	13	1	7.7	4	30.8	8	61.5	9	69.2	4	30.8	
11-15 days	12	2	16.7	6	50.0	4	33.3	11	91.7	1	8.3	
16-20 days	12	8	66.7	1	8.3	3	25.0	10	83.3	2	16.7	
21-30 days	16	10	62.5	1	6.25	5	31.25	14	87.5	2	12.5	

**TABLE IV**  
**Correction between 'Discrete' smear type and menstrual history with the expected date of delivery**

Total 60	Smear 'at term' (Discrete)				Correlatoin between menstrual history and E.D.D.			
	Delivery in 5 days		Delivered after 5 days		Delivered in 5 days		Delivered after 5 days	
	No	%	No	%	No.	%	No.	%
41	68.3	19	31.7	40	67	20	33	

**TABLE V**  
**Shows the result of induction in relation to the type of smear**

Type of smear	No. of cases	Successful		Partially successful		Unsuccessful	
		No.	%	No.	%	No.	%
1. Discrete	20	19	95	1	5	...	7.14
2. Cytolytic	14	8	57.14	5	35.72	1	7.14
Total	34	27	79.14	6	17.65	1	29.94

**TABLE VI**  
**Response to induction in 18 cases of toxæmia**

Type of smear	No. of cases	Successful		Partially successful		Unsuccessful	
		No.	%	No.	%	No.	%
1. Discrete	11	10	90.91	1	9.09	...	...
2. Cytolytic	7	4	57.14	3	42.86	...	...
Total	18	14	77.8	4	22.2	...	...

**TABLE VII**  
**Response to induction in 14 cases of prolonged pregnancy**

Type of smear	No. of cases	Successful		Partially successful		Unsuccessful	
		No.	%	No.	%	No.	%
1. Discrete	7	70	100	...	...	...	...
2. Cytolytic	7	4	57.14	2	28.57	1	14.29
Total	14	11	78.6	2	14.3	1	7.1

was not affected by the method of induction used.

### Discussion

In this study there was a definite though not invariable tendency for the smear pattern to change towards term and before the onset of labour. The smear pattern changed into the discrete type with approach of labour in only 54% of the cases, which is in close agreement with that of Hindman *et al* (1962) who found the change to occur in 43.2% of their cases, while Abrams and Abrams (1962) found the change in only 34% of their cases. In labour itself where one would expect a 100% discrete cytology, it was only 77%. This is at variance with the findings of Pundel (1959) and Lichtfus (1959) who found the smear pattern to change into the discrete type within 5 days of labour in 95% of the cases. The punctuality with which Leeton (1963) found a change from the clumped to the partly discrete and from partly discrete to discrete at term was not seen in this study. In a study of serial smears the percentage conversion into the discrete type (54%) was found to be too low to allow accurate assessment of prediction of labour. Even in this group the change in 12% occurred too early, i.e. 3 weeks prior to term to be of much value.

On comparing the value of colposcogram with the expected date as calculated by the Naegele's rule in predicting the date of delivery no significant difference was found in the two methods, the accuracy being 68% to 67% in either case. This is

in contradiction to the findings of Parikh (1967) who found colposcology to be accurate in 77.5% in predicting labour while date of delivery as calculated from the menstrual history to be accurate only in 38.75%. Our findings agree with those of Samuel D. Soule (1964) who found the relation between cytology and delivery to be of the same correlative value (87%) as that between the menstrual history and expected date of delivery.

Induction of labour was studied in the discrete and cytolytic types of smear. The response to induction was seen to be superior in the discrete type of smear (95% successful) as compared with the cytolytic type of smear (57.14% successful) irrespective of the indication of induction or the method of induction. Thus, ultimately it was the type of smear which predicted the response to induction.

### Summary and Conclusion

A total of 141 smears in 118 pregnant patients were studied as detailed above to assess the prediction of labour. Response to induction was studied in an additional 34 cases; percentage conversion to a discrete type was too low and the time of conversion too variable to allow prediction of the onset of labour with much accuracy. The relationship between cytology and delivery was almost of similar correlative value as that between the menstrual history and expected date of delivery. Induction was more successful when the smear pattern was discrete rather than cytolytic.

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*Figs. on Art Paper III*