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## Original Communications

### NORMAL VARIATIONS IN TYPE OF THE FEMALE PELVIS AND THEIR OBSTETRICAL SIGNIFICANCE

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IN 1543, less than four hundred years ago, Andreas Vesalius gave the first correct anatomical description of the normal pelvis. Eighteen years later his pupil, Arantius, first recognized the existence of contracted pelves. Two hundred and thirty more years elapsed before Baudelocque, in 1789, invented the pelvimeter and put the study of the pelvis in the living woman upon a scientific basis. Scientific obstetrics may be said to date from this invention, although the study advanced so slowly that it was not until 1861, seventy-two years later, that Litzman published the first classification of pelves based upon form as well as size. It is not remarkable, therefore, that, since the recognition of gross abnormalities developed so slowly, the study of variations in the normal pelvis should have received little attention. Ethnologists have long been familiar with variations in the form of the pelvis in different races, but since from an obstetrical standpoint we are concerned mainly with women of the white race, I shall not refer further to such racial differences.

The rarity of deformed pelves in white American women has been remarked by a number of observers. Reynolds<sup>1</sup> found only 1.34 per cent of contracted pelves in 2,227 women, but as he measured the pelvis in those cases only in which dystocia occurred, we must regard his figures as too low. Flint<sup>2</sup> found 8.46 per cent of contracted pelves in 10,233 women delivered by the New York Lying-in Hospital. Williams<sup>3</sup> found, in Baltimore, 8.49 per cent of contracted pelves among 2,178 white women. Among the 300 primiparous women upon whom

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the study of this paper is based I found 27 in whom I felt the measurements were small enough and the disproportion between the pelvis and fetus great enough to demand cesarean section for mechanical reasons alone. In the majority of these the pelvis was perfectly normal in shape but of small size.

The normal female pelvis, as described in all textbooks of anatomy or obstetrics, presents the following characteristics: the bones are lighter and thinner than in the male. The flare of the ilia is greater resulting in broader hips. The superior strait is elliptical and wider in all its diameters than is the case in the male. The pelvic outlet is wide in the female and the descending rami of the os pubis form an arch rather than an angle. According to Dieulafé<sup>4</sup> the arch in the female intercepts an arc of from 70 to 100 degrees, while in the male the rami form an angle of always less than 70 degrees. The outlet is therefore wider in all its diameters in the female than in the male. The sacrosciatic notch is also wider in the female. The obturator foramen is more triangular in the female and more oval in the male. Quain<sup>5</sup> gives the following average measurements from a number of full sized male and female pelves:

|                           | MALE     | FEMALE   |
|---------------------------|----------|----------|
| Intercristal diameter     | 28.6 cm. | 31.9 cm. |
| Interspinous diameter     | 24.1 "   | 25.0 "   |
| External conjugate        | 18.4 "   | 18.0 "   |
| Transverse of outlet      | 8.8 "    | 12.1 "   |
| Anteroposterior of outlet | 8.5 "    | 10.8 "   |

J. Whitridge Williams<sup>6</sup> gives the following internal measurements:

|                  | MALE     | FEMALE   |
|------------------|----------|----------|
| Superior Strait. |          |          |
| Anteroposterior  | 10.5 cm. | 11.0 cm. |
| Transverse       | 12.5 "   | 13.5 "   |
| Oblique          | 12.0 "   | 12.75 "  |
| Inferior Strait. |          |          |
| Anteroposterior  | 9.5 "    | 11.5 "   |
| Transverse       | 8.0 "    | 11.0 "   |

With the development of the study of the pelvic outlet by Williams, Thoms and others, the great frequency of pelves with small outlet measurements became recognized. Thoms<sup>7</sup> found that 5.3 per cent of 4000 consecutive patients at the Johns Hopkins Hospital had contractions of the pelvic outlet. Williamson,<sup>8</sup> in New York, found outlet contraction in 7.7 per cent of 1,579 cases at the Manhattan Maternity Hospital. These figures include only those cases in which the transverse diameter of the outlet was 8 cm. or under. If all cases where the diameters of the outlet were less than those given by Quain or Williams had been included the percentages would have been considerably higher.

Two explanations have been advanced for the occurrence of outlet



contractions in women. J. Whitridge Williams<sup>9</sup> believes the majority of them to be due to assimilation of the fifth lumbar vertebra with the sacrum. This results in a higher articulation of the ilium with the spinal column which causes the ischia to converge. He was able to confirm this mechanism in a number of patients by palpating six sacral vertebræ. On the other hand, this explanation does not hold good for all cases. I have had several cases of outlet contraction x-rayed in which the sacrum showed definitely only five segments.

Berry Hart<sup>10</sup> explains the incidence of contractions of the pelvic outlet by what he describes as inversion of certain parts of the female pelvis to the male type. He differentiates two forms of inversion, an iliosacral and an ischiopubic type. In the iliosacral form the ilium and sacrum invert to the male type resulting in contraction at the superior strait. In the ischiopubic inversion the outlet is contracted; the pubic arch is angular, and the ischia close together as in the male pelvis. Hart's views are based upon the examination of one autopsy and seven museum specimens.

Impressed in the course of routine antepartum examinations by the large number of contracted outlets found in women with broad hips and large external measurements, I found after a time that I could predict almost with certainty that when the external measurements exceeded 30 cm. in the intercrystal, and 20 cm. in the anteroposterior, the transverse diameter of the outlet would be more or less contracted and the pubic arch angular. On the other hand, in women with measurements which did not exceed 20 cm., 25 cm., and 28 cm. for the external conjugate, the interspinous and intercrystal diameters, respectively, I could with equal certainty predict a wide arch and an ample transverse diameter of the outlet. These observations led me to believe that there are two distinct types of female pelvis both of which must be regarded as normal. Further study has revealed other characteristics of both types which I shall enumerate.

The more common type corresponds rather closely with the ordinary textbook description of the normal female pelvis. The external measurements are normal or often slightly below normal. An external conjugate of 18 cm. or 19 cm. is not uncommon and from the usual course of labor in these pelvises must be regarded as within normal limits. The intercrystal is almost never over 28 or 29 cm. The pubic arch is wide and the transverse diameter of the outlet ample. The bones are thin and internal examination gives a sense of roominess. The os pubis is vertical or nearly so, and its vertical diameter is short. The general development of the patient is in keeping with the form of the pelvis. The entire skeleton is lighter than in the other type. This type of pelvis is more commonly found in slender women, although it may be found in obese subjects. The perineum is usually

elastic and not particularly thick or muscular. For purposes of designation, I shall call this the feminine type of pelvis.

The other, which is also the less common type of pelvis is, as I have indicated, characterized by broad external measurements and a narrow outlet. The external conjugate varies from 21 cm. to 23 cm., the interspinous from 26 cm. to 28 cm., and the intercrystal diameter from 30 cm. to 32 cm. The pubic arch is narrow and the ischia close together. The bones are usually thicker and heavier than in the first type of pelvis. This is especially noticeable in the os pubis, which is considerably increased in height, and is horizontal rather than vertical so that its anterior surface is directed downward instead of forward. This is due in part to an increased pelvic inclination. The

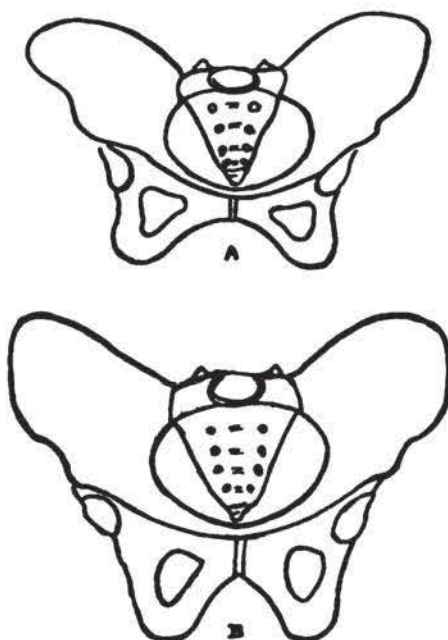


Fig. 1.—Feminine type above. Muscular type below. Purposely exaggerated to show differences. Note the wider pubic arch and lighter bones in the first type and the narrower outlet but wider hips in the second.

skeleton is heavier than in the type of pelvis first described. The patients are either large and muscular, usually obese, but with distinctly feminine type of figure, or short and thick set with heavy figures. The perineum is thick and muscular. I shall call this the muscular or heavy type of pelvis. Although difficult to measure or even estimate in the living woman, I believe the superior strait to be normal or increased in area in this type.

These two types are as a rule readily distinguished upon examination, although some modifications of each will be met with and an occasional case which is hard to classify. A pelvis of the feminine type in which the measurements are very small constitutes a just minor pelvis. A pelvis of the muscular type in which the outlet contraction



is particularly marked is usually described as a funnel pelvis. These two are very naturally the most common forms of contracted pelvis in this country.

#### EFFECT OF TYPE OF PELVIS UPON THE COURSE OF LABOR

This study has been based upon three hundred consecutive primiparae attended in private practice, although confirmed by observations upon multiparae and patients at the Boston City Hospital obstetric ward. I have restricted my figures to primiparae for three reasons. First: because it is only in the first labor that the effect of type of pelvis can be accurately estimated. Second: to prevent the same patient appearing in the statistics more than once. Third: to exclude an undue proportion of cases referred because of difficulty in a previous labor. These primiparae were with few exceptions delivered in private hospitals around Boston between Jan. 1, 1918, and April 30, 1921. I have selected private cases only because I have been able to give them more detailed study than the hospital cases and in all instances to follow them through from beginning to end.

*Proportion of Types.*—The first or feminine type made up 221 cases or 73.6 per cent; and the second or muscular type 79, or 26.4 per cent.

*Rupture of Membranes.*—Rupture of the membranes before labor or at the onset of labor occurred in 18.3 per cent of the feminine type, and 38.4 per cent of the muscular type of pelvis. (Cesarean section was performed before onset of labor or rupture of membranes in eight patients of the first type and in one patient of the second type.)

*Presentation and Position.*—The accompanying table gives the number and percentage of the various presentations occurring in each type of pelvis.

| PRESENTATION<br>AND POSITION | FEMININE |          | MUSCULAR |          |
|------------------------------|----------|----------|----------|----------|
|                              | NUMBER   | PER CENT | NUMBER   | PER CENT |
| O.L.A.                       | 140      | 63.3     | 40       | 50.6     |
| O.D.P.                       | 50       | 22.6     | 25       | 31.6     |
| O.D.A.                       | 10       | 4.5      | 6        | 7.6      |
| O.L.P.                       | 9        | 4.0      | 5        | 6.3      |
| Brow                         | 1        | 0.4      | 1        | 1.2      |
| Face                         | 1        | 0.4      | 0        | 0        |
| Breech                       | 10       | 4.5      | 2        | 2.4      |

These figures show that in the muscular type of pelvis there is a decided increase in the proportion of the two posterior positions of the occiput, but a smaller number of abnormal presentations (brow, face, breech). This I attribute to the larger superior strait. To the same cause and the larger number of posterior positions of the occiput must be attributed the much larger percentage of premature rupture of the membranes, which is the most striking effect of the muscular type of pelvis upon labor. In the feminine type the head as a rule engages before labor and molds early. It also passes the plane of greatest resistance, which in this type is the superior strait, before the pains

have spent themselves and the patient become exhausted. In the muscular type the pelvis narrows toward the outlet and the resistance increases as the head descends. In the muscular type the perineum and the muscles and fasciae of the pelvis are stronger and offer greater resistance, and it is my belief that the cervix is more apt to be rigid.

*Difficult Labors.*—There were among the three hundred primiparae, three stillbirths due to difficult delivery, all in instances of the muscular type of pelvis, all associated with premature rupture of the membranes. In all of these patients because of the duration of the rupture of the membranes, cesarean section seemed contraindicated. Cesarean section was performed 33 times. In the feminine type of pelvis the measurements seemed sufficiently small to justify cesarean section as an elective operation in 11 patients. In six it was done after failure of the test of labor to bring the head into the pelvis. In six more it was done for nonpelvic reasons: placenta previa centralis, threatened eclampsia, multiple fibroids or elderly primiparity. Among the muscular type of pelvis the outlet was so small in three cases that elective cesarean section was performed. In seven more cesarean was performed after failure of the test of labor.

Reducing the above figures to percentages: in the feminine type elective cesarean section was performed for just minor pelvis in 4.9 per cent and after failure of the test of labor in 2.7 per cent, a total of 7.6 per cent for this type requiring cesarean section. As would be expected because of the greater difficulty in estimating disproportion in advance of labor in the muscular type of pelvis, elective cesarean section was performed in only 3.8 per cent but cesarean section after failure of the test of labor was done in 8.8 per cent bringing the total requiring abdominal delivery to 12.6 per cent, without counting the three stillbirths in which cesarean would have been performed had there been no contraindications. Therefore it will be seen that, excluding cesarean section performed for other than pelvic reasons, the muscular type of pelvis is considerably the more unfavorable of the two. This is still further borne out by the greater number of posterior positions of the occiput and the enormous percentage of premature rupture of the membranes.

Furthermore in the muscular pelvis, as has been stated, the resistance to the presenting part increases as the fetus descends, making interference more difficult, whereas in the feminine type the greatest difficulty is over once the head has passed through the superior strait, and low interference is relatively easy.

#### CONCLUSIONS

1. There are two distinct and easily recognizable types of normal female pelvis, which for purposes of designation may be called the "feminine" and the "muscular" types.



2. The first or "feminine type" presents external measurements closely approximating the 20, 25, 28 cm. of the textbooks with thin bones and a wide outlet.

3. The second or "muscular type" is characterized by large external measurements, but a narrow outlet and an angular pubic arch. The bones are as a rule heavier. The os pubis is thicker and more horizontal, and the pelvic inclination increased. The muscles and fasciae are firmer than in the first type.

4. Although both of these types must be considered as normal, the "feminine type" is much the more favorable for labor. In the "muscular type" premature rupture of the membranes occurs in nearly 40 per cent and posterior positions of the occiput are more common. In spite of the larger external measurements, cesarean section was necessary in a greater percentage of pelvises of the muscular type. Both the normal mechanism of labor and operative interference are unfavorably affected by the horizontal os pubis and the greater pelvic inclination in this type.

#### REFERENCES

- (1) Trans. Amer. Gynec. Soc., 1890, xv, 367. (2) Report Soc. Lying-in Hosp., N. Y., 1897, p. 258. (3) *Williams: Obstetrics*, 1920, p. 739. (4) Quoted by Quain: *Anatomy*, iv, pt. 1, p. 177. (5) *Quain: Anatomy*, iv, 1, pp. 176-178. (6) *Williams: Obstetrics*, 1920, p. 15. (7) *Amer. Jour. Obst.*, 1915, lxxii, 121. (8) *Amer. Jour. Obst.*, 1918, lxxviii, 528. (9) *Amer. Jour. Obst.*, 1918, lxxvii, 714. (10) *Edinburgh Med. Jour.*, 1917, xix, 82.

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