

# VITAL CAPACITY OF LUNGS AND PREGNANCY

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Women respond to pregnancy by adaptations that refer to morphological, physiological and psychical properties.

In the relevant literature we can encounter the view that during pregnancy the vital capacity decreases (Jerie J., Klaus K., 1964, Mourek J., 1966, Pros J. R., 1957), which the authors ascribe to the high position of the diaphragm analogically to the case as, for example, in the lying position, in ascites, in abdominal cavity tumours, inflation of the stomach, intestines, etc. On the other hand, there exist papers (Cugel D. W., Frank N. R., Gaensler E. A., Badger T. L., 1953, Herd J. A., Franklin M. J., Metcalfe J., 1960, Hytten F. E., Leitch I., 1964, Klaus E. J., 1959, Melčová A., 1967), that speak of stable vital capacity during pregnancy or of its elevation.

A reply to these contradictory views has been looked for in repeated longitudinal observation of women in the course of pregnancy, in puerperium and after delivery.

## METHODS

The investigated women had been random selected among patients of the 2nd Gynaecological-Obstetrical Clinic of the Faculty of General Medicine, Charles University, Praha, in cooperation with A. Doležal, M.D. CSc.

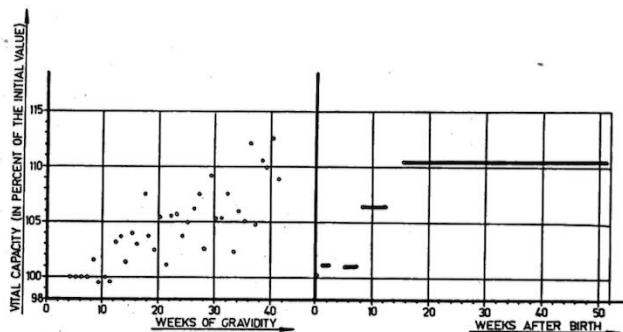
The cases in question were primiparae, since within the scope of broader observation somatic changes were found at the first meeting with pregnant women. The mean age of the probands was 26 years. The vital capacity was measured on completely undressed probands with the aid of a water spirometer. From two measurements always the higher value was taken.

The pregnant women were examined at intervals of 4 to 5 weeks, in the last month before childbirth the intervals were shortened to 1 week. After delivery, examinations were carried out, inasmuch it was possible, in the first week, in 6 weeks, and in 6 months. The last three intervals were hardly kept to, because the mother was already tied to her child and came rather irregularly to the examinations.

The measured values were referred to the pre-

gnancy weeks counted according to the last menstruation and to the weeks after birth. A total of 480 examinations in 50 women were involved.

The value from the first trimester (6th—13th week according to how early we had a possibility of ranging the woman into our set) was taken for further treatment in every woman as a starting one and estimated at 100 per cent. We assumed that the somatic changes could not yet manifest themselves on the condition of the diaphragm.



From each woman, 8—10 values were thus obtained which in further treatment were ranged into the respective week of pregnancy or into the respective postdelivery period. For the most part, data from several women had accumulated by a certain week, so that the mean value of these data had to be calculated. Thus a single value was obtained for every week. The data were plotted into a diagram which shows the course of vital capacity in dependence on the weeks of pregnancy and the postdelivery period. The values after birth were, with the exception of the first week, summarized after the 2nd—3rd, 4th—8th (end of puerperium), 9th—13th, 16th—25th, and over the 26th week. This manifests itself in the diagram so that these values are not marked by rings, but by horizontal line segments between the respective weeks.

## RESULTS

The results of treatment are graphically expressed. The diagram of the course of vital capacity during pregnancy and after it shows that the vital

capacity on the average increases with the advancing weeks of pregnancy and that this elevation reaches 10 and more per cent towards the end of pregnancy. For the period from the 36th week until birth we had 94 measurements available, 18 of them having a value lower than 100 per cent (the minimum value was 91.5 per cent).

A return to the original value of vital capacity can be registered already in the 1st week after birth. Even though many puerperae had difficulties with maximum exhalation for comprehensible reasons, nevertheless the mean value calculated from 27 examinations was 100 per cent. The minimum value made 74 per cent, while a vital capacity below the original value of 100 per cent was exhibited by 11 women. From the 2nd week followed a slight increase of vital capacity by about 1 per cent, this value being maintained for a period of about 8 weeks (puerperium). From the 9th or the 10th week an increase of vital capacity (106 per cent on the average) occurred, while from the 16th week practically the same capacity that was at the end of pregnancy (110 per cent) was reached.

#### DISCUSSION

Data on the diminution of vital capacity of lungs during pregnancy can, for the most part, be found in older literature and text-books, whose authors had taken over general findings and themselves did not go in for the research of vital capacity. At random I mention the publications of J. R. Pros (1957), J. Jerie (1964), K. Klaus (1961) and J. Mourek (1966).

The authors who studied the vital capacity of lungs during pregnancy got the bulk of data from a few women or compared with each other the groups of pregnant and non-pregnant subjects. In the works of these authors we have never found any mention of the diminution of vital capacity during pregnancy.

Our data were approached most closely by the observations of J. A. Herd et al. (1960) who report a 15 per cent increase of vital capacity during pregnancy. According to their interpretation, a diminution of the residual volume and a diminution of the expiratory reserve volume occur during pregnancy. The inspiratory reserve volume, however, increases so much that it not only compensates the diminution of the expiratory reserve volume, but contributes also to the elevation of the absolute value of vital capacity.

D. W. Cugell et al. (1953), who studied 19 women before birth and after birth arrived at the opinion that vital capacity does not change.

F. Hytten and I. Leitch (1964) draw their conclusions about the respiratory functions during pregnancy from the view that vital capacity is probably unchanged by pregnancy, but that there is a rearrangement of its components. The inspiratory capacity increases at the expense of the expiratory reserve volume, while the residual volume decreases.

As far as the increase of vital capacity after birth and its return to the elevated predelivery value are concerned, we can use the interpretation by E. J. Klaus and H. Noack (1961), who compare pregnancy to hard sports training. Therefore, we believe that after the bulk of the consequences of childbirth has died away this elevated vital capacity obtained through pregnancy remains to the woman.

Our study refers, first and foremost, to primiparae and therefore we dispose only of data about the first pregnancy. At present many of these women are coming with their second pregnancy and we hope that from their investigations we can obtain an answer to these very questions.

#### SUMMARY

With the aid of a water spirometer the vital capacity during and after pregnancy was measured in 50 primiparae at the 2nd Gynaecological-Obstetrical Clinic in Prague.

In each woman the first examination at the beginning of pregnancy was taken as the starting one and in its percentage all the following examinations before and after childbirth were expressed.

The vital capacity increases with advancing weeks of pregnancy and at the end it is 10 and more per cent higher. In the first week after birth it drops, for the most part, to the original 100 per cent, while in the 10th week after birth it already makes 106 per cent and after 4 months following birth it is practically the same as at the end of pregnancy.

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