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VENTRAL HERNIAE

An essay

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TO MY PARENTS
WHO HAVE GIVEN TOO MUCH
AND GOT TOO LITTLE



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CONTENTS

NO.	SUBJECT	PAGE
1.	Introduction	1
2	Embryology of the anterior abdominal wall and its anatomy	3
3.	Aetiology , pathology, and complications of ventral herniae	15
4.	Rare types of ventral herniae	51
5.	Management of ventral herniae	60
6.	Recurrence of ventral herniae	89
7.	Summary	95
8.	References	100
9.	Photographs.....	110
10.	Arabic summary	

INTRODUCTION

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It is a fact that the problem of hernia is one which is facing a surgeon in his every-day work .

Ventral herniae have been recognized for centuries ; however, too many definitions have been tried for them . A ventral hernia is a protrusion of an intra-abdominal content through a defect or a weak area in the anterior abdominal wall , excluding the groin and lumbar areas .

Also too many classifications of ventral herniae have been tried. The most satisfactory one is to include all herniae that can be seen in the area of the anterior abdominal wall; i.e. incisional herniae, omphalocele, infantile umbilical hernia, adult paraumbilical hernia, epigastric hernia and divarication of the recti, and other rare types as Spigelian and interstitial herniae .

In this review of the problem of ventral hernia , the embryology and the anatomy of the anterior abdominal wall muscles , umbilical region , and linea alba have been reviewed in brief ; with stress on the relation of the linea alba structure to the problem of herniation through it . Also stress is put on the anatomy of the linea semilunaris and the Spigelian fascia , for their relation to Spigelian hernia .

The aetiological factors of the different types of ventral herniae have been reviewed with stress on the controlable factors for the incisional hernia . The pathogenesis and the pathology of different types of herniae are well known . Stress is put on the most recent diagnostic aids for omphalocele and Spigelian hernia .

The complications of ventral herniae are reviewed in brief . The complications of omphaloceles and adult paraumbilical herniae in cirrhotic patients are mentioned in detail .

Classical surgical management of the different types of ventral herniae is reviewed in brief. New operative techniques for incisional hernia repair and for the management of omphaloceles are mentioned. Reinforcing materials used for hernia repair in extensive cases of muscular or aponeurotic weakness are also reviewed .

Recurrence of a hernia is a challenge which is facing a surgeon dealing with it . Every effort is to be given to avoid the aetiologic factors of a recurrence, pre-operatively, intra-operatively, and post-operatively with co-operation of the patient and the nursing staff . Recurrence rates of different types of ventral herniae are reviewed .

It is a fact that the march of progress is continuous and the surgeon has to be in touch with the most recent reports ; has to have an observing eye getting benefit from his own experience ; and has to be clear-minded , logically dealing with each patient as an individual problem .

EMBRYOLOGY AND ANATOMY
OF THE
ANTERIOR ABDOMINAL WALL

THE ANATOMY OF THE ANTERIOR ABDOMINAL WALL

It is a fact that refinement of our knowledge of anatomy will continue, however much of the available information is not fully utilized. The surgeon should be aware of the direction of Langer's lines if, after abdominal section, the incision is to heal with minimal scarring. Vertical incisions across these lines produce widely gaping wounds, and although they do heal, with the passage of time, there is a great tendency for widening of the cicatrix.

The amount of subcutaneous fat between the skin and muscular layer is extremely variable. In the thin individual, the linea alba may be recognized as a slight depression in the midline and is usually more apparent above the umbilicus.

The rectus muscles may be recognizable on either side of the midline. At the lateral margin of the rectus muscle, the linea semilunaris may be identified in thin well developed individuals, extending from the tip of the ninth costal cartilage to the pubic tubercle.

Camper's fascia is the poorly developed superficial fascial layer of the abdominal wall. Scarpa's fascia is an easily recognizable connective tissue structure, situated more deeply and should be approximated during wound closure, if the best cosmetic results are to be obtained post-operatively (Ponka 1980).

The muscles of the abdominal wall are segmental in origin, arising from the lower thoracic and the upper lumbar somites. They arise by differentiation of the cells of the myotomes, which multiply and migrate into the somatopleure. Here the muscle fibres take a longitudinal direction, extending between the septa that separate the segments. With further development, muscle fibres of the adjacent segments fuse and undergo lamination into layers and the fibres of the various laminae modify their direction to conform with the final pattern as seen in the adult. Finally, aponeurotic replacement of certain areas of the muscles occurs.

Union of the muscles of both sides takes place along the linea alba. The first stage starting from the symphysis pubis to the umbilicus . The second stage starts from the xiphoid process towards the umbilicus (Christopher) .

THE EXTERNAL OBLIQUE :

The external oblique is an extensive flat muscle , which arises by eight fleshy slips, from the external surfaces and inferior borders of the lower eight ribs at their anterior angles . These slips interdigitate with the digitations of the serratus anterior and latissimus dorsi muscles . It is actually covering a portion of the lower thorax. The muscle fibres then take an oblique course downwards and towards the midline . The muscle presents as an aponeurosis as it approaches the lateral margin of the rectus abdominis muscle, and then contributes its aponeurosis to the anterior sheath of the rectus muscle. They then continue to decussate in the midline or linea alba .

The fibres from approximately the lower half of the external oblique muscle insert into the anterior half or more of the outer lip of the ventral segment of the iliac crest . Those in the region of the groin form a free border known as Poupart's (inguinal) ligament . Some of the lowermost and medially placed fibres curve posteriorly to the iliopectineal ligament (lacunar ligament of Gimbernat) .

The muscular and aponeurotic parts of the external oblique are invested by external and internal layers of fascia, of which the outer is better developed . The upper and lower digitations of origin may be absent ; and digitations or even the whole muscle may be reduplicated (Gray 1980 - Last 1984) .

THE INTERNAL OBLIQUE :

The internal oblique muscle is internal to the external oblique , thinner and less bulky . It arises , by muscular fibres , from the lateral two-thirds of the grooved upper surface of the inguinal

ligament, from the anterior two thirds of the intermediate line of the ventral segment of the iliac crest, and from the thoraco-lumbar fascia . The uppermost fibres form a short free border superomedially. The posterior fibres pass upwards and laterally to the inferior borders of the lower three or four ribs .

The fibres from the inguinal ligament, paler in colour, arch downwards and medially across the spermatic cord in the male and round ligament of the uterus in the female . Becoming tendinous, they are attached with the corresponding part of the aponeurosis of the transversus abdominis to the crest and the medial part of the pectin pubis , forming the falx inguinalis (conjoint tendon) .

The rest of the fibres of the internal oblique diverge and end in an aponeurosis which gradually broadens from below upwards . In its upper two-thirds this aponeurosis splits at the lateral border of the rectus abdominis into two laminae which pass around it and reunite in the linea alba . The anterior layer blends with the aponeurosis of the external oblique , the posterior with the aponeurosis of the transversus abdominis , and its upper part is attached to the cartilages of the seventh, eighth, and ninth ribs . In the lower part of the abdominal wall, the whole aponeurosis passes with that of the transversus in front of the rectus to the linea alba(Gray 1980) .

THE TRANSVERSUS ABDOMINIS:

The transversus abdominis is the innermost of the flat muscles of the abdominal wall . Its muscle fibres arise from the lateral third the inguinal ligament, the anterior two thirds of the inner lip of the ventral segment of the iliac crest, the thoraco-lumbar fascia between the iliac crest and the twelfth rib, and the internal aspects of the lower costal cartilages (usually six) where it interdigitate with the diaphragm .

From such a broad origin , the fibres pass in a transverse direction to the rectus sheath and the midline .

The lower fibres of the transversus abdominis pass downwards and medially and insert into the pubic crest, tubercle, and the iliopectineal ligament of Cooper .

The aponeurotic fibres of the transversus abdominis above the arcuate line (linea semicircularis of Douglas) pass posterior to the rectus abdominis muscle, while those below this level generally pass anteriorly and thus contribute to the anterior portion of the rectus sheath . So, the posterior rectus sheath in this area is composed of the transversalis fascia only .

Fusiform defects filled with fascia occur in the lower muscular and the aponeurotic parts of both the internal oblique and the transversus abdominis (Ponka 1980) .

THE TRANSVERSALIS FASCIA:

The transversalis or endo-abdominal fascia is an extensive connective tissue layer that lines the entire abdominal cavity and lies just superficial to the peritoneum . It is not so easily recognizable as, for instance, the external oblique fascia ; but it is a distinct structure that varies in its appearance .

It forms a portion of the posterior rectus sheath below the linea semicircularis . It is contiguous with the fascia on the inferior surface of the diaphragm . It also lines the abdomen laterally and posteriorly where it covers the psoas and quadratus lumborum .

Furthermore, it is easily recognized in the pelvis, where it covers the levator ani . It is a layer through which all herniae must pass; hence its great importance (Ponka 1980) .

THE RECTUS ABDOMINIS AND RECTUS SHEATH:

These are structures of paramount importance to the surgeon. They enter into the repair of ventral herniae located in the central abdomen, either above or below the umbilicus .

The rectus abdominis muscle attaches superiorly to the lower thorax specifically the fifth, sixth, and seventh costal cartilages as well as the xiphoid process . It attaches inferiorly to the superior pubic ramus and the symphysis .

Three to five tendinous intersections, or inscriptions, cross the rectus muscle . They are attached to the anterior portion of the rectus sheath and hence serve to prevent retraction of the muscle in transverse incisions. One is usually situated opposite the umbilicus another opposite the free end of the xiphoid process, and a third about midway between the xiphoid process and the umbilicus. Sometimes one or two incomplete intersections are present below the umbilicus (Gray 1980) .

The pyramidalis muscle is located medially within the lowermost portion of the rectus sheath . It is attached by tendinous fibres to the front of the pubis and the ligamentous fibres in front of the symphysis . The muscle passes upwards, diminishing in size as it ascends, and ends in a pointed extremity which is attached to the linea alba midway between the umbilicus and pubis ; but may extend to a higher level (Gray 1980) .

The muscle varies much in size and may be larger on one side than on the other; or may be absent on one or both sides. It is occasionally double . The muscle is supplied by the subcostal nerve .

The composition of the rectus sheath is variable, depending upon the level under consideration . Aponeurotic contributions from the three flat abdominal muscles that cross the midline make up that powerful sheath .

If one is to select a level midway between the xiphoid and the umbilicus, the arrangement of the aponeurotic layers is such that the external oblique aponeurosis passes in front of the rectus abdominis muscle . The internal oblique aponeurosis divides into two laminae at the lateral margin of the rectus abdominis . One layer passes in front to form a portion of the anterior sheath of the rectus , while the other one is contributed to the posterior rectus sheath .

Below the arcuate line, or the linea semicircularis of Douglas , layer forming have another arrangement . Here, the aponeurosis of the external oblique, the internal oblique, and the transversus abdominis muscles all pass anterior to the rectus abdominis muscle . The transversalis fascia forms the fascial layer posterior to the rectus abdominis muscle below the level of the arcuate line, which is found approximately midway between the umbilicus and the symphysis pubis . Thus the posterior rectus sheath in this area is composed of peritoneum, areolar tissue, and transversalis fascia .

Variations in the anatomic arrangement of the laminae of the rectus sheath are common (Ponka 1980) .

LINEA SEMILUNARIS :

According to Nyhus (1978) and Ponka (1980), different definitions for this line were pointed out . River (1948) defined it as the line created by the transition of the transversus abdominis muscle from muscle to aponeurosis . Watson (1948) marked it as the line created by the division of the internal oblique aponeurosis into anterior and posterior lamellae of the rectus sheath . Johnson and Willis (1949), defined it as the line in the rectus abdominis sheath just lateral to the rectus muscle . It can also be marked as the indentation seen just lateral to the rectus abdominis muscle .

However, each definition places the linea semilunaris at the same anatomic location practically , extending from the costal cartilage of the ninth rib to the pubic tubercle .