

## EXTERNAL PELVIMETRY WITH SPECIAL REFERENCE TO THE METHOD OF MEASURING THE OUTLET.\*

HOWARD H. CUMMINGS, M. D.

INSTRUCTOR IN AND DEMONSTRATOR OF OBSTETRICS AND GYNECOLOGY IN THE UNIVERSITY OF  
MICHIGAN.

THE present status of pelvimetry is peculiar. In the obstetric department of every first-class medical school, pelvimetry is taught, and the men directly connected with such institutions make use of pelvimetry. The recent graduate, early in his career usually discards his knowledge of pelvimetry, and the majority of older practitioners have long since ceased to measure the pelves of pregnant women. What is the explanation of this condition? If you ask the general practitioner why he does not use a pelvimeter, usually he will tell you that nature delivers most children, and if not, he can apply forceps. It is true that the majority of children are delivered spontaneously, whether the pelvis be of normal size or somewhat contracted, but this does not excuse the physician from measuring the pelvis and knowing the actual condition. What would the profession think of a physician who never made physical examinations or tried to diagnose the true condition because he maintained that many diseases were self-limiting and would reach a cure in time? Authors of textbooks in obstetrics have been blamed for the present condition of pelvimetry. The fault is stated in the following quotation: "Many writers delight in giving the length of pelvic diameters in the living in millimeters. This is hypocrisy—to say the least—and such writers are partly responsible for the deplorable fact that pelvimetry is not as generally used by the general practitioner or by the obstetrician as it should be" (Ehrenfest).

It is a well known fact that two people cannot measure a pelvis and have their measurements agree accurately, but this does not destroy the value of pelvimetry. It is not important that the physician be able to measure the pelvis accurately, but that he be able to recognize and distinguish between normal and abnormal pelves. Occasionally, one will hear a practitioner say that he does not meet with contracted pelves in his practice. Dice, in his recent article on "Choice of Delivery in Moderately Contracted Pelves," explains this by saying: "Few men in general practice take more than half an interest in the question of pelvic deformities because they claim to see so few of them. They think them infrequent because they never look for them or never investigate the cause of many difficult labors and still births." As to the frequency of con-

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with long rests when you are worn out, for remember that for the most of you health is your greatest asset. Do not look for the rewards of life in the praise of your fellow men. Rather seek to be true to the high ideals of one of the noblest of professions, ideals which I trust you are carrying away with you this evening. Then, if you satisfy your own self, you will have made a success.

*Ann Arbor, 620 Forest Avenue.*

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tracted pelves, all authors differ in their figures but a fair average would be from seven to eight per cent.

It is not the purpose of this paper to champion the cause of pelvimetry, its purpose and usefulness being too obvious, but rather to set forth some of the more recent views and methods of pelvimetry, especially of the pelvic outlet.

External pelvimetry is notoriously inaccurate as far as actual measurements are concerned, but it often gives one valuable information. The diameters usually included under external pelvimetry are the interspinous, intercrystal, bitrochanteric and external conjugate. The diameters of the outlet will be considered later.

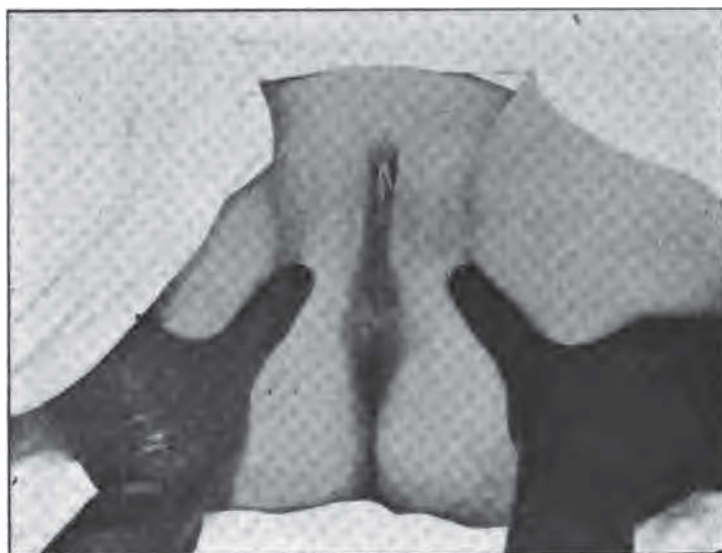
**INTERSPINOUS DIAMETER.**—This measurement is taken between the anterior superior spines of the ilium and of itself is of little value. The bony spines are relatively broad and if the knobs of the pelvimeter are placed anywhere on their surface, a difference of from one to two centimeters is found. However, if the knobs of the pelvimeter are carried to the most outward projection of the spines and firm pressure is made, a difference of over one-half centimeter is rarely found. The interspinous diameter in normal pelves is from twenty-four to twenty-six centimeters.

**INTERCRISTAL DIAMETER.**—This measurement is taken at the widest point of the iliac crests, by bringing the tips of the pelvimeter firmly against the outer lip of the crests. In normal pelves this diameter varies from twenty-seven to twenty-nine centimeters. Like the interspinous diameter, the intercrystal of itself is of little value but there is a normal difference between the two measurements of from two and one-half to three centimeters. When the interspinous diameter approaches, equals, or is larger than the intercrystal, one is justified in suspecting a rachitic pelvis.

**BITROCHANTERIC DIAMETER.**—This diameter is the measurement between the trochanters of the femurs when the patient's thighs are closely adducted. Of all the external measurements this is the least accurate and of very slight value.

**EXTERNAL CONJUGATE, OR BOUDELLOCQUE DIAMETER.**—The external conjugate is measured by inserting one tip of the pelvimeter into the depression below the last lumbar vertebra while the other tip is held firmly against the median and upper part of the symphysis pubis. The anterior point is easily located, but the depression below the last lumbar spine is not always easily found. If a line be drawn between the iliac crests, a point taken three-quarters of an inch below the middle of this line will locate quite accurately the spine of the last lumbar vertebra. Another method of value in patients who show the dimples of Michaelis's rhomboid, is to take a point two and one-half centimeters above the middle of a line connecting the two lateral dimples. The external conjugate is one of the most important external measurements, though it is not of as much value as Boudellocque first thought. He asserted that by deducting three inches from this measurement, one would know the length of the true conjugate. Williams has in his collection two pelves with equal true conjugates but the external conjugates vary by five centimeters. Although the external conjugate is not an accurate index to the conjugate vera this

much can be said concerning it, that when the external conjugate measures twenty centimeters or more; one is safe in assuming that the true conjugate is not shortened. An external measurement of between eighteen and nineteen centimeters would lead one to further investigation, as about



FIGURES I and II.—Palpating the Pubic Arch.

one-half of all pelves with these measurements show a slight shortening of the true conjugate. However, when the external conjugate falls below seventeen centimeters, in nearly all cases there is a contraction of the inlet.

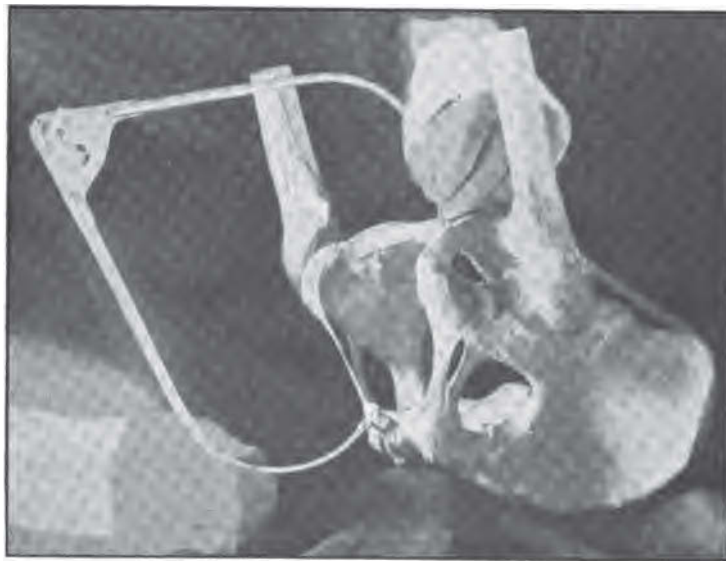
If one is to judge by the literature on the subject, routine pelvimetry of the outlet has been sadly neglected. Klien, in his monograph upon this subject, published in 1896, called attention to the importance of pelvic outlet contraction. Williams, in this country, has written more



FIGURES III and IV.—Measuring the Transverse Diameter of the Outlet.

upon this subject than any other author and was first to note the great frequency of funnel pelvis among American women. In the typical funnel pelvis, the contraction is entirely at the outlet, the inlet being of

normal size. The diameter of the outlet usually measured are the bischial or transverse and the anteroposterior diameters. Klien has added to these the anterior and posterior sagittal diameters. The following method of outlet pelvimetry is that taught by Professor Williams of John Hopkins



FIGURES V and VI.—Measuring the Anteroposterior Diameter of the Outlet.

and has been adopted by Professor Peterson for the University of Michigan Maternity Service.

The patient is placed in the dorsal position, the buttocks being at the

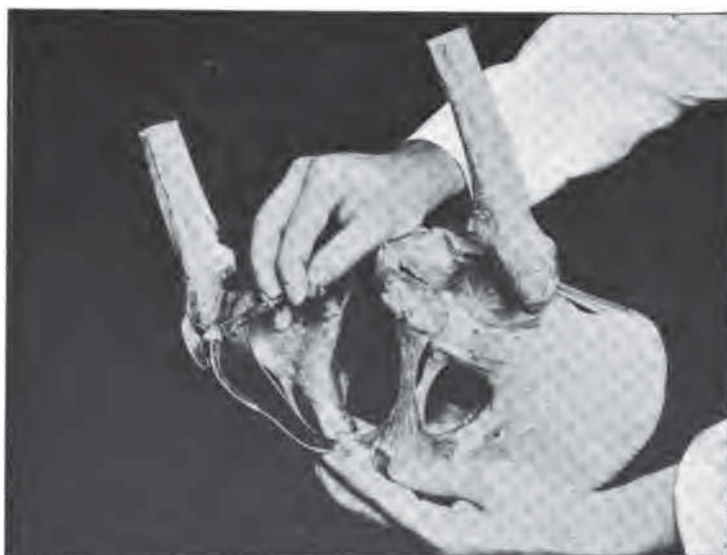


edge of the table or the bed and the legs flexed. The width of the pubic arch and course of the ischiopubic rami is outlined by palpation with the inner surface of the thumb, the remaining fingers grasping the buttocks below the gluteal folds. (Figures I and II). The transverse diameter



FIGURES VII and VIII.—Measuring the Anterior Sagittal Diameter of the Outlet. of the outlet or the bischial is next measured. For this purpose a special pelvimeter designed by Williams is used. The two measuring arms are equipped with rings which encircle the thumbs and the flat tips lie

in close apposition to the nails. The thumbs palpate the most widely distant portions of the two tuberosities and the distance is read off from a scale at the end of the pelvimeter. (Figures III and IV.) The antero-posterior diameter of the outlet is measured by having the patient's but-



FIGURES IX and X.—Measuring the Posterior Sagittal Diameter of the Outlet.

tocks brought well over the edge of the table or bed, in order to palpate the posterior surface of the tip of the sacrum. With one bulb of the pelvimeter at this point, and the other carried in the median line to the



lower margin of the symphysis, the reading is taken. (Figures V and VI). In case the coccyx is ankylosed, the posterior point must be taken from the tip of the coccyx. It is necessary to deduct one centimeter from the anteroposterior measurement to compensate for the thickness of the sacral tip. Klien has designated the distance from an imaginary line connecting the ischial tuberosities to the lower margin of the symphysis, as the anterior sagittal diameter of the outlet; likewise the distance from this same line to the sacral tip, he calls the posterior sagittal diameter. To measure the anterior and posterior sagittals, Klien devised a special pelvimeter which has been modified by Williams. It consists of a horizontal crossbar and a short straight arm connecting the crossbar and the scale, while a longer curved arm measures the diameters. The crossbar is placed to coincide with a line connecting the tubera, the tape of the measuring arm is carried forward to the lower border of the symphysis and the anterior sagittal diameter taken. (Figures VII and VIII.) In the same manner the measuring arm is carried to the posterior surface of the tip of the sacrum, the horizontal crossbar remaining in the same position. (Figures IX and X.) The scale shows the length of the posterior sagittal diameter plus the thickness of the sacral tip, so it is necessary to deduct one centimeter from this region.

The diameters of the outlet of a normal pelvis should measure, according to Klien who based his conclusions upon the study of one hundred and thirteen normal pelves, as follows:

Transverse .....	11	centimeters
Anterior sagittal .....	6	centimeters
Posterior sagittal .....	9.5	centimeters
Anteroposterior .....	11.5	centimeters

Williams measured one hundred and eighty-five normal pelves and obtained as average outlet measurements the following:

Transverse .....	10.5	centimeters
Anterior sagittal .....	5	centimeters
Posterior sagittal .....	7.5	centimeters
Anteroposterior .....	11.5	centimeters

During the last year at the University of Michigan Maternity outlet measurements have been taken on seventy patients with normal pelves. The average diameters were as follows:

Transverse .....	10.2	centimeters
Anterior sagittal .....	5.4	centimeters
Posterior sagittal .....	8.5	centimeters
Anteroposterior .....	11.3	centimeters

The importance of careful examination of the pelvic outlet cannot be emphasized too much. Williams has shown that in his clinic forty-four per cent of all pelvic contractions in white women occurred at the outlet. It is a fact well known to every physician who does obstetric work, that nature uses all the available space of the pubic arch in the birth of the head. The pubic arch normally forms an angle of about ninety degrees and the occiput comes to lie well up to this angle lessening the strain on the posterior part of the perineal body. When the pubic arch

is narrowed by a close relation of the tuberosities, the space normally available for the occiput cannot be used, and in order that the birth of the head be accomplished, most of the strain must fall posterior to the tuberosities. This gives rise to deep second degree tears, often third degrees tears and sometimes to fracture of the coccyx. The prognosis in outlet contractions does not depend entirely upon the narrowing of the pubic arch, but upon the length of the posterior sagittal in relation to the transverse diameter. For example, in a case where the transverse diameter measured eight centimeters and the posterior sagittal measured seven and five-tenths centimeters, spontaneous delivery would be unusual, while a large child has been born when the transverse and posterior sagittal diameters measured six and five-tenths and nine centimeters respectively. Without doubt many cases of difficult low forceps operations, large tears of the perineum and still-born children have as their explanation outlet contractions.

In this connection I wish to review the history of a patient who entered the gynecologic service this spring for repair of external and internal lacerations of a rather marked degree. She gave the history of having been pregnant three times, of carrying the children to full term, and of long difficult labors terminated each time by a forceps delivery and birth of a dead child. Upon examination of the pelvis the external measurements were normal for the inlet, but the pubic arch was markedly narrowed and the posterior sagittal was shortened to such an extent that birth of a normal child's head seemed impossible; and judging from her history it was impossible.

In the University of Michigan Maternity service during the past year we have had three cases of typical funnel pelvis. In the typical funnel pelvis the transverse diameter of the outlet measures eight centimeters or less, or the anteroposterior diameter measures nine centimeters or less, the inlet measurements being normal.

*Case I.*—Obstetric history number 551.—The first case was that of a young married woman, a primipara at full term. Her pelvic measurements were as follows: interspinous 22.5 centimeters, intercrystal 26 centimeters, bitrochanteric 30 centimeters, external conjugate 17.5 centimeters. The measurements of the outlet were: anteroposterior 9.5 centimeters, transverse 8 centimeters, anterior sagittal 7 centimeters, posterior sagittal 7 centimeters, pubic arch  $70^{\circ}$ . The labor lasted about twenty-four hours but the child, weighing six pounds, was delivered spontaneously. However, there was a large second degree tear extending down nearly to the rectum, and the child's head showed marked molding.

*Case II.*—Obstetric history number 597.—The second case was one of incomplete abortion at the fourth month and the case was only interesting from the point of the pelvic measurements. These were as follows: interspinous 26.5 centimeters, intercrystal 31 centimeters, bitrochanteric 32 centimeters, external conjugate 18.5 centimeters. The measurements of the outlet were anteroposterior 11 centimeters, transverse 8 centimeters, anterior sagittal 5 centimeters, posterior sagittal 9 centimeters, and pubic arch about  $70^{\circ}$ .



In Case I the prognosis was unfavorable, for with a transverse diameter of eight centimeters the posterior sagittal measured only seven centimeters. However, the small size of the child explains the spontaneous delivery. In Case II the prognosis would be favorable for the long posterior sagittal of nine centimeters would compensate for the transverse of eight centimeters.

*Case III*—Obstetric history number 584.—We have in the Maternity service at present a young woman in the eighth month of pregnancy who has pulmonary tuberculosis and whose pelvis is of the typical funnel type. The distance between the tuberosities is eight centimeters and the posterior sagittal diameter measures seven centimeters. The question of outlet contraction is of great importance in her case, for vaginal Cesarean section, version and extraction has been mentioned as a possible means of delivery without submitting the patient to the strain of a long, hard labor. However, if the outlet is contracted, could the after-coming head be delivered if the case goes on to full term?

As a fairly typical course of labor in a case with moderate outlet contraction, I wish to briefly relate this history.

*Case IV*.—Obstetric history number 526.—The patient, a young white primipara, was examined and found to have normal inlet measurements; however, the pubic angle was narrow and the transverse diameter measured eight and five-tenths centimeters. The posterior sagittal was of normal length. On December 26, 1910, at 4 A. M. the patient went into labor. The progress was normal and at 6:45 P. M. the membranes ruptured. At 11 P. M. slight bulging was noticed but at 2:30 A. M. on December 27 the head, having been on the perineum two and a half hours without any appreciable advancement, and the patient's pulse being 105, her temperature 100°, it was thought advisable to terminate the labor by the application of forceps. A low forceps operation was performed. The head was advanced with great difficulty and at 3:15 A. M. the child was delivered and found in excellent condition. The mother had a large second degree laceration.

Cases I, II, and III are examples of true funnel pelvis, there being no contraction of the inlet. The following case is a good example of a generally contracted funnel pelvis.

*Case V*.—Obstetric history number 601.—A white school girl, aged fourteen years, admitted in July, 1911, in the second month of pregnancy. The external pelvic measurements are as follows; interspinous 21 centimeters, intercrystal 24 centimeters, bitrochanteric 27 centimeters, external conjugate 16 centimeters, anteroposterior of the outlet 9.5 centimeters, bischial 8 centimeters, anterior sagittal 4.5 centimeters, posterior sagittal 8.5 centimeters, pubic angle about 75°.

In this case all of the external measurements of the inlet are shortened but the relative lengths are maintained. The distance between the tuberosities is a scant eight centimeters.

These brief histories are sufficient to show that outlet contractions are not uncommon as the cases were collected from the last eighty patients admitted to the maternity service.