

ESTIMATION OF FOETAL WEIGHT

by

P. K. DEVI,* M.S., F.R.C.S.

and

N. MOKADAM,** M.D.

Assessment of foetal maturity and weight is usually based on clinical impressions on palpation of the uterus and foetal parts and hence subject to a considerable degree of error. Johnson (1957) using a simplified modification of McDonald's method predicted the foetal weight in over 50% of cases within 8 ozs of the actual weight. Poulos and Langstadt (1953) evolved a formula correlating the volume of the uterus during labour and the birthweight of the baby ± 250 gms. McSweeney (1958) obtained 88% accurate results in the prediction of foetal weight with the method evolved by him. Direct measurement of the occipitofrontal diameter of the foetal head gives surprisingly accurate results when correlated to the duration of pregnancy (Greenhill 1965). However it is well known that cephalic volume or diameters may not bear any constant relation to birthweight. An investigation was undertaken to assess foetal weight using different methods based on measurements of the uterus. The results were examined to see whether

any of them could be used with advantage in problems where accurate assessment of foetal weight was an important factor in the management of labour.

Methods

The three methods used in each case are described below.

(a) *McDonald's method as simplified by Johnson (1957)*

The height of the fundus from the upper border of the pubic symphysis was recorded by a tape measure in centimeters (McDonald's measurement = M)

Calculation $\frac{M - 13}{13} =$ Foetal weight
in pounds

or $(M-13) (155) =$ Foetal
weight in grams

If presenting part is at station 0,

$\frac{M-12}{3} =$ weight in pounds

$(M-12) (155) =$ weight in grams

If presenting part is at + station

$\frac{M-11}{3} =$ Weight in pounds

$(M-11) (155) =$ Weight in grams

Correction for obesity: If mother's weight is over 200 lbs, subtract one more from M's measurement before dividing or multiplying.

*Prof. of Obstetrics & Gynaecology,
Postgraduate Institute of Medical Education & Research, Chandigarh.*

***Asst. Prof. Medical College & Hospital, Nagpur.*

Example:

$$\begin{aligned} \text{Vertical height by tape} &= 31.5 \text{ cms} \\ \text{Station of head at } 0 & \\ \frac{31.5 - 12}{3} &= \frac{19.5}{3} = 6.5' \text{ lbs.} \end{aligned}$$

(b) *Method of Poulos & Langstadt (1953)*

Measurements of the longitudinal and transverse diameters of the uterus when relaxed are taken by pelvimeter or callipers. The double thickness of the abdominal wall at a convenient point below the umbilicus is also measured using the pelvimeter.

$$\begin{aligned} W &= 1870 + 0.11 D^3 \pm 250 \\ W &= \text{Foetal weight in grams} \\ D &= \text{Corrected average diameter in cms} \\ D &= \frac{T + L}{2} - (\text{DAWT} - 2) \end{aligned}$$

T & L = Widest transverse and longitudinal measurements of the uterus
DAWT = Double abdominal wall thickness

No correction for DAWT is necessary if it is 2 cms or less when $D = \frac{T + L}{2}$

Example:

$$\begin{aligned} T &= 16.00 \text{ cms} \quad L = 20.00 \text{ cms} \\ \text{DAWT} &= \pm 5 \text{ cms} \\ W &= 1870 + 0.11(18)^3 \pm 250 \text{ gms} \\ &= 1870 + 0.11(5832) \pm 250 \text{ gms} \\ &= 1870 + 641.5 \pm 250 \\ \text{Foetal weight} &= 2511.5 \pm 250 \text{ gms} \end{aligned}$$

(c) *McSweeney's Method (1958)*

The total of the following four measurements was used, to determine the foetal weight (1) height of the uterus

by tape measure and pelvimeter (2) width of the uterus by tape measure and pelvimeter. If patient is over 150 lbs or if double abdominal wall thickness as measured by pelvimeter was 2 cms or more, the double abdominal wall thickness was subtracted from each diameter. The following corrections were made for station of head:- To each of the vertical diameter, 3 cms were added if head was engaged, 2 cms if station was at -1 and 1 cm was added if station was at -2. The total of the four measurements after correction for the above factors was used to determine the range of the foetal weight from the original chart prepared by McSweeney (1958). If total was more than 110 cms, twins, hydramnios or large size babies over 10 lbs was suspected.

Example:

Vertical Height (Tape)	= 32 cms
Vertical Height (Pelvimeter)	= 23 cms
Width of the uterus (Tape)	= 25 cms
Width of the uterus (Pelvimeter)	= 18 cms
Station of head	= 0
Double abdominal wall thickness	= 1 cm
Weight of patient	= 110 lbs
Total of 4 corrected measurement	= 32+3 23+3 25 18
	104 cms

Predicted Range of Weight = 7.8 lbs.

McSweeney's Chart

Total of 4 Range of Wt. in lbs.
measurements

80 — 89	4½ — 5
90 — 94	5 — 6
95 — 100	6 — 7
101 — 105	7 — 8
106 — 110	8 — 9

at birth of the infant on a level type scale checked for zero error.

Observations

The predicted birth weight according to the three different methods was compared to the actual birth weight. The results are summarised below:-

TABLE I
Analysis of Results

	Johnson's Method		Poulos Formula	McSweeney
	± 4 ozs	± 8 ozs	± 250 gms	
Correct	61	74	63	51
Wrong	39	26	37	49
Overestimated	26	16	26	32
Underestimated	13	10	11	17

Material

Hundred normal women were examined at the onset of labour. All had vertex presentations, but otherwise no selection was made as regards age, parity, weight, height and whether membranes were intact or ruptured. There were nineteen primigravidae in the group. Four primigravidae and six multigravidae had membranes absent at the time of measurement. Observations made in each case were (1) vertical height of the uterus by tape measure and pelvimeter (2) maximum width of the uterus by pelvimeter and tape measure (3) double abdominal wall thickness by pelvimeter at a point midway between pubic symphysis and umbilicus (4) obstetric palpation (5) vaginal examination to determine station of head and condition of bag of membranes (6) weight

Comments

Johnson's simplified method using McDonald's measurement gave correct values ± 8 ozs in 74% of cases. With all the methods, where the prediction was incorrect, the weight of the baby was more often overestimated. In 60% of cases all the predictions tallied whether right or wrong. Macdonald's measurement (height of the uterus by tape measure) is commonly used to calculate the duration of pregnancy from the rule which stated that the length in centimeters divided by 3.5 gives the duration of pregnancy in lunar months. This is not applicable before 6 months and in complications like hydramnios, twins and malpresentations. Poulos and Langstadt (1953) correlated the volume of the uterus and its correlation is best when the uterus is judged to be a sphere

rather than an ellipsoid. They concluded that the calculated birth weight from uterine volume is higher than the predicted weight by palpation where the tendency was to underestimate large babies and overestimate small babies. Their formula was based on the average of longitudinal and transverse diameters corrected for abdominal wall thickness and gave predicted weights ± 250 gms. They concluded that age, parity, condition of bag of membranes etc. made no significant difference to the calculations. From the present study, it appears that McDonald's measurement can be used with satisfactory results for prediction of foetal weight in cases where the liquor amnii is not excessive as noted clinically. In oblique or transverse lie the Poulos and Langstadt formula is to be preferred since that is based on the average of the vertical and transverse measurements. Where the duration of pregnancy is accurately known, serial measurements of the uterus and calculation of foetal weight might help to establish the diagnosis of placental insufficiency and foetal undernutrition. There may be large variations in foetal size at identical periods of gestation and hence caution must be exercised in relating foetal size to duration of pregnancy and prediction of date of delivery. Though Johnson's method using McDonald's mea-

surement is simpler, the Poulos and Langstadt method appears more sound theoretically, since both longitudinal and transverse dimensions of the uterus are used for the calculations.

In the present study McSweeney's method was found to be the least reliable (51% correct) and hence no further comment is needed on the use of this method.

Acknowledgements of thanks are due to the Dean, Medical College and Hospital, Nagpur for permission to use the hospital records and Doctors M. F. Quraishi and A. B. Balsara for accurate records of the cases.

Summary

Estimation of foetal weight was made by three well known methods using the measurements of the uterus in one hundred cases. Johnson's simplified method gave 74% correct results ± 8 ozs. The relative merits of the different methods are discussed.

References

1. Greenhill, J. P.: "Obstetrics" ed. 13, Saunders, (1965), p. 258.
2. Johnson, R. W.: *Am. J. Obst. & Gynec.*, 74: 929, 1957.
3. McSweeney, J.: *Am. J. Obst. & Gynec.*, 76: 1279, 1958.
4. Poulos, P. P. & Langstadt, J. P. *Am. J. Obst. & Gynec.*, 65: 233, 1953.

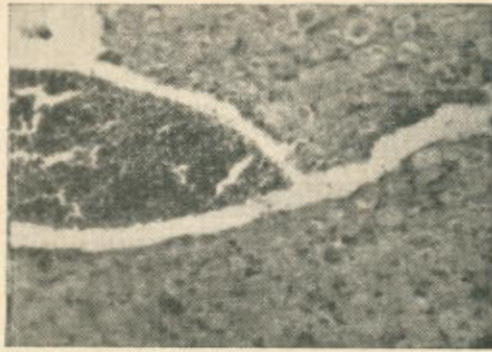
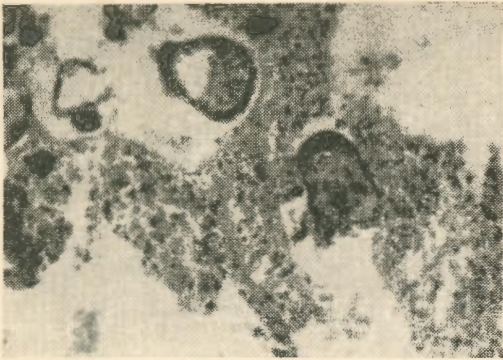


Fig. 1
Photomicrograph showing fibrosis, necrosis and calcification of chorionic villi, decreased vascularity and inflammatory cells.

Fig. 2
Photomicrograph showing haemorrhage and inflammatory cells in the decidua.

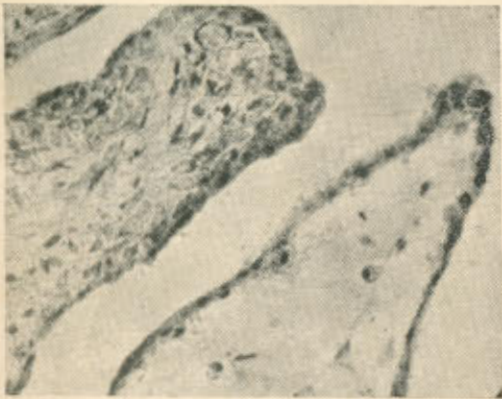


Fig. 3
Photomicrograph showing hydropic degeneration and calcification of chorionic villi. Blood vessels are absent.



Fig. 4
Photomicrograph showing hydropic and hydatidiform degeneration of chorionic villi.



Fig. 1

Smear of 1st trimester of pregnancy, showing clustering of cells and folding of cell borders. Cells are mostly of intermediate type with few superficial cells.

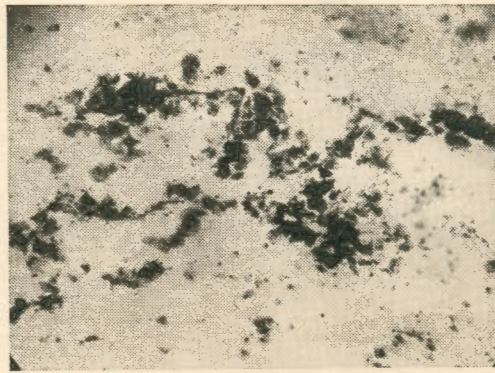


Fig. 3

Smear showing 'at term' type of changes characterised by diminution of clustering, leukocyte infiltration and slightly raised number of superficial cells. The appearance of mucus has produced clumping at places.

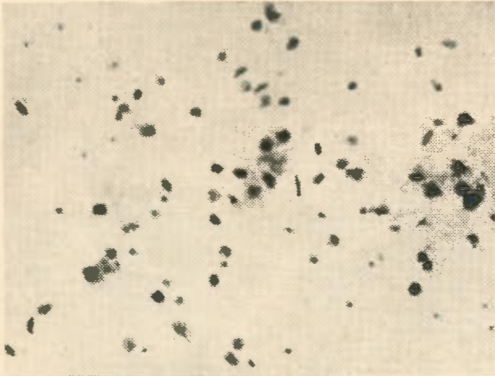


Fig. 2

Smear showing heavy growth of Döderlein bacilli producing cytolysis of cells. Free lying nuclei of vesicular type are lying among broken cell fragments.

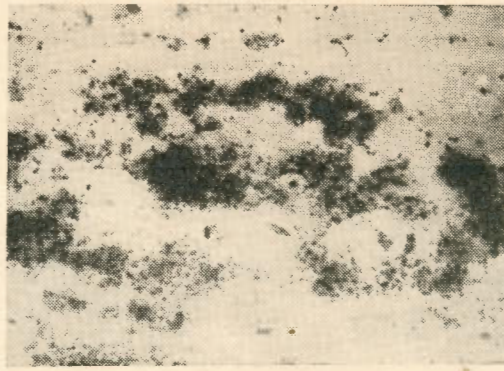


Fig. 4

Smear showing marked leukocytosis and bacterial invasion producing inflammatory type of picture.

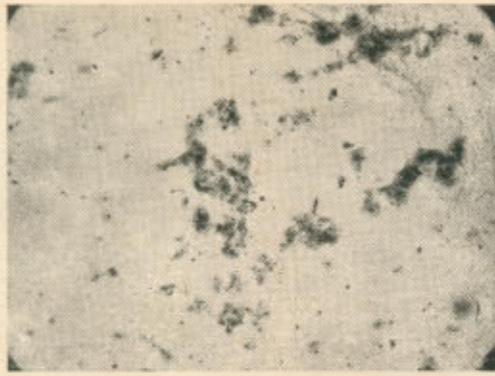


Fig. 5
Smear from a case of post-mature pregnancy (20 days past the expected date of delivery) showing fairly raised superficial cell ratio. Rest of the findings of smear are similar to a normal pregnancy smear.

Study of Vaginal Cytology in Third Trimester of Pregnancy—Misra et al pp. 478-484

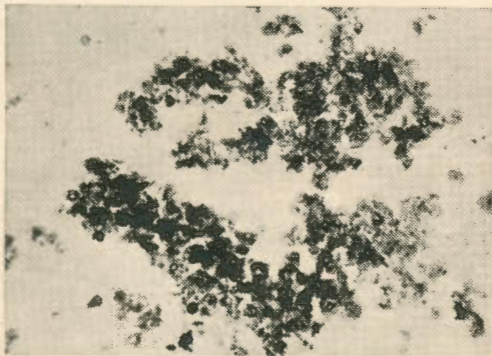


Fig. 1
'Pre-term' smear with big clusters of cells with only occasional discrete cells.

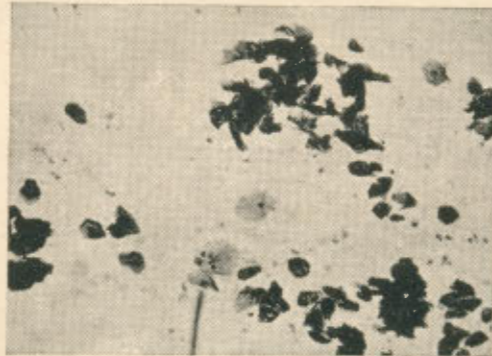


Fig. 2
'At term' smear with marked diminution of cell clusters and increased number of isolated cells.

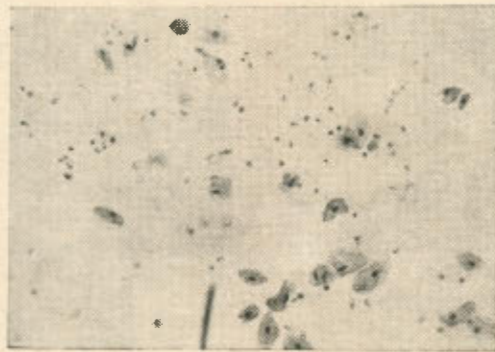


Fig. 3
Smear during onset of labour showing absence of clumps and increase in number of discrete cells.

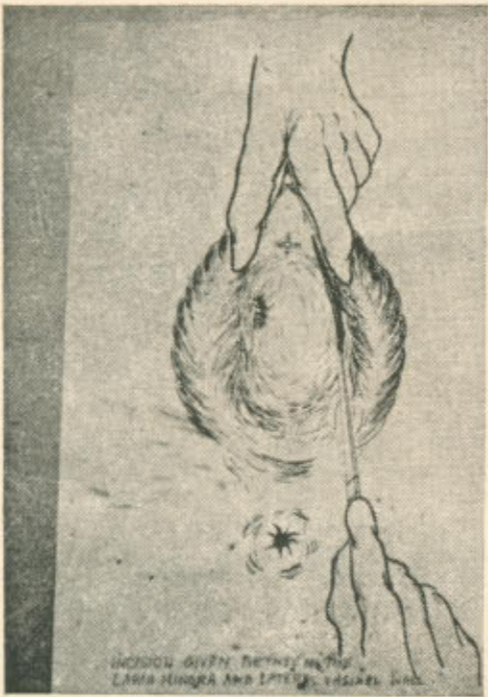


Fig. 1
Shows the nature of incision.



Fig. 2
Dissection of space between the inner side of labia minora and lateral vaginal wall.

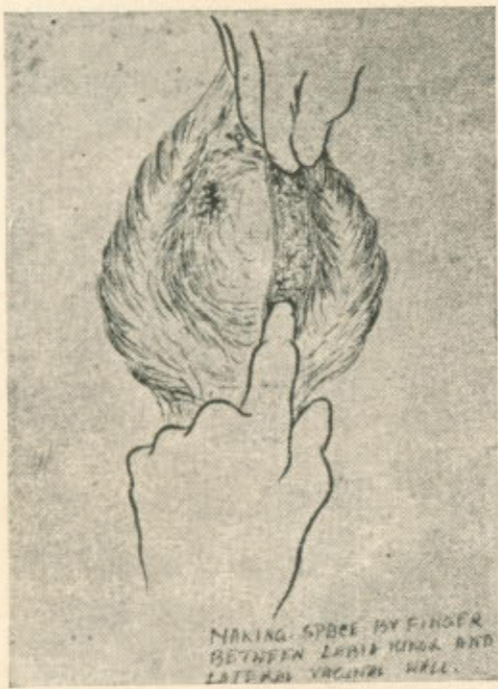


Fig. 3
Making adequate space by finger stretching.

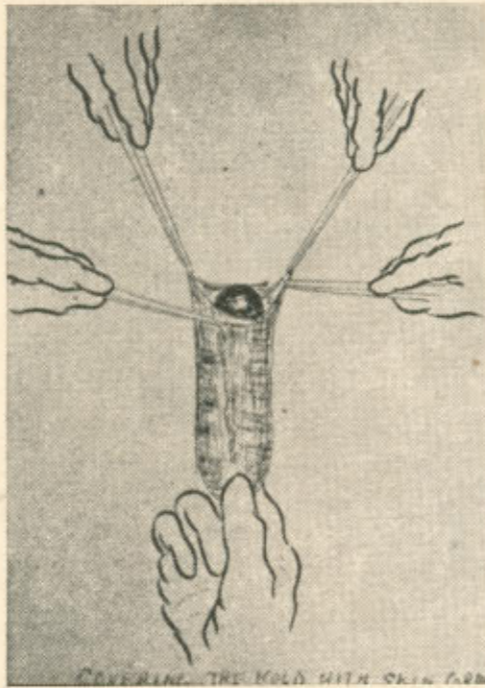


Fig. 4
Preparation of Mould by covering it with skin.

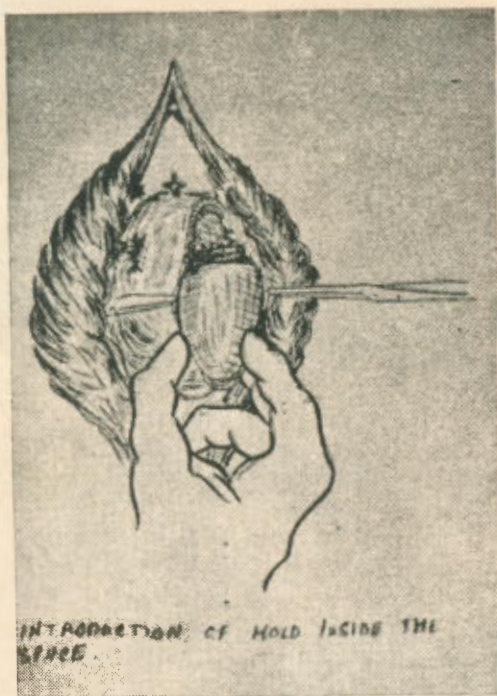


Fig. 5
Introduction of mould inside the crashed space.

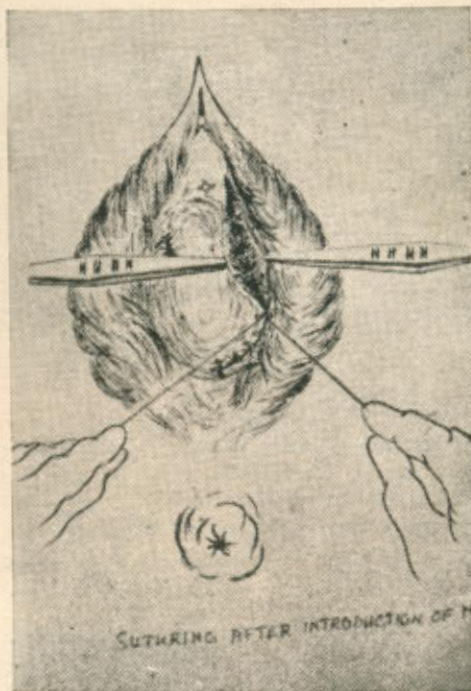


Fig. 6
Suturing after introduction of mould.

Vaginal Cytology in Clinically Threatened Abortion—Endley et al pp. 471-477

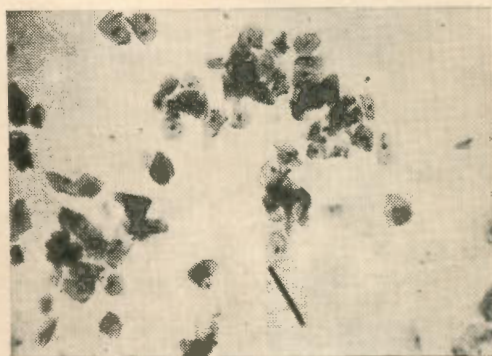


Fig. 1
Smear from threatened abortion showing mild progesterone deficiency.



Fig. 2
Smear from inevitable abortion showing discrete cells, R.B.C., Karyopyknotic index 40.



Fig. 1

Hysterosalpingography showing a normal sized uterine cavity. The dead foetus is lying high up in the abdomen transversely with the limbs hanging down and it has not changed its position though this examination was carried out 8 days after the plain x-ray abdomen.

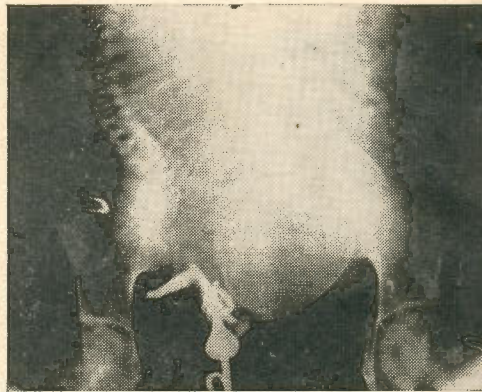


Fig. 2

Hysterosalpingography showing a normal uterine cavity and right tube. The foetal skull with gross spaulding's sign is lying to the left.

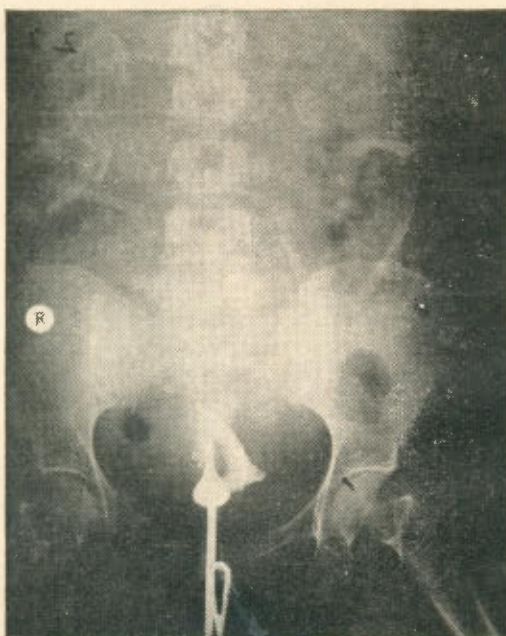


Fig. 3

Lateral view of abdomen showing a dead foetus lying transversely; foetal parts are clearly visualised. There is intermingling of maternal gaseous shadows with the foetal skeleton. One femur of the foetus is lying transversely over the intervertebral disc space between borders of lumbar 3 & 4 vertebrae of the mother.

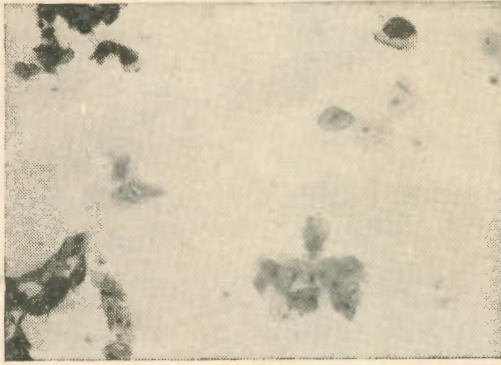


Fig. 1

'Before term' smear. This slide has a 'clear' appearance. Many intermediate cells are seen, most of them forming clusters. Very few superficial and deep cells are seen. Cell count showed superficial cells less than 10%.

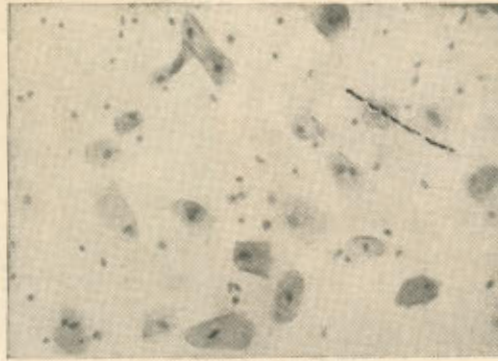


Fig. 2

'At term' smear. This slide has 'dirty' appearance. Cells are discrete. Intermediate and many superficial cells are seen. Deep cells are very few. Leucocytes are many. Cell count showed superficial cells more than 10%.



Fig. 3

'Inflammatory' smear. This slide shows the different types of cells usually seen in the vaginal smear. (1) Superficial cells, (2) intermediate cells and (3) deep cells. In addition there are many leucocytes. Smear looks hazy. Cell count showed superficial and deep cells each more than 10%.

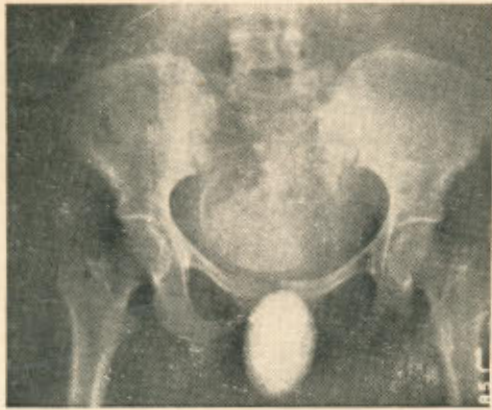


Fig. 1
X-ray of the abdomen showing a laminated
stone in the supra pubic re area.



Fig. 1
Pyelography showing single ectopic pelvic
kidney.