МИНИСТЕРСТВО ЗДРАВООХРАНЕНИЯ РЕСПУБЛИКИ БЕЛАРУСЬ

УЧРЕЖДЕНИЕ ОБРАЗОВАНИЯ
«ГОМЕЛЬСКИЙ ГОСУДАРСТВЕННЫЙ МЕДИЦИНСКИЙ УНИВЕРСИТЕТ

Кафедра акушерства и гинекологии

О. А. ТЕСЛОВА

НОРМАЛЬНЫЕ И ЗАТРУДНЕННЫЕ РОДЫ

Учебно-методическое пособие на английском языке
для студентов 4 и 6 курсов лечебного факультета
и факультета по подготовке специалистов для зарубежных стран
медицинских вузов

NORMAL AND OBSTRUCTED LABOR

Teaching workbook in English
for 4thand 6th year students of the Faculty of General Medicine
and the Faculty on preparation of experts for foreign countries
of medical highest educational institutions

Гомель
ГомГМУ
2014

УДК 618.4/.5(07)=111
ББК 57.161.2+57.162.2 (2Англ) я73
Т 36

Рецензенты:
доктор медицинских наук, профессор,
профессор кафедры акушерства и гинекологии
Белорусского государственного медицинского университета
Е. И. Барановская;
кандидат медицинских наук,
заведующий обсервационным отделением
Гомельской городской клинической больницы № 2
Е. Л. Лакудас

Теслова, О. А.

Т 36 Нормальные и затрудненные роды: учеб.-метод. пособие на английском языке для студентов 4 и 6 курсов лечебного факультета и факультета по подготовке специалистов для зарубежных стран медицинских вузов = Normal and obstructed labor: teaching workbook in English for 4th and 6th year students of the Faculty of General Medicine and the Faculty on preparation of experts for foreign countries of medical highest educational institutions / О. А. Теслова; ред. англ. яз. В. В. Аверьянова. — Гомель: ГомГМУ, 2014. — 68 с.

ISBN 978-985-506-649-2

В учебно-методическом пособии кратко изложены и проиллюстрированы основные биомеханизмы родов в норме и при патологии, классификации, принципы диагностики и акушерская тактика при затрудненных родах.

Пособие может быть использовано студентами 4 и 6 курсов, обучающимися на английском языке для подготовки к текущей и итоговой аттестации по акушерству, а также студентами, обучающимися на русском, клиническими ординаторами, аспирантами и врачами акушерами-гинекологами для углубления знаний по акушерской терминологии на английском языке.

Утверждено и рекомендовано к изданию научно-методическим советом учреждения образования «Гомельский государственный медицинский университет» 19 февраля 2014 г., протокол № 2.

УДК 618.4/.5(07)=111
ББК 57.161.2+57.162.2 (2Англ) я73

ISBN 978-985-506-649-2

CONTENTS

ABBREVIATIONS

AC — abdominal circumference
BP — blood pressure
BPD — biparietal diameter
cm — centimeter
CT — computed tomographic scanning
CTG — cardiotocography
EFW —estimated fetal weight
e.g. — example
etc. — etcetera
FH — fundus height
FHR — fetal heart rate
Fig. — figure
FL — femur length
g — gram
g.a. — gestational age
HR — heart rate or pulse
IVF — in vitro fertilization
kg — kilogram
LGA — large for gestational age
MRI — magnetic resonance imaging
Rh — rhesus
USG — ultrasonography
X-ray— roentgen ray

PREFRACE

For the successful implementation of specialized obstetrical knowledge into practice it is fundamentally important to understand the processes and phenomena occurring throughout childbirth.

Three-dimensional interaction design «mother-fetus» during childbirth involving the fourth dimension — time, creates difficulties in understanding for the students. However, the generalization of the differences, specific to various types of delivery, uniforms laws, allowing formulating a comprehensive holistic view of childbirth, and applying this knowledge to choose the optimal strategy of diagnostic and medical actions.

This book provides basic information on the main types of the biomechanism of normal and pathological labor, possible causes and common complications. The main methods of diagnosis of pathological conditions, features of pregnancy and childbirth are described. Practical manuals are maximally illustrated. All information is possibly adapted to the nomenclature used in the Republic of Belarus.

1. NORMAL LABOR

The most important factors that influence trial and outcome of labor are:

- Maternal pelvis: its shape and diameters of planes
- Expulsive forces: uterine contractions and mother's bearing down efforts
- Fetus: its size, position and presentation

The result of the interaction of these components is the biomechanism of labor.

Biomechanism of labor is the set of movements made by the fetus during passage through the birth canal of the mother (Figure 1).

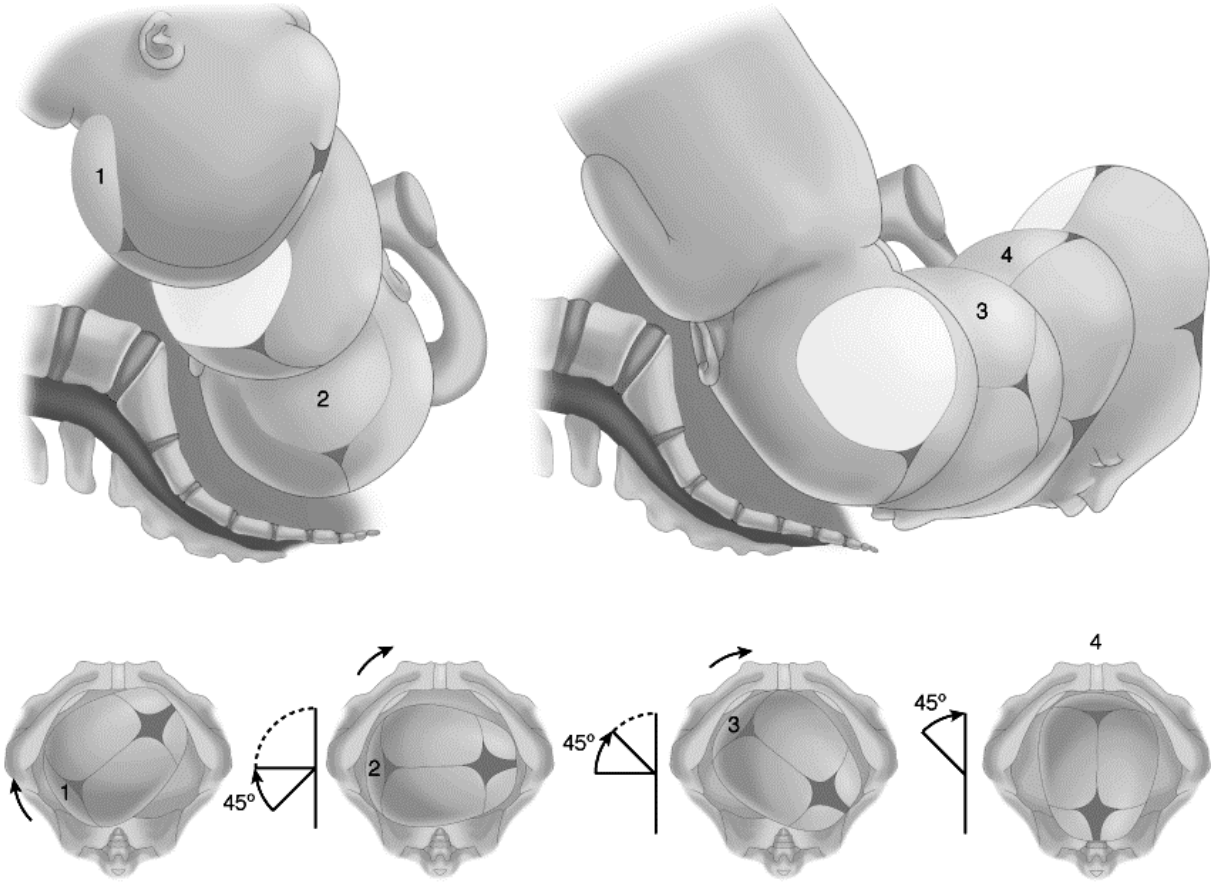

Figure 1 — Example of the biomechanism of labor

1.1. MATERNAL-FETAL ANATOMY

1.1.1. NORMAL PELVIS FROM AN OBSTETRICAL VIEWPOINT

The pelvis is composed of four bones: the sacrum, coccyx, and two innominate bones. They are united together by four joints — two sacroiliac joints, sacrococcygeal junction and symphysis pubis.

The *false pelvis* lies above the linea terminalis and the *true pelvis* is below this anatomical boundary (Figure 2). Exactly the true pelvis is the part important in childbearing.

The sizes of the false pelvis determine the capacity and the shape of the true pelvis. Four basic diameters of false pelvis are available for direct measurements by a pelvimeter – external pelvimetry (Figure 3).

1. *Distantia spinarum* is a distance between antero-superior spines of iliac bones which is usually 25–26 cm (Figure 3-A).

2. *Distantia cristarum* is a distance between the most prominent points of crests of iliac bones which averages to 28–29 cm (Figure 3-Б).

3. *Distantia trochanterica* is a distance between trochanters of femurs which is 30–31 cm (Figure 3-B).

4. *External conjugate* is measured between the upper-outer edge of the symphysis anteriorly and the suprasacral fossa posteriorly. Its normal length is 20–21 cm (Figure 3-Г).

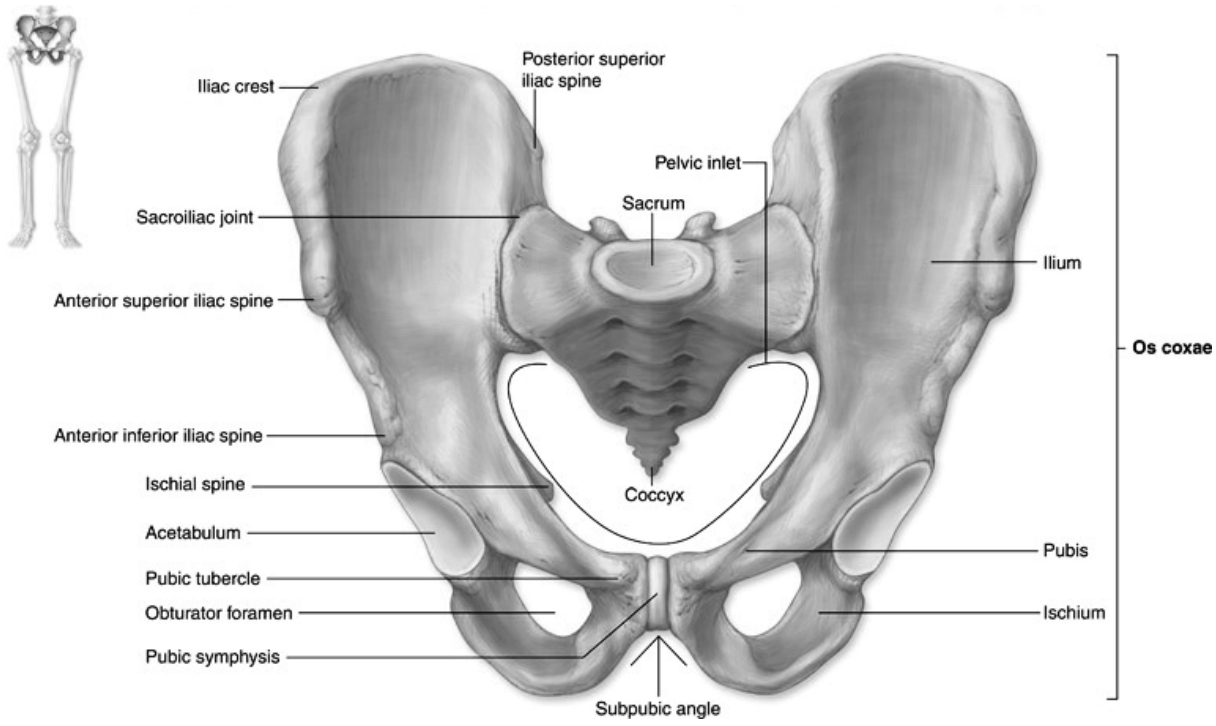

Figure 2 — False and true pelvis

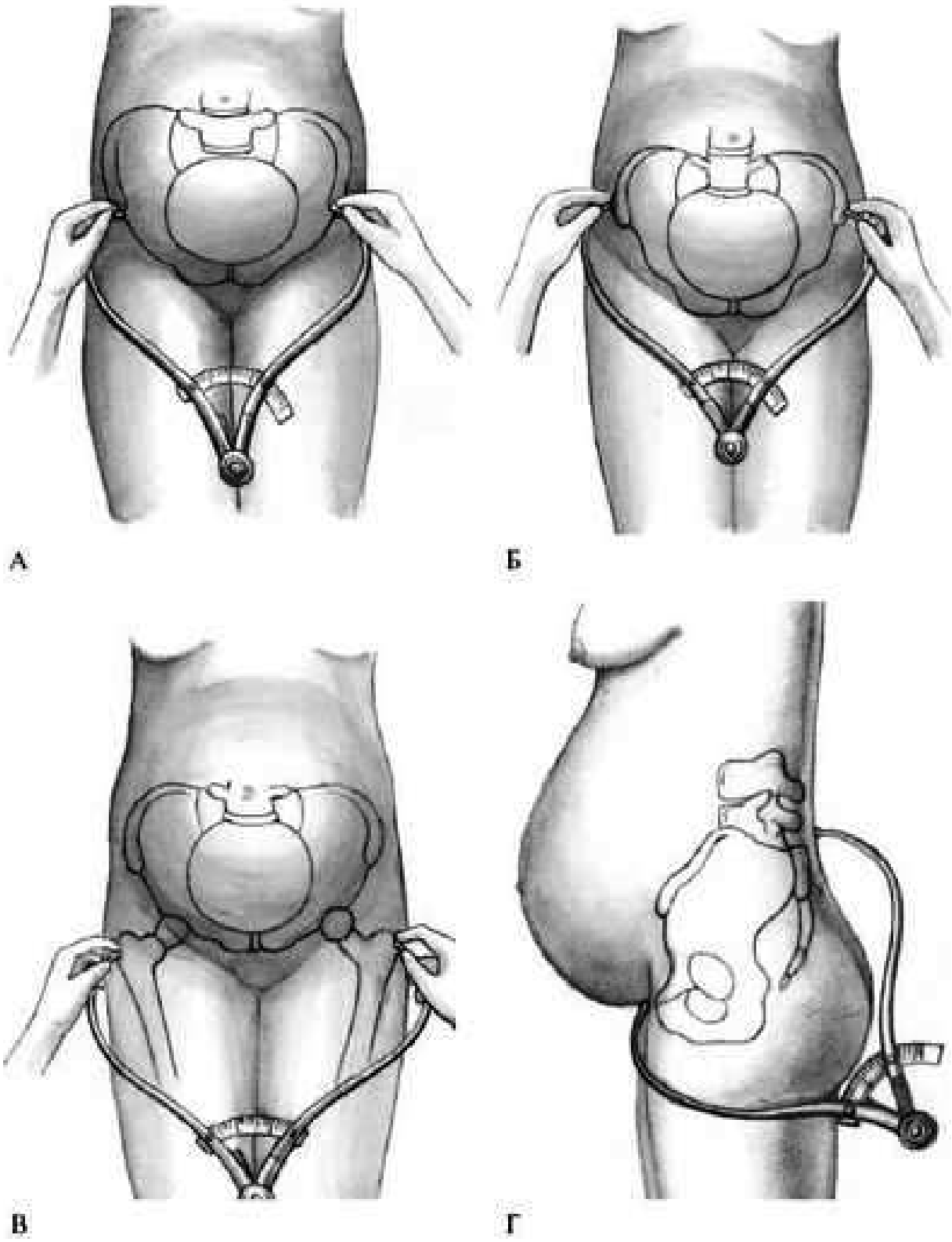

Figure 3 — External pelvimetry

The true pelvis is bounded above by the promontory and alae of the sacrum, the linea terminalis and the upper margins of the pubic bones and below

by the pelvic outlet. The cavity of the true pelvis can be described as an obliquely truncated bent cylinder with its greatest height posteriorly.

The true pelvis is described as having four imaginary planes:

1. *The plane of the pelvic inlet* is formed by the upper inner edge of the pubic symphysis anteriorly, linea terminals laterally, and the promontory of the sacrum posteriorly. The inlet of the female pelvis typically is transversely ovoid with antero-posterior diameter 11–11.5 cm (Figure 4-1, Figure 5), oblique diameter 12 cm, and transverse diameter 13 cm (Figure 5).

2. *The plane of the greatest pelvic dimension* is bounded by the middle of the inner surface of the symphysis pubis anteriorly, the internal surfaces of the acetabulums laterally, and the junction of the second and third sacral vertebrae posteriorly. It is the roomiest plane of the pelvis and is almost round in shape. Its antero-posterior and transverse diameters are equal and measure 12–12.5 cm (Figure 4-3, Figure 6).

3. *The plane of the midpelvis* is the least pelvic plane and is formed by the lower edge of the symphysis pubis anteriorly, ischial spines laterally and tip of the sacrum posteriorly. Its antero-posterior diameter is above 11 cm (Figure 4-4); the transverse (bispinous) diameter is the smallest pelvic diameter and it measures 10.5 cm. The shape of this plane is longitudinally ovoid.

4. *The plane of the pelvic outlet* has the following boundaries: pubic arch anteriorly, ischial tuberosities laterally and the apex of coccyx posteriorly. The diameters of the pelvic outlet usually are described in the following way: the antero-posterior is up to 11.5 cm (Figure 4-5, Figure 4-6) and transverse is 11 cm (Figure 7).

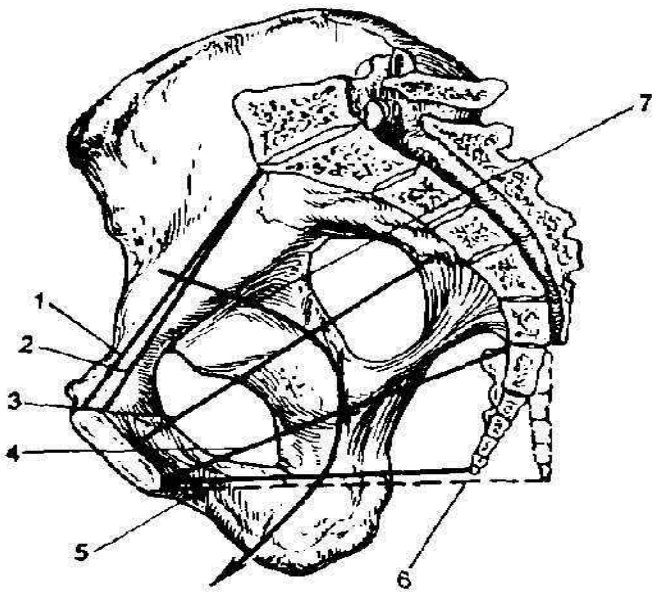

Figure 4 — Sagittal view of the planes of pelvis

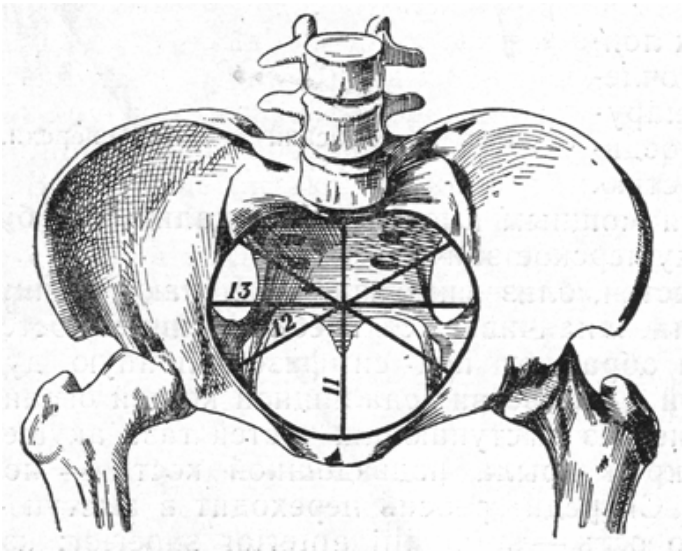

Figure 5 — The plane of the pelvic inlet

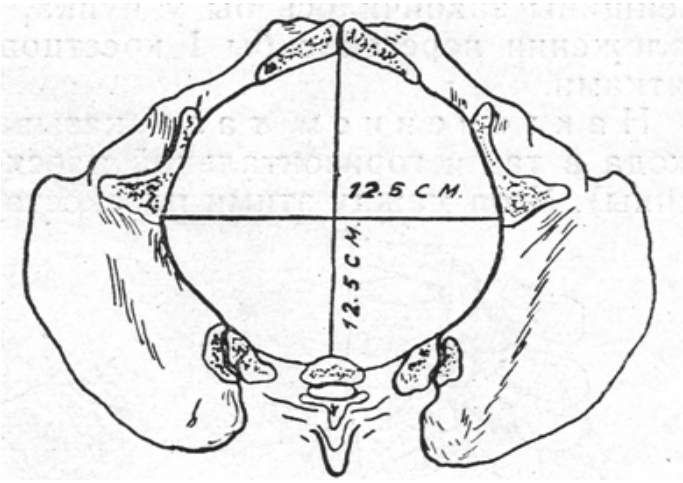

Figure 6 — The plane of the greatest pelvic dimension

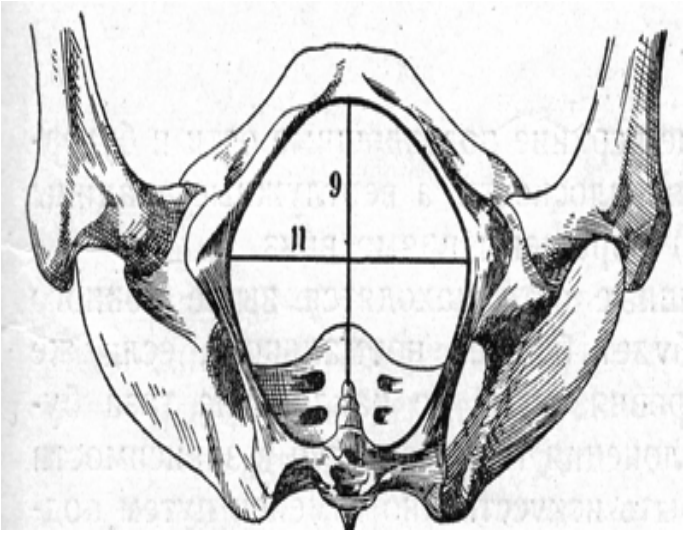

Figure 7 — The plane of the pelvic outlet

Only the diameters of the pelvic outlet can be measured directly. From the obstetrical viewpoint the most important internal diameter of pelvis is the *obstetrical conjugate*.

*Obstetrical conjugate (*or *true conjugate)* is the shortest distance between the promontory of the sacrum and the symphysis pubis. Normally, it measures 11 cm or more (Figure 4-2).This diameter is distinct from the antero-posterior diameter of the pelvic inlet that has been identified as the *true conjugate*. The obstetrical conjugate cannot be measured directly with the examining fingers or pelvimeter. For clinical purposes, the obstetrical conjugate is estimated indirectly; the methods are:

1. By *diagonal conjugate*, this is determined by measuring the distance from the lower margin of the symphysis to the sacral promontory during the vaginal investigation (Figure 8). Normally it measures 13 cm. To obtain the length of obstetrical conjugate subtract 1.5-2 cm from the diagonal conjugate.

2. By *external conjugate*, this is measured by external pelvimetry (normally 21 cm). One should subtract 9 cm from the length of external conjugate to assess the length of true conjugate (Figure 9).

3. By *longitudinal diagonal of Michael's rhombus*, it measures 11 cm and is equal to obstetrical conjugate. Michael's rhombus contour is visible on the lower woman back (Figure 10).

Figure 8 — Investigation of the diagonal conjugate

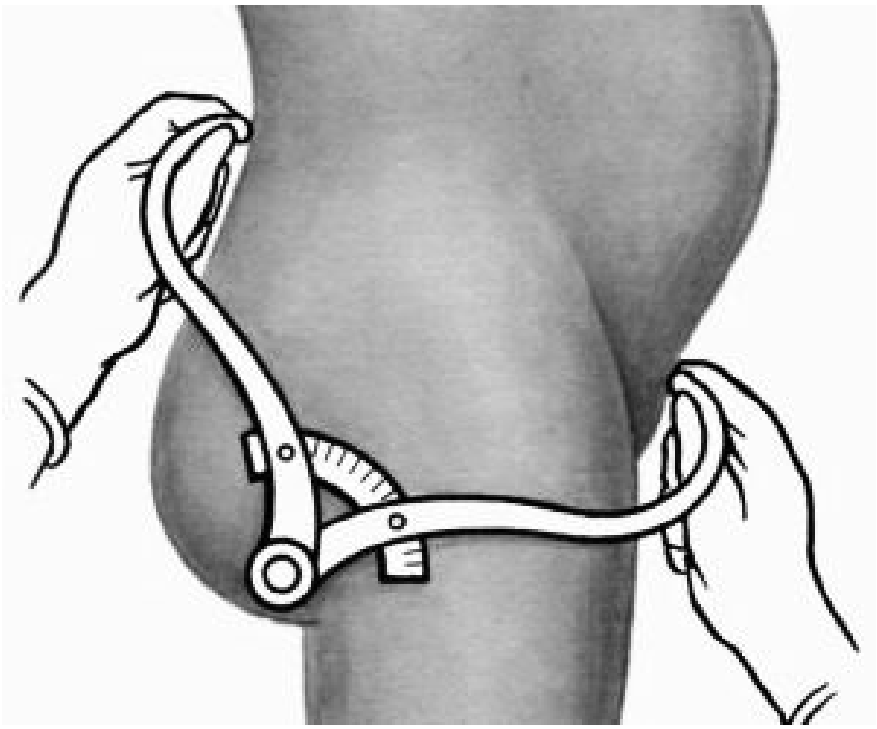

Figure 9 — Measurement of the external conjugate

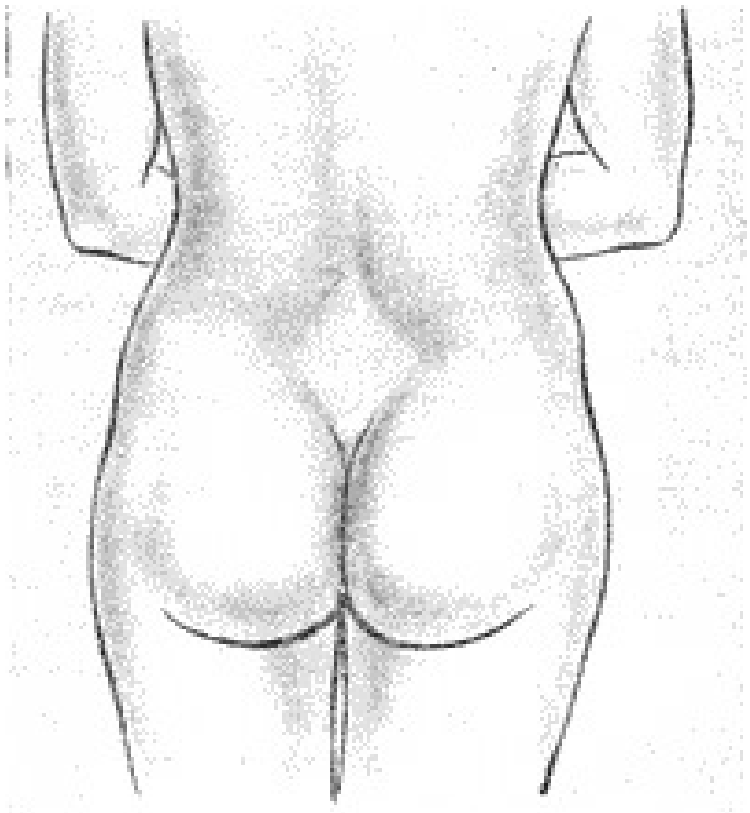

Figure 10 — The Michael's rhombus

1.1.2. FETUS AS AN OBJECT OF LABOR

From an obstetrical viewpoint, the fetal head size is the most important because an essential feature of labor is the adaptation between the head and the maternal bony pelvis. At term only a comparatively small part of the head is represented by the face. The rest of the head is composed of the firm skull, which is made up of two frontal, two parietal and two temporal bones, along with the upper portion of the occipital bone and the wings of the sphenoid (Figure 11). These bones are separated by membranous spaces, or sutures. The most important sutures are:

1. *The frontal suture* lies between the two frontal bones.
2. *The sagittal* (or *longitudinal*) *suture* separates the two parietal bones.
3. *The* two *coronal sutures* run between the frontal and parietal bones.
4. *The* two *lambdoid sutures* are between the parietal and the occipital bones.

Where several sutures meet, an irregular space forms, which is enclosed by a membrane and designated as fontanels:

1. *The anterior* (or *greater*) *fontanel* (or *bregma*) is a lozenge-shaped space that is situated at the junction of the sagittal and the coronal sutures.
2. *The posterior* (or *lesser*) *fontanel* is a small triangular area at the intersection of the sagittal and lambdoid sutures.
3. *The temporal* (or *casserian*) *fontanels* have no diagnostic significance.

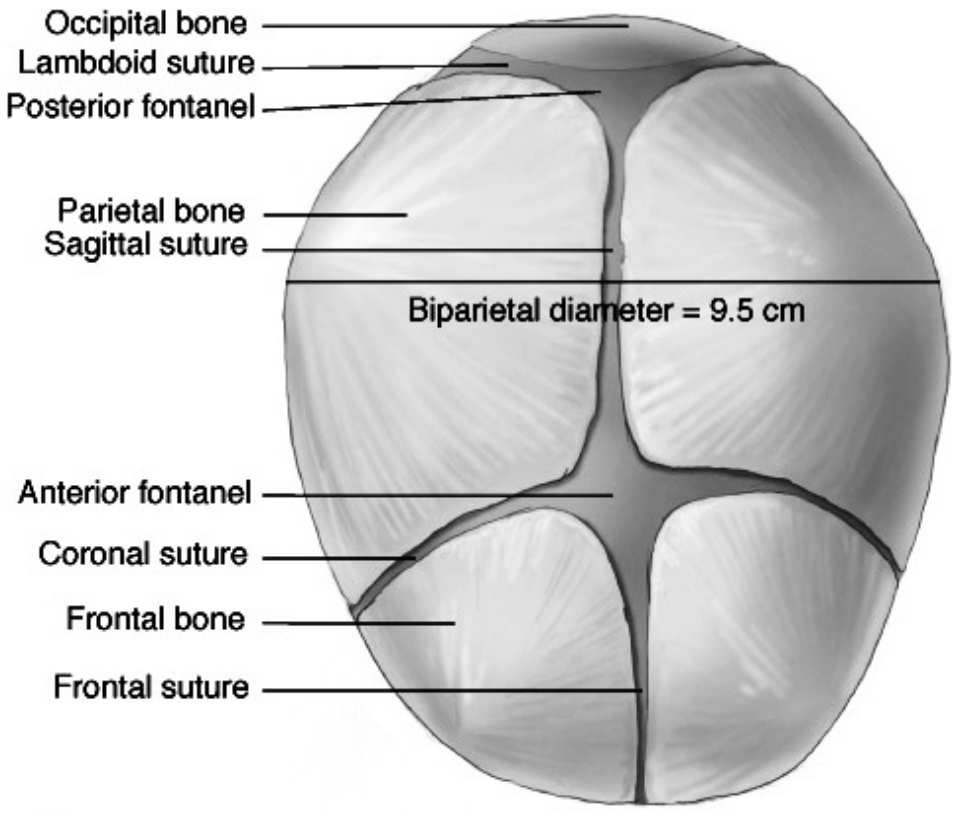

Figure 11 — Sutures and fontanels of the fetal skull

Thereby the fetal skull is arbitrarily divided into several zones of obstetrical significance (Figure 12):

1. *Face* is an area bounded superiorly by the root of the nose and supra-orbital ridges and inferiorly by the junction of the head to the neck.

2. *Brow* (or *sinciput*) is an area bounded superiorly by the anterior fontanel and coronal sutures and inferiorly by the root of the nose and supra-orbital ridges.

3. *Vertex* is bounded by the anterior fontanel and coronal sutures anteriorly and by the posterior fontanel and lambdoid sutures posteriorly.

4. *Occiput* is an area bounded by the posterior fontanel and lambdoid sutures superiorly and the base of the skull inferiorly.

It is customary to measure certain critical diameters (dimensions) and circumferences of the newborn head (Figure 12). These diameters include:

1. *The suboccipito-bregmatic* (9.5 cm), which follows a line drawn from the nape of the neck (suboccipital fossa) to the center of the anterior fontanel (bregma).

2. *The suboccipito-frontal* (10 cm) is a line from the nape of the neck (suboccipital fossa) to the anterior edge of the anterior fontanel.

3. *The occipito-frontal* (11.5 cm), which follows a line extending from theoccipital protuberance to the root of the nose.

4. *The occipito-mental* (12.5 cm), which extends from the most prominent portion of the occiput to the chin.

5. *The submento-bregmatic* (9.5 cm) is a line from the center of the anterior fontanel (bregma) to the point below chin.

6. *The biparietal* (9.5 cm), the greatest transverse diameter of the head, which extends from one parietal bone to the other.

7. *The bitemporal* (8.0 cm), which is the greatest distance between the two temporal sutures.

Other important diameters of the fetal body are:

1. *The bisacromial diameter* (12 cm) is the distance between the outermost points of the fetal shoulders.

2. *The bitrochanteric diameter* (9 cm) is the distance between the trochanters of the fetal femurs.

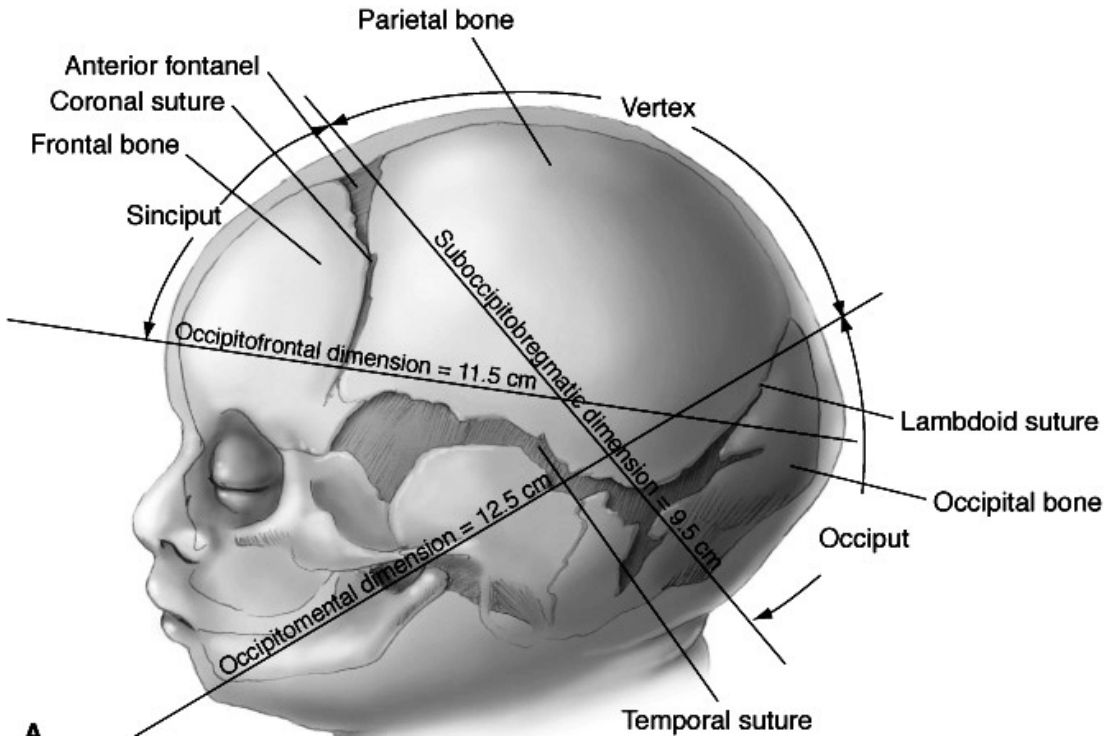

Figure 12 — Diameters of the fetal skull

At the onset of labor, the position of the fetus with respect to the birth canal is critical to the route of delivery. Fetal orientation relative to the maternal pelvis is described in terms of fetal lie, presentation, attitude and position.

1. *Fetal posture* is a relationship between different parts of the fetal body and head inside the uterus. Normal fetal posture is considered to be *flexed* when the fetus becomes folded or bent upon itself in such a manner that the back becomes markedly convex; the head is sharply flexed so that the chin is almost in contact with the chest; the thighs are flexed over the abdomen; and the legs are bent at the knees, and the arms are usually crossed over the thorax or become parallel to the sides. Pathological type of fetal posture is extended.

2. *Fetal lie* is the relation of the fetal long axis to that of the mother. Normally these two axes are congruent and that is called *longitudinal* lie. Pathological lies including the transverse and oblique ones are described in Chapter 9.

3. *Fetal presentation* is the relation of the portion of the fetal body that is the foremost within the pelvic inlet. The normal type of presentation is *cephalic occipital.* Pathological types include extended cephalic (malpresentation), breech and shoulder presentations, which are described below.

4. *Fetal position* is the relationship of the fetal back to the right or left side of the uterus. Accordingly, there may be two positions – left (L or the first) or right (R or the second) in each presentation. Other varieties of the fetal position are the direction of the fetal back more anteriorly (A type), posteriorly (P type) or transversely (T type).

So for the accurate orientation, the relationship of a fetus to the maternal pelvis is considered. For example occiput presentation (O) may be described as it is done on Figure 13 (abbreviated in clockwise fashion).

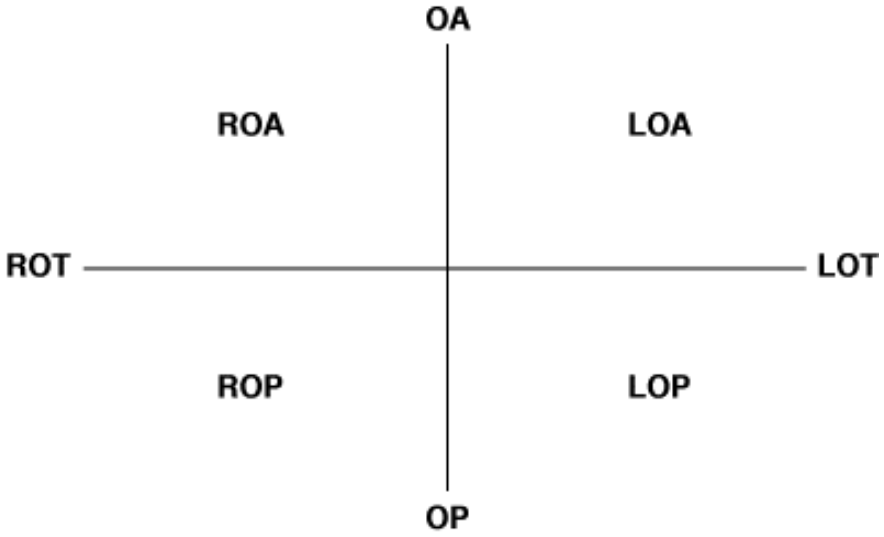

Figure 13 — Fetal position types in occipital presentation

Approximately two thirds of all occiput presentations are in the left antero-occipital (LOA) presentation, and one third is in the right antero-occipital (ROA) – these are considered to be absolutely normal (Figure 14).

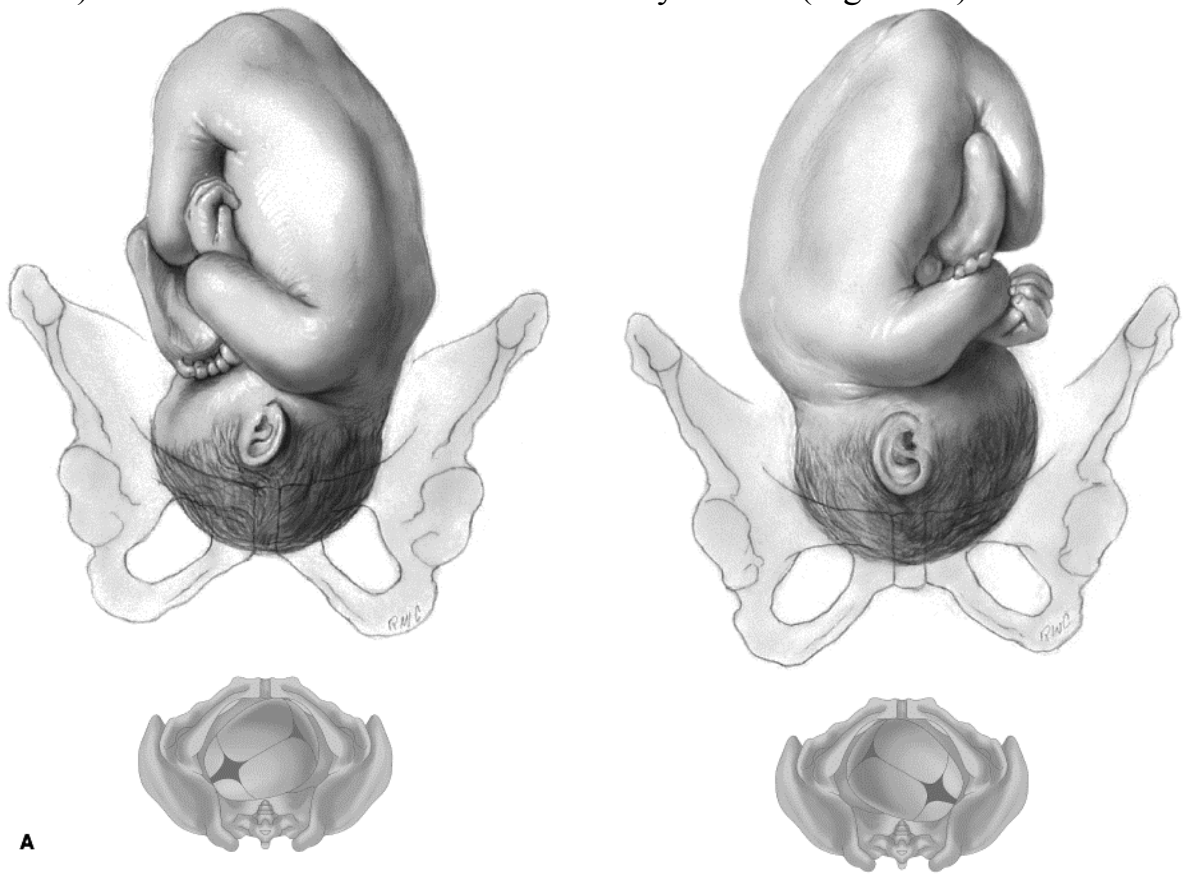

Figure 14 — Left antero-occipital (LOA) and right antero-occipital (ROA) presentations

The diagnosis of fetal lie, presentation and position is very important to predict the outcome of labor but it is not very difficult nowadays. The methods are:

1. *Leopold maneuvers* are an external obstetrical abdominal examination (Figure 15). The mother lies supine and is comfortably positioned with her abdomen bared and the doctor starts sitting on her bed facing her face.

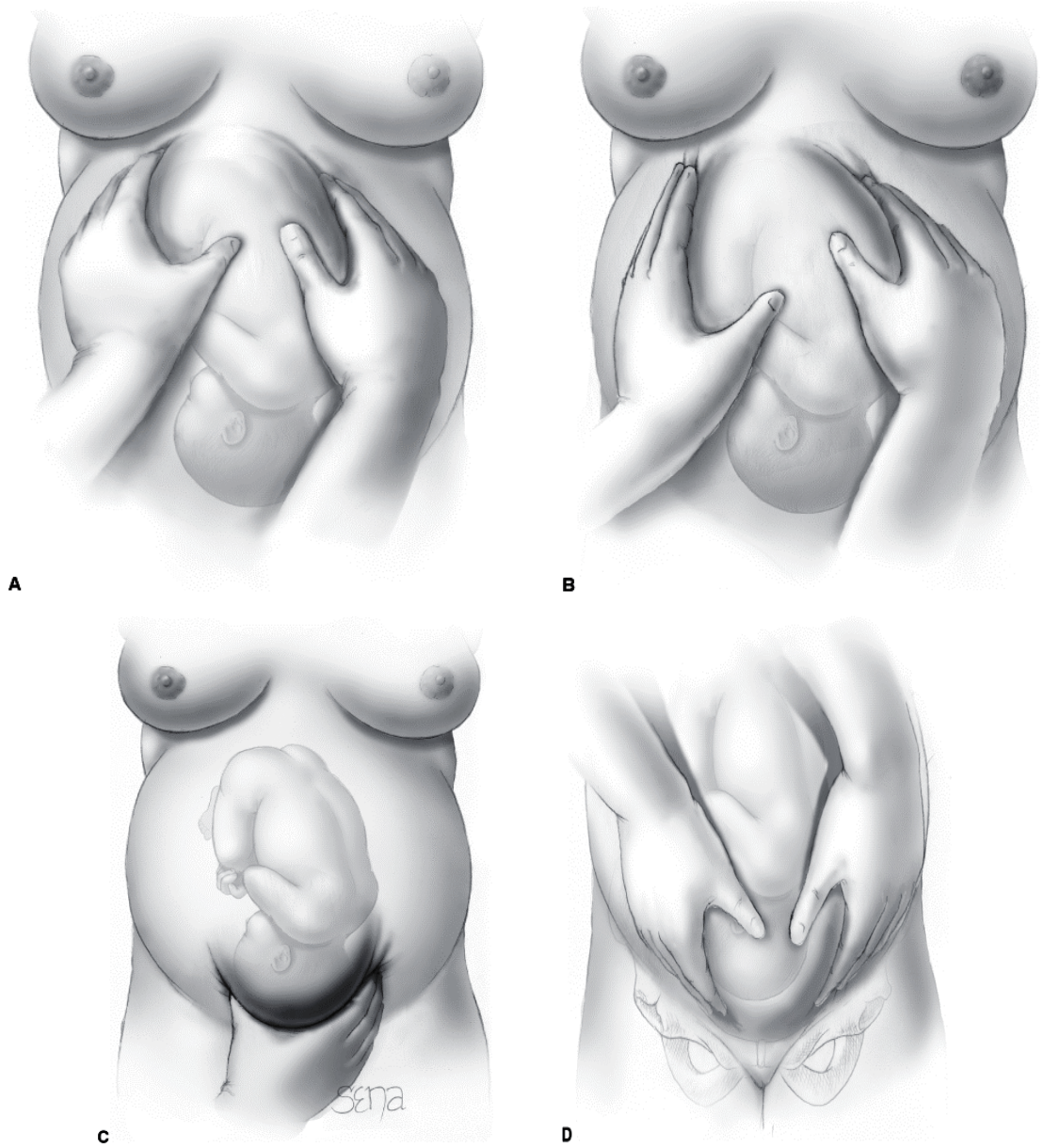

Figure 15 — Leopold maneuvers

The first maneuver permits to identify which fetal pole occupies the uterine fundus and fundus height. An obstetrician applies his hands on the uterine fundus. The head is felt as hard, round and more mobile and ballottable whereas the breech gives the sensation of a large, nodular mass.

The second maneuver allows determining fetal lie and position. The palms are placed on either side of the maternal abdomen, and gentle but deep pressure

is exerted. On the one side, a hard, resistant structure is felt – the fetal back. On the other, numerous small, irregular, mobile parts are felt – the fetal extremities.

The third maneuver is performed to determine fetal presentation. Doctor grasps with the thumb and fingers of one hand the lower uterine segment just above the symphysis pubis. If the presenting part is not engaged, a movable mass will be felt, usually the head. The differentiation between head and breech is made as in the first maneuver.

The *fourth maneuver* is necessary to do during labor to determine the engagement of the presenting part into the birth canal. The examiner faces the mother's feet and, with the tips of the first three fingers of each hand, exerts deep pressure in the direction of the axis of the pelvic inlet.

2. *Vaginal investigation* allows determining the type of fetal presentation and position of presenting part (Figure 16). Before labor, the diagnosis of fetal presentation and position by vaginal examination is often inconclusive because the presenting part must be palpated through a closed cervix and lower uterine segment. At the onset of labor and after cervical dilatation, vertex presentations and their positions are recognized by palpation of the various fetal sutures and fontanels. Face and breech presentations are identified by palpation of the facial features and the fetal sacrum, respectively.

The examiner inserts two fingers into the vagina and the presenting part is found. If the vertex is presenting, the fingers are directed posteriorly and then swept forward over the fetal head toward the maternal symphysis. During this movement, the fingers necessarily cross the sagittal suture and its course is delineated. The positions of the two fontanels then are ascertained. The fingers are passed to the most anterior extension of the sagittal suture, and the fontanel encountered there is examined and identified. Then, with a sweeping motion, the fingers pass along the suture to the other end of the head until the other fontanel is felt and differentiated.

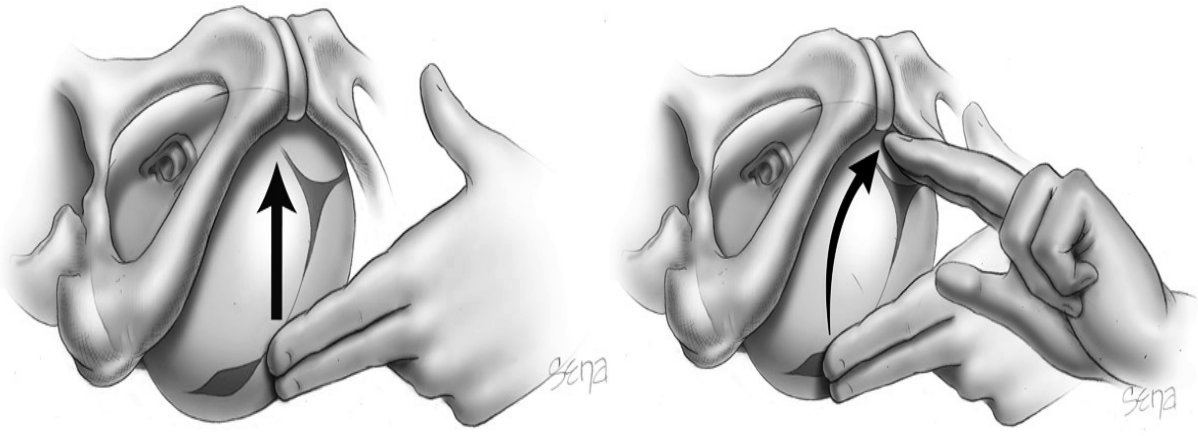

Figure 16 — Vaginal investigation

3. *Ultrasonic techniques (USG)* can aid to identify fetal lie, presentation and position exactly. Routinely USG is performed transabdominally and gives satisfactory results, but it is described that transvaginal sonography is superior.

1.2. BIOMECHANISM OF NORMAL LABOR

From the obstetrical standpoint, the normal labor occurs in antero-occipital presentation of the fetal head. In this case, the vertex enters the pelvis with the sagittal suture lying in the transverse diameter of pelvic inlet.

Biomechanism in antero-occipital presentation:

1. *Fetal head flexion*. As soon as the descending head meets resistance at the plane of pelvic inlet, then the flexion of the head normally results. In this movement, the chin is brought into more intimate contact with the fetal thorax, and the head enters the inlet with appreciably shorter suboccipito-bregmatic diameter. The lower point of the head is situated in the area of posterior fontanel (Figure 17).

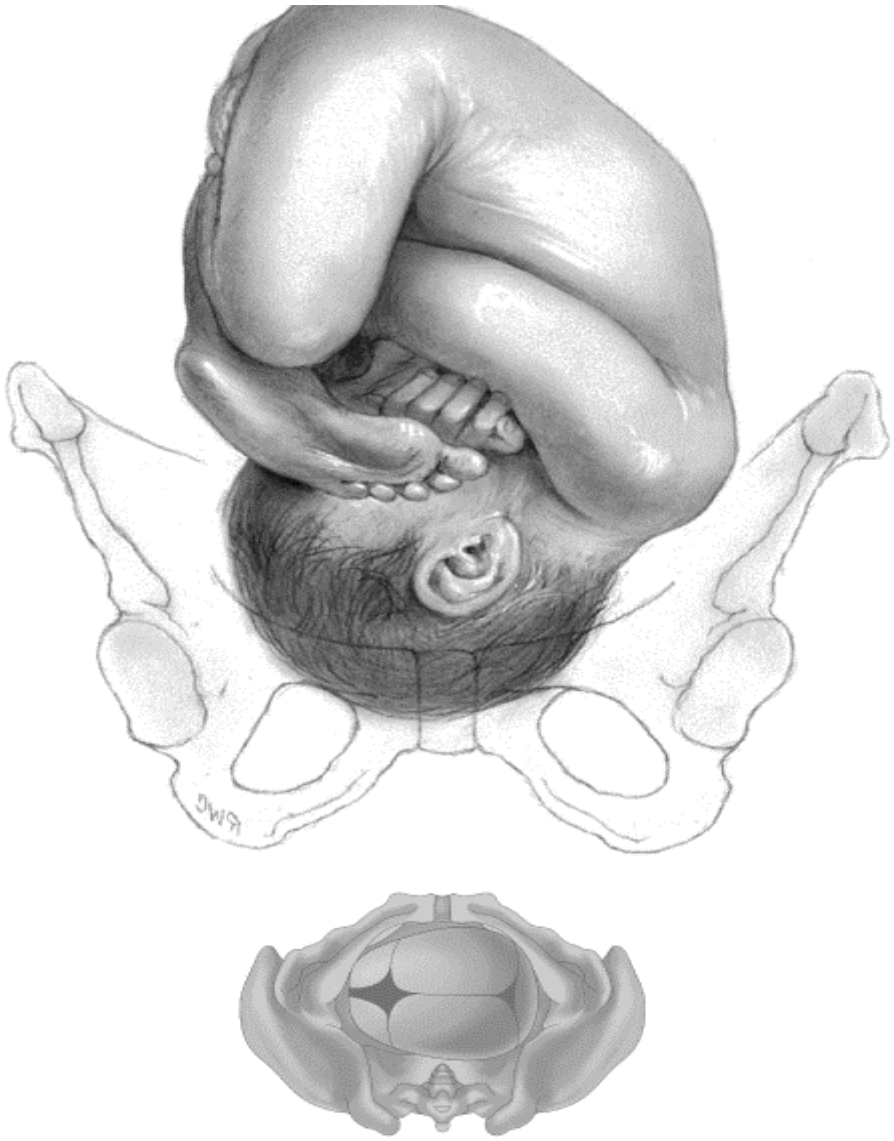

Figure 17 — Fetal head flexion

2. *Internal rotation of the fetal head*. This movement consists of a turning of the head in such a manner that the occiput gradually moves toward the symphysis pubis anteriorly. Internal rotation is essential for the completion of labor. Usually the fetal head rotates in the planes of greatest pelvic dimension and midpelvis (Figure 18, Figure 19).

Figure 18 — Internal rotation of the fetal head

Figure 19 — Final position of the fetal head after internal rotation

3. *Fetal head extension*. After the internal rotation, the sharply flexed head reaches the pelvic floor and undergoes extension. The base of the occiput goes into direct contact with the inferior margin of the symphysis pubis making point of fixation (Figure 20). Two forces cause the final vector of head movement: the first force — exerted by the uterus, and the second, supplied by the resistant pelvic floor. With progressive distension of the perineum and vaginal opening, an increasingly larger portion of the occiput gradually appears. The head is born as the occiput, bregma, forehead, nose, mouth, and finally the chin pass successively over the anterior margin of the perineum. Immediately after its delivery, the head drops downward so that the chin lies over the maternal anus.

Figure 20 — Fetal head extension

4. *External rotation of the fetal head and internal rotation of the fetal body*. The delivered head next undergoes restitution. If the occiput was originally directed toward the left, it rotates toward the left ischial tuberosity. If it was originally directed toward the right, the occiput rotates to the right. Restitution of the head to the oblique position is followed by the completion of external rotation to the transverse position. This movement corresponds to internal rotation of the fetal body and serves to bring its bisacromial diameter into relation with the antero-posterior diameter of the pelvic outlet. Thus, the one shoulder is anterior behind the symphysis and the other is posterior. This movement apparently is brought about by the same pelvic factors that produced internal rotation of the head. Almost immediately after external rotation, the anterior shoulder appears under the symphysis pubis, and the perineum soon

becomes distended by the posterior shoulder (Figure 21, Figure 22). After delivery of the shoulders, the rest of the body quickly passes.

During labor, these movements are not only sequential but also show great temporal overlap.

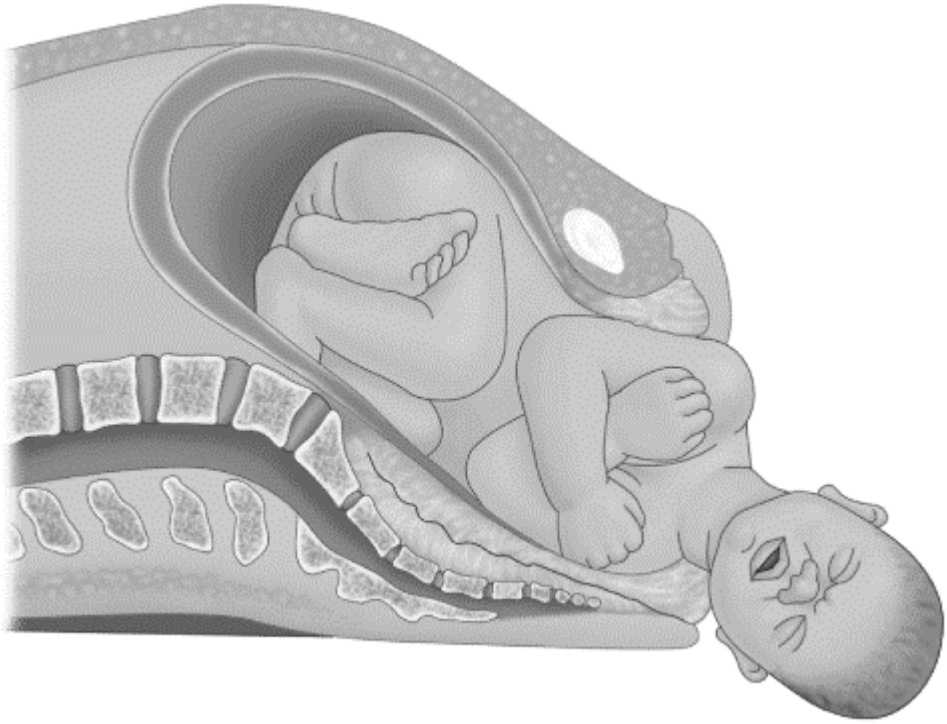

Figure 21 — Delivery of the anterior shoulder

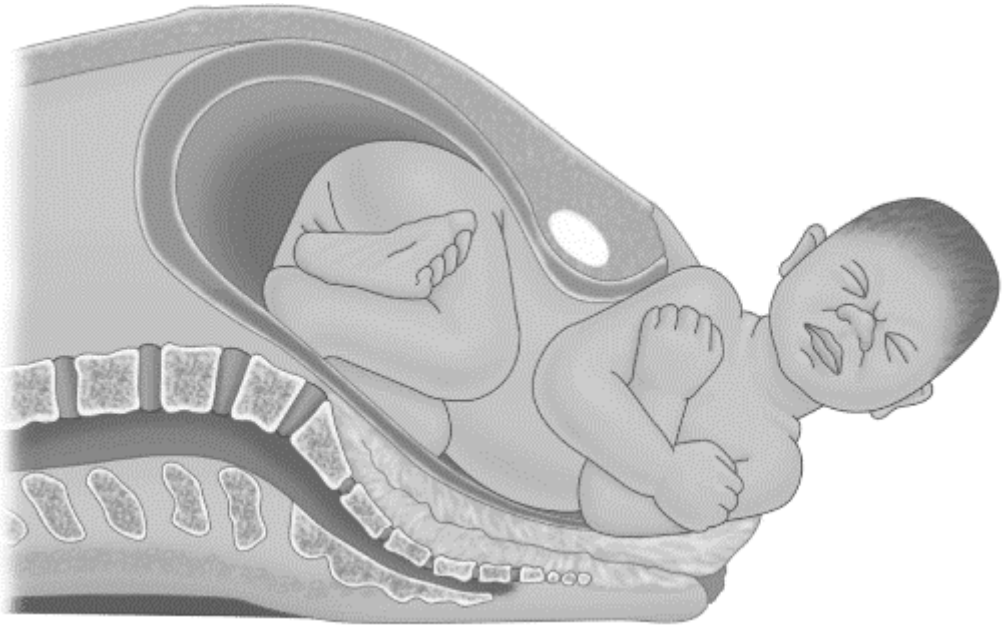

Figure 22 — Delivery of the posterior shoulder

1.3. MANAGEMENT OF NORMAL PREGNANCY AND LABOR

If the pelvic size is normal and there are not any other genital or extragenital pathology in woman so her management in pregnancy is determined by clinical protocols and includes routine antenatal screening.

The ideal management of labor and delivery must imitate normal physiological process that most women experience without complications. In normal conditions the management of labor includes:

- waiting for the spontaneous onset of labor;
- review of pregnancy records;
- external and internal obstetrical examination;
- laboratory studies (blood type, Rh-factor, total blood count, urine analysis, microscopy of vaginal swabs);
- evaluation of the maternal vital signs (HR, BP) and fetal well-being (FHR, CTG);
- evaluation of the effectiveness of uterine contractions, partograph;
- labor pain relief;
- detection of membranes rupture, amniotomy in cervical dilatation 8 cm;
- delivery of a baby, Apgar scoring and first toilet of the newborn;
- delivery of a placenta, evaluation of blood loss.

2. OCCIPUT POSTERIOR PRESENTATION

In approximately 20 % of labors, the fetus enters the pelvis in an *occiput posterior (OP)* position. The right occiput posterior (ROP, Figure 23-A) is slightly more common than the left (LOP, Figure 23-B).

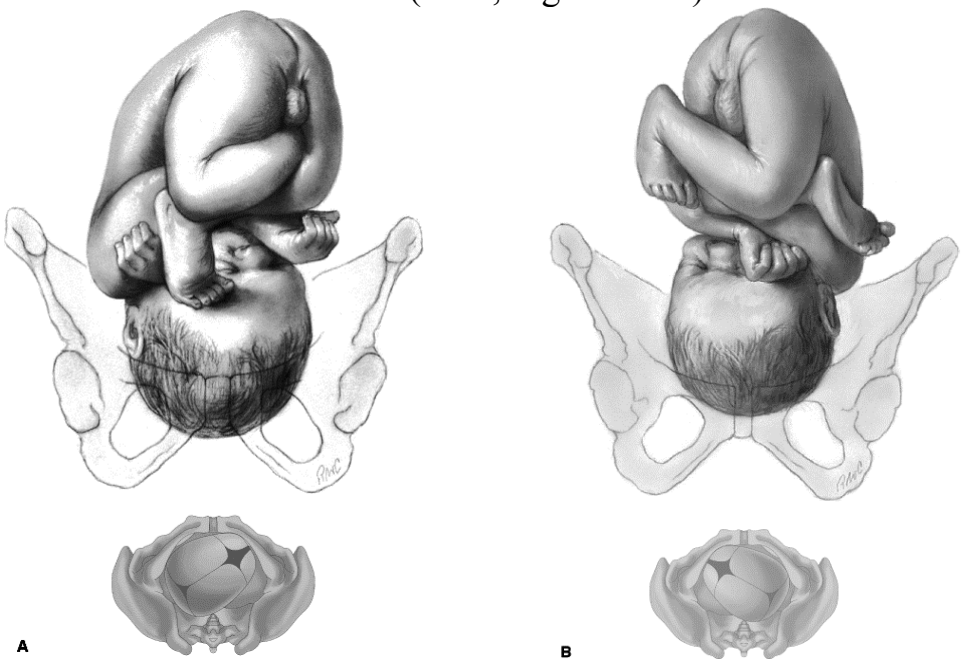

Figure 23 — Right occipital posterior (ROP) and left occipital posterior (LOP) presentations

2.1. DIAGNOSIS OF OCCIPUT POSTERIOR PRESENTATION

As the presentation type is not stable during pregnancy, the diagnosis of occiput posterior presentation is possible to do only during labor. Even if the fetal head occupies occiput posterior presentation at the first stage of labor, occiput can rotate promptly to the symphysis pubis through 135 degrees as soon as the head reaches the pelvic floor, and labor biomechanism is not much altered.

For the diagnosis of occiput posterior presentation obstetricians use the next methods:

1. Leopold maneuvers give us satisfactory results in diagnosis of longitudinal position and cephalic presentation of the fetus (first and third maneuvers). During the second maneuver in palpation of the lateral uterine walls the doctor can't obviously find the fetal back (as it is rotated posteriorly) but only small parts of the fetus are distinguished — that arouses the suspicion of the occiput posterior presentation.
2. During vaginal palpation of the fetal head in occiput posterior presentation with the oblique direction of the sagittal suture we can find the posterior fontanel closer to the sacrum and the anterior fontanel under the symphysis pubis.
3. USG investigation at the first and the second stage of labor gives the picture of the fetus «looking» anteriorly so the face is positioned under the symphysis.

2.2. BIOMECHANISM OF LABOR IN OCCIPUT POSTERIOR PRESENTATION

Biomechanism of labor in occiput posterior presentation does not principally differ from that in antero-occipital presentation, but still has some particularities which can cause labor obstruction. Classical Obstetrics distinguishes 5 moments of this biomechanism.

Biomechanism in occiput posterior presentation:

1. *Fetal head flexion* occurs through the same mechanism as in the antero-occipital presentation, but the flexion is not full. As a result the head will move throughout the true pelvis with *suboccipito-frontal* diameter (10 cm). The fetal head engages to the pelvic inlet with sagittal suture in an oblique dimension, the posterior fontanel is determined closer to the sacrum, the anterior fontanel is closer to the symphysis. The lowermost point of the fetal head is located between these two fontanels (Figure 24-A).
2. *Internal rotation of the fetal head* results in antero-posterior position of the sagittal suture in the pelvic outlet. Because of the relatively large size of the fetal head, internal rotation is obstructed and requires more time as compared with an antero-occipital presentation (Figure 24-B).

3. *Additional head flexion* occurs when the front edge of the large fontanel encounters the mother's symphysis. Here the first fixation point is formed, around which the head is flexed anteriorly moving forward. The vagina opens and a large portion of the occiput appears (Figure 24-C).

4. *Fetal head extension* follows next when the remaining portion of the head (forehead, face and chin) is delivered. This forms the second fixation point between the suboccipital fossa of the fetus and the coccyx of the mother.

5. The mechanism of the *external rotation of the fetal head and internal rotation of the fetal body* is not altered and is the same as in the normal labor.

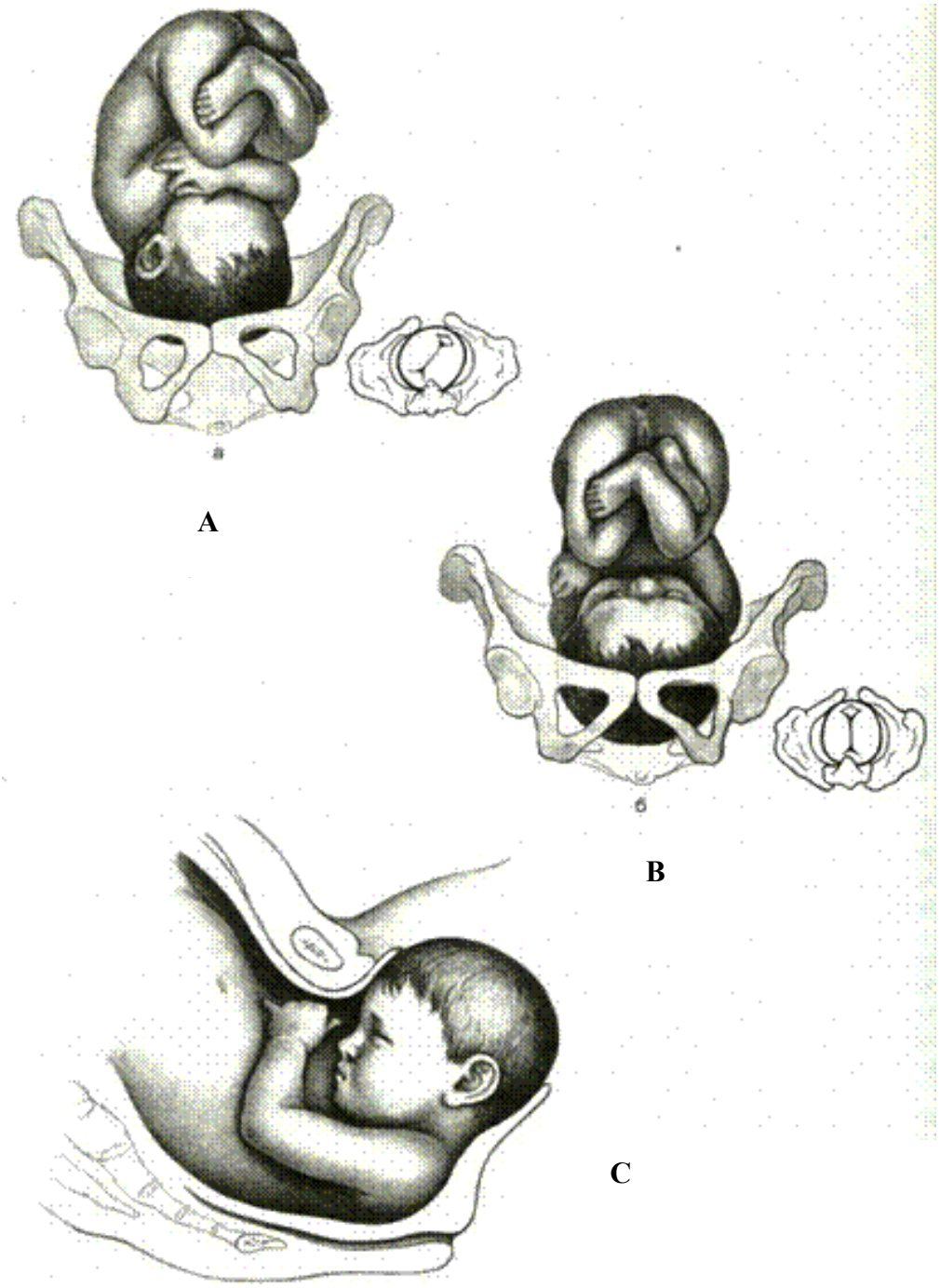

Figure 24 — Biomechanism in occiput posterior presentation

2.3. MANAGEMENT OF PREGNANCY AND LABOR IN WOMEN WITH OCCIPUT POSTERIOR PRESENTATION

As occiput posterior presentation is finally formed in late pregnancy and is significant only during labor, the management of pregnancy doesn't have any special features and is provided by physiological protocols.

Occiput posterior presentation diagnosed during labor needs additional monitoring of the fetal wellbeing and uterine contractions to achieve good outcome.

As the biomechanism is obstructed that leads to the specific complications. In perhaps 5–10 % of cases, however, rotation may be incomplete or may not take place at all, especially if the fetus is large. Poor contractions, faulty flexion of the head or epidural analgesia, which diminishes abdominal muscular pushing and relaxes the muscles of the pelvic floor, may predispose to incomplete rotation. If the rotation is incomplete, *transverse arrest* may result. If no rotation toward the symphysis takes place, the occiput may remain in the direct occiput posterior position, it is a condition known as *persistent occiput posterior.*

Consequently when occiput posterior presentation is combined with the large fetus, contracted pelvis, poor obstetrical history or accompanied by abnormal uterine action or fetal hypoxia during the first stage of labor it is advisable to consider the possibility of delivery by Cesarean section.

If vaginal delivery tactics has been chosen, continuous fetal monitoring must be performed at the second stage of labor. The delivery of the head must be controlled by an experienced midwife. At the moment of crowning it is expedient to make an episiotomy to prevent the spontaneous laceration of the perineum.

3. MALPRESENTATION

Malpresentation is any other presentation than vertex presentation.

Malpresentation is formed at different degrees of extension of the presenting fetal head. Due to degree of such extension we distinguish the types of malpresentation:

1. *Sinciput* (forehead) occurs when the fetal head is slightly extended, and the occipito-frontal diameter (11.5 cm) of the fetal head is presented (Figure 25-B). The lowermost point on the head is the anterior fontanel.

2. *Brow* — the fetal head occupies a position midway between flexion and extension and the head engages to the pelvic inlet with the maxillo-occipital diameter (12.5 cm, Figure 25-C). The lowermost point of the presenting head is situated in the middle of the frontal suture.

3. *Face* — the head is hyperextended so that the occiput is in contact with the fetal back, and the chin (mentum) is the lowermost presenting point (Figure 25-D). The head is born in submento-bregmatic diameter (9.5 cm).

Sinciput and brow types of presentation are commonly unstable during pregnancy and may convert to a face or an occiput presentation in labor.

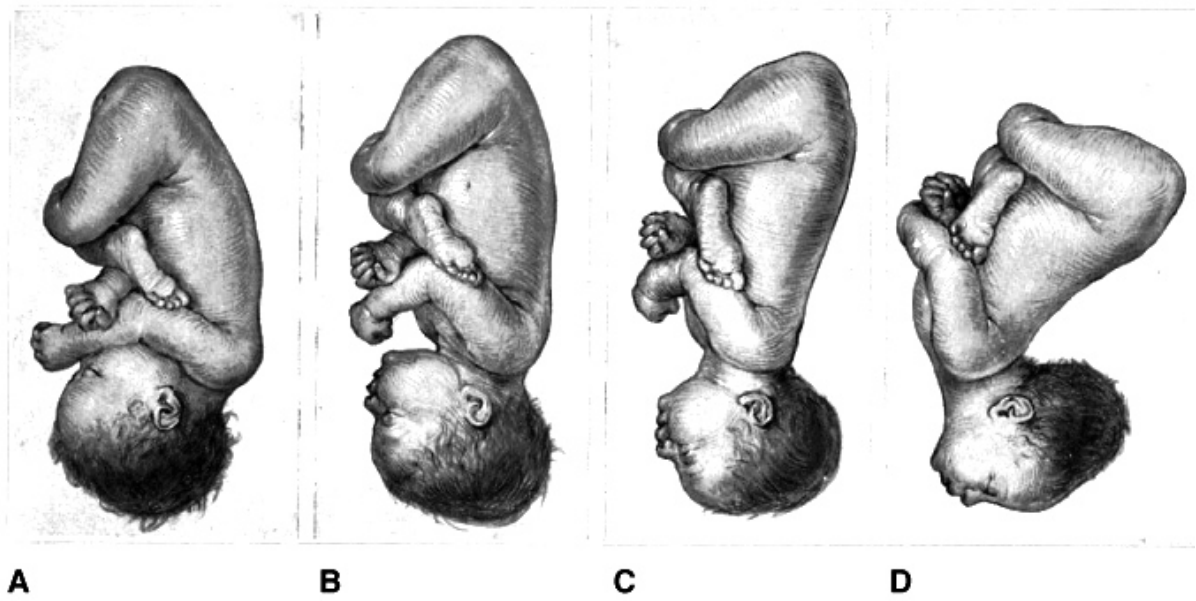

Figure 25 — Types of malpresentation

3.1. DIAGNOSIS OF MALPRESENTATION

Diagnosis of malpresentation requires great personal experience and exceptional attention from an obstetrician not to confuse these types with the normal vertex presentation. Methods for diagnosis of malpresentation include:

1. Leopold maneuvers are not so informative, but the third maneuver can give some information in the case of face presentation. Here we can palpate the fetal chin on the one side of the uterus above the inlet and the occiput and back on the other side.

2. Auscultation of fetal heart beating is better from the side of the fetal chest as opposed to the best auscultative picture from the fetal back in the occipital presentation.

3. Vaginal examination can give satisfactory results for the accurate diagnosis of malpresentation. In sinciput presentation the anterior fontanel and the forehead of the fetus are palpated through the vagina. In the brow type we can palpate the frontal suture, the front edge of an anterior fontanel, eyebrows with orbits, and glabella. If the fetus presentation is face so we can find orbits, the mouth and chin of the fetus.

4. Ultrasonography gives good results, if it is performed by an experienced diagnostician. However, please note that the information content of the method is low during pregnancy, as malpresentation type finally forms in labor.

3.2. BIOMECHANISM OF LABOR IN MALPRESENTATION

From the standpoint of the general mechanics of fetal movements, biomechanism of labor in malpresenting fetuses does not differ fundamentally from that in the vertex presentation. The differences are determined by the direction of two-armed lever motion of the engaging head, fixation and lower points and resulting diameters of the delivering head.

General differences of the biomechanism in malpresentation are characterized by two main features:

- first, in the vertex presentation (flexion type) biomechanism of labor starts with the flexion of the head in the pelvic inlet and finishes at the outlet of the pelvis with extension; conversely, biomechanism of labor in malpresentation (extension type) starts with extension of the head and finishes by extension;
- secondly, in the flexion type of presentation internal rotation of the head commonly results in anterior position (occiput is ahead); in the extension type the rotation of the head leads to the formation of the posterior position of the fetal head in the pelvic outlet (face is ahead).

Biomechanism in sinciput presentation:

1. Slight *extension of the fetal head* due to which the head engages with the occipito-frontal diameter, the sagittal suture is in the transverse dimension of the pelvic inlet. The anterior fontanel acts as a lower point of the head (Figure 26-а).

2. *Internal rotation of the head* takes place in the pelvic cavity. As a result on the pelvic floor the sagittal suture is in the antero-posterior diameter, forehead lies under the symphysis, occiput – under the sacrum (Figure 26-б).

3. *Flexion of the head* occurs due to moving the head while being fixed by glabella under the lower edge of the pubic arch. Areas of anterior fontanel together with connecting parietal bones appear in vulva (Figure 26-в).

4. *Fetal head extension* on the pelvic floor is caused by the formation of the second fixation point between the occiput of the fetus and the mother's coccyx (Figure 26-г). Here we can see the forehead, the face, the suboocipital area of the head coming from the birth canal. Coming out the head greatly stretches the perineal tissues threatening their rupture.

5. *External rotation of the fetal head and internal rotation of the fetal body* do not have any distinguishing features, since the position of the body of the fetus is not disordered.

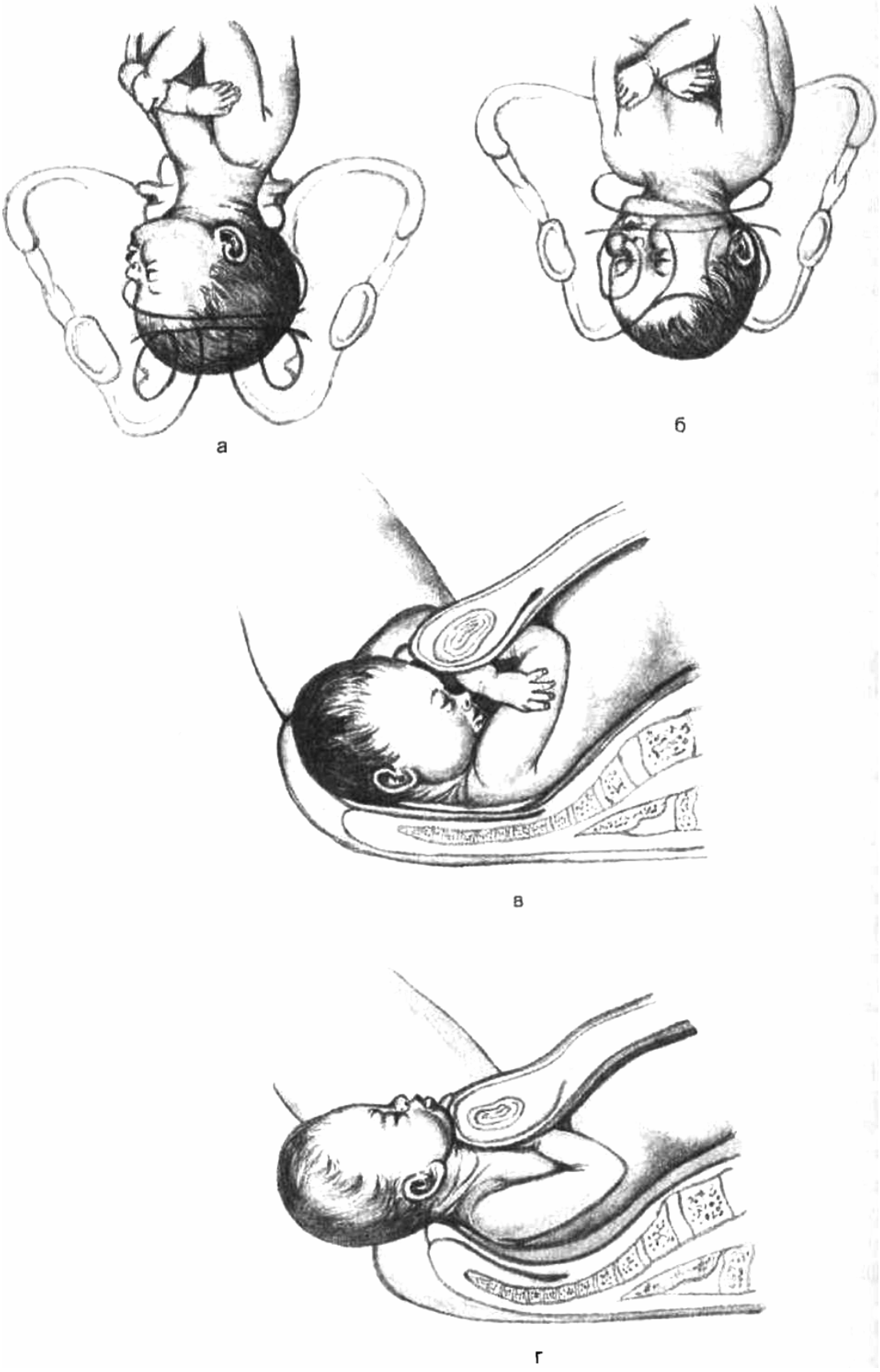

Figure 26 — Biomechanism in sinciput presentation

Biomechanism in brow presentation:

1. *Marked extension of the head* at the pelvic inlet results in that the head is positioned in the transverse diameter with the frontal suture. The middle of the frontal suture becomes the lowermost point of the presenting head (Figure 27-а).

2. When descending into the pelvic cavity the head makes *internal rotation* in the pelvic cavity (Figure 27-б). Finally in the plane of pelvic inlet the face is turned anteriorly, occiput looks posteriorly.

3. Coming out from birth canal *the head flexes* around the point of fixation – the maxilla which is in contact with the lower point of symphysis (Figure 27-в). The forehead and nasal areas are coming out of the vagina.

4. After the part of the head is delivered the second point of fixation forms between the occiput and the coccyx. The rest of the head is coming out by the *extension*: the lower part of the face, the chin, the suboccipital area. The head is delivered by the maxillo-occipital diameter risking perineal lacerations.

5. *External rotation of the fetal head and internal rotation of the fetal body* is not altered.

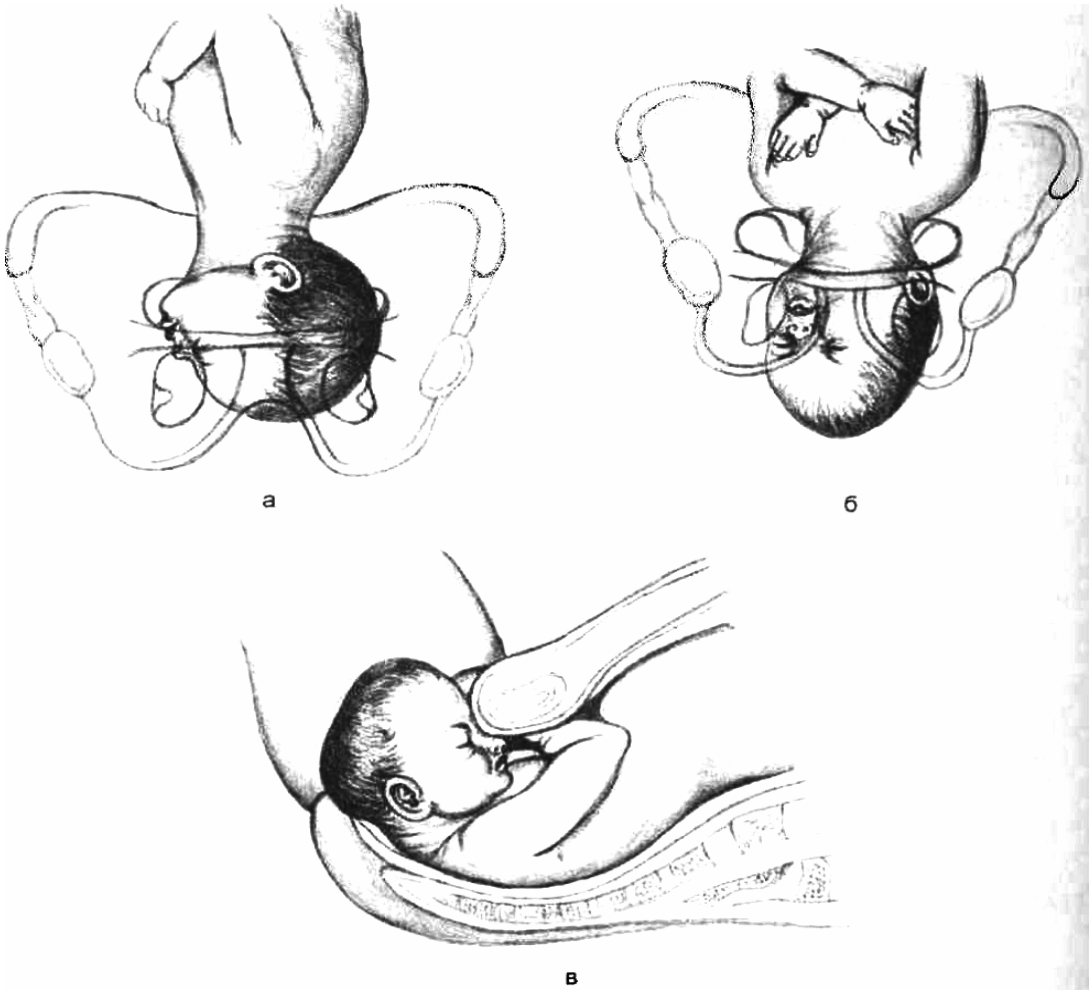

Figure 27 — Biomechanism in brow presentation

Biomechanism in face presentation:

1. Engagement occurs due to severe *head extension* at the plane of pelvic inlet. The front line (line from the frontal suture to the chin, extending along the back of the nose) corresponds to the transverse diameter of the pelvic inlet. The chin becomes the lowermost presenting point of the head (Figure 28-а).

2. The objective of *internal rotation* is to bring the chin under the symphysis pubis (Figure 28-б). Only in this way the neck can traverse the posterior surface of the symphysis pubis.

3. After anterior rotation, the chin and mouth appear at the vulva, the undersurface of the chin presses against the symphysis, and the head is delivered by *flexion* (Figure 28-в). The nose, eyes, brows and occiput then appear in succession over the perineum.

4. *External rotation of the fetal head and internal rotation of the fetal body* don't differ from the same as in vertex presentations.

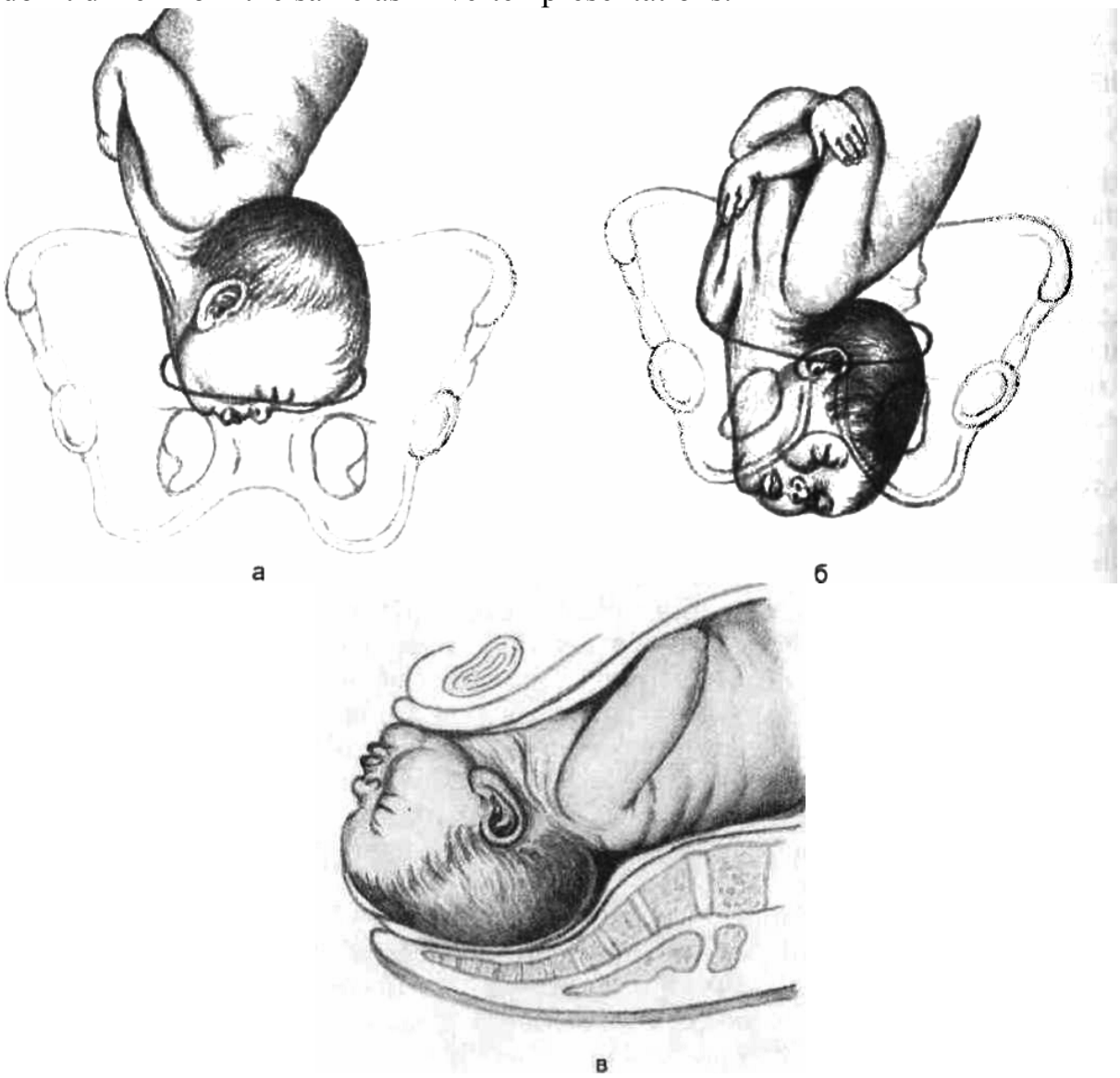

Figure 28 — Biomechanism in face presentation

3.3. MANAGEMENT OF PREGNANCY AND LABOR IN WOMEN WITH MALPRESENTATION

The causes of malpresentation are numerous and include conditions that favor extension or prevent head flexion and act as complications of pregnancy and labor:

- preterm labor — the smaller head dimensions in preterm infants cause engagement prior to conversion to vertex position;
- fetal malformations, marked enlargement of the neck or coils of cord around the neck may cause extension. Anencephalic fetuses naturally present by the face;
- polyhydramnios;
- contracted pelvis, especially flat types with inlet contraction;
- large fetus;
- high parity with a pendulous abdomen;
- genital malformations and tumors in mother;
- abnormal uterine action.

Women with diagnosed or suspected malpresentation need additional care to prevent traumatic and other complications during childbirth. The management of pregnancy includes additional counseling from the 32nd gestational week (weekly), additional USG with Doppler imaging of the fetus in 37–38 weeks. Women are suggested to do corrective gymnastics.

A pregnant must be admitted to the maternity hospital at the gestational age of 38–39 weeks for the accurate prenatal diagnosis and choice for the adequate delivery method.

Malpresentation alters the biomechanism. The vaginal delivery of malpresenting fetuses is possible only if the size of the fetus is rather small and the pelvic capacity is large and the uterine action is effective. In other case vaginal labor in malpresentation is associated with excessive maternal and fetal morbidity and mortality due to prolonged labor and waterless period, fetal and maternal injuries, disproportion and arrest, fetal distress, postpartum purulent-septic diseases. In general it means that the predominant method of delivery for patients with fetal malpresentation is Cesarean section.

4. CONTRACTED PELVIS

Contracted pelvis is one of the reasons of maternal and fetal birth traumas, perinatal mortality and childhood disability. The frequency of contracted pelvis is 1–7.7 %.

Anatomical definition of contracted pelvis is a pelvis where one or more of its diameters are shortened below the normal by 1.5–2 cm.

Due to the morpho-radiological classification and on the basis of the shape of inlet, the female pelvis is divided into four parent types (Figure 28):

1. *Gynecoid pelvis* (normal female type pelvis) — with the almost round inlet.
2. *Android pelvis* – the shape of the pelvic inlet takes the triangular form.
3. *Anthropoid pelvis*– with the antero-posteriorly oval shape of the inlet.
4. *Platypelloid pelvis* is transversely-oval in the plane of pelvic inlet.

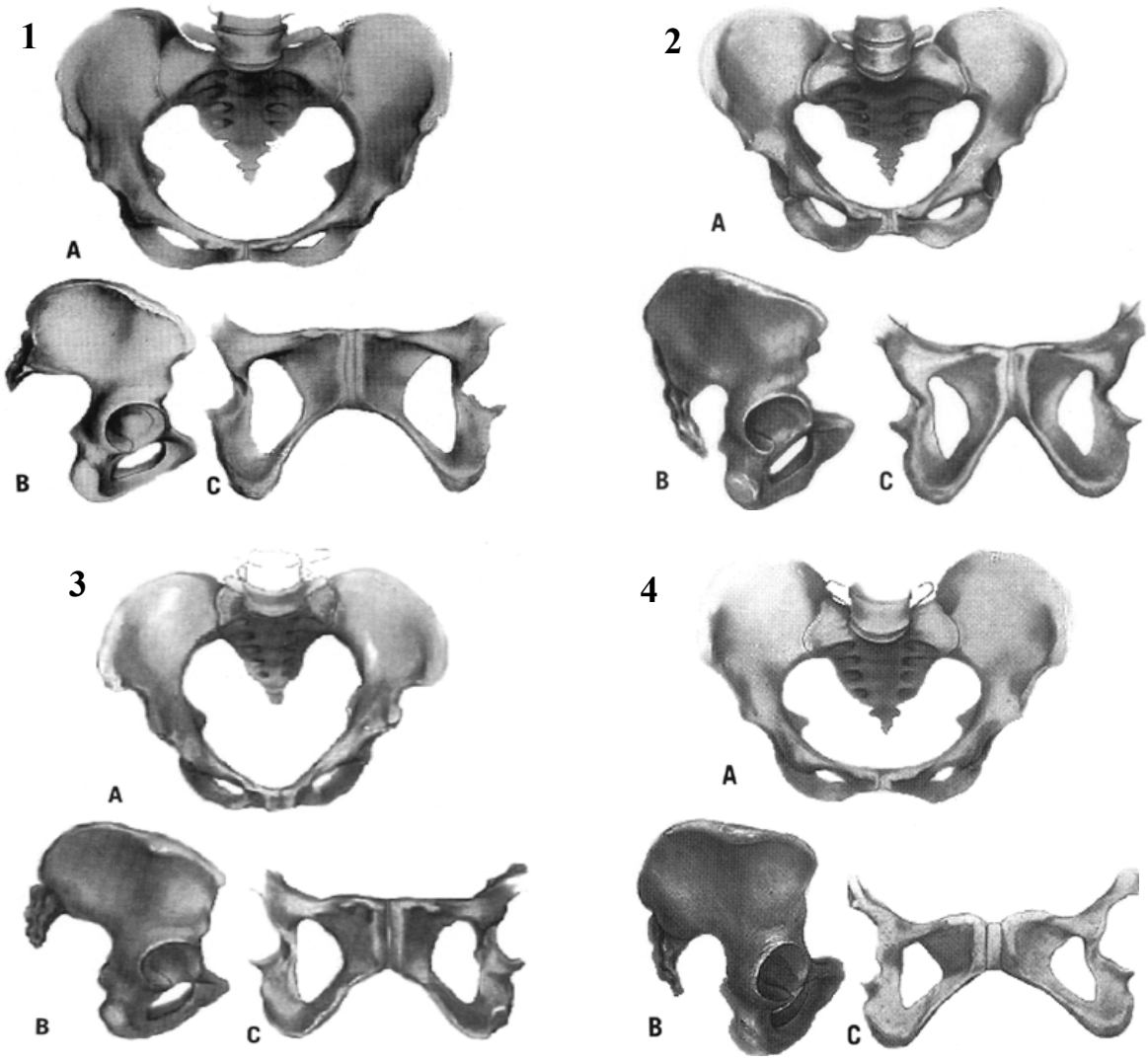

Figure 29 — Morpho-radiological types of pelvis

As to speak about the shape of contraction all the pelvises are divided into relatively common and rare types which in their turn are divided into subtypes (Figure 30):

A. Relatively common types of pelvic contraction:

1. *Generally contracted pelvis* (or *justo minor pelvis*) — when all dimensions are proportionately diminished.

2. *Flat pelvis* — pelvis with reduced antero-posterior diameters; includes several varieties:

a. *Simple flat pelvis* — when all the antero-posterior diameters are reduced.

b. *Flat rachitic pelvis* — pelvis with reduction of the antero-posterior diameter of the pelvic inlet, specific deformation of pelvic bones and cavity due to rickets.

3. *Transverse pelvic contraction* — pelvis with reduced transverse diameters.

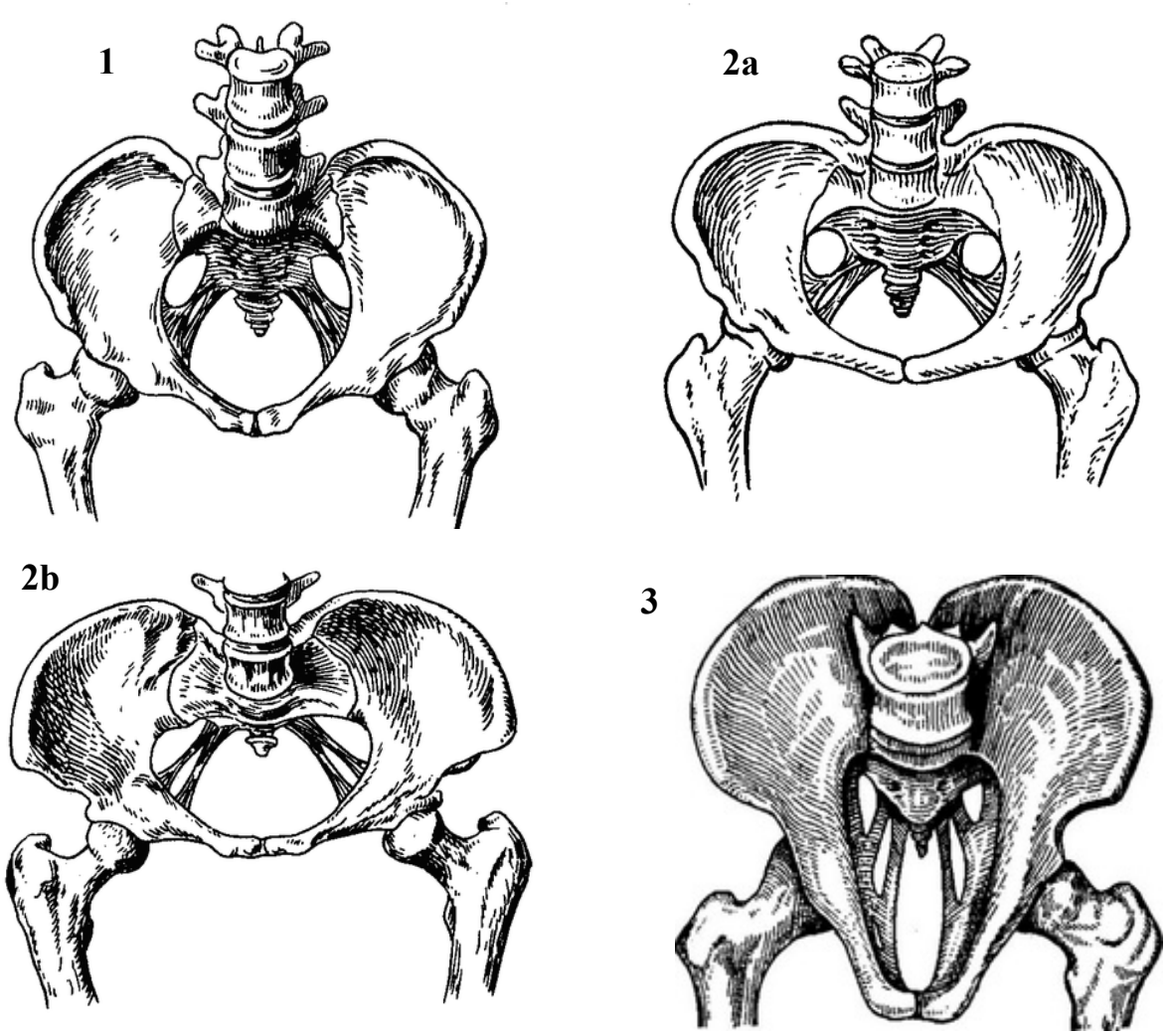

Figure 30 — Relatively common types of pelvic contraction

B. Rare types of pelvic contraction (Figure 31):

1. Scoliotic pelvis.

2. Spondylolisthetic pelvis.

3. Osteomalatic pelvis.

4. Obliquely contracted pelvis.

5. Pelvis contracted with exostosis, bone tumors, fractures.

6. Assimilation pelvis.

7. Funnel-shaped pelvis.

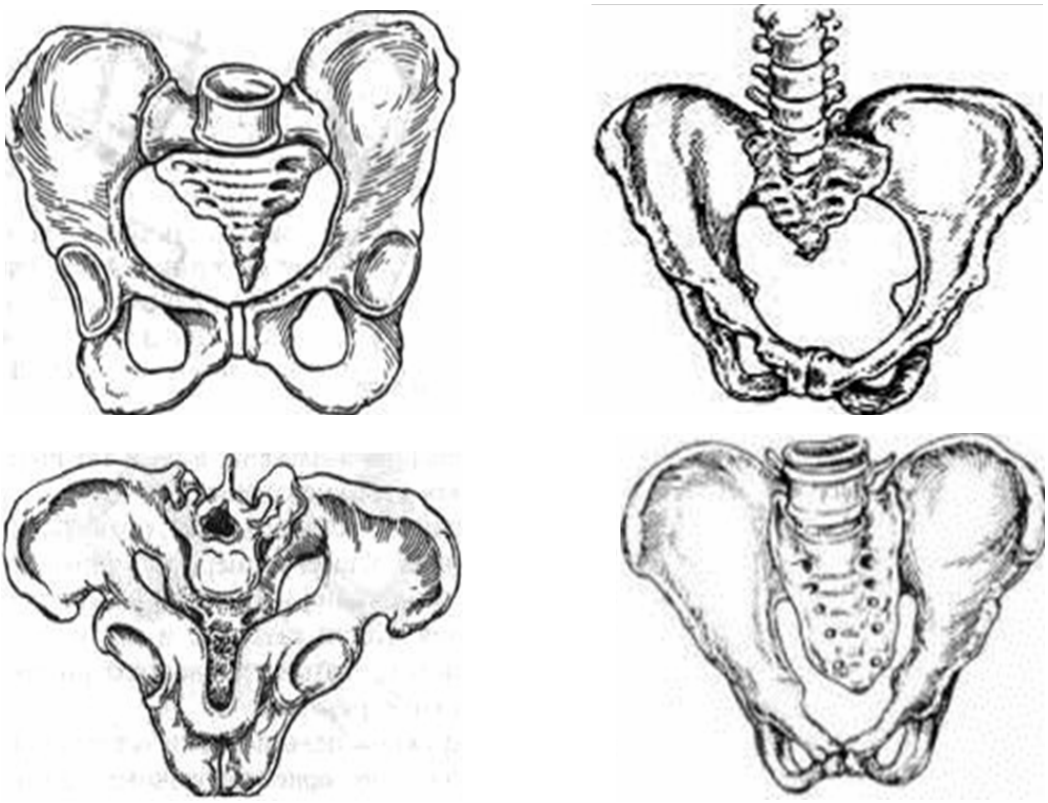

Figure 31 — Rare types of pelvic contraction

Also obstetricians distinguish the degrees of pelvic contraction in magnitude the obstetrical conjugate:

1. *I (minor) degree of contraction* — when obstetrical conjugate is 11–9 cm.

2. *II (moderate) degree of contraction* — when obstetrical conjugate is equal to 9–7.5 cm.

3. *III (severe) degree of contraction* — when obstetrical conjugate is 7.5–6 cm.

4. *VI (extreme) degree of contraction* — when obstetrical conjugate is less than 6 cm.

4.1. DIAGNOSIS OF CONTRACTED PELVIS

Direct diagnosis of contracted pelvis is based on the estimation of pelvic sizes. Methods are:

1. External pelvimetry (described above).
2. Measurement of the diagonal conjugate (described above).
3. Calculation of the obstetrical conjugate (described above).
4. Estimation of the Michael's rhombus is a useful method to obtain information about the type of contraction as it relates to the shape of the pelvic inlet. In normal pelvis the Michael's rhombus represents as a square with both diagonals equal to 11 cm. Rhombus shape remains square in generally contracted pelvis but the diagonals are less than 11 cm. In the flat pelvis it is geometrical rhombus with reduced vertical diagonal. Conversely in transverse contraction the rhombus has reduced horizontal diagonal. In rare types of pelvic contraction the shape of Michael's rhombus is irregular (Figure 32).
5. Measurement of Solovyov's index — wrist circumference that corresponds with the thickness of the bones (Figure 33). Normally it is equal to 14–17 cm. If this index is more than 17 cm so the bones are thick and the capacity of the pelvis is diminished. If the Solovyov's index is less than 14 cm, this enlarges the volume of pelvic cavity due to thin bones.
6. Measurements of the diameters of the pelvic outlet are performed with a standard pelvimeter (Figure 34). Both antero-posterior and transverse diameters are available. That gives exact information about the capacity of the outlet.
7. Ultrasound pelvimetry (or USG) is a simple, noninvasive cost-effective and clinically useful method of assessing the diameters of the pelvic inlet in women. This method is safe and doesn't have any risks or hazard to the fetus. Nevertheless, this method is rarely used in routine clinical practice.
8. Radio-pelvimetry (or X-ray pelvimetry) is of limited value in obstetrics as it causes radiation exposure to the mother and the fetus. So commonly in obstetrics radio-pelvimetry is restricted to selected cases only (for example, to cases with fractured pelvis).
9. Computed Tomographic Scanning (or CT) involves less radiation exposure; its accuracy is greater than that of radio-pelvimetry. Although it is performed on strict indications.
10. Magnetic Resonance Imaging (or MRI) is more accurate to assess the bony pelvis. The advantages of MR pelvimetry include lack of ionizing radiation, accurate measurements, complete fetal imaging, and the potential for evaluating soft tissue.

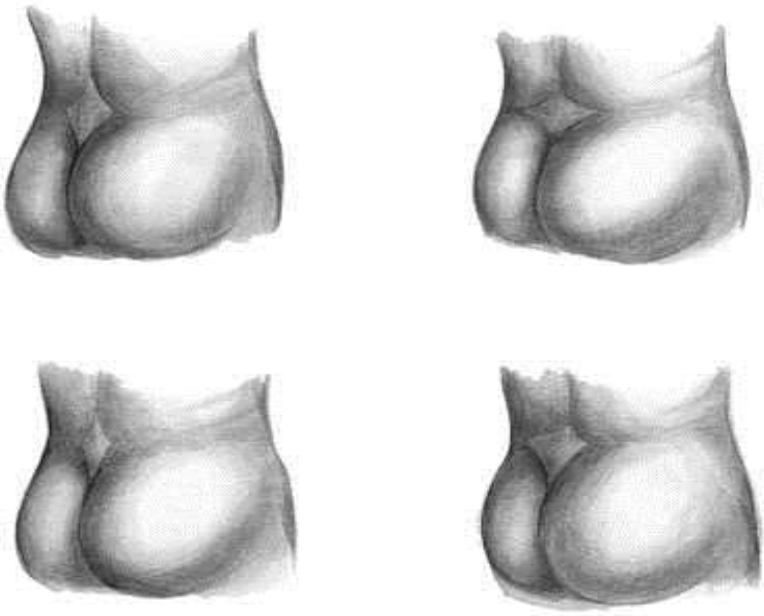

Figure 32 — Types of Michael's rhombus

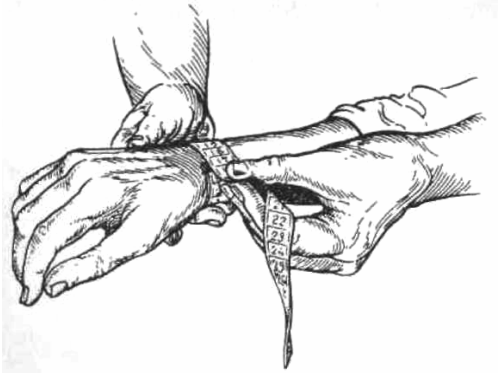

Figure 33 — Measurement of Solovyov's index

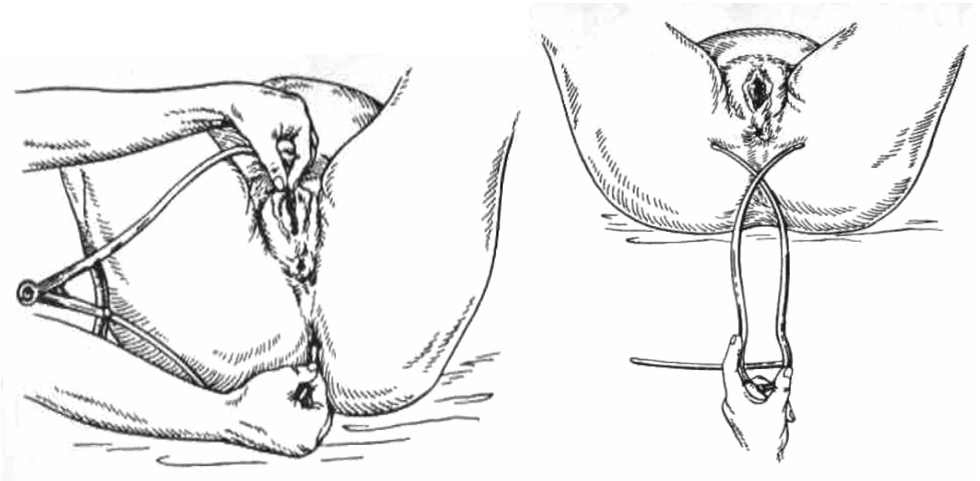

Figure 34 — Measurements of the diameters of the pelvic outlet

4.2. BIOMECHANISM OF LABOR IN CONTRACTED PELVIS

Biomechanism of labor depends greatly on the shape of the pelvic contraction.

Biomechanism in generally contracted pelvis:

1. There is *maximal fetal head flexion* in the plane of the pelvic inlet — so the head enters the pelvis with the sagittal suture in transverse dimension.

2. The mechanism of *internal head rotation* is almost unaltered, but it takes longer time because generally contracted cavity creates more obstacles to the expulsion of the head.

3. Besides *extension of the head* is more durable, it has some peculiarities. The base of the occiput can't go directly to contact with the inferior margin of the symphysis pubis because branches of the pubic bones form an acute angle. Therefore, the fetal head rests on the branches of the pubic bones and severely deflects towards the perineum, threatening its injuries.

4. *External rotation of the fetal head and internal rotation of the fetal body* usually do not have the specifics, but the expulsion of the baby's body may last longer.

Biomechanism in flat pelvis:

1. Instead of fetal head flexion we observe *extension and lateralization of the fetal head*; frequently asynclitism takes place. Finally the fetal head enters the pelvis with the bitemporal diameter in the antero-posterior diameter of the plane of inlet.

2. In a simple flat pelvis *internal rotation of the fetal head* is altered because of antero-posterior contraction of the pelvic cavity – so rotation of the fetal head as well as its flexion occurs in the plane of the pelvic outlet. In a flat rachitic pelvis there are no any difficulties for the rotation of the head because of specific enlargement of the pelvic cavity.

3. There are no any significant differences in the process of *fetal head extension*, but in women with a flat pelvis perineal lacerations occur more frequently.

4. *External rotation of the fetal head and internal rotation of the fetal body* usually do not have the specifics, but the expulsion of the baby's body takes longer.

Biomechanism in transverse pelvic contraction:

1. *The fetal head engages* to the plane of the pelvic inlet with the sagittal suture in antero-posterior diameter – so rotation of the head occurs above the pelvic inlet.

2. There is *no any rotation of the fetal head* in the pelvic cavity. The head simply descends through the planes of the greatest pelvic dimension and midpelvis with the sagittal suture in antero-posterior diameter.

3. As in a generally contracted pelvis the base of the occiput can't go directly to contact with the inferior margin of the symphysis pubis because branches of the pubic bones form an acute angle. Therefore, the fetal head rests on the branches of the pubic bones and making *extension* severely deflects towards the perineum, threatening its injuries.

4. Finally *external rotation of the fetal head and internal rotation of the fetal body* usually do not have the specifics, but it can take a long time to pass through the contracted cavity.

Thereby all the biomechanism of labor in contracted pelvis have some common features:

- the sagittal suture of the fetal head corresponds to the longest dimension of the pelvic planes;
- rotation of the fetal head takes place in the widest plane of the pelvis or even above it;
- delivery of the fetal head takes longer, while delivery of fetal body is not much altered;
- there is increased risk of perineal lacerations:
- spontaneous delivery is mainly possible in the anterior position of the fetus;
- women with contracted pelvis are at high risk of such complications as severe asynclitism and arrest.

Biomechanism of asynclitism and labor arrest:

Normally the longitudinal axis of the fetal head is almost perpendicular to the plane of the pelvic inlet, so the sagittal suture is positioned midway between the symphysis and the sacral promontory — this is called *synclitism* (Figure 35-1).

When the longitudinal axis of the fetal head is not perpendicular to the plane of the pelvic inlet, so the sagittal suture is deflected either posteriorly towards the promontory or anteriorly towards the symphysis. Such lateral deflection to the more anterior or posterior position in the pelvis is called *asynclitism*. If the sagittal suture approaches the sacral promontory, anterior parietal bone presents itself to the examining fingers, and the condition is called anterior asynclitism (Figure 35-2a).If, however, the sagittal suture lies close to the symphysis, posterior parietal bone will present, and the condition is called posterior asynclitism (Figure 35-2b). With extreme posterior asynclitism, the posterior ear may be easily palpated. Moderate degrees of asynclitism represent in contracted pelvis of different types. However, if severe, the condition is a common reason for cephalo-pelvic disproportion.

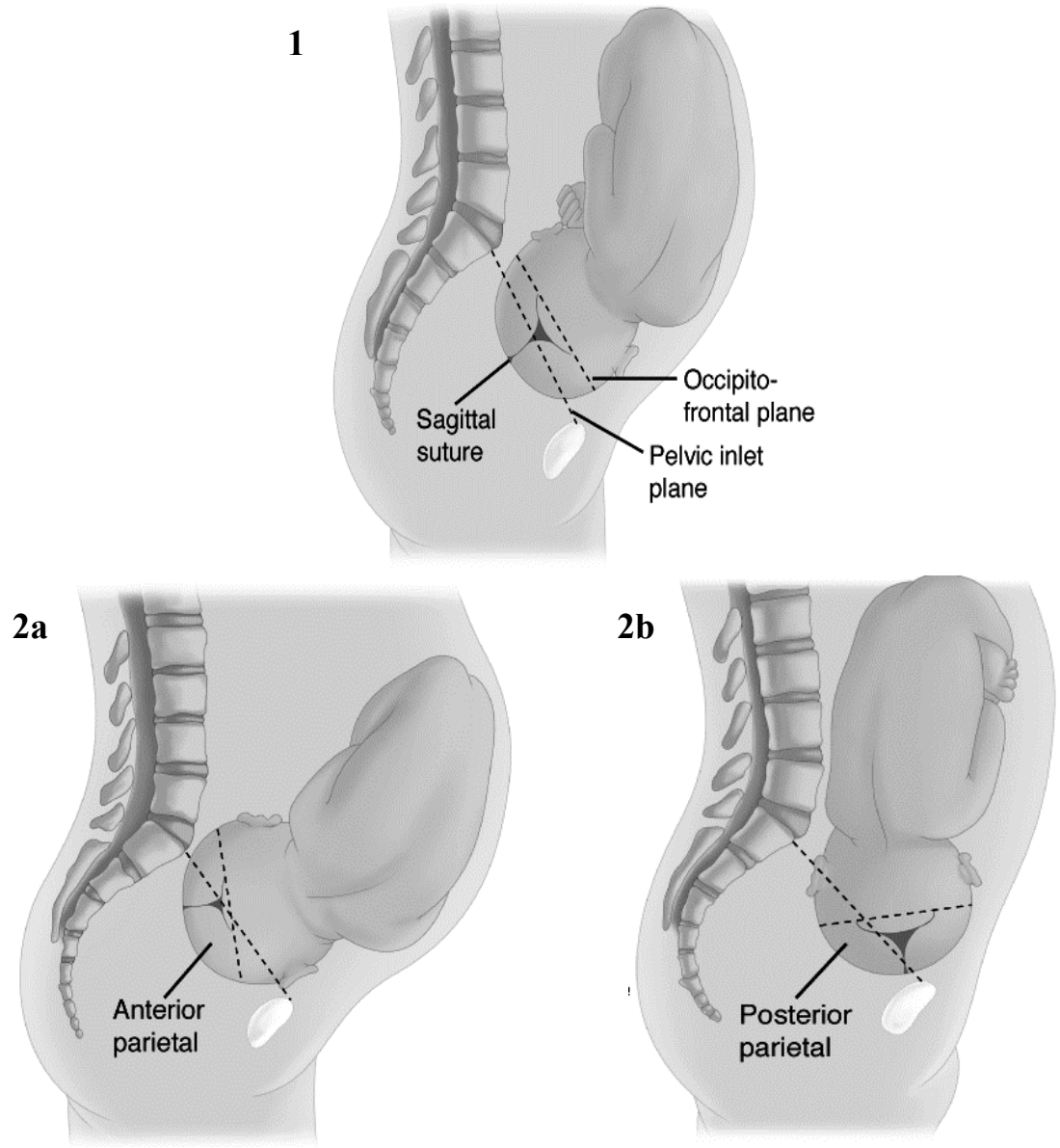

Figure 35 — Synclitism and asynclitism

If the mechanisms of the internal rotation and/or engagement of the fetal head are incomplete, *arrest* may occur. There are two types of arrest.

In transverse narrowing of the pelvis the internal rotation takes place above the pelvic inlet whereupon the sagittal suture occupies antero-posterior diameter. If the capacity of the inlet is insufficient the head engagement fails — that is called *high arrest* (Figure 36-а, Figure 36-б).

In flat types of pelvic contraction due to reduced antero-posterior diameters of the pelvis the rotation of the head becomes impossible. Thus at the pelvic outlet the sagittal suture occupies transverse diameter and the head stops its motion because of the inability of extension — that is *deep transverse arrest* (Figure 36-в).

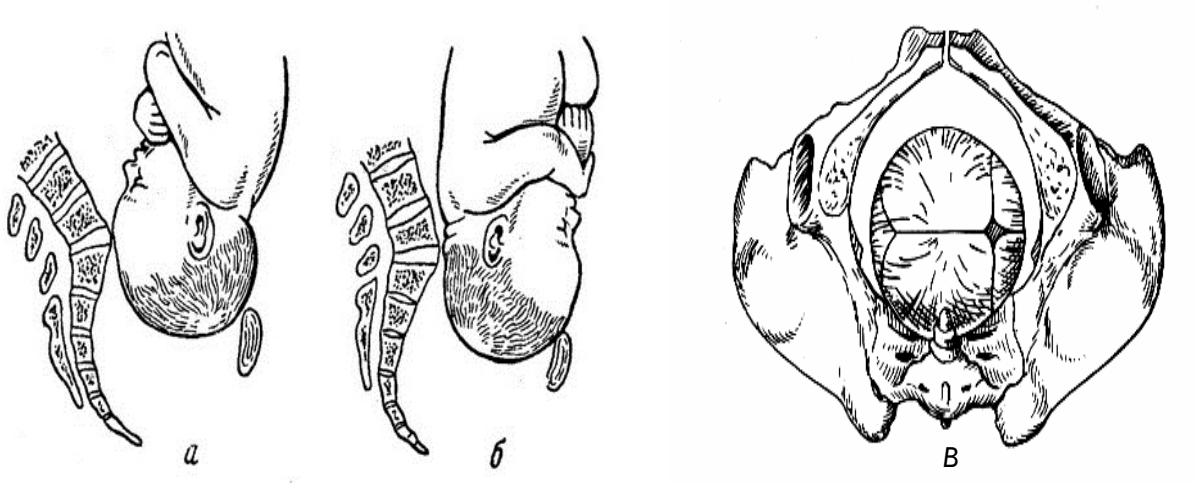

Figure 36 — High and deep arrest

4.3. MANAGEMENT OF PREGNANCY AND LABOR IN WOMEN WITH CONTRACTED PELVIS

Pregnant women with contracted pelvis are at high risk of obstetrical and perinatal complications, such as:

- preterm rupture of membranes;
- acute fetal distress as a result of cord prolapse;
- abnormal uterine action, dystocia;
- cephalo-pelvic disproportion, high and deep arrest;
- prolonged duration of labor;
- fetal hypoxia and fetal injury;
- maternal trauma (lacerations of birth canal, uterine rupture, fistulas);
- postnatal purulent-septic diseases.

Management of pregnancy includes accurate prenatal counseling, timely diagnosis of fetal malposition and malpresentation, calculation of the estimated fetal weight from 37th week of pregnancy, additional USG investigation at 36–38 weeks to prevent large fetus syndrome. Hospitalization must be done at 38–39 gestational weeks to define more exactly the date of labor and to choose the optimal mode of delivery.

The strategy of labor management depends on the shape and degree of pelvic contraction, fetal position and presentation, head size and its moulding, and force of uterine contractions. As well indications for elective cesarean section include:

- pelvic contraction of II-IV degree with term pregnancy;
- combination of contracted pelvis with estimated fetal weight 4000 g and more;
- combination of contracted pelvis with malpresentation and malposition of the fetus;

• combination of contracted pelvis with prolonged pregnancy (g.a. 42 weeks and longer);

• rare types of pelvic contraction;

• combination of contracted pelvis with other obstetrical and extragenital pathologies increasing perinatal risks.

Conservative (vaginal) delivery is indicated in cases of low perinatal risk. Particularities of the delivery include:

• delivery at the gestational age of 38–41 week to avoid prolonged pregnancy;

• monitoring of fetal well-being (continuous CTG);

• evaluation of the effectiveness of uterine contractions, prevention of uterine inertia;

• adequate labor pain relief;

• external and internal obstetrical examination, evaluation of the signs of cephalo-pelvic disproportion;

• episiotomy to prevent perineal lacerations;

• careful delivery of a baby.

Indications for emergent cesarean section during labor include:

• cephalo-pelvic disproportion;

• abnormal uterine action;

• risk of uterine rupture;

• acute fetal distress.

5. MACROSOMIA OF FETUS

The term *macrosomia* (or *large fetus syndrome*) is used rather imprecisely to describe a very large fetus or neonate. A baby is also called «large for gestational age» (LGA) if its weight is greater than the 90th percentile at birth. Newborns weighing more than 4000 g are large. Newborns' weight rarely exceeds 5000 g — in such cases it is called an excessively large (or giant) fetus.

5.1. DIAGNOSIS OF MACROSOMIA OF FETUS

Accurate estimating of the size and weight of a child in the uterus is quite difficult due to the influence of many factors: gestational age, parity, maternal weight and height, fetal position and presentation, pathological conditions in mother (e.g. gestation diabetes) and child (e.g. malformations), etc. The methods of diagnosis include:

1. Formulas for estimated fetal weight (EFW) are classical obstetrical methods based on measurements of abdominal circumference (AC, cm), uterine

fundus height (FH, cm), weight (kg) and height (cm) of the pregnant. The most popular are:

- Jordania: EFW=AC×FH;
- Lankowitz: EFW=(AC+FH+weight+height)×10;
- Johnson: (FH-11)×155.

2. Fetal growth percentile charts graphs show growth curves of the baby based on different measurements.

3. Ultrasonography allows calculating of the fetal weight by measuring biparietal diameter (BPD), femur length (FL), abdominal circumference (AC), and other bony landmarks of the fetus. Computerized data processing provides a fairly accurate result.

5.2. BIOMECHANISM OF LABOR IN MACROSOMIA OF FETUS

The essence of the biomechanism of labor with a large fetus is very similar to that with the generally contracted pelvis.

Biomechanism in macrosomia:

1. Maximal fetal head flexion starts at the plane of the pelvic inlet so the head descents with appreciably shorter suboccipito-bregmatic diameter. The sagittal suture is positioned in the transverse diameter. The posterior fontanel is the lowermost point of the head.

2. Internal rotation of the fetal head results in turning of the occiput towards the symphysis pubis anteriorly. Due to the large-sized fetal head it takes longer to overcome the resistance of relatively small planes of the pelvic cavity.

3. Fetal head extension occurs through the point of fixation between the suboccipital fossa of the fetal head and the lower edge of the maternal symphysis. As the size of the head is large so it threatens perineal lacerations.

4. The mechanism of *external rotation of the fetal head and internal rotation of the fetal body* is just common. Difficulties arise at the delivery of shoulders, which are much larger than the head in macrosomic fetuses – this creates the possibility of shoulder dystocia.

5.3. MANAGEMENT OF PREGNANCY AND LABOR IN WOMEN WITH MACROSOMIA OF FETUS

A number of factors associated with fetal macrosomia are:

- diabetes;
- multiparity;
- obesity;
- postterm pregnancy;
- fetal abnormalities;
- large size of parents.

So the plan of pregnancy and delivery management in patients with macrosomia includes consideration of risk factors of maternal and fetal origin. Additional antenatal diagnostic procedures include: weekly estimation of fetal weight from 37 weeks of pregnancy, blood test for glucose and ultrasound with Doppler blood flow imaging at 37thweek of pregnancy.

The decision on the mode of delivery is made at 39–41 weeks of pregnancy. Cesarean section is favorable in the combination of the large fetus with:

- breech presentation;
- malposition and malpresentation;
- contracted pelvis;
- placenta previa;
- poor obstetric history (miscarriage, stillbirth, etc.);
- prolonged pregnancy;
- infertility, IVF;
- operated uterus.

In modern obstetrics the vaginal delivery of the large fetus should be associated with low risk of complications for the mother and child. Particularities of the delivery include:

- delivery at the gestational age of 38-41 week to avoid prolonged pregnancy;
- monitoring of fetal well-being (continuous CTG);
- evaluation of the effectiveness of uterine contractions, prevention of uterine inertia;
- adequate labor pain relief;
- external and internal obstetrical examination, evaluation of the signs of cephalo-pelvic disproportion;
- episiotomy to prevent perineal lacerations;
- careful delivery of a baby.

6. CEPHALO-PELVIC DISPROPORTION

Cephalo-pelvic disproportion (or feto-pelvic disproportion) is a complication of labor which exists when the capacity of the pelvis is inadequate to allow the fetus to overpass the birth canal. Cephalo-pelvic disproportion arises mostly from diminished pelvic capacity, excessive fetal size, or more usually, as a combination of multiple factors.

The most common combinations of causes of cephalo-pelvic disproportion are:

- combination of mild contraction of pelvis with large size of a fetus;
- abnormal inclination and presentation of the head, and asynclitism with mild contraction or even a normal pelvis;
- the large size of the head and a normal pelvis;
- organic deformations of the pelvis.

6.1. DIAGNOSIS OF CEPHALO-PELVIC DISPROPORTION

The diagnosis of cephalo-pelvic disproportion is usually retrospective after a well-conducted trial of labor. At the first stage of labor, failure of cervical dilatation despite good contractions, increasing caput and moulding, CTG changes arouse the suspicion of the head compression and appearance of fresh meconium may suggest the possibility of disproportion. At the second stage of labor, failure of descent of the head with increasing caput and moulding in the presence of good contractions may indicate disproportion.

There are few clinically significant tests for the diagnosis of cephalo-pelvic disproportion, they are as follows:

1. *Vasten-Henkel sign* — an obstetrician puts his hand on the pubic symphysis of the woman lying on her back, and leads it up the abdominal wall. If the head of the fetus is lower than the symphysis (negative Vasten sign, Figure 37-1) — so the forecast of delivery is good. If the head is determined at the same level as the symphysis — so the delivery is conditionally possible (Vasten intermediate, Figure 37-2). But if the head of the fetus is elevated above the symphysis — the delivery is not possible (Vasten positive, Figure 37-3).

2. *Zangemeister sign* — to estimate this sign one must measure external conjugate with a pelvimeter. Then the anterior jaw of a pelvimeter moves to the most prominent point of the fetal head (second jaw of a pelvimeter remains at the same place). If the resulting size is less than the external conjugate, the sign of Zangemeisteris considered negative, and if it is more, that indicates a disproportion between the size of the fetal head and the mother's pelvis (Zangemeister positive). If the both sizes are equal, it indicates the relative size mismatch of the fetal head and the mother's pelvis.

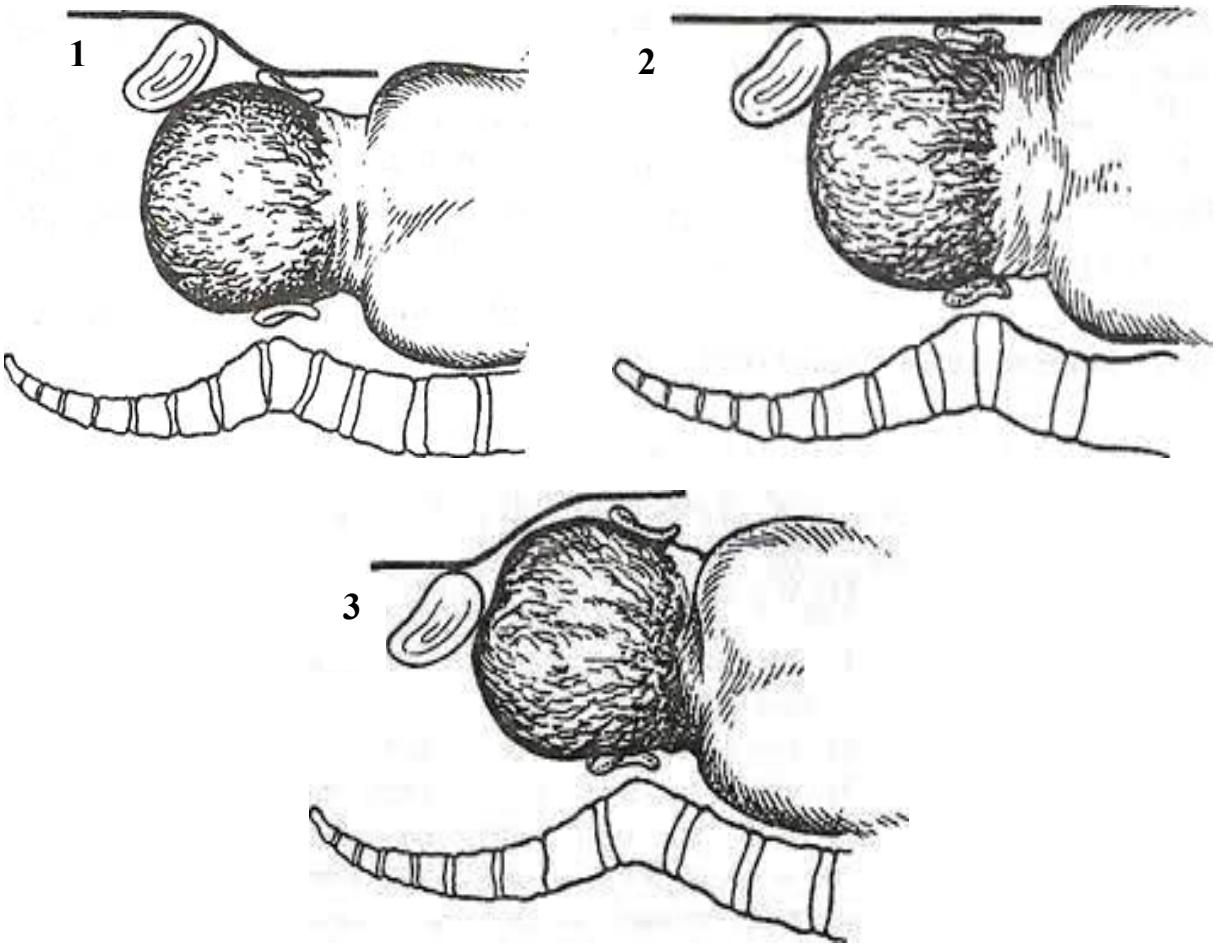

Figure 37 — Vasten-Henkel sign

Conditions for the diagnosis of cephalo-pelvic disproportion are:
- the second stage of labor;
- full dilatation of the cervix (10–12 cm);
- ruptured membranes;
- adequate uterine contractions;
- evacuated bladder.

Symptoms of cephalo-pelvic disproportion are:
- painful ineffective bearing-down efforts;
- absence of descent of the head;
- configuration, asynclitism, moulding of the head;
- fetal hypoxia;
- symptoms of pelvic organs pressing;
- threatening uterine rupture;
- positive Vasten's and Zangemeister signs.

6.2. MANAGEMENT OF LABOR IN WOMEN WITH CEPHALO-PELVIC DISPROPORTION

Importantly, cephalo-pelvic disproportion cannot be diagnosed prior to the labor. Even in labor in the absence of threatening uterine rupture cephalo-pelvic disproportion is diagnosed within 1 hour.

When the accurate diagnosis of cephalo-pelvic disproportion has been made, the safest type of delivery for a mother and baby is emergent Cesarean section. A woman undergoes perioperative care. Some of obstetric authorities recommend tocolysis to prevent uterine rupture while preparing for operation; other recommendations include prophylaxis of fetal hypoxia. The standard method of Cesarean section in the lower uterine segment is preferred, at the same time lower midline laparotomy is suggested to carry out for full revision of the uterus and abdominal cavity.

In rare cases, the cephalo-pelvic disproportion occurs in the pelvic outlet, when the Cesarean section is technically impossible. In such cases, the fetus is extracted by obstetrical forceps or a vacuum extractor.

7. SHOULDER DYSTOCIA

Shoulder dystocia is a specific case when after the delivery of the head, the anterior shoulder of the fetus cannot pass below the pubic symphysis, or requires significant manipulation to pass below the pubic symphysis. It is diagnosed when the shoulders fail to deliver shortly after the fetal head.

Several factors are associated with shoulder dystocia; they are as follows:

- macrosomia of the fetus;
- maternal diabetes and associated diabetic fetopathy;
- postterm pregnancy;
- fetal malformations;
- contracted pelvis;
- immobility of the coccyx due to fractures, exostosis, etc.

Shoulder dystocia causes perinatal and maternal morbidity and even mortality:

- fractures of the clavicle or shoulder;
- fetal hypoxia;
- Klumpke paralysis, Erb's palsy;
- cerebral palsy;
- intranatal fetal death;
- injuries of birth canal;
- maternal postpartum hemorrhage;
- postpartum purulent-septic diseases.

7.1. DIAGNOSIS OF SHOULDER DYSTOCIA

Even taking into account all risk factors it is extremely difficult to predict shoulder dystocia. The main risk factor is increased chest-to-head diameter ratio.

Shoulder dystocia should be diagnosed if within 60 seconds after the delivery of the head there is no shoulders delivery despite the active bearing-down of the parturient.

7.2. MANAGEMENT OF LABOR IN WOMEN WITH SHOULDER DYSTOCIA

In diagnosed dystocia, an obstetrician should act quickly while avoiding three things: pulling, pushing, and pivoting (the rule of 3P). One of the important actions is the episiotomy.

Shoulder dystocia can be corrected by the following maneuvers:

- McRoberts maneuver involves hyperflexing the mother's legs tightly to her abdomen. It widens the pelvis and flattens the spine in the lower back (Figure 38).
- Rubin maneuver — suprapubic pressure or posterior pressure on the anterior shoulder, which would bring the fetus in an oblique position with the head somewhat towards the vagina (Figure 38).
- Woods' screw maneuver which leads to turning the anterior shoulder to the posterior and vice versa.
- Jacquemier's maneuver or delivery of the posterior shoulder first, in which the forearm and hand are identified in the birth canal, and gently pulled (Figure 39).

Figure 38 — McRoberts and Rubin maneuver in shoulder dystocia

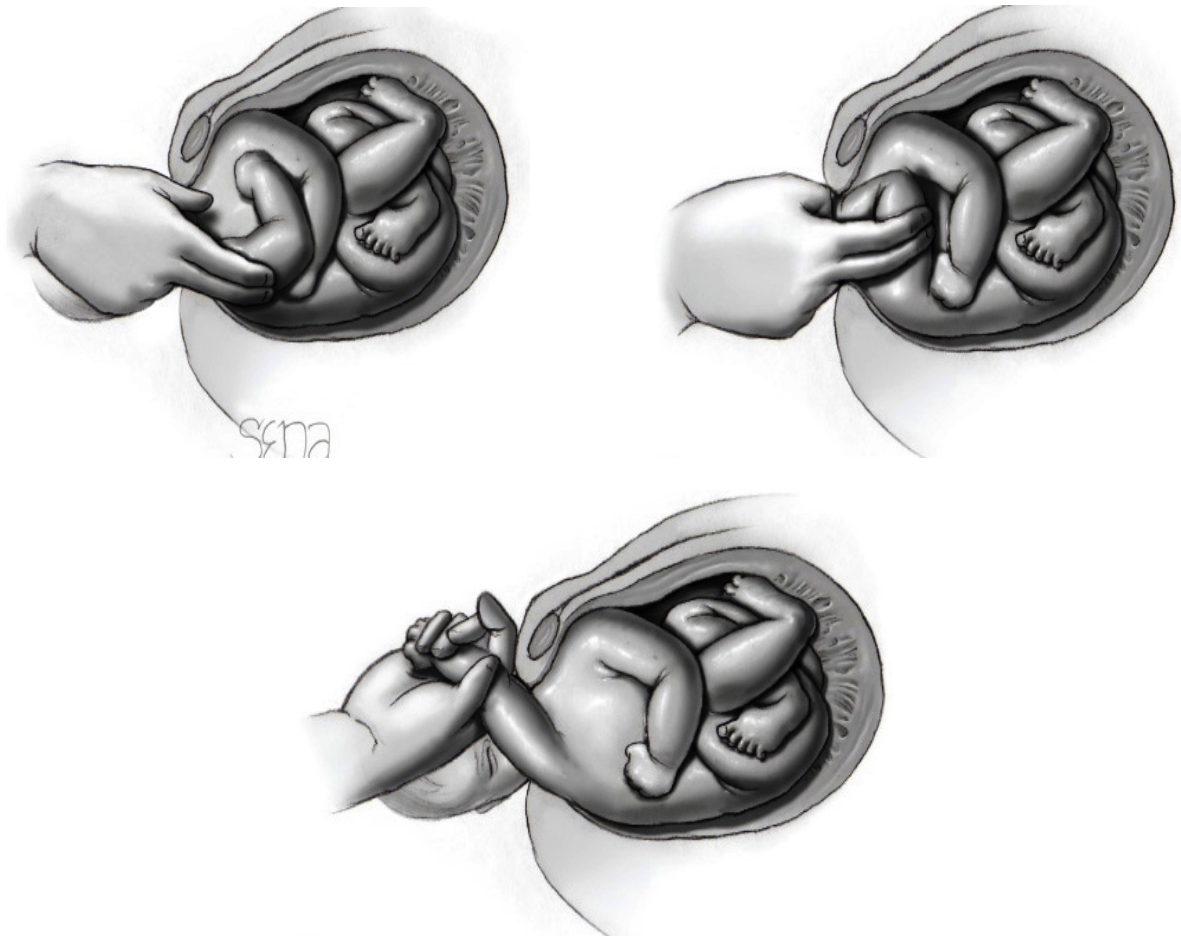

Figure 39 — Jacquemier's maneuver

In some cases operative techniques could be applied to rescue the mother's and infant's lives; these are as follows:

- cleidotomy — intentional fetal clavicle fracture, which reduces the diameter of the shoulder girdle that allows to pass through the birth canal;
- maternal symphysiotomy, which makes the opening of the birth canal laxer by breaking the connective tissue between the two pubes bones facilitating the passage of the shoulders.

However, currently these techniques are used very rarely.

8. BREECH PRESENTATION

When the buttocks of the fetus enter the pelvis before the head, the presentation is *breech.*

The varying relations between the lower extremities and buttocks of breech presentations form the categories of frank, complete and incomplete breech presentations. With a *frank breech* presentation, the lower extremities are flexed at the hips and extended at the knees, and thus the feet lie in close proximity to the head (Figure 40-1). A *complete breech* presentation differs in that one or both knees are flexed (Figure 40-2). With *an incomplete breech* presentation, one or both hips are not flexed, and one or both feet or knees lie below the breech, such that a foot or knee is the lowermost in the birth canal (Figure 40-4). *A footling breech* is an incomplete breech with one or both feet below the breech (Figure 40-3).

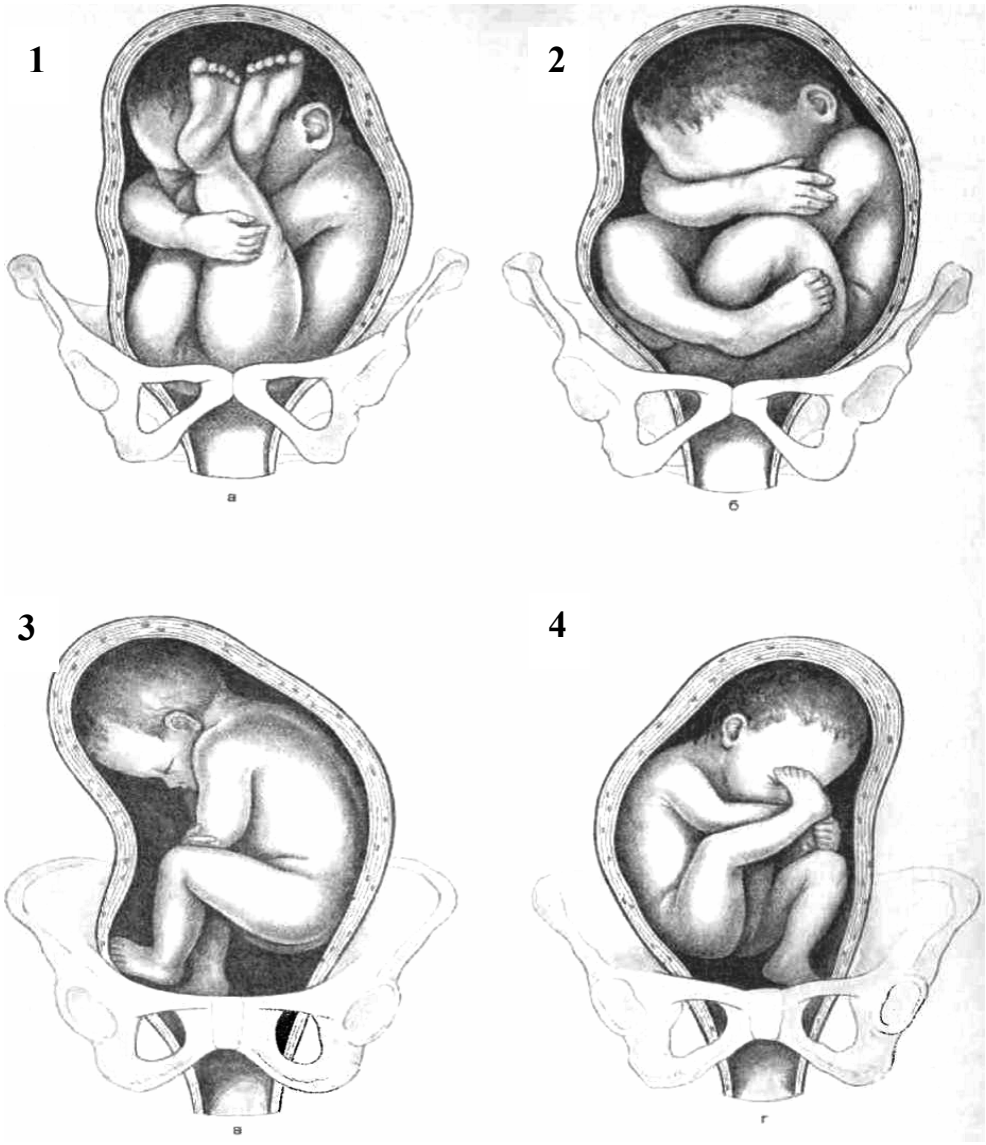

Figure 40 — Types of breech presentation

8.1. DIAGNOSIS OF BREECH PRESENTATION

Diagnosis of breech presentation in the modern world is not very difficult. Classically we use obstetrical examination and USG study. Methods for diagnosis of breech presentation are:

1. Leopold maneuvers are used to diagnose fetal position and presentation. With the first Leopold maneuver, the hard, round, readily ballottable fetal head may be found to occupy the fundus. With the third maneuver, the breech is found above the pelvic inlet.

2. Vaginal examination. With the frank breech presentation, ischial tuberosities, the sacrum, the anus and the external genitalia usually are palpable. Regarding presentation, with a complete breech, the feet may be felt alongside the buttocks. In footling presentations, one or both feet are inferior to the buttocks.

3. Ultrasonography is the best confirmation of a suspected breech presentation. It also can provide information regarding the breech type and neck angle.

8.2. BIOMECHANISM OF LABOR IN BREECH PRESENTATION

There are important fundamental differences between labor and delivery in cephalic and breech presentations. With a cephalic presentation, once the head is delivered, the rest of the body typically follows without difficulty. With a breech, however, successively larger and much less compressible parts are born. Spontaneous complete expulsion of the fetus that presents as a breech, as subsequently described, is seldom accomplished successfully.

Biomechanism in breech presentation:

1. *Engagement and descent of the breech* usually take place with the bitrochanteric diameter in one of the oblique pelvic diameters. The anterior hip usually descends more rapidly than the posterior hip (Figure 41-а).

2. *Internal rotation of breech* brings the anterior hip towards the pubic arch and the bitrochanteric diameter stands in the antero-posterior diameter of the pelvic outlet (Figure 41-б).

3. *Delivery of breech.* After rotation, descent continues until the perineum is distended by the advancing breech, and the anterior hip appears at the vulva. By lateral flexion of the fetal body, the posterior hip then is forced over the perineum, which retracts over the buttocks, thus allowing the infant to straighten out when the anterior hip is born. The legs and feet follow the breech and may be born spontaneously or require aid (Figure 41-в).

4. *External rotation of the breech and internal rotation of the shoulders* — the back is turning anteriorly as the shoulders enter the pelvic inlet in transverse diameter (Figure 41-г).

5. *Delivery of the shoulders* — the shoulders descend rapidly and undergo internal rotation, with the bisacromial diameter occupying the antero-posterior diameter of the plane of the pelvic outlet. Thus, the one shoulder is anterior behind the symphysis and the other is posterior. The anterior shoulder fixes under the symphysis pubis, and the perineum soon becomes distended by the delivering posterior shoulder. After it the delivery of shoulders takes place and the arms of the baby are coming outside the woman's body (Figure 41-д).

6. *External rotation of the fetal body and internal rotation of the fetal head.* Immediately following the shoulders, the head, which is normally sharply flexed upon the thorax, enters the pelvic inlet in one of the oblique or in transverse diameters and then rotates in such a manner as to bring the posterior portion of the neck under the symphysis pubis.

7. Delivery of the head. Suboccipital fossa fixes under the pubic arch. The head is born being flexed so the chin comes first, than — the face and the skull (Figure 41-е).

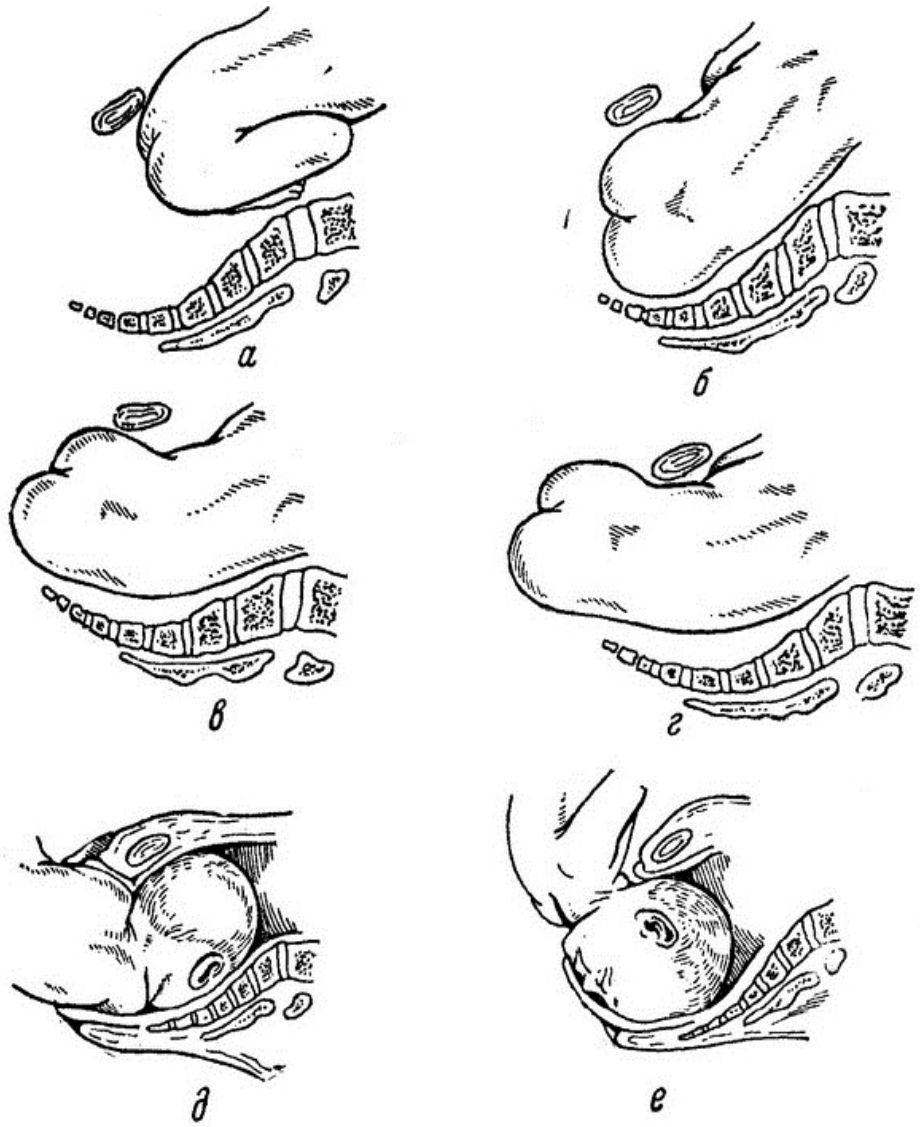

Figure 41 — Biomechanism in breech presentation

8.3. MANAGEMENT OF PREGNANCY AND LABOR IN WOMEN WITH BREECH PRESENTATION

In cases of breech presentation there is increased frequency of specific complications both in the mother and the child. They are as follows:

- prolapsed cord;
- preterm rupture of amniotic membranes;
- placenta previa;
- congenital anomalies;
- uterine anomalies and tumors;
- abnormal uterine action;
- maternal and fetal injuries;
- increased maternal and perinatal morbidity.

Therefore women with breech presentation need to be provided with careful antenatal counseling. The management of pregnancy includes additional counseling from the 32nd gestational week (weekly), additional USG of the fetus at 37–38 weeks and hospitalization to the maternity hospital at the gestational age of 38–39 weeks to define more exactly the date of labor and to choose the optimal mode of delivery.

There are some methods to convert breech presentation into cephalic. One of them is *external version* of the fetus (Figure 42).

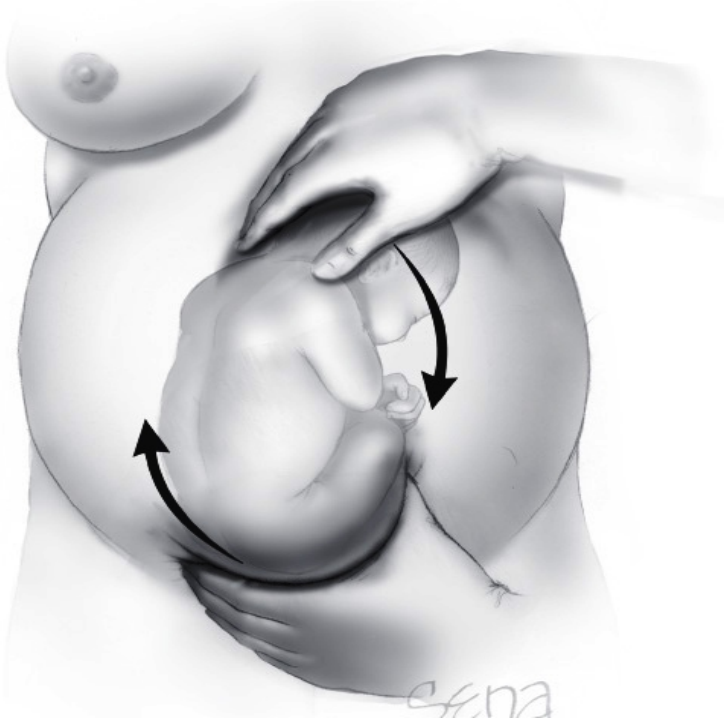

Figure 42 —— External version of the fetus

This operation must be performed in a woman who has reached 36 weeks' gestation. Women's position is supine, the bladder is empty, the condition of the fetus is normal. Some of the authors recommend tocolytics and analgesics for the procedure. Each hand grasps one of the fetal poles, and the buttocks are elevated from the maternal pelvis and displaced laterally. The buttocks are then gently guided towards the fundus, while the head is directed towards the pelvis. Version attempts are discontinued due to excessive discomfort, fetal distress, or after multiple failed attempts. The nonstress test is repeated after version. Nowadays this operation is rarely used because of the risk of such complications as placental abruption, uterine rupture, feto-maternal hemorrhage, isoimmunization, preterm labor, fetal compromise, amniotic fluid embolism, and even death.

To avoid complications and to get satisfactory perinatal outcome in modern conditions Cesarean section is the most frequently used method of delivery for breech presentation. Cesarean delivery is used in the following circumstances:

- incomplete or footling breech presentation;
- large fetus syndrome;
- contracted pelvis;
- a hyperextended head;
- an apparently healthy and viable preterm fetus;
- severe fetal-growth restriction;
- poor obstetric history (miscarriage, stillbirth, etc.);
- primipara older than 35 years;
- prolonged pregnancy;
- infertility, IVF;
- operated uterus.

As a rule, vaginal delivery requires skilled participation for a favorable outcome. Vaginal delivery can be proposed when estimated fetal weight is not exceeding 3500 g and there is spontaneous onset of labor at gestational age of 38–41 weeks. The first stage of labor requires careful monitoring and care, including:

- continuous monitoring of fetal well-being (permanent CTG);
- evaluation of the effectiveness of uterine contractions, prevention of uterine inertia;
- adequate labor pain relief;
- external and internal obstetrical examination;
- episiotomy to prevent perineal lacerations;
- special maneuvers at the delivery of a baby.

Nowadays only frank and complete breech presentation types are indicated to be delivered vaginally. There are three general methods of breech delivery through the vagina:

1. *Spontaneous breech delivery.* The fetus is expelled entirely spontaneously without any traction or manipulation other than support of the newborn. Nowadays this practice is very rare and it is used only in emergent conditions by unexperienced doctor (e.g. while transporting a parturient by an ambulance).

2. *Partial breech extraction* is the most widely used practice in our country. The fetus is delivered spontaneously as far as the umbilicus, but the remainder of the body is extracted or delivered with operator traction and assisted maneuvers, with or without maternal expulsive efforts. This technique includes three main steps: extraction of the breech, extraction of shoulders and delivery of the fetal head.

• *Tsovyanov maneuver* is done for extraction in frank breech presentation and has an aim to keep the normal attitude of the fetus so the fetal body together with fetal legs could enlarge the maternal birth canal and provide safe delivery of the fetal head. The maneuver starts after the delivery of the buttocks. The obstetrician applies his hands over the fetal sacrum buttocks, the thumbs are placed on the legs. The doctor gently supports legs to avoid their extension and delivery (Figure 43). If the normal attitude of the fetus is completely kept, the aftercoming head delivers easily.

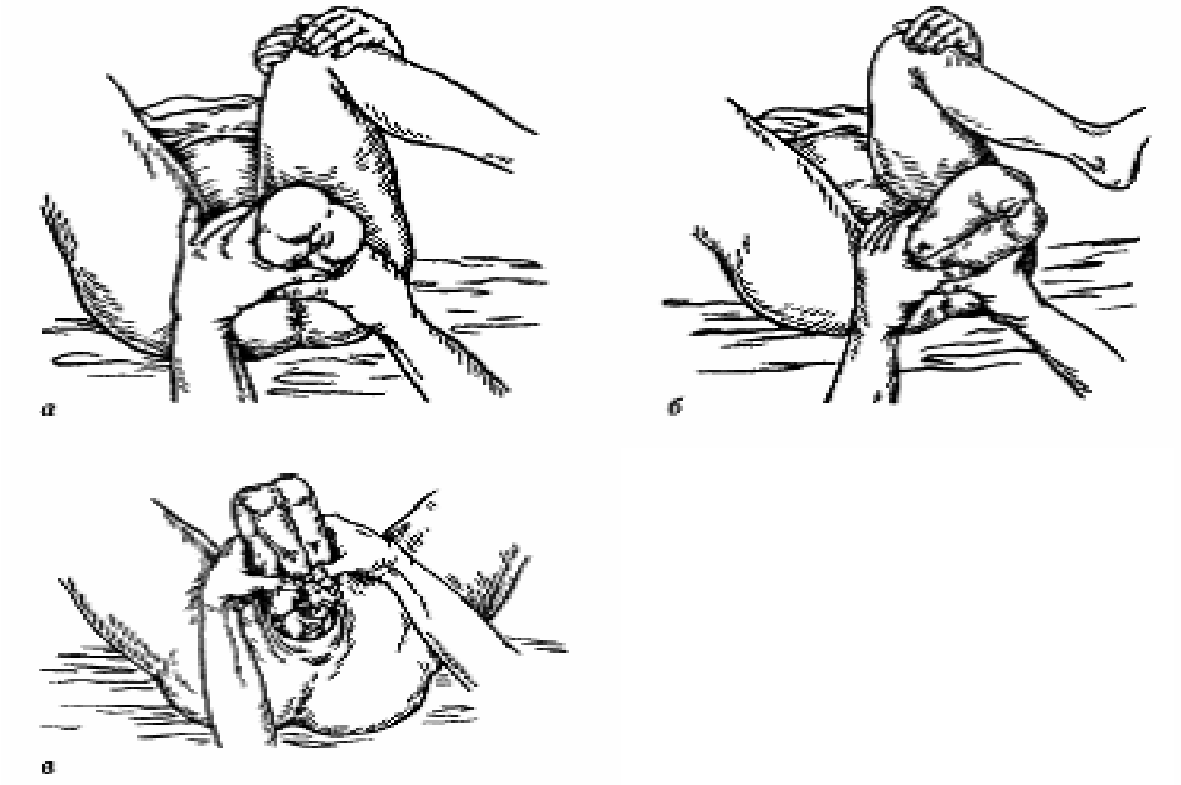

Figure 43 — Tsovyanov maneuver

• If fetal arms and shoulders have not been delivered spontaneously, there is a need to do *shoulders' manual extraction*. The posterior shoulder is delivered first. The feet are grasped with the one hand and drawn up towards the ventral

surface of the fetus. An obstetrician inserts his two fingers of the other hand along the fetal humerus until the elbow is reached. The arm is swept downward and delivered through the vulva (Figure 44). To deliver the anterior arm the body of the fetus is rotated manually so the anterior arm becomes posterior and then all the maneuvers are repeated.

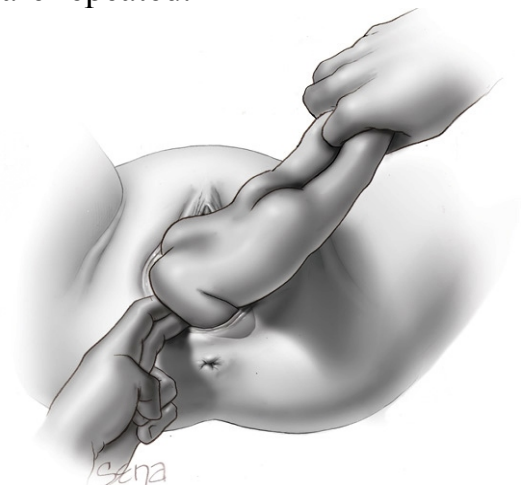

Figure 44 — Shoulders' manual extraction

• *Mauriceau maneuver* is done to evacuate the after coming fetal head. An obstetrician inserts his index finger of the one hand into the mouth of the fetus to flex the head, while the fetal body lies on the other hand. The forearm is straddled by the fetal legs. Then two fingers of the other hand hook over the fetal neck, and grasping the shoulders, downward traction is applied until the suboccipital region appears under the symphysis (Figure 45). Then the body is elevated towards the maternal abdomen, and the mouth, nose, brow, and eventually the occiput emerge successively over the perineum.

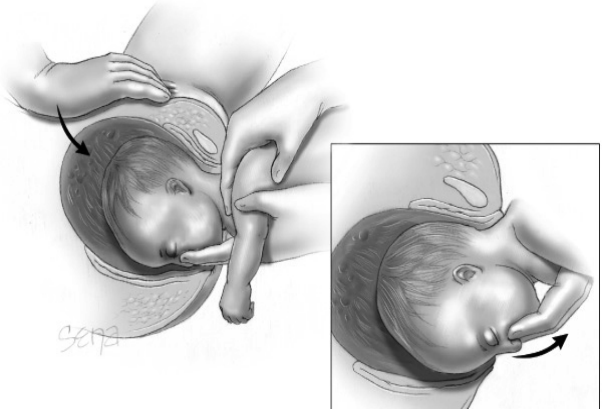

Figure 45 — Mauriceau maneuver

3. *Total breech extraction* when the entire body of the fetus is extracted by the obstetrician. Usually this is done in emergent conditions when we need fast delivery of the baby.

In a frank breech presentation fetus is extracted with fingers of an obstetrician inputted in each groin (Figure 46-1). In a complete or incomplete breech, the hand is introduced through the vagina and a leg of the fetus is grasped (Figure 46-2). As the legs begin to emerge through the vulva, the downward gentle traction is then continued (Figure 46-3). When the breech appears at the vaginal outlet, gentle traction is applied until the hips are delivered. As the buttocks emerge, the back of the fetus usually rotates to the anterior. The thumbs are then placed over the sacrum and the fingers over the hips, and assisted breech delivery is completed (Figure 46-4). Delivery of shoulders and head is done as described earlier.

1

2

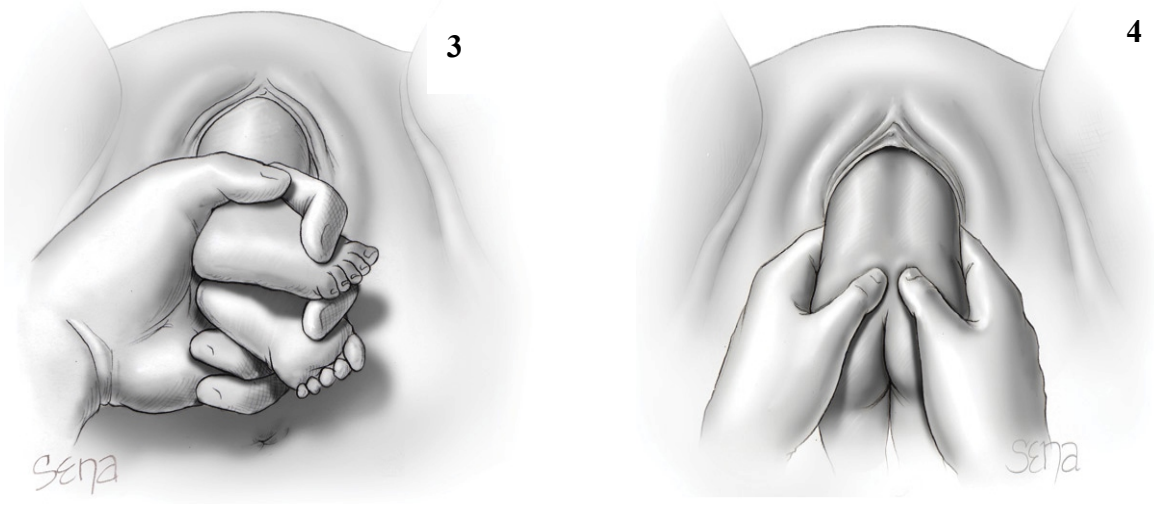

Figure 46 — Total breech extraction

9. TRANSVERSE AND OBLIQUE LIE

In the *transverse lie*, the long axis of the fetus is approximately perpendicular to that of the mother (Figure 47-A). In the transverse lie, the shoulder is usually positioned over the pelvic inlet. The head occupies the one iliac fossa and the breech the other. It creates a *shoulder presentation* (Figure 47-B).

When the long axis forms an acute angle, an *oblique lie* results (Figure 47-Б).

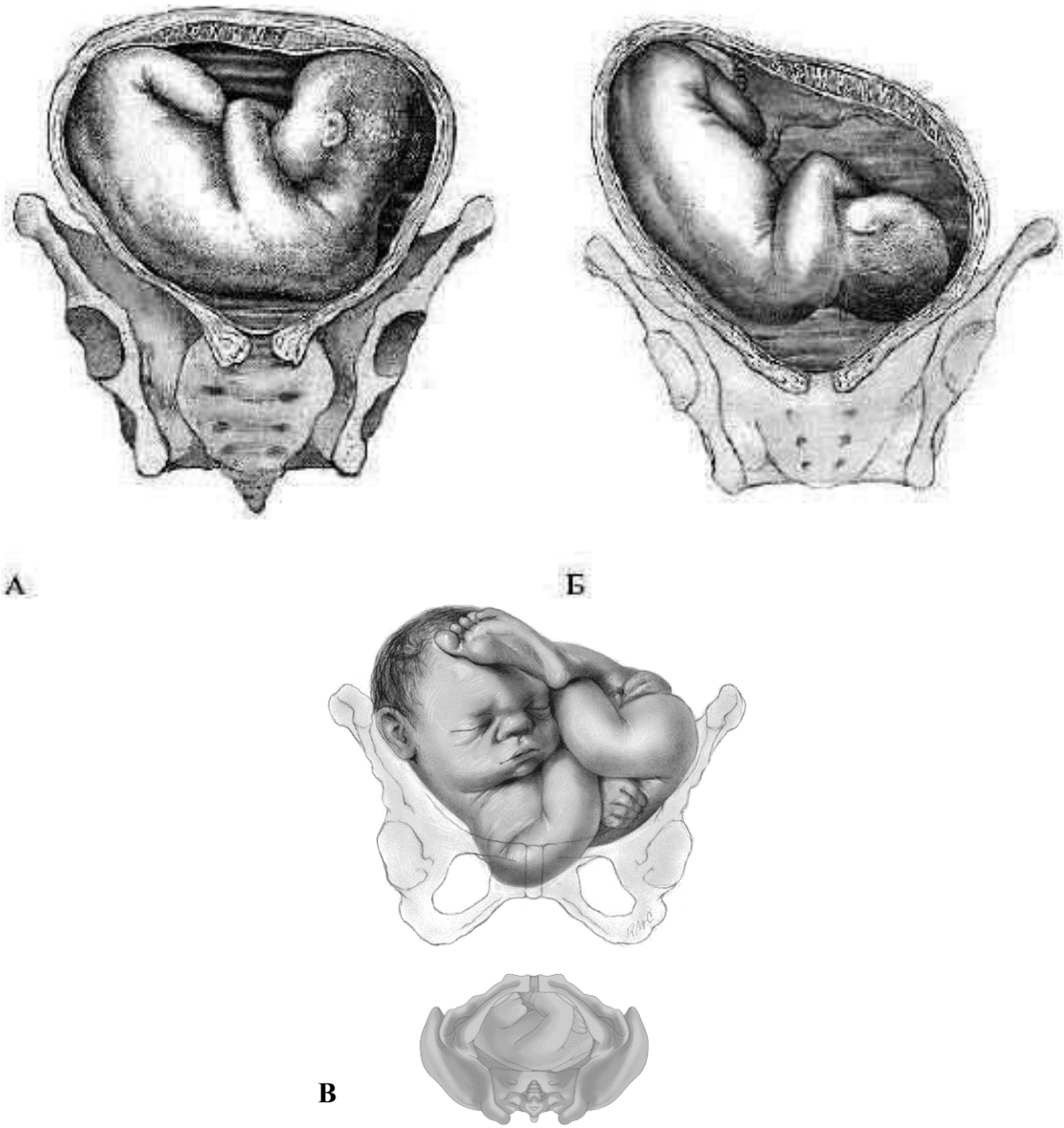

Figure 47 — Transverse and oblique lie of the fetus and shoulder presentation

Some of the most common causes of transverse and oblique lies include:

- abdominal wall relaxation from high parity;
- preterm fetus;
- tweens;
- placenta previa;
- abnormal uterine anatomy;
- polyhydramnios;
- contracted pelvis.

9.1. DIAGNOSIS OF TRANSVERSE AND OBLIQUE LIE

The diagnosis of abnormal fetal lie is not difficult and made by the same methods as in breech presentation. They are as follows:

1. The abdomen is unusually wide, whereas the uterine fundus extends only slightly above the umbilicus. Leopold maneuvers show no fetal pole detected in the fundus, and the ballottable head is found in the one iliac fossa and the breech in the other. The position of the back is readily identifiable.
2. During vaginal examination the shoulder, the side of the thorax, the scapula and the clavicle are distinguished.
3. Ultrasonography is the best confirmation of the fetal lie.

9.2. BIOMECHANISM OF LABOR IN TRANSVERSE AND OBLIQUE LIE

Spontaneous delivery of a fully developed newborn is impossible with a persistent transverse lie. After rupture of the membranes, if labor continues, the fetal shoulder is forced into the pelvis, and the corresponding arm frequently prolapses. After some descent, the shoulder is arrested by the margins of the pelvic inlet, with the head in the one iliac fossa and the breech in the other. As labor continues, the shoulder is impacted firmly in the upper part of the pelvis — this is called *neglected transverse lie* (Figure 48).

The uterus then contracts vigorously in an unsuccessful attempt to overcome the obstacle. With time, a retraction ring rises increasingly higher and becomes more marked. With this, the uterus will eventually rupture. Even without this complication, morbidity is increased because of the frequent association with placenta previa, the increased likelihood of cord prolapse, and the necessity for major operative efforts.

If the fetus is small — usually less than 800 g — and the pelvis is large, spontaneous delivery is possible despite persistence of the abnormal lie. The fetus is compressed with the head forced against its abdomen. A portion of the thoracic wall below the shoulder thus becomes the lowermost part, appearing at the vulva. The head and thorax then pass through the pelvic cavity at the same time. The fetus, which is doubled upon itself and thus sometimes referred to as *conduplicato corpore*, is expelled (Figure 49).

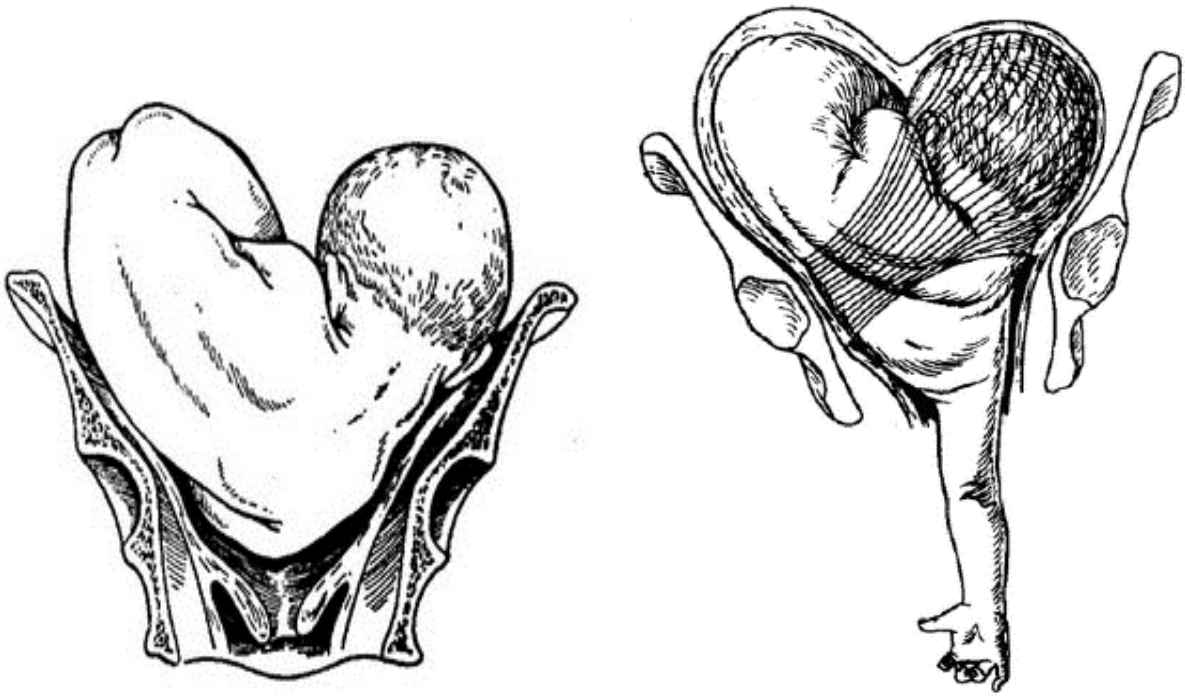

Figure 48 — The neglected transverse lie of the fetus

Figure 49 — Biomechanism of conduplicato corpore in transverse lie of the fetus

9.3. MANAGEMENT OF PREGNANCY AND LABOR IN WOMEN WITH TRANSVERSE AND OBLIQUE LIE

The pregnancy and labor in abnormal fetal lie represent some specific but dangerous complications including:

- preterm rupture of amniotic membranes;
- prolapse of the arm (Figure 50), leg or cord;
- abnormal uterine action;
- uterine rupture;
- maternal and fetal traumas;
- associated maternal and perinatal morbidity.

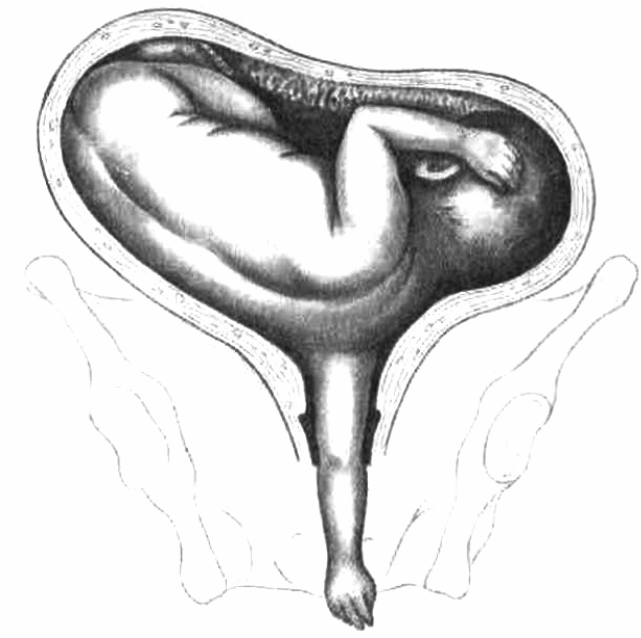

Figure 50 — Arm prolapse

Women with abnormal fetal lie need to be provided with careful antenatal counseling. The management of pregnancy includes additional counseling from the 32nd gestational week (weekly), additional USG of the fetus at 37–38 weeks and hospitalization to the maternity hospital at gestational age of 38–39 weeks.

Transverse or oblique lie of the fetus are indications for Cesarean delivery, even for the second of tweens.

REFERENCES

1. Williams Obstetrics: 23rd edition / F. G. Cunninghamт [et al.]. — McGraw-Hill Companies, 2009. — 1404 p.

2. *Dutta, D. C.* Textbook of Obstetrics / D. C. Dutta. — New Central Book Agency, 2001. — 670 p.

3. *Bodyazhina, V. I.* Textbook of Obstetrics / V. I. Bodyazhina. — Mir Publishers, 1983. — 400 p.

4. *Edmonds, K.* Dewhurst's Textbook of Obstetrics and Gynaecology: 7th edition / K. Edmonds. — Blackwell Publishing, 2008. — 732 p.

5. *Pickersgill, A.* Key Questions in Obstetrics and Gynecology: second edition / A. Pickersgill, F. Meskhi, S. Paul. — BIOS Scientific Publishers, 1999. — 168 p.

6. *Hanretty, K. P.* Obstetrics Illustrated: sixth edition / K. P. Hanretty. — Churchill Livingstone, 2004. — 438 p.

7. *Norwitz, E. R.* Obstetrics and Gynecology at a Glance / E. R. Norwitz, J. O. Schorge. — Blackwell Science, 2001. — 144 p.

8. Акушерство в вопросах и ответах [Электронный ресурс]. — Режим доступа: http://www.e-reading.co.uk/bookreader.php/73638/Akusherstvo_v_voprosah_i_otvetah.html. — Дата доступа: 27-30.01.2014.

9. *Dolea, C.* Global burden of obstructed labour in the year 2000 / C. Dolea, C. AbouZahr // Global Burden of Disease, 2000. — 17 p.

10. Contracted pelvis. Lacerations of the birth canal [Electronic resource]: lection E. A. Einysh (translated by O. A. Teslova). — Electronic data: ppt file 6 923 822 bytes. — EE «GomSMU».

11. *Иванов, А. А.* Акушерский фантом / А. А. Иванов, А. В. Ланковиц. — Медгиз, 1952. — 168.

12. *Жиляев, Н. И.* Акушерство: фантомный курс / Н. И. Жиляев, Н. Н. Жиляев, В. В. Сопель. — Книга плюс, 2002. — 236 с.

13. *Айламазян, Э. К.* Акушерство: учебник для медицинских вузов / Э. К. Айламазян. — СпецЛит, 2003. — 528 с.

14. Акушерство: учебник / Г. М. Савельева [и др.]. — Медицина, 2000. — 816 с.

15. Приказ Мин-ва здравоохр. Респ. Беларусь № 1182 от 09.10.2012 «Клинические протоколы наблюдения беременных, рожениц, родильниц, диагностики и лечения в акушерстве и гинекологии». — Минск, 2012. — 230 с.

10. APPENDIX

LIST OF BIOMECHANISMS

LIST OF FIGURES

Учебное издание

Теслова Оксана Александровна

НОРМАЛЬНЫЕ
И ЗАТРУДНЕННЫЕ РОДЫ
(на английском языке)

Учебно-методическое пособие на английском языке
для студентов 4 и 6 курсов лечебного факультета
и факультета по подготовке специалистов для зарубежных стран
медицинских вузов

Редактор *Т. М. Кожемякина*
Компьютерная верстка *А. М. Терехова*

Подписано в печать 22.07.2014.
Формат $60\times84^{1}/_{16}$. Бумага офсетная 80 г/м^2. Гарнитура «Таймс».
Усл. печ. л. 3,95. Уч.-изд. л. 4,3. Тираж 75 экз. Заказ № 183.

Издатель и полиграфическое исполнение:
учреждение образования «Гомельский государственный медицинский университет».
Свидетельство о государственной регистрации издателя,
изготовителя, распространителя печатных изданий № 1/46 от 03.10.2013.
Ул. Ланге, 5, 246000, Гомель.