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Management of contracted pelvis

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THE MANAGEMENT OF CONTRACTED PELVIS

A THESIS
PRESENTED TO THE FACULTY OF THE
COLLEGE OF MEDICINE OF THE UNIVERSITY
OF NEBRASKA, IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF MEDICINE

A. LYMAN COOK 1840
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II. Factors Influencing Passage of
The Fetal Head Through The Pelvis

This chapter is introduced to present a brief survey of
the principal causes of dystocia so that the relative importance
of contracted pelvis as a cause of dystocia may be estimated.

In the passing of the head through the pelvis in labor
there are three controlling factors: the forces, the fetus, and
the passage. The sound attitude toward dystocia is to attempt to
estimate in each case how far each of these factors has been dis-
turbed. The proper evaluation of these factors, which comes only
through years of careful clinical observation, should lead to more
rational treatment and to a greater degree of safety to mother
and child.

The forces of labor, which consist chiefly of the muscles
of the uterus and the abdominal wall, are usually sufficient in
a normal, healthy woman to expel the fetus unaided. Nevertheless,
faults of the expulsive forces constitute one of the commonest
causes of minor dystocia and delay in labor. The necessary forces
of labor are a relative manner, since forces which might be en-
tirely adequate with a fetus of a certain size, engaged in a cer-
tain manner in a pelvis of a certain size and configuration; might
in a different set of circumstances be entirely inadequate.

A number of causes of defective uterine contractions, or
uterine inertia, are discussed by Davis (79). Among the more
important causes listed are the following: a debilitated con-
stitution, a uterus which is congenitally weak, uterine inflammation, tumors of the uterus or adjacent tissues, distention of the bladder or intestine, premature escape of liquor amnii, hydramnios, fright or severe pain. Secondary inertia, on the other hand, results when the uterus becomes exhausted due to some abnormality in the passage of the fetus.

The uterus occasionally becomes hyperactive and goes into any one of the following states: a generally contracted condition, a tonic contracted condition, or strong regular contractions with precipitate labour. (Berkley et al.) (6). The first two conditions frequently follow a prolonged labor in which repeated attempts have been made to deliver the child. The cause of the latter may be either some hormonal influence or personal idiosyncracy.

Caldwell and his associates (16) have recently advanced the idea that the axis of the lower uterine segment and its associated soft parts are occasionally an active factor in inlet dystocia. The axis of the lower uterine segment may be such as to force the head against the brim of the fore-pelvis and hinder descent in a head in which there is no actual bony disproportion between the head and pelvic inlet. This situation should always be thought of when the head rides high or when the head overrides the anterior brim.

Since the head is usually the most difficult fetal part to deliver, variations in the size, shape, and moldability of this part are most important and likewise quite frequent. It was
observed by Kerr (43) that in general large babies tend to be produced by women of large stature. Walsh (77) found that in the majority of cases of pelvic dystocia in the gynecoid pelvis, an oversized fetus was responsible for the obstruction rather than a contracted pelvis. The shape of the fetal skull, fortunately, is usually subject to changes in the process of labor. These changes are possible because the skull is composed of several bones loosely connected together. A prolonged pregnancy frequently produces an oversized fetus in which the skull is more square in shape, less malleable, and less compressible, and the spine is less flexible. Multiple pregnancies are always a potential source of dystocia.

The commonest causes of dystocia referable to the fetus are alterations in its attitude, presentation, and position. We consider the child in the normal attitude when it lies flexed with the chin on the sternum and the limbs folded across its trunk; in the normal presentation when it lies longitudinally with its head lowermost; and in the normal position when the long axis of the head lies in the right oblique diameter with the occiput anterior (Kerr) (43). It is impossible to discuss these three conditions separately since they are closely interrelated. Furthermore, these three conditions are intimately associated with the size and configuration of the pelvis and the position and contractions of the uterus.

Deflexion in various degrees is the most common defect of attitude in vertex presentations. The resulting difficulty is directly in proportion to the degree of extension.
III. Clinically Important Types of Pelvis

The study of pelvic deformities and its effects on labor resulting therefrom, was held up until well into the sixteenth century by the universal misconception that failure of the pelvic bones to separate was the chief cause of pelvic obstruction. This conception of obstruction was propounded by Hippocrates and developed to its fullest scope by Soranus. Arangio, (1520-89), laid the foundation on which our knowledge of pelvimetry has been erected. Maupertius (1694) a French obstetrician denied the separation of the pelvic bones at time of labor, and stated that this was unnecessary, considering the large size of a woman's pelvis. Hendrik van Levente (1701) was the first to describe the bones of the pelvis from the standpoint of practical obstetrics, and he is generally considered to be the founder of the science of contracted pelvis. He gave no definite pelvic measurements, but he defined a narrow pelvis as one which "considering the proportion of the body is too small" (41). The first definite measurements for normal and abnormal pelves were suggested by that exponent of practical obstetrics, William Smellie (1752). His work also included a description of the mechanism of labor in contracted pelvis (49). The importance of the diagonal conjugate and a method of measuring this diameter was
brought out a short time later by Baudelocque (4). He described the
digital method of measuring the diagonal conjugate which is used ex-
tensively even today. In cases of difficult labor Johnson (1769)
advised that the whole hand be introduced into the pelvis to check
the size and shape of the birth canal (42). The first instrument
for internal pelvimetry, a calibrated stick, was described by
Stein (1772). It was used in the measurement of the diagonal con-
jugate.

In the past one hundred years an infinite number of classifi-
cations of pelvis have been presented by as many authors. Some
classifications are based entirely on the form of the pelvis as are
those of Michaelis and Litzman. The classification of Schauta (1889),
on the other hand, was based entirely on etiology. Tarnier-Budin-
Donnaire (1898) attempted to combine both factors in the classifi-
cation, and ended up with a hopelessly complicated grouping. From
the clinical standpoint, a classification of pelvis is of value only
insofar as it gives aid to the diagnosis and treatment of obstetrical
problems. A brief discussion has been given of only a few of the most
outstanding pelvic classifications.

Michaelis originally presented three pelvic types: the generally
contracted, the flat, and the generally contracted flat type. Litzman,
Michaelis' successor modified his system and presented the following
classification (41):
Litzman's System

1. Pelves with normal shape, but either too large or too small:
   (a) Justo major.
   (b) Justo minor.

2. Pelves with abnormal shape:
   (a) Flat pelvis.
      (1) Simple.
      (2) Rachitic.
      (3) Generally contracted, flat pelvis.
   (b) Transversely contracted pelvis.
   (c) Irregularly contracted pelvis.
      (1) Scoliotic.
      (2) Coxalric.
      (3) Amputation.
      (4) Dislocation of Femur.
      (5) Asymmetric sacrum, as the Naegle pelvis, tuberculous hip disease, etc.
   (d) Osteomalacic and pseudo-osteomalacic pelves.

Kerr's system (1906)(44), which classifies deformities of the pelvis according to causative factors, was modified from systems of Schauta and of Breus and Koliska. He gives the following classification:

1. Deformities resulting from faulty development:
   (a) Justo major pelvis.
   (b) Justo minor pelvis or generally contracted pelves.
   (c) Simple flat non-rachitic pelvis.
   (d) Naegle's pelvis, imperfect development of one sacral ale.
(a) Robert's pelvis, imperfect development of both sacral alae.

(f) Split pelvis, imperfect development of pubes.

(g) Assimilation pelvis.

2. Deformities resulting from disease of the pelvic bones and joints.
   (a) Rickets.
   (b) Osteomalacia.
   (c) New growths.
   (d) Fractures.
   (e) Atrophy, caries, and necroses.
   (f) Disease of sacroiliac, pubic and sacrococcygeal joints.

3. Deformities resulting from disease in spinal column:
   (a) Kyphosis.
   (b) Scoliosis.
   (c) Spondylolisthesis.

4. Deformities resulting from disease of the lower extremities:
   (a) Coxitis.
   (b) Dislocation of one or both femurs.
   (c) Atrophy or loss of one or both limbs.

As can be readily seen, Kerr introduced a comprehensive system of classification, but one which is not of great clinical value.

Zanemeister's classification is a more simple and in many ways a more practical classification than the others, in that it is based on the plane of contraction of the pelvis and the diameters involved.
System of Caldwell and Koloy

A. Gynecoid type (G. gyno--woman)-"the average female pelvis."

All groups are subdivided on the basis of variations in the subpubic angle:
(1) With a narrow outlet; (2) with a moderate outlet; (3) with a wide outlet; (4) large or small.

B. Android type (G. ander--man), closely resembles the male pelvis.

C. Anthropoid type (G. anthro os--man), closely resembles pelvis of anthropoid apes.

D. Platypelloid type (G. platy--flat, pellis--pelvis), the simple, flat nonrachitic pelvis.

E. Asymmetrical type, may be irregular in different ways.

Although this system is based chiefly on the shape of the superior strait, certain other characteristics were found to be associated with each type.

In the gynecoid pelvis, the shape of the inlet depends largely on features of the subpubic angle and sacrosciatic notch. A view through the inlet shows only the tip of the sacrum and the ischial spines discernible, but offering no obstruction. The sacrosciatic notch is quite wide. The subpubic angle is wide and presents an arched rather than an angulated appearance.

The android, or masculine pelvis, presents a heart shaped inlet. The widest transverse diameter is quite close to the sacrum, and this in addition to a protruding sacrum makes the posterior pelvis...
How shall we measure the birth canal? Such a question is pertinent to the diagnosis of contracted pelvises, and yet it is still under considerable debate. In general there are four methods which have been used extensively at one time or another. They are (1) external pelvimetry, (2) internal pelvimetry, (3) roentgenometric pelvimetry, and (4) pelvimetry by actual test of cephalo-pelvic proportions. The first three methods seek to determine the prognosis of labor by measuring the absolute dimensions of the pelvis; whereas, the fourth method seeks to prognose labor by comparing the cephalo-pelvic proportions in any specific case.

The measurements ordinarily taken by external pelvimetry are four in number: the intercristal, the interspinous, the intertrochanteric, and the external conjugate. The intercristal measurement, which is the distance between the most widely separated portions of the crests of the ileum, may be taken with the tips of the pelvimeter applied to the outer edges, to the superior edges, or to the inner aspects. When measurements are listed it should, however, be stated whether the outer or inner lips of the ilii were used as there is 1.5 to 2.5 cm. difference (Williams, J. W.) (78). By interspinous diameter is ordinarily meant the distance between the outer edges of the anterior superior spines of the ilii. In considering the significance of these two measurements, the relationship between these two diameters is more important than the actual measurements involved. Cragin (21) states that if these two diameters are equal or if the interspinous
vis very shallow. The antero-posterior diameter of the fore-pelvis is increased, but the acute angle at which the superior pubic rami join cancels any compensation that this might give. The sacrosciatic notch is long and narrow. The subpubic angle is narrow and the sides are quite straight as compared with the gynaeoid pelvis. The narrow subpubic angle is frequently a factor in outlet contractions. The depth of the true pelvis is considerably greater here than in the average female pelvis, frequently being increased by from 5 to 10 mm. The sidewalls show a tendency for convergence, which with the anterior convergence of the sacrum gives rise to a funnel pelvis.

The inlet of the anthropoid type is characterized by an oval shape in which the antero-posterior diameter represents the long axis. The antero-posterior diameter shows an absolute increase; whereas the transverse diameter is relative or actually shortened. The obstetric capacity is limited in the fore-pelvis by the acute angle at which the superior pubic rami meet. If there is an associated narrowing of the subpubic angle, the fore-pelvis assumes a triangular shape. The subpubic angle has no particular characteristics, and is subject to considerable variation. The long posterior pelvis tends to compensate for the narrowed anterior portion, and for the narrow transverse diameter. The sacral promontory is high, and the sacrum is narrow and spear shaped. The rare platypelloid form presents an elliptically shaped inlet, the long axis of which is the transverse diameter. The sacrosciatic notch is narrow. The suprapubic angle is subject to wide variations. The antero-posterior
diameter is markedly contracted, and finds compensation only in the added width of the pelvis.

In the instance of the rare asymmetrical pelvis, the shape of the inlet is usually an oblique oval. The asymmetry which is present is usually due to a shortening of the posterior iliac portion on one side with an associated narrowing of the corresponding sacrosciatic notch. Caldwell and Noloy make this significant statement: "In this classification the pelvic inlet becomes the denominator as we have attempted to correlate sound anatomical principles and obstetric significance."

The recent classification of Thoms (1937)(72) resembles that of Caldwell in its simplicity, its clinical value, and its basis on form of the pelvis. Much of Thoms' work is based on roentgen studies of the pelvis (67)(68)(69). Thoms based his classification largely on that of Turner. The majority of pelvises can be classified for clinical purposes into the following groups:

**Thoms' System**

1. Dolichopelvic or anthropoid type. The antero-posterior diameter is longer than the transverse.

2. Mesatipelvic or round type. The antero-posterior diameter is equal to or only slightly less than the transverse, the difference being never more than 1 cm.

3. Brachypelvic or oval type. The antero-posterior diameter is between 1 and 3 cm. shorter than the transverse.

4. Flattpelvic or flat type. The antero-posterior diameter is
markedly shorter than the transverse, by 3 cm. or more.

In comparing the pelvic types of this system with those of Caldwell, it is quickly apparent that they are not comparable, type for type. The dolichopelvic pelvis and the mesatipelvic type might compare with either the anthropoid or android pelves of Caldwell's system, depending upon other factors such as the degree of convergence of the sidewalls, the character of the subpubic arch present, and the diameters of the outlet. The brachypelvic type is probably quite similar to the gynecoid type, provided that a normal type outlet is present. The platypelloid pelvis of Thoms' is directly comparable to the pelvis of the same name in Caldwell's classification. The mesatipelvic pelvis evidently closely resembled the gynecoid pelvis since Thoms' found it to be present in 48% of the patients checked.

A study of the incidence of various types of pelves, by Thoms(72) in 450 white women revealed the following figures:

<table>
<thead>
<tr>
<th>Type</th>
<th>Incidence</th>
<th>Large</th>
<th>Average</th>
<th>Small</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dolichopelvic type occurred 70 times or 15.8%</td>
<td>6</td>
<td>53</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Mesatipelvic</td>
<td>203</td>
<td>45.1</td>
<td>17</td>
<td>145</td>
</tr>
<tr>
<td>Brachypelvic</td>
<td>156</td>
<td>34.7</td>
<td>27</td>
<td>110</td>
</tr>
<tr>
<td>Platypelvic</td>
<td>21</td>
<td>4.8</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

This group of 450 patients which has been classified by Thoms is of considerable interest in the study of the clinical importance of pelvic variations since each of these patients was subjected to careful pelvimetry, both internal and roentgenometric; each was registered for

(17)
versely, or obliquely.

In contractions of the inlet, the true conjugate is the most common diameter to be shortened. Hence the measurement of this diameter is made the clinical basis for the diagnosis of a contracted inlet. As the transverse diameter is usually greater than the antero-posterior, a moderate amount of shortening in this diameter may show no clinical effect. Michaelis, who founded the scientific obstetrical study of the pelvis, placed the beginning of contracted pelvis at a C.V. of 10 cm. in the justo minor types, and at 9.5 cm. in those of the flat variety. Any pelvis with a C.V. of 10 cm. or less, or a dia. Conjugate of 11.5 cm. or less is considered as contracted by Williams (78). The conjugate vera is different in the contracted form of the various pelvic types in Thom's classification (72) as follows: (1) dolichopellic small pelvis, 12 cm. or less; (2) mesatipellic small pelvis, 11 cm. or less; (3) brachypellic small pelvis, 10 cm. or less; (4) Platypellic pelvis, the true conjugate is always 3 cm. or more shorter than the transverse diameter.

Mid-Pelvic contraction occurs as a separate entity very rarely. It occurs more frequently in connection with a generally contracted pelvis, or with a funnel pelvis (with outlet contraction). In a pelvis showing any marked degree of outlet contraction, the existence of mid-pelvic contraction is almost certain. This type of contraction is most difficult to diagnose by ordinary clinical pelvimetry, which is often quite misleading. (Welsh) (77).

Pelvis showing contractions of the outlet are known as funnel
pelvis, or android pelves in Caldwell's system. The incidence and clinical importance of this type of anomaly varies widely among different reports. Thoms (66) stated that this is the most frequent type of abnormal pelvis occurring in white women, and found an incidence of 37% among contracted pelves of all types. The operative frequency in funnel pelvis is greater than that occurring in other types of contraction. In a series of 471 contracted pelvis, McCoogan (50) found an incidence of 24%. On the other hand, Fitzgibbon (26) states that he has never encountered difficulty in extracting a head that has advanced to the outlet, and he thinks that outlet contractions are of practically no clinical importance.

The biischial (bituberosous) diameter is commonly used as the standard in determining contractions of the outlet. The outlet is considered to be contracted when the transverse diameter measures 8 cm. or less (Thoms) (66). Outlet contractions have been subdivided into groups according to the degree of transverse contraction as follows: minor degree, 7.5 cm.; medium degree, 6.5-7.0 cm.; major degree 6.0 cm. or less.
measures the distance from the external surface of the sacroccygeal articulation to the lower rim of the synphysis pubis, may be easily measured with an ordinary pelvimeter. Sellheim's method of manually palpating the subpubic arch gives one a good estimate of the pubic angle. The thumbs are used to follow the course of the ischiopubic rami. This determination is helpful in checking outlet contractions. In cases in which contraction of the outlet is indicated by the transverse diameter or by palpation of the subpubic angle, the posterior sagittal diameter should be taken. If the transverse diameter is 8 cm. or less, the posterior sagittal must be 7.5 cm. or more to permit spont. delivery of a normal fetus.

Of the numerous instruments devised over many years to facilitate measurement of internal diameters, none has proved sufficiently practical to gain popular usage. The internal pelvimeters of Stein, Skutsch, and Farabouf, have been ingenious and theoretically accurate, but they have the disadvantage of being cumbersome, difficult to introduce, and so painful as often to require anesthesia. Hirst's pelvimeter for measuring the true conjugate indirectly has been fairly successful. A pelvimeter for the direct measurement of the obstetric conjugate has recently been developed by J. T. Smith (31). It is a comparatively small instrument, about the size of a man's finger, so that its introduction into the vagina is not painful. Reports as to the success of this instrument have not come out.

The diagonal conjugate is still measured in most clinics by digital examination in the vagina, as was first advised by Smellie and Baudelocque. This measurement is taken from the promontory of
metal frame as a scale (Fabre and Pouchet). The stereoscopic method of roentgenography, developed by Mackenzie Davidson, was first applied to making pelvic measurements by Hanges (41) in 1911. This method made it possible to measure the anteroposterior, oblique and transverse diameters of the inlet and also of the outlet. Since that time several modifications of this stereoscopic method have been introduced to simplify and to make it more accurate.

Thoms has published several reports on roentgen pelvimetry since he began his work in 1922. Distortion was overcome by placing the patient so that the superior strait was exactly parallel with the film. Measurements are obtained by the interposition of a calibrated lead grid in the plane of the superior strait following the removal of the patient, and a secondary flash exposure made on the same film. The size of the superior strait can thus be read directly from the film. If pelvic disproportion is suspected from the size of the superior strait a lateral exposure showing the relation of the presenting part to the pelvic brim should be made just before or at the onset of labor. A lateral view is indicated also when a rachitic pelvis is suspected or the head has failed to engage at the onset of labor. (Roentgen pelvimetry employed at various stages of labor has revealed mysteries in the mechanism of labor and causes of obstruction. These will be considered later.) Hall has developed a method of assessing cephalopelvic proportions by calculating the pelvic capacity in volume from the size of the inlet and comparing this with the determined volume of the fetal head. He has further determined the absolute rate of increase in volume of the fetal cranium which has préréa
tic value. Lateral pelvic roentgenography is the chief means of assessing pelvic disproportion by Reichenmiller. He believes the method is so accurate that the prognosis of delivery can be made on this basis alone.
A Critical Analysis of Methods of Pelvimetry

How accurate are the various methods of pelvimetry? What are the sources of errors? Are present methods of pelvimetry sufficiently accurate to permit precise prognosis of labor and to permit the formulation of a definite method of treatment? An analysis of the exactness of pelvimetry is important in order that we may know the importance and implications of a diagnosis of contracted pelvis.

Of all external pelvis measurements, that of the external conjugate is probably the most significant since it gives a clue to the anteroposterior diameter of the inlet. Baudelocque (4) believed that the true conjugate could be estimated from the ext. conjugate by subtracting 3 inches (7.6 cm.). Litzmann, however, has shown that the average difference between the two diameters was 9.5 cm., with a variation of from 7 to 12.5 cm. (±2.7 cm.). Now a variation of ±2.7 cm. is comparatively large when determining whether the pelvis is large enough to permit passage of a fetus or not. According to the editor of the British Medical Journal (25) there may be serious contraction of the true conjugate with a normal external conjugate; and conversely, small external measurements are no certain indication of a corresponding diminution of the pelvic cavity. Thoms (71) showed by roentgenometric methods that two external conjugates may differ as much as 4 cm., and yet the true conjugates be identical.

Regarding the measurement of the intercrystal diameter, many of the same errors hold true as in the preceding instance. We are dealing with the measurement of a blunt bony prominence covered by a variable
amount of soft tissue. Sheffer (71) found the transverse diameter of the inlet to be equal in certain pelvis, yet the intercristal diameters differed by as much as 3.3 cm. The interspinous diameter is of still less value than the intercristal, as the spines are subject to considerable splaying. The intertrochanteric diameter is probably the least valuable of all external diameters, because its length is determined largely by the angle which the neck of the femur forms with the shaft. External measurements of the outlet tend to be more accurate than those referable to the inlet. In taking the biischial diameter with the patient in the lithotomy position, the soft tissues can be fairly well pushed aside. This measurement is taken very close to the actual pelvic outlet. The antero-posterior diameter, however, is not as accurate as the transverse since the thickness and contour of the sacrum is subject to considerable variation.

In summarizing the accuracy of external methods of pelvimetry, it may be said that they convey a rough idea of size and shape of the pelvis. However, in many instances external measurements are not only erroneous but misleading in their indications (Thoms) (68) (71). Variations in the thickness of soft tissue and shape and thickness of the bones involved, makes an accurate estimate of the pelvic canal impossible (Bourne) (9).

The measurements obtained routinely on internal examination are the diagonal conjugate and the shape of the internal canal by digital examination. The determination of the true conjugate from the diagonal conjugate is not as accurate as formerly thought. Recently,
ments have not been satisfactory. External measurements give only a rough estimate of the size of the fetus, since these measurements are subject to errors similar to those listed under external measurements of the pelvis.

The determination of cephalopelvic proportions by impression methods such as those of Hueller, Kerr(15), and Hillis(32) has a wide degree of accuracy. Among conservative, experienced obstetricians it has given very significant results. The accuracy of this method is greatly hindered if the lower soft parts are rigid or displaced, if the lower uterine segment is distended with fore-waters, or if there is marked asynclitism or obliquity of presentation.

Roentgen methods of pelvimetry have undergone great improvements in recent years. Roentgenographic pelvimetry was, for many years, held in disrepute because they were unreliable. The roentgenograms contained distortion in the size and shape of the pelvic shadows owing to unsatisfactory technique as regards the position of the patient, the direction of the ray, and the lack of a measuring scale to overcome the distortion present on the film. Early roentgen methods required such detailed mathematical calculations that they never became popular. Thoms has been quite active in the development of more accurate methods of pelvimetry. The "Grid" method, which he developed, was found by himself to be accurate to ± 2 mm. Dippel's work (24) indicates that it is even more accurate than that. The method of Fall (2) of calculating the cephalopelvic relationship by determining, from roentgenographic study, the volume capacity of a
percentage of gynecoid pelvies in which the dimensions were listed as "average." Walsh concludes from his observations that while roentgenography may give warning that difficulty can arise in labor, it proved reliable for prognosis in only a small number of cases. Thoms, even admits that while roentgen methods of diagnosis are important, it is also essential to consider other factors in dystocia. We have, then, a highly accurate method pelvic measurement without having a method which permits accurate prognosis.

Pelvic contraction of even a major degree does not preclude pelvic delivery, nor is pelvic delivery assured in minor degrees (Fitz-gibbon)(26). That a large proportion of cases of minor pelvic disproportion occur in women possessing normal pelvies, was brought out by Brown (12). Other factors besides the size of the maternal pelvis and the fetal cranium are involved in dystocia. The pelvimeter is no barometer which forecasts the manner in which the presenting part will engage nor indicate the frequency and strength of the uterine contractions. Cummings (22) discusses the importance of the malleability of the head, the rigidity of the cervix and the strength of the labor pains.

In concluding this discussion, it should be emphasized that bony disproportion is only one phase of dystocia, and that in order to attempt to prognose any given case requires not only accurate pelvimetry, but an estimation of other conditions pertaining to delivery such as the factors mentioned above, (and discussed in detail in ch. IV).
VI. Management of Contracted Pelvis

How shall we manage the pregnant woman who possesses a contracted pelvis to deliver her with the greatest degree of safety to herself and to the unborn child?

Physicians have been trying to answer this question since it was first recognized that contractions of the pelvis existed and that they might be responsible for some of the cases of difficult labor. The question remains today, a storm center of obstetrics.

Various procedures and operations have been developed over the past 200 years to aid in the treatment of contracted pelvis; and undoubtedly more casualties have occurred in the parturients and their children from well-intended but ill-advised procedures of interference, than would have occurred without their use. Internal version was introduced in 1722, by De la Lotte, for contraction of the inlet. Contracted pelvis was so feared by William Cooper (1722), that he strongly advised therapeutic abortion in women so afflicted. In instances in which the external (Baudelocques') conjugate or diagonal conjugate were appreciably shortened, Baudelocque (1775) advised either podalic version or extraction of the head with forceps, depending upon how far labor had progressed. The first symphysiotomy on a living woman was performed by Jean Sigault (1777). The prognosis to the child was thus improved; but many women developed serious tears, rupture of the bladder, and not infrequently died. Artificial premature labor was advocated by Thomas Denman (1788) for pelvic disproportion. The low cervical cesarean section was (43).
invented by Osiander (1805). Although this procedure has proved very useful today, it fell into disrepute shortly after its original introduction due to a number of bad results. Extraperitoneal cesarean section was first introduced by Mitgen (1821) in an attempt to overcome the danger of peritoneal infection. In cases in which the uterus is suspected of being infected, this operation is of great value. The combined podalic version was first described by Braxton Hick's (1863) and was soon adopted for use in cases of dystocia. Various types of forceps had been in use for some time before axis-traction forceps were developed by Stephene Larmier (1877). These forceps, devised for use in high transverse arrest have always been accompanied by a high morbidity of both mother and child. The value of deep episiotomy in cases of difficult labor was established by Duehrssen (1887). He is also responsible for the introduction of the vaginal cesarean section. It was about the time that Duehrssen came out with his operative procedure that the so-called "surgical era" of obstetrics began. (The information for this brief history was obtained from DeLee (80), from Jarcho (41) and one or two individual sources.)

Any discussion of the management of contracted pelvis falls naturally into two divisions: (1) care during pregnancy, and (2) treatment at time of delivery. In this discussion only the more commonly employed procedures of today will be presented.

During pregnancy every woman should receive a complete pelvic and pelvimetric examination. (External pelvimetry of the inlet is
ment of a moderately contracted pelvis in which the parturient is permitted to go into spontaneous labor, under careful observation, to see what she will accomplish without intervention.

But how long shall the patient be allowed to remain in labor without intervention? Shall she remain in labor until full dilatation of the cervix develops, or until the membranes rupture? These questions as to what constitutes a trial of labor draw different answers from nearly every obstetrician. A trial of labor has been given, according to Cummins (22), if after 4 to 5 hrs of active labor with the membranes intact, the head doesn't come down below the lower border of the symphysis. It is fair, then, to assume that labor will not go normally, and that delivery from below will be done only with difficulty and danger to mother and child. Dourne (6) defined a trial labour as a labour which is being closely watched with a view to terminating it by cesarean section should the head not engage and descend. Williams (78) believes that the patient should go through a 2-hour second stage for a real determination of the possibility of vaginal delivery. A trial of labor is not intended as a battle between the fetal skull and the bony pelvis, in which we hope that the skull will collapse before the uterus gives out. It is rather the provision of an opportunity for a deflexed head or a conical lower uterine segment to readjust themselves, and for the increasing tension on the cardinal ligaments to draw down the uterus and its contents. (Walker)(76). King (46) emphasizes the importance of the strength and frequency of labor pains in his concept. He feels that an adequate test has been given when, after strong pains have established themselves every 5 to 10 minutes, and lasting 30 to 60 seconds, labor has proceeded for from
yet moulded, or by rigid soft parts. It is this difficulty in being
certain of a bony pelvic disproportion accounts for the extensive use
of a test of labor by Brown (12). He specifies a true conjugate of
9.1 cm. as the lower limit for the use of a test labor. A series of
1980 cases of pelvic contraction has been reported Livchina (17) in
which a trial of labor was used. (Any pelvis with ext. conjugate less
than 12 cm. is considered contracted.) Delivery was spontaneous in
1612 instances, or 81.5%. No maternal deaths occurred in this group.
There were 59 stillborn infants (3.8%). His series indicates a consider-
ably high percentage of spontaneous deliveries than recorded by most
authors, possibly due to his loose standard of a contracted pelvis. A
group of 551 contracted pelvis was tabulated (and delivered) by Browna
(11). The results were as follows: 254 patients delivered spontaneously;
72 cases (20.5%) required cesarean section; the maternal mortality
was 1.7%, and the infant mortality amounted to 6.8%. Kerr (45) uses
trial of labor in a large percentage of cases in which his impression
that indicates may give dystocia in labor. He believes that the fetal
death rate is not over 2 to 3% if disease, malformation, and prematur-
ity be excluded. It is employed on the understanding that at any time
in the course of labor intervention by cesarean section may be necessary
and he finds it necessary in only 6 to 10% of cases. Thomas (74) has
presented one of the few series of cases in which trial labor were used
that have been checked by roentgenography. His series of cases is class-
ified according to the pelvic types, however, and not according to the
ordinary standards of adequate and contracted pelvis. Operative inter-

(50)
vention was required in 18.9% of cases. Cesarean section was resorted to 15 times (2.5%), 9 cases of which were performed by election. The corrected fetal mortality of the entire series was 0.82%. These figures all seem somewhat high to the writer, especially in view of the fact that these cases represent 800 "consecutive" deliveries, and not 600 cases of contracted pelvis or disproportion. A group of 400 cases of women, with contracted pelvis or who manifested disproportion, was reported by Walsh (77). Storoareontgenography was used in all these cases. Of these 400 cases considered to be contracted, only 25.5% actually developed dystocia. The operative intervention in all types of contraction averaged only 18.9%. Borderline cases of pelvic contraction (C.V. of 8-10 cm.) are routinely given a test of labor by Beck (5). He believes that if after the onset of labor, the presenting part can be forced to within 1 cm. of the ischial spines, that vaginal delivery may be expected. The value of roentgen pelvimetry of determine absolute disproportion is not granted by Nixon (52). He sites a case of his own in which definite disproportion had been so demonstrated, which went into labor and delivered with ease.

The advantages of trial of labor as a practical procedure in contracted pelvis are as follows:

1. It gives women with a suspected disproportion an opportunity to see what nature can accomplish without intervention.

2. A large percentage of these patients will deliver spontaneously.

3. In a carefully regulated test of labor the risk to the mother
should be no greater, or only slightly greater, than in normal labor with an adequate pelvis.

4. The fetal mortality, in general, is considerably better than that for cases in which induction of premature labor has been performed.

5. It is impossible to tell at the 36th week whether the head will or will not pass through the pelvis in borderline cases.

The use of cesarean section in the treatment of disproportion has its absolute and its relative indications. (The interpretation of the words "absolute" and "relative" vary from one author to the next.) In this discussion we will consider cesarean section as a primary treatment, i.e. performed before the onset of labor.

The use of cesarean section by Fitzgibbons (23) is limited to marked disproportion, in which the head will not enter the inlet when the impression test is used. A true conjugate of 7 cm. or less is considered as absolute indication by Cragin (21) for section if the child is living. A true conjugate of 5 cm. or less (very rare) is considered as an absolute indication for cesarean section regardless of whether the child is alive or dead. A very low incidence cesarean section, for absolute indications, was reported by Bailey and Williamson (5). They performed only 5 cesarean operations in a group of 676 cases of pelvic contraction. Only 24 instances of cesarean section, for relative indications, were performed. In 471 cases of contracted pelvis reported by McGoogan (35), cesarean section was performed in 104 instances. There were no maternal deaths, and the fetal death rate was only 2.3%. These figures, which indicate the low risk now involved in cesarean
VII. Why Use Trial of Labor?

Having considered the three more common forms of treatment, and their advantages, the question now arises: When shall we use each of these procedures?

The drawbacks to induction of premature labor proved to be so numerous, that this procedure will not be considered. It is the author's impression that this operation has no place in the treatment of contracted pelvis.

Elective cesarean section is by all odds the procedure of choice when absolute disproportion is present. No other procedure equals it in the safety to both mother and child which can be obtained by an experienced operator with by cervical cesarean section. Some men believe that elective cesarean section should be used in all instances of suspected disproportion. The drawbacks to any such universal surgical treatment have been presented in the last chapter. That indications do exist in which it is better judgement to do a cesarean section than to permit a trial of labor is granted. If the mother is suffering from some constitutional disorder such as a toxemia of pregnancy, hyperthyroidism, some cardiac disfunction, or tuberculosis, it is frequently a wise policy to perform cesarean section under spinal or local anesthetic. Abnormal presentations of the fetus such as a breach, shoulder or transverse presentation in addition to disproportion, frequently require cesarean section. Cesarean section should be used only when it is known that a normal, viable fetus is present in the uterus. Fetal monsters or stillbirths should be delivered by embryotomy or
in secondary cesarean section is increased with every hour after the rupture of membranes, and with every added examination and intervention which has been done before the cesarean section. Kerr (45) advocates the use of craniotomy after failed forceps even if the fetus is living, in an attempt to reduce maternal mortality. The Letzko extraperitoneal cesarean section or the Porro cesarean section with exteriorization of the uterus offer a good prognosis in infected cases. The difficulty here is the technic involved. LaGoogan used version and extraction in several cases with a fetal mortality of 28.5% in the prophylactic operations, and a mortality of 66.6% in emergency operations. In general version and extraction do not give results comparable to other procedures.
X. Conclusions

1. Contracted pelvis and pelvic disproportion represent only one of several conditions which may be responsible for dystocia in labor.

2. The various shapes of the internal pelvis found in the various types of pelvises exert an influence on the course and mechanism of labor.

3. Measurement of the diagonal conjugate, and of the transverse and anteroposterior diameter of the outlet are the only clinical measurements which give an estimate of the size of the birth canal.

4. Roentgenographic pelvimetry has introduced a hitherto unknown accuracy to pelvimetry.

5. No method of pelvimetry can be used alone on which to base the prognosis of labor, as many other factors are involved.

6. Contracted pelvis exerts a deleterious effect on the course of labor only when the size of the fetal head involved shows disproportion to the pelvis through which it must pass.

7. Contracted pelvis is commonly treated by any one of three procedures: (1) induction of premature labor, (2) trial of labor, (3) cesarean section.

8. Trial of labor offers a procedure with a comparative high rate of spontaneous delivery, and a low rate of operative intervention. In moderately contracted pelvises, it is definitely to be preferred to either induction of premature labor or elective cesarean section.

9. A trial of labor should be so conducted that the risk to the
mother is not increased, or only slightly so, if operative intervention becomes necessary.

10. The "failed test of labor" may be treated by forceps, or by low cesarean section. Craniotomy should be performed if the child is dead.
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