Inaugural Theses

on

Mechanism of Labour

By

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There are few things connected with the study of Midwifery so essential to be known by those whose duty it is to attend on that department of practice, than the one whose title we have adopted for our thesis. This is the keystone to all other labor kinds of labour, and he who has mastered the phenomena, and has a right appreciation of them, is able to discern any deviation from the normal standard, and to devise the safest, safest and best means to be adopted in adjusting nature in accomplishing her task, or in applying artificial means for the safety of both mother and child. But he who is ignorant of this, the elements of obstetric practice is in no better position than the ignorant, and too often presumptuous midwife, who allows nature to go on in
her Course totally ignorant of
the beautiful Mechanism that
is taking place, but whose
Knowledge is deemed to be
Sufficient, if she care, after
the birth of the Child, deport
it in the usual way and
afterwards remove the After-
Month. — Such is every
the ignorance of a few
Medical men, who profess
to be good Accoucheurs, which
in the present day is un-
endurable. Dearly we have
in every Medical School,
Teachers who have made this
a Special Study, and who are
ready and willing to impart
their Knowledge both in Theory
and Practice.

As the Importance of
a right Knowledge of the Birth
of Labour is so great, it is
indeed surprising that
Medical Men will teach females
the difficult and responsible
duty of going about performing duties, which too often from a scanty knowledge, even of the rudimentary parts of the English language, they are incapable of rightly beginning.

The Mechanism of Salvars has only within a comparatively few years, attracted that attention from Medical Men which it deserved. Kacele being the first to explain the membrane in which the Child's head entered, passed through and was ultimately expelled from the Pelvis.

A Gentleman professing a thorough knowledge of these phenomena, must have his mind greatly at rest, by attendingly upon a case of Labour, than one who is entirely ignorant of the process. Having mind must be in a
Constant state of anxiety and dread, lest every thing should not be going on as it should do.

In studying the mechanism of labour, there are three elements to which we must direct special attention, and with which we must be familiarly acquainted, as all three are necessary and concerned in the expulsion of the child (1) we have the motive or mechanical power by means of which the child is pushed or propelled into, and through the pelvis (2) we have the resistance or power to be overcome by the mechanical means (3) and lastly, we require to be acquainted with the structure and
and uses of the different part forming the Pelvis through which the child must pass.

As it will be more convenient, first to speak of the bone passage and afterwards to consider the other two elements, I will now begin by describing the Bones which go to form the Pelvis, the Relation each bears to the process, and the Diameter and area of the Standard Female Pelvis.

The term Pelvis is applied to that mass of flat bones which are placed at the bottom of the Spinal Column and having articulating with them in front, in the Acetabula the Femora or thigh bones, when entirely directed of all the Rump parts.
The pelvis somewhat resembles a basin; hence its name, in many of the older works the term basin is used, but in the present day authors prefer using the term pelvis.

In adults, the bones constituting, or forming part of the pelvis, are four in number, two flat expanded bones on each side (the innominate), and two behind, the sacrum and coccyx. The sacrum is wedged in between the innominate bones, having the coccyx attached to its lower extremity, whilst to the upper the last lumbar vertebra is applied.

In the child, the osa innominata consist of three distinct and separate bones joined together,
by cartilage, which, toward adult age, have ossified or horny matter deposited, so as to form one continuous bone, which have more or less the original division into three.

As it is convenient in studying the bones to describe them, as if they still consisted of three pieces, we will follow this plan, and briefly examine at each separately, beginning with the uppermost and largest portion — the isthmus.

The isthmus is the largest of the three divisions of the innominate bone, and may be divided into an outer surface or dorsum, an inner surface or center — the lower portion or body — and the crest or border, terminating in front in the anterior superior iliac spine, and behind in
the posterior. — The dorsum or external surface may be considered as irregular, convex more or less, and cleft for the attachment of the powerful glutæi muscles.

The inner surface is concave and covered by the iliacus internus muscle, on the right side, the rectus femoris of the edge, and on the left, the biceps lie in contact with the muscles.

As this portion of the uterus, which we have described, is of little importance in the mechanism of labour, we will not dwell any longer in the consideration of it, but will now briefly examine the next portion — the umbilicus.

The umbilicus is near to the ilium and occupies the lowest position of the thora.
divisions of the Pelvis, it is sometimes called "Os Lepontarium" from being that portion of Bony on which we rest when sitting.

It is divided, into a Base or Body, a 2 lining process, a tubercle, and an ascending ramus; the body, the thickest part forms the outer and back part of the acetabulum, and forming nearly two-fifths of that cavity, the anteriorly thin and sharp, and bounded by the obturator foramen externally, the posterior joins the ilium, and the ilio-ischiatic notch anteriorly. A thin conical process of bone juts out from the posterior border, backward and inward to which the name of spine is given, to it is attached the
Sacro-sciatic ligaments, and it gives origin to the
Gemmellus Superior and Coccygeus
Muscles: This process is
an object of great interest
to The Accoucheurs, more so
than we would anticipate
from its small size.
Sometimes by its being lengthened
or too much curved inclined,
it diminishes the cavity
of the pelvis, and obstructs
the passage of the Child's
head in delivery; passing
downward from the body
the bone bulges out into
a considerable protuberance
"the tubercle," and
from that process, ascending
forward and inward, the
"ascending Ramus" joins that
of the Pubes. The Schem
rough externally, and
smooth within, and is
connected to the Ligum and
Pubes in the Acetabulum.
Pubis

It is also connected to the symphysis by means of the sacro-pectineal ligaments.

The third division of the Os Innominatum is situated in the fore part of the Pelvis, and is smaller than either the Ilium or Ischium. It is divided into a body, two rami, and four processes. The body is most external—-is the chief portion of the bone, and forms the internal and upper part of the acetabulum—forming but a comparatively small portion of it, running horizontally forward and upwards from the bone. The first Ramus Proceeds—

The Horizontal Ramus, smooth and concave upwards covered by the Pettineum; it is also smooth on the
Surface looking towards the cavity of the pelvis, the surface is grooved beneath forming the boundary of the obturator, or hypochondrial membrane, foramen. A sharp ridge separates its superior from its posterior surface, which proceeding backwards towards the promontory of the sacrum forms the oblique rectus line; this line forms the upper boundary of the true pelvis. The two horizontal rami are attached in the middle line by means of a fibro-cartilaginous disk, interfaced between them, which Articularis has been called, the synovial membrane interfaced between the cartilaginous heads and the bone, and that slight lateral motion is allowed by the
ligates, this being limited by the strong ligaments surrounding the joint, from the lower part of the symphysis. The descending Ramus, passes downwards, backwards, and outward, to join the ascending Ramus of the Ischium.

The external surface of the bone, like that of the Ilium and Ischium, is rough for the attachment of muscles, and its internal surface is smooth. On the upper and inner surface there is a ridge—a part of the rim of the pelvis—terminating at its inner extremity, the little swelling, the 'spinous process' to which is attached by its own extremity, a part of the Tuber ischii, and by its fellow of the

Pubis is connected with the Ilium and Ischium in the acetabulum, and with its fellow of the
opposite side by the symphysis

When these bones are
joined together, constituting
the innominate bone we find
at once strong with its
irregular shape; it is
articulated posteriorly to
the sacrum, and anteriorly
to its fellow of the opposite
side by the symphysis.

It enters into the formation
of the side and front of
the pelvis. A cup-shaped
concavity may be observed in
front from which the three
portions of the bone diverge
- the acetabulum - at
the head of the femur,
on the inner and long
part long the deep eare
ovar foramen formed chiefly
by the rami of the ischium
or pubis called the obturator
or hypogid foramen.

this foramen is naturally
Covered over by a membrane, except superiorly, where it is perforated for the Obturator vessels and nerve.

This foramen seems to have been intended for the purpose of rendering the portion of the Pelvis lighter than it would be if a thick piece of bone were inserted in its place.

The relation that the three portions of the Pelvis bear to the inlet and outlet is worthy of consideration.

The pelvic forms the largest portion of the inlet, but none of the outlet.

The Sacrum forms a part of the outlet but none of the rim, whilst the Pelvis enters into the composition of neither inlet and outlet. So that in deformity of
of the rim, the Ilium by Pubis would be at
guist, but not the Ilium
- in the outlet the Ilium
is Pubis, but not the Ilium

The Pelvic Cavity
is bounded posteriorly by
the Sacrum and Coxa;
the Sacrum is the
largest bone of the Vertebal
Column - a triangular
shape, the base above
articulating to the Sumbor
vertebrae of the apex below
articulating with the Coxa.
It presents for examination
an ante surface which is
convergent and narrower than
that of the inner, very
rough, and presenting in
the Middle four Eminences
analogous to the Synous
Processes of the other Vertebrae
on either side. Each of these
Processes is a Shallow
Groove in which is placed the free fibres of the extensor muscles of the back. In this groove too there are four holes or foramina, for the transmission of the posterior sacral nerves. The upper surface is concave from above downward and right to left, it is marked by four transverse lines which indicate its former division into fields.

The sides of the Sacrum are triangular, and uneven for the upper part, where they articulate to corresponding surfaces on the Sphincter and Rectum below, where the Sacro-Iliac ligaments are attached.

The Coccyx appears to be a continuation of the Sacrum, and is often
Great importance in an obstetric point of view, it is somewhat triangular, the base above, the apex below, smooth towards the cavity of the Pelvis, and rough on its exterior. The coccygeal points have great mobility, which enlarge the outlet of the Pelvis, facilitate the passage of the Child's head.

It occasionally happens that these points become enchyplosed, which must often great impendiment to the passage of the Child's head, and must of necessity be broken to enable it to enlarge the outlet, thus generally results from the resistance caused by it against the Child's head.
We will now examine the Pelvis as a whole in reference to partition, the size and form of which is of great importance to the obstetrician. The Pelvis has been divided into true and false, the false Pelvis being properly speaking a part of the abdomen; if it is bounded above by the crest of the ilia, below by the diosrectal line, and posteriorly by the Brimontary of the Sacrum, this portion of the Pelvis here as is of trifling interest to obstetricians. The true pelvis is the portion below the expanded wings of the false, bounded above by the true rectal line, posteriorly of the Sacrum, and anteriorly above, constituting its...
rim of inlet; its cavity being bounded by the Sacrum and Coccyx behind, nearly five inches in length—in front by the Pubic wall, varying from an inch to an inch and a half in length—on either side it becomes wide and deep. (about 2 inches) passing in front of the Obturator foramen, and behind the Ischial—Ischiatic—Foramina. The outlet for lower orifice of the Pelvis is bounded anteriorly by the Symphyses and Rami of the Pubis and Iodcia—an either side by the Intertines of the Ischia and Occipital Notches—and posteriorly by the Sacrum and Coccyx; the outlet with the ligaments attached presents a very different appearance from the form.
outlet, it being much more contracted, and having a Diamond shaped appearance - the Symphysis being the anterior angle, and the Plane the posterior angle of the Diameter.

The axes of the two orifices are not the same that of the upper is produced, would pass anteriorly through the Abdominal Muscles, between the Pubis and umbilicus, and posteriorly it would rest against the lower end of the Sacrum. The axis of the lower or outlet, if produced from below upward, would impinge against the Promontory of the Sacrum; these lines, therefore, will descussate near the
Centre of the Pelvis, and form an obtuse angle forward.

The Pelvic axis may be represented by a curved line passing through the centre of the upper plane, and descending through the cavity, parallel to the curve of the Sagrum, and locating through the centre of the lower plane. The axis of the inlet corresponds to a line passing through its centre, and directed from beneath the umbilicus, downward and backwards to the lower part of the Sacrum. The axis of the outlet by a line directed from the Promontory of the Sagrum, downward and forward through the Centre of its Plane.

The Female Pelvis
differs from that of the
male, in many respects — it is wider and larger, but not quite so deep; — the area of the ilium
in the female are more expanded, the inlet and
outlet are rounder and wider — the pubic arch
is also rounder & wider — the symphysis pubis
is not as deep; — the acetabula are more distant
from each other — and the bones generally, are
not as strong, and muscular, but thinner and more
delicate.

The Nameles of
the spin of the pelvis
are three in number,
the first transversal,
from side to side, the
second or antero-posterior
from sacrum to pubis
and the third, or oblique, midway between the two others, pass from either sacro-iliac synchondrosis to the opposite acetabulum. The lateral or transverse diameter measures five inches; the antero-posterior four, and the oblique five inches. These measurements are of course less in the recent pelvis, before the soft parts are removed, and in the living body — the must allow in the antero-posterior at least a quarter of an inch, and fully half an inch in the transverse.

Great disputes have arisen whether the transverse or oblique diameter is greater in the long state, but this is of little importance. Since the
the soft parts are
removed, the oblique
position is the longest.

The cavity of the
pelvis is much deeper
behind than in front,
it's greatest depth, extending
from the prominence of
the sacrum, to the top
of the coccyx, should
measure about five and
a half inches — at the
symphysis pubis about
twice and a half; the
diameters in the cavity
are nearly the same as
those of the inlet both
in P. I. and situation.

The outlet of the pelvis
is very irregular in shape
— its diameters in situation,
being nearly the same as
those of the rim and
cavity, but in extent
the Anter-posterior, when
the coccyx is pressed
towards the labour, measures
five inches or more, although
in the ordinary state it is
only about four.
The short diameter
extends laterally from one
tuber ischiun to that of
the opposite side.

The position of
the pelvis bears to the body, is not as
would be anticipated from
viewing one disarticulated from
(thoracic vertebrae
above, and femora below)
horizontal, neither is it
perpendicular, but oblique
the os coccygis being in a higher
level than the pubis; this
obliquity is essential for
the support of the abdominal
muscles on the symphysis pubis.
and is of great importance in reference to mechanism of Labour.

The Pelvis has two axes, the first passing downwards and backwards through the inlet or brim of the Pelvis; the second downwards and forwards through the outlet; it is necessary for the accouchewr to bear in mind the relative position of these two axes, both in regard to mechanism and likewise in applying instruments, as in placing the hand onto the uterus, as in turning.

Having from briefly sketched the first element, as to onset of the Mechanism of Labour, the bones entering into
or forming part of the Pelvic Cavity—their Shape, Size, Position, axes, 
and have now to consider the second element, viz. 
The fæces which is to be expelled in a peculiar 
manner through that cavity 
adopting itself as the 
channel. Free to the diameters 
of the Pelvis, both in 
their passage and exit 
from their bones. 

As the form and 
outlet of Pelvis are 
aval in shape, so the 
fœtus head approximates 
in a very considerable 
degree, whereas to that 
shape, the long diameter 
of the oval being from 
the kind forwards. 
The length of the long 
diameter varies considerably 
in practice, but on an 
average it may be
estimated at four inches and a half. The brain which extends from one parietal bone through to that of the opposite side is about three and a half inches. The circumference may be estimated at thirteen or fourteen inches.

In the fetal head the bones differ from those in the adult, and this difference is of use in enabling the head to be adapted to the cavity in parturition. In the adult, the bones are connected together by bones perforated otolines, but in the fetus, they are perforated to some considerable extent by a membranous formation at the anterior portion of what is the sagittal
In the adult, there is a space closed likewise by a membrane, being of a diamond shape, made as it were at the expense of the two anterior corners of the parietal bones and the corners where the two portions of the frontal meet, this space is termed the anterior fontanelle. A space is also found at the posterior portion of the occipital bone, but differing from the anterior in shape, being 3 corners to triangle not base of the triangle resting against the occipital bone. Knowledge of the shape and portions of these fontanelles is essential to enable the practitioners to draw from the relation of the parts of the child's head, and to watch the progress
The uterus at the full term of gestation assume an ovoid form; the neck of the uterus as pregnancy advances being obliterated and enters into the formation of the cavity, the large end as we should expect being uppermost, the small end downwards; the long axis of the uterus corresponds to the inlet of the pelvis.

Dr. Haldane that the foetus occupies in the cavity of the uterus is that of an ovoid, corresponding to that of the patent, with its large end above and its small end below, its long axis at the beginning of labour,
walet or a pin of the pelvis. — The avoidsd form of the foetus is obtained by the flexure of the thighs upon the abdomen, and crossing of the legs — the spinal column is bent somewhat in the shape of a bow — and the arms are folded over the chest. They, the foetus occupies the least possible room, and is admirably fitted to the shape of the uterus.

The third element necessary to accomplish the birth of a foetus is the muscular contractions of the uterus, assisted in the second stage, by the abdominal muscles; on this subject I need not dwell long, as it is now freely admitted by all, that
the uterus, aided by the Abdominal Muscles, is the MechanicalPower required for the Purposes of propelling the Fetus through the Pelvic Cavity. The Child is a Passive Agent, having no Power (as was alleged by the Ancients) of assisting itself in its Passage. The Muscular Fibres of the Uterus are so arranged, traversing it in all directions, that their Contractions lessen every Part of the Uterine Cavity—presumably is exerted on every Part of the Fetus except the Presenting part, and by this means Profusion is produced.

Having now briefly considered the three Elements necessary for the birth or bringing forth of a Child, hopefully,
We will now inquire into their combined action.

In order that the head, which is, in all natural cases the presenting part, may enter the birth of the pelvis, it is necessary that its long diameter should be adapted to the long diameter of the pelvis with the soft parts attached. This takes place — the oblique diameters of the pelvis being the longest, it follows that the center must lie in either of these two diameters, the face of the child either looking backward or forward as the case may be, thus being one position, two having the face looking backward, towards the sacro-iliac lymphnodes, and two forwards towards the...
Acetabula. Some have enumerated no less than eight positions, making four for the conjugate or antero-posterior, and for the transverse diameters that there is a normal sized pelvis, or in a full grown child, Beldon, if one can be traced to the position in which the child enters, therefore one will not consider these amongst the positions of a natural presentation.

The frequency of occurrence of these four positions was for some time not well understood. Some maintaining, that the position where the anterior fontanelle looked towards the sacro iliac joint, to be the second in frequency, and others holding that to be the second when the
Where the anterior fontanelle looked toward the left foramen magnum. Such a discrepancy, no doubt arose from the observations having been made near the time of labour; as in the case already referred to, the forehead turns round and occupies the second position, which might be very easily mistaken for the original.

The most frequent position relating to the pelvis is the one when the anterior fontanelle and face look toward the right navel joint, the posterior fontanelle towards the left acetabulum. The short diameter occupies the left oblique of the pelvis. The next in frequency has the anterior fontanelle toward the left acetabulum.
and the Posterior towards the Sacro-Iliac joint. The third has the Anterior Fontanelle towards the Left Sacro-Iliac Synchondrosis, and the fourth the Anterior Fontanelle and Face toward the Right Foramen Magnum. Now consider the changes the head undergoes in each of these positions resulting from the perfect adaptation of the Child's head to the pelvis of the mother.

And, already sufficient, examining its structure, one need only now refer to the parts.

First Position

In the first position the Anterior Fontanelle looks toward the right Sacro-Iliac joint. That the chin rests upon the Sternum, and the head is bent a little on one
the passage of the head through the outlet, as we have already been, that the longest diameter in the outlet is the Antero-Posterior, especially when the vertex is pushed back, as invariably happens in Parturition. - The Occiput then coming in contact with the spine of the Sacrum, is turned so that the face looks towards the Capacity of the Sacrum the best position for its Passage through the outlet having then changed its Position. The next step in the Progress is the Occiput gradually being pushed under the Arch of the Pubes, the Chin of the Child is Repeared from the Sternum, the Face makes a Peep of the Perineum and ultimately the head is born. There is usually a little rest before litterne.
action comes again into play, to expel the shoulders and body of the child, varying in different cases.

The shoulders have, during the passage of the head through the neck and cavity, been in the opposite oblique diameter but at the outlet, the shoulders are in the transverse or short diameters. Consequently, they require to alter their position to that of the anterior-posterior before they can be expelled: this is effected by their being pressed against the spine of the osseum, which causes them to rotate into the proper position, the head likewise turning along with them, towards the right thigh of the mother, the left arm passing under the arch of the ilium and the right
Second Position

In the second position, or that where the anterior fontanelle looks towards the left sacrum. The synchondrosis, nearly the same changes occur as were already mentioned in the first, with the exception that the turns are made in an opposite direction. The head of the child enters the prom. Do. that the left posterior angle of the Parietal Bone is the presenting part. The Chin is flexed upon the sternum, and in this position it enters the cavity of the Pelvis, having engaged itself in the cavity; the face makes a turn round towards the middle line of the Sacrum. The occiput is gradually...
Prolonged under the arch of the Pubis, the Spine is separated from the Abdomen and finally the face makes a sweep of the Perineum, giving Birth to the Head. The farther changes are the same as those already mentioned as taking place in the first position, with the exception that during the expulsion of the Shoulders, the face turns towards the left thigh of the Mother.

Third Position

In the third position (which is the second in point of frequency) the anterior fontanella looks in the direction of the left acetabulum. The Head is a little bent on one side, so that the anterior portion of the right Parietal Bone is
the front employed upon
in making an examination
the clasp is bent as
before alluded to, and thus
it enters the cavity of the
pelvis. The further changes
that happen are the following.
In face is gradually turned
farther round by the left
until it almost occupies
the antero-posterior diametrical
during this change it has
occupied the position already
indicated, as that which
the second possessed, and
the further change being
nearly similar to it, we
need not dwell any longer
regarding them.

Fourth Position

In the fourth position
which is indeed very near
the anterior fontanelle.
looks toward the right
forearm, orale, and the
posterior toward the left.
Sacrococcygeal synchondrosis.

The face of the child,
dering the action of the
utter, turns forward the
right, and becomes as if
had originally presented
in the first position, its
change are they similar
to those we have already
considered as taking place
in that position. After
the need not again repeat

The other positions
mentioned by authors,
are of so very rare
occurrence that they can
hardly be said to exist,
they may occasionally
happen where the foetus is proportionally small, or where the pelvis is comparatively larger than the child.

In these cases as the labour advances, they generally assume one of the four positions we have already enumerated.

I have now described the three elements necessary for the mechanism of labour, and have then spoken of their combined action. It now only remains for me in conclusion to apologize for this delay, not being accustomed to essay hunting. I felt it difficult in expressing my ideas, and treating the subject for a medical journal of the present century throw myself on the mercy of the public, hoping that he will deal kindly with me.

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