Rare Forms of Umbilical Hernia in the Fetus

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RARE FORMS OF UMBILICAL HERNIA IN THE FETUS.

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UMBILICAL hernia in the new-born child is of sufficiently common occurrence to be familiar to all practitioners. The hernial sac is rarely larger than an acorn, and ordinarily contains but few intestinal convolutions, which readily retreat into the abdominal cavity when the sac is squeezed between the fingers. The neck of the sac, by which it communicates with the abdomen, is often large enough to admit a finger, and therefore presents no obstacle to the reposition of the extruding intestinal coils. When the protrusion of the intestines through the umbilical ring of a newly-born child is prevented for a length of time by the pressure of a pad, supported by a bandage, the opening in the abdominal walls gradually contracts, until its closure is complete.

This reparative process clearly indicates one of the agencies whereby umbilical hernia is produced during the growth of the fetus. Deficient development of the "abdominal plates" of embryonic life is generally accepted as the chief factor, but it must be borne in mind that the diminished capacity of the abdominal cavity, which would result from the complete closure of imperfectly developed plates, might still suffice to contain the abdominal organs, in case they were equally undeveloped. If, however, the volume of the abdominal organs be too great to be easily embraced by the undersized abdominal walls at the period when the latter should normally close, the intra-abdominal pressure prevents the retreat within the abdominal walls of a certain portion of those intestinal convolutions, which have, until that time, lain nor-

mally in the umbilical cord. Under these conditions the abdominal plates coalesce, except at the point where intestinal coils interpose between their opposite borders. If artificial pressure be subsequently applied to the extruding mass of intestines, it may be crowded back into the abdomen, owing to the distensibility of its walls, and to the fact that its contained organs are, after birth, being repeatedly emptied and hence diminished in bulk. Under these circumstances the abdominal walls are free to unite, which they speedily do.

From the specimens of umbilical hernia in the Warren Museum of the Harvard Medical College, I might adduce several instances of this form, but they are sufficiently well known to require no illustrations. Specimens four and five are probably of this nature, but as they present other complications, they may best be considered in another place.

There is, however, another agency by which umbilical hernia may be brought about, without the assumption of any deficient growth in the abdominal plates. For a proper understanding of this point, I must revert briefly to the development of the intestines.

The alimentary canal is formed by the curving forwards of the internal layer of the blastodermic membrane, so as to constrict the vitelline sac, and ultimately to divide it into two cavities; one of these is the intestinal canal, which appears as a straight tube, closed at the ends; the other is the umbilical vesicle. The cavities intercommunicate at the outset by a large opening, which, by subsequent changes, becomes a canal — the omphalo-mesenteric duct. The blood vessels, ramifying in the vitelline sac, become consolidated into two principal arteries and two veins, which convey all the nourishment to the embryo at this period, when the placental circulatory system has not been formed. These are termed the omphalo-mesenteric vessels. The arteries are the main branches of the embryonic vertebral arteries, which later fuse to form the abdominal aorta. They give off many branches to the intestines, and then spread out on the umbilical vesicle. The veins return from the vesicle, and after receiving branches from the intestines, unite to form

a single trunk, which enters the lower end of the heart. As the placental system is developed, those vessels of the other system which ramify on the vesicle (omphalic) are superseded by the placental, and gradually diminish in size until they disappear. Those vessels which are distributed to the intestines (mesenteric) continue to develop, being then supplied with blood from the placental circulation.

In the omphalo-mesenteric duct, which connects the alimentary canal with the umbilical vesicle, and in the vessels that traverse its walls, we at once discover a possible cause for the extra-abdominal position of some of the coils into which the intestine is thrown, by its subsequent very rapid growth in length. We have only to conceive that the umbilical vesicle and its duct, with their vessels, fail to atrophy in the process of embryonic growth, and persist, to a later period than usual, as a cord anchoring that portion of the intestinal tube, with which they are in connection, outside of the umbilical ring. Here, as above, the umbilical hernia is due simply to the retention of the intestines outside of the umbilical ring, the difference being confined only to the agency whereby the deformity is produced. In the one case, the retreat of the coils into the abdomen is resisted by the exaggerated intra-abdominal pressure; in the other, by the outward traction of the still attached and persistent omphalo-mesenteric duct.

It is rare that the connection of the duct with the intestine can be demonstrated, as specimens seldom come into our hands early enough in the process of development. Kraemer,[1] however, describes a case in which, on dissection, he found the liver occupying the greater part of the hernial sac. The umbilical vein was already obliterated; the urachus with both umbilical arteries could be traced, as an obliterated cord, to a point near the insertion of the round ligament into the abdominal walls. Between this cord and the ligament the hernial sac was connected with a coil of the

[1] *Heilung eines sehr grossen, s. g. angebornen Nabel- oder Nabelschnur-Bruches. Zeitschrift für rationelle Medicin N. F.* Bd. III., p. 218. 1853

ileum, sixteen inches above the cecal valve, by a ligamentous appendage. When the intestine was opened, a small canal was seen entering the appendage to the depth of two lines. This was clearly the remains of the omphalo-mesenteric duct. The traction exerted by it was such as to produce an acute flexion of the intestine at the point of insertion, but no occlusion. The presence of the liver in the hernial sac will be considered later.

The omphalo-mesenteric duct is usually patulous until about the end of the fourth week of fetal life. It then rapidly shrivels to a thin cord, and disappears by the end of the sixth week, when the intestine retreats into the abdominal cavity, and the umbilical ring closes. The remains of the duct in the umbilical cord may be seen as a slender pedicle as late as the end of the third month, and vestiges of it — and even of the vesicle — have recently been discovered in many placentæ and cords, after delivery at full term.[1]

Specimen one (Plate I.) is an anencephalous fetus, with a hernial sac over an inch long, connected with the abdominal cavity by a pedicle nearly as large as a goose-quill, and measuring three quarters of an inch in length. The sac contains many convolutions immediately continuous with the intra-abdominal portions of the alimentary canal. No trace of the omphalo-mesenteric duct can be found on the intestine, but it undoubtedly persisted until the abdominal walls had closed, so as to prevent the retraction of the imprisoned coils. Instances of such herniæ may be found in medical literature. They may be distinguished from those forms that are due to deficient growth of the abdominal plates, by the fact that the hernial sac lies at a distance from the umbilicus, being connected with it by a neck. Opposition to the entrance into the abdomen of the extruding coils of intestines at the sixth week of embryonic life, would manifestly have no power to remove the intestines to a distance from the abdomen, as in the class of cases now under consideration.

Specimen two (Plate II.) is a fetus with an umbilical hernia,

[1] Schultze. *Das Nabelbläschen, ein constantes Gebilde in der Nachgeburt des ausgetragenen Kindes.* Leipzig, 1861.

which is quite unique with respect to the length and attenuation of the canal which connects its sac with the abdominal cavity. The distance of the sac from the umbilical ring is an inch and three quarters. The two portions of the intestines that pass into, and out of, the ring, can be inflated to a point nearly half way to the sac, where they are evidently occluded by a post-mortem contraction on the part of the cord. I have no doubt that during life the intestinal canal was patulous throughout its whole course.

This fetus presents many deficiencies of development, but none of interest in this connection, except the absence of the anus, and the termination of the alimentary canal as a blind pouch soon after its return to the abdomen.

Ahlfeld[1] has recently called attention to the frequent coincidence of congenital umbilical hernia with atresia ani, and pointed out the probable dependence of the latter malformation upon this displacement of the intestines. For a proper understanding of the subject, it is necessary to refer again to the earliest embryonic form of the intestinal canal as a straight tube closed at both ends. The allantois soon forms as an offshoot of the intestine at its lower end. The cavity of the allantois is subsequently divided into two halves, the anterior of which becomes the urogenital canal, while the posterior half — continuous with the intestinal canal — forms the anterior wall of the rectum. At about the ninth week of fetal life the rectum opens into the anal groove. Several weeks before this occurs, it will be remembered, the abdominal walls should normally have closed. If, however, a portion of the intestines be contained in a hernial sac external to the abdomen, owing either to persistence of the omphalo-mesenteric duct, or to non-union of the abdominal walls at the median line, the end of the rectum would, in all likelihood, be drawn away from the perineum, and thus fail to be in a position to connect with the anal groove, and to establish its excretory opening. As a result, therefore, of umbilical hernia, we may, and often do have an imperforate anus, and the rectum terminating in a

[1] *Archiv für Gynækologie*, Bde. V. 2, p 230, and X. 2, p. 394.

blind pouch within the abdominal cavity. Of course this phenomenon would not take place unless the traction upon the rectum by the extruding intestines were sufficient to remove its end from contiguity with the perineum.

My *second specimen* may be regarded as a fair illustration of the views enunciated by Dr. Ahlfeld. So many coils of intestines are displaced to so great a distance from the abdomen, that the rectum terminates in a blind pouch soon after reëntering the abdominal cavity, no connection having taken place with the anal groove. In the first specimen, however, the hernial pouch is comparatively short, and contains comparatively few intestinal convolutions. Hence, the traction upon the rectum at the beginning of the third month may be assumed to have been but slight, and insufficient to drag it away from its natural position. We therefore find, as we should expect, that the alimentary canal connects with the anus. In the third specimen, the whole alimentary canal, except the esophagus, is contained in the extra-abdominal sac, and terminates necessarily in a blind pouch. There is no trace of an anus, unless the small spot indicated in the drawing (Plate IV.) just beneath the umbilicus — which is the opening of a minute canal that runs a short distance into the pseudo-cord, without, however, connecting with its duct — can be regarded as an attempt at an anus. I am more disposed to consider this canal as a part of the undeveloped urogenital system.

Specimens four and five, likewise, exhibit umbilical herniæ, containing, besides the liver and spleen, the stomach, and many convolutions of the intestines, yet in each the rectum enters the abdominal cavity, and terminates in a natural anus. In these two cases the traction upon the rectum, if it had been due to persistence of the duct, would seem to have been sufficient to have drawn its end away from the perineum, and thus to have prevented the formation of the anus. Ahlfeld meets this objection to the general applicability of his explanation, by supposing that the traction upon the rectum is not applied until the fusion of the terminal pouch and the anus has been effected. This view can

hardly be accepted, because the traction must exist, if at all, prior to the closure of the abdominal cleft at about the sixth week, whereas the junction of the rectum and anus does not take place until the ninth week. In other words, if there be be no dragging upon the intestines by a persistent omphalo-mesenteric duct before the sixth week, it cannot take place after the ninth week, because the abdominal walls will then have closed.

These two cases may, however, be much more readily explained, by supposing them to be due to deficient or retarded development of the abdominal walls. In that contingency, the hernial sacs would probably communicate with the abdominal cavities by rather large openings, which probably would not confine such coils, as had entered the herniæ, until long after the rectum and anus had coalesced. Subsequent contraction of the abdominal walls at the median cleft might constrict the neck of the hernia until it should attain the small circumference found in the specimens. This suggestion receives some confirmation from the fact, that in the fifth specimen, the abdominal wall, with its integument, is so tense as to have drawn the left leg and arm together, presenting a deformity that simulates the one so often produced by the cicatrices of extensive burns.

Specimens three, four, and five (specimen six will be discussed separately), differ from the previous ones in the presence of several abdominal organs, notably of the liver, in the hernial pouch, besides the greater portion of the alimentary canal. This ectopia of the liver is by no means of rare occurrence. In twenty-nine cases, in which Kraemer[1] found the contents of the sac given, the liver was within its cavity twenty-two times.

At first sight the prolapse of other organs than the intes-t.nes would seem to demand still further abnormities of growth for their production. A closer study of the development of the vascular system in the fetus will, however, demonstrate that the displacement of the liver, at all events, may be dependent upon the same causes as we have already discussed.

[1] Loc. cit., p. 234.

It has been stated above that the two omphalo-mesenteric veins form a single trunk before entering the lower end of the heart. Around this trunk is formed the liver as an offshoot of the intestines. The umbilical veins, coming from the placenta, empty into the omphalo-mesenteric veins at the point where the latter unite in a common trunk. The right omphalo-mesenteric vein and the right umbilical vein soon shrivel up and disappear. The left omphalo-mesenteric vein diminishes in size as the nourishment of the fetus is gradually transferred from the vitellus to the placenta, while for the same reason the left umbilical vein increases in calibre. The common trunk of the omphalo-mesenteric system, into which all four veins, at one time, empty, likewise gains in size and appears as the direct continuation of the only remaining umbilical vein. It is subsequently known as the *ductus arteriosus Arantii.* The development of the *venæ hepaticæ advehentes* from the umbilical vein proceeds in such a manner as to make the remaining omphalo-mesenteric vein empty into one of these branches, instead of into the main trunk as before.

In 1850, Neugebauer[1] published a theory, whereby he made the displacement of the liver into the hernial sac depend upon the junction of the omphalo-mesenteric and umbilical veins lower in the abdomen than is customary, or even in the sheath of the umbilical cord. This abnormal fusion of the two veins he thought would be rendered possible by a position of the duodenum unusually near to the navel. He admitted that the displacement of the liver might be further favored by the fact, that the organ is originally developed from this very portion of the intestines, and is permanently connected with it by the gall duct. The malposition of the duodenum he attributed to an abnormal course of the intestinal canal, whereby "the right portion of the large intestine is displaced to the left side of the abdomen, and the small intestine is, therefore, constrained to re-

[1] *Ueber das Auftreten der Leber im Nabel als Fehler der Ersten Bildung. Caspar's Wochenschrift für die gesammte Heilkunde*, 1850, 38, p. 607, and 39, p. 616.

main exclusively in the right side." Owing to this derangement of the parts, the duodenum was supposed not to receive the habitual support from the transverse colon, and consequently prolapsed toward the umbilicus.

This theory is an ingenious hypothesis, but has few, if any, facts in its support. On the other hand, the persistence of the omphalo-mesenteric duct and its vessels is quite generally accepted by embryologists as the determining cause of many cases of protrusion of the intestines into the umbilical cord. This being assumed to be correct, it is at once apparent that the same agency which displaces the intestines will also displace the liver, because one of the largest branches of the omphalo-mesenteric veins passes directly to the liver and might, in case it were unduly persistent, exercise considerable traction upon the liver, in the same way as the duct itself and the other branch would upon the intestine. In Kraemer's case, the round ligament of the liver was shorter than usual. As this cord is the obliterated umbilical vein of the fetus, it is evident that the liver must have been displaced prior to the fusion of the umbilical with the omphalo-mesenteric vein, whose functions it usurped, or it would have appeared of normal length, and been coiled up by the descent of the liver. Undoubtedly, the development of the liver from the duodenum, and its permanent connection with it by means of the gall duct, are likewise potent, if not the chief, factors. According to this view, the same abnormity of growth is the chief cause of displacement of both the liver and the intestines.

In the *third specimen* there is no spleen or pancreas, but the right kidney, and both genital bodies also, lie in the hernial sac. The left kidney is the only organ remaining in the abdominal cavity. The displacement of these other organs is not unnatural, when we consider that they are all connected with the liver and intestines by the peritoneum, and are, undoubtedly, dragged by means of it from their proper sites. The left kidney is the farthest removed from the liver and would naturally be the last dislodged. The force of the traction, in this specimen, is further illustrated

by the prolongation of the two pleural cavities just through the neck of the hernia, and of the pericardium as far as the umbilicus. The diaphragm is not distinguishable as such, but probably contributed to the formation of these pouches.

One further peculiarity of the third specimen requires notice: the *curvature of the spine* to the right in the dorsal region. I can only regard this as an accidental complication, due chiefly to the spina bifida, although the dislodgment of the liver may have exerted a traction that aided in determining the direction of the curvature. Foerster refers to the frequent coincidence with umbilical hernia, of anterior curvature of the vertebral column, so that the body appears to be bent at its middle. This deformity is attributed to the absence of the support that is commonly given to the column by the abdomen and its contents, and to the traction applied to the middle of the column by the prolapsed organs. The last of my specimens is a remarkable instance of the extent to which this curvature may be carried, if the traction upon the middle of the column be greatly increased by an adventitious growth.

Finally, *specimen six* (Plate V.) presents a new complication of umbilical hernia, in the presence of a cyst as large as a medium-sized orange, which, growing from the vertebral column, has pushed the peritoneum, and all the abdominal organs, through the cleft in the abdominal walls. The source of this cyst cannot be definitely decided; it was bound firmly to the bodies of the lumbar vertebræ by many short, very strong fibrous bands, and was otherwise free over its whole surface. There was not the least indication of an opening in the spinal column, or of a pouch in the sac, which might suggest a former communication with the spinal canal. The entire absence of the right kidney suggests that this cyst may be an abnormal development of that organ, yet in that case we should have no reason to expect that it would be so closely connected with the vertebral column, and it is difficult to imagine that it could insinuate itself, in the process of development, beneath the inferior vena cava, so as to have that vessel crossing the cyst at its largest circumference.

In this specimen the abdominal walls were cleft from the ensiform cartilage to the pubes, the seeming deficiency of their development being very great. The defect may, in a measure, be one of appearance only, and attributable to the extreme curvature of the spine. It moreover requires no stretch of imagination to understand that the abdominal plates, even if normally developed, would be unable to encompass a cyst, relatively as great as that here existing, besides the other organs, which commonly alone suffice to fill the cavity. This is, of course, on the assumption that the cystic formation dates from the earliest embryonic stage of development, as is probable.

The spinal column, after dissection, was found to bend backwards to the extent of a right angle in the lumbar region. There was extensive posterior spina bifida in the same region. The coccyx and sacrum were so displaced in their relations to the pelvis, by the traction of the cyst, that they projected above the pelvic brim, the point of the coccyx lying one half inch above the pubes.

One common trait is noticeable in all but one of these specimens, — *spina bifida.* This I am inclined to regard as merely a coincident manifestation of deficient development, although in such a case as the sixth it is readily conceivable that the compression applied to the arches of the vertebræ by the extreme anterior curvature might easily become a cause of deficient growth, or even of the absorption of the compressed parts of the vertebræ.

Foerster [1] asserts that umbilical hernia is much more common in the female than in the male fetus, which statement brings to mind the saying of Aristotle: that the operations of Nature tend to perfection in all things, even in the formation of human beings; but if a male cannot be produced owing to the resistance of matter, then a female is the result.

The other deformities presented by this series of fetus will not be discussed now, as the only object of this paper is to sketch in outline the varied causes of umbilical herniæ,

[1] *Die Missbildungen des Menschen.* Jena, 1861.

and to illustrate (1) their frequent dependence upon an abnormal persistence of the omphalo-mesenteric duct; (2) the possible causal relation between such herniæ and imperforate anus; and (3) the dependence of hepatic displacement in great measure upon the same cause as intestinal.

DESCRIPTION OF THE SPECIMENS.

All the specimens, except the sixth, had been preserved in alcohol for many months before the dissections and illustrations were made. The sixth was obtained in the fresh state. The preparations all belong to the Warren Anatomical Museum of the Harvard Medical College, and were placed at my disposition for study by the courtesy of the curator, Professor J. B. S. Jackson, to whose catalogue I am indebted for many of the data recorded.

The plates have been made slightly diagrammatic by Dr. H. P. Quincy, for the purpose of rendering them more intelligible. They represent the specimens of natural size, except the sixth, which is reduced to one third of the natural size.

The descriptions will not enter into detail upon points that are foreign to the subject of this paper.

First Specimen. (Plate I.) No history. Anencephalous fetus five inches long. Spina bifida of all the dorsal vertebræ, but no cyst. Very sharp antero-posterior curvature of the spine in the dorsal region. The head is twisted to the left and closely united to the thorax by integument. The thoracic cavity is much flattened, and is smaller on the left side than on the right, owing to a slight twist in the vertebral column. The lungs are fused into a single one, overlying the spine and extending further into the right side of the thorax than into the left. The heart is of very diminutive size, being smaller than in the second specimen, but of the same shape.

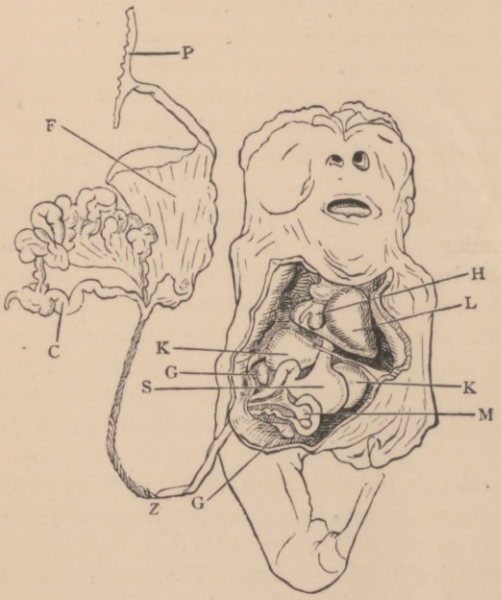
The *diaphragm* is normal. There is no liver, pancreas, or spleen. In the *abdominal cavity* are two large kidneys and suprarenal capsules. The *stomach* is normal. Half an inch from the pylorus the *small intestine* passes through the umbilical ring into a canal three quarters of an inch long, which communicates with an oblong hernial sac, an inch long. Within this sac is contained the greater part of the small and large intestines; the colon,

PLATE I.

SPECIMEN I.

Fetus with Hernial Sac containing Intestines only.

PLATE II.



SPECIMEN II.

Fetus with Hernial Sac, containing only Intestines, 1 3-4 inches from the Umbilicus.

H. Heart.
L. Lungs.
K K. Supra-renal capsules and kidneys.
S. Stomach.
G G. Genital bodies.
M. Mesentery covering the terminal rectal pouch.
C. Colon.
F. Hernial sac.
P. Placenta.
Z. Point at which the intestines are constricted.

however, reënters the abdominal cavity, and descends at once into the pelvis, terminating in a very large rectum and anus, devoid of any constriction at the outlet indicating the presence of sphincters. Along the left side of the sac, continuous with it, lay the umbilical cord and vessels.

SECOND SPECIMEN. (Plate II.) Presented to the Museum by *Dr. H. Tuck.* A blighted, very imperfectly developed fetus, one of triplets born prematurely; the other two fetus belonged to about the sixth month of pregnancy, and were well formed externally, excepting one hand and varus of one foot.

The head and trunk together measure one and three fourths inches in length. The head is anencephalous, and the spine bifid throughout. The right upper extremity is wanting; the left upper arm, five eighths of an inch long, is attached to the side; the lower arm and hand are very imperfectly formed. The left lower extremity is wanting. The right thigh is one inch long; the leg two thirds of an inch long, very slender, and ends in a point, without a foot. The thorax is flattened on the right side so as to obliterate the cavity almost entirely. The lungs are fused, the right appearing as a lobe, protruding from the side of the left lung, which consists of but one lobe. The heart is shaped like a mitten. On the right side the diaphragm is wanting; on the left it is normal.

The *liver*, *pancreas*, and *spleen* are wanting. The *stomach* is normal; the *intestines*, after a few convolutions, pass through a very small umbilicus and thin cord to a sac with thin, transparent walls, one and three fourths inch distant from the abdomen. This sac contains the greater part of the small and large intestines; the latter returns through the umbilical cord to the abdominal cavity, where it ends in a blind pouch. The two intestinal tracts in the cords can be inflated as far as the point Z, where they appear to be constricted by post-mortem twists and dessication of the cord. There is no *anus* or genital opening. The two kidneys and supra-renal capsules, and two small genital bodies are likewise contained in the abdominal cavity.

THIRD SPECIMEN. (Plates III. and IV.) Presented to the Museum by *Dr. J. R. Chadwick.* — *History:* Mrs. B. was delivered on March 14, 1875, at what was thought to be about the end of the sixth month of gestation, by operative procedure, in consequence of hemorrhage and a foul discharge from the vagina, which had persisted for six weeks and reduced the patient to a

perilous condition. The size (length four and three fourths inches) and condition of the fetus showed that it must have been dead for many weeks. No cause for the death was discovered at the time, but a recent dissection of the fetus has disclosed an absence of the laminæ and spinous processes of the tenth, eleventh, and twelfth dorsal vertebræ. There was no cyst connecting with the spinal canal, or curvature of the column. The importance of examining the spinal column for such deficiencies of growth, with a view to elucidating the cause of a miscarriage, is made apparent by this case.

On June 23, 1876, Mrs. B. again miscarried spontaneously at about the fourth month of pregnancy. The specimen was immediately preserved in alcohol and not examined until three months later.

Specimen. — The *placenta* measured two by one and three fourths inches, and varied from one quarter to one half an inch in thickness. It was connected by the chorion with what, at first sight, was supposed to be a *placenta succenturiata*, about an inch in diameter and a quarter of an inch in thickness; both surfaces of the latter were, however, seen to be covered with smooth membranes continuous with the fetal membranes. In these could be seen two vessels passing from the right border of the disk-shaped body to the placenta, in the substance of which they were lost. The centre of the supposititious second placenta was connected with the abdomen by an umbilical cord not over an eighth of an inch in length.

The *fetus* was four inches long with the feet extended. The *thorax* contained both lungs and the heart in normal position; the thymus gland was apparently wanting. Prolongations of the two pleural cavities extended through the pseudo-cord and terminated blindly, while a diverticle of the pericardium ended in the same way just within the umbilicus. There was no appearance of a diaphragm.

The *abdominal cavity* was extremely small and only contained the left kidney.

The disk-shaped body between the fetus and placenta proved to be a sac, the cavity of which communicated with the abdominal cavity by means of the pseudo-cord.

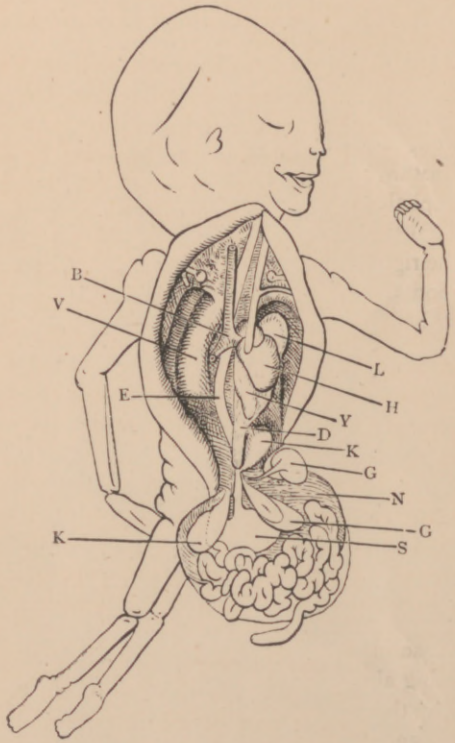
The *hernial sac* contained the liver, the right kidney, two genital bodies, the stomach, and the small intestines ending in a blind pouch. There appeared to be no large intestine, spleen, or pan-

PLATE III.

SPECIMEN III.

Fetus having a Hernial Sac connected with the Placenta by the Membranes, through which run two Umbilical Vessels. *Vide* Plate IV.

PLATE IV.



SPECIMEN III.

H Heart.
L. Left lung, the right having been removed.
B. Bronchi
Y. Yellow body within the pericardium.
V. Spine curved to the right.
E. Esophagus.
K K. Kidneys.
D. Diverticle of the pericardium.
G G. Genital bodies.
N. Liver.
S. Stomach.

creas. The mesentery was inserted into the investing membranes of the sac at the line of junction of the anterior and posterior walls throughout the right half of the circumference. The esophagus passed from the stomach through the pseudo-cord, the abdominal and thoracic cavities to the mouth.

Just below the umbilicus was the opening of a small canal which ran for half an inch through the walls of the pseudo-cord and hernial sac, without opening into their cavities; it was probably the urogenital excretory duct.

The vertebral column of the fetus showed a well-marked lateral curvature to the right, in the lower dorsal region, and posterior spina bifida, throughout the lumbar and sacral regions.

FOURTH SPECIMEN. Presented to the Museum by *Dr. J. F. Perry.* — Anencephalous male fetus of about the fourth month, with the spine bifid throughout, and curved irregularly backwards and a little to the right. The head is rotated to left, and bound closely down upon the shoulder by integument; the tension of the latter having been so great as to have drawn the lower jaw widely distant from the upper. The right upper extremity is deficient. The left scapula is displaced forwards, and the left arm so distorted that the elbow seems directed towards the front; the hand is very strongly bent upon the fore-arm. Both feet are much bent upon the legs.

The distance from the top of the sternum to the pubes is not over one and a half inches, owing to the curvature of the spine. The anterior abdomino-thoracic walls, especially their integument, are very tense. On the left side the scapula and thigh are connected with each other, at a distance of three eighths of an inch apart, by tense integument.

From an opening about one quarter of an inch in diameter are hanging, partly by the mesentery, the two lungs, the heart, liver, spleen, stomach, and greater part of the intestines; the colon, however, reënters the abdominal cavity, and on reaching the pelvis becomes greatly distended, but finally ends in a natural anus.

The thoracic cavity contains only the thymus gland.

The abdominal cavity contains two large kidneys, two testicles, a bladder, and rectum. The right supra-renal capsule is elongated, and drawn partially out of the abdomen by the traction of the extra-abdominal organs. There is no trace of a sac investing the prolapsed organs.

FIFTH SPECIMEN. Presented to the Museum by *Dr. J. S.*

Jones. — Fetus at about the fifth month. "The placenta adheres to the top of the head. The cranial cavity, which is large, was mostly filled by serum, though there was also an undeveloped brain. The vault of the cranium is entirely wanting, the base being well developed." The spinal column is curved to the right in the dorsal region, but is otherwise normal, as are the limbs, except "the left thumb, which is an oval mass of flesh, attached by a thread-like process," and varus of both feet.

The abdomino-thoracic walls seem normal, except that an opening one half inch in diameter exists at the umbilicus. The thorax contains both lungs, the heart, and the thymus gland. The diaphragm is entire.

Through the umbilical ring passes the esophagus, the mesentery, and the colon. Outside the abdomen are the liver, invested over a great part of its surface by a thin membrane, which is intimately connected with the upper border of the umbilical ring, and forms the chief apparent support of the liver. The *stomach* is closely bound to the liver by folds of peritoneum, and by adventitious thin membranes, which likewise bind some few coils of the intestines to the liver. The spleen depends from the stomach. Nearly all the intestines lie without the abdomen; the colon, as soon as it reënters the abdominal cavity, descends at once to the anus, with which it is continuous. The bladder, kidneys, supra-renal capsules, and testicles, occupy the abdomino-pelvic cavity.

The umbilical cord is independent of the hernial mass, the vein not entering the abdominal cavity, but passing directly to the cleft of the liver; it is patulous.

Sixth Specimen. (Plate V.) Presented to the Museum by *Dr. M. B. Leonard*, with the following history: The father and mother were healthy, and aged thirty and twenty-five years respectively. The mother had had no fright or anxiety during her first pregnancy, had felt vigorous fetal movements until labor was terminated, fifteen minutes before the arrival of Dr. L. The child was found in the bed, the cord having been lacerated; the placenta, lying partly in vagina and partly in the uterus, was readily removed. There was no hemorrhage from the uterus, or from the cord, which latter was torn across close to the placenta. From the report of the nurse, and the state of the bed, the amount of liquor amnii was assumed to have been small. The head and one foot had presented. No deformity of the pelvis,

PLATE V.

SPECIMEN VI.

Fetus with Abdominal Cleft, through which protrude the Heart, Left Lung, all the Abdominal and Pelvic Organs, besides a large Cyst.

H. Heart.
N. Liver.
A. Cyst.
I. Ileo-cecal valve.
J. Labia majora.
U. Umbilical vein.
R. Undeveloped uterus.(?)
O. Right ovary.
Q. Pouch from the bladder.
W. Exstrophied bladder.
X. Vena cava inferior.
C. Colon.
C W. Junction of colon and bladder.

or uterine tumor, are discoverable; there is no history of deformities on either the father's or mother's side.

Specimen. — The *head* seemed to have been subjected to pressure upon the left side, so as to be of ovoid shape, the two apices being at the right frontal bone and the left half of the occipital. The left *ear* was so flattened as to be very thin throughout, and almost devoid of the usual markings as well as of cartilage. The *nose* was likewise bent to the right side, and flattened upon the face. The *head* was so rotated that the right lower jaw rested upon the right shoulder, and the right cheek upon the left thigh and leg. The *arms* were crossed upon the chest. The *legs* were bent backwards so that the right buttock was apposed to the right shoulder blade, the leg resting in the hollow of the neck, and the foot upon the left shoulder. The left leg lay alongside the right. This position of the legs was rendered possible by the extreme curvature of the spine backwards and somewhat to the right.

The *sternum* and thoracic integument were normal. An incision through the sternum in the median line revealed a large thymus gland extending from the upper to the lower margin of the sternum. The right *pleural cavity* was of fair size, and contained the right lung. On the left side the ribs were so flattened upon the spine as to leave little or no thoracic cavity.

The *abdominal walls* were widely cleft from the sternum to the pubes. The left *lung* protruded through the abdominal fissure just below the ribs on the left side, resting upon the *heart*, which, inclosed within its pericardium, likewise protruded, and formed the upper portion of the hernial tumor.

Next to the heart was the *liver*, flattened and spread out over a large cyst. Its fissure was on the lower surface toward the right side, and received a large, still pervious, *umbilical vein*, which ran in the thin membranous walls of the hernial sac at their junction with the abdominal integument on the right side, and terminated in a torn end near the bladder. When the liver was turned up, the *gall-bladder* became visible, connected with the duodenum by the *gall-duct* and by folds of the peritoneum. The *stomach* lay in the median line over the *lobus Spigelii* of the liver. The course of the duodenum was at first toward the right, but it very soon took a sharp turn to the left, the angle apparently being due to the traction of the bile-duct and its investing layers of peritoneum. Hanging from the stomach by a double fold of peritoneum was the *spleen*.

Beneath the liver and intestines was a *cystic tumor* as large as a medium-sized orange. From the under side of the liver and from the mesentery the peritoneum was deflected over the surface of the cyst so as completely to invest it. Resting upon the cyst, on either side, about an inch from the margin of the abdominal cleft, were two oval bodies, as large as white beans, supposed to be the ovaries. The *small intestines* hung freely from the mesentery. The *cecum*, cleft longitudinally throughout most of its length, ended in a blind pouch, the cavity of which was divided into two equal halves by a longitudinal septum. The fissure in the colon extended to the *bladder*, which was directly continuous with the intestine and exstrophied throughout. In its posterior walls was a depression, three fourths of an inch deep, which was lined with what resembled integument. Near the base of the bladder, on the right side, was a prominence formed of firm tissues, which Dr. Fitz found under the microscope to be composed chiefly of muscular fibres; this was possibly one horn of an otherwise undeveloped uterus. On the left side of the cyst rested one solid body and a group of small cysts, taken respectively for a supra-renal capsule, and a kidney which had undergone cystic degeneration. No right kidney could be found. The tumor was constricted at its middle by a large vein, beneath the peritoneum, which proved to be the *inferior vena cava*. The large cyst was attached by firm fibrous bands to the bodies of the lumbar vertebræ, being otherwise free. The labia majora depended as two long folds of integument. There was no anus or genito-urinary opening.

On dissection by *Dr. Jackson*, a small cyst was found hidden in the gluteal muscles and communicating with the *spinal canal* by an opening in the upper sacral vertebræ.

The vertebral column, when straightened, measures five and one fourth inches from the atlas to the tip of the coccyx. The cervical and dorsal vertebræ are rotated to the right so that the atlas is at right angles with the lumbar vertebræ. The spine is not curved above the lumbar vertebræ; in this region, however, it is bent so greatly backwards and to the right as to form a right angle. The *sacrum* and *coccyx* do not form the posterior wall of the pelvic cavity, but project across the pelvic brim, terminating one half inch above the pubes. The pelvis presents no other deformity except that the two pubic bones are one half inch apart, and are joined together by a firm fibrous band. The *ribs*

of the left side are bent forward upon themselves at their angles so as completely to obliterate the left thoracic cavity. Those on the right side are somewhat modified to meet the altered relations.

The large abdominal cyst was lined with a smooth membrane, and filled with a clear serum in which nothing characteristic was detected by Dr. Fitz. A round solid cord, as thick as ordinary twine, passed from one wall of the cyst across the cavity to the other, without being in any relation to the fetal vessels.