CONFERENCE PAPER

THE CLINICAL ANATOMY OF LAPAROSCOPIC INGUINAL HERNIA REPAIR

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ABSTRACT

Laparoscopic approaches for abdominal surgery are being used with increasing frequency. Their advantages are sometimes negated by the disturbing incidence of postoperative sequelae. In the case of inguinal hernia repair, these are often the result of failing to understand that the anatomy of the anterior approach to the abdominal wall cannot necessarily be directly applied to laparoscopy. The inguinal ligament, easily identified in an anterior approach, is only seen laparoscopically after removal of the iliopubic tract, a key structure which lies in the plane of the original defect of most groin hernias. Thus, an understanding of the incompletely trilaminar anterior abdominal wall, including the iliopubic tract, is the foundation for effective inguinal hernia repair using any approach (anterior or posterior) or technique (sutures, mesh or staples). Laparoscopic inguinal hernia repair has produced an increase in the frequency of debilitating neuropathies, most notably of the lateral femoral cutaneous nerve (LFCN). This is directly related to the variable intrapelvic course of this nerve or its branches. In more than 13% of the 114 pelves we examined, the LFCN was within 0.5 cm of the iliopubic tract or in the vertical plane of the anterior superior iliac spine, key lateral landmarks and anchoring sites for mesh in laparoscopic hernia repairs. Medial landmarks also have variable features. These data indicate that the identity of anatomical landmarks and the variability of other structures will continue to be important in the successful development of new laparoscopic techniques.

Keywords: laparoscopy, inguinal hernia, iliopubic tract, lateral femoral cutaneous nerve

SINGAPORE MED J 1996; Vol 37: 519-521

This paper was presented at The First Asia-Pacific Anatomical Conference at the National University of Singapore, 16-20 December 1995.

INTRODUCTION

Hernia repair is one of the most common surgical procedures in the United States[1] where about half a million operations are performed each year. The long recovery period of traditional surgical approaches to the anterior abdominal wall and the economics of health care have encouraged the development and application of laparoscopic procedures which have greatly reduced the recovery period[2,3]. However, entrapment neuropathies and other sequelae of this new approach[4,5] are much higher than expected and negate many of its advantages. We believe that the complications of this posterior approach to the anterior abdominal wall are due in part to a failure to understand and apply the anatomy of this area to laparoscopic hernia repair. In this report we illustrate this point by reviewing the variable anatomy of this region including the course of the lateral femoral cutaneous nerve and its application to the development of reliable laparoscopic techniques for hernia repair.

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Laparoscopic anatomy of the anterior abdominal wall

A laparoscopic view of the right inferior part of the anterior abdominal wall is shown in Fig 1. This view shows the bladder medially, the deep inguinal ring, the relations of the iliopubic tract (IPT) and the psoas and iliacus muscles. The sites of direct (D) and indirect (I) inguinal hernias are clearly marked. Surgical repair of either type of hernia from either an anterior or a laparoscopic approach depends upon reducing the herniated abdominal tissue and reinforcing the wall to prevent a recurrence. These approaches are illustrated schematically in Fig 2 which is a sagittal section through the anterior abdominal wall at the site indicated by the large arrow in Fig 1. Notice that the external oblique aponeurosis anteriorly and the transversalis fascia posteriorly with its inferior projection, the iliopubic tract, meet inferiorly in the inguinal ligament to surround and suspend the spermatic cord or its homologue at this site. In the traditional (open) anterior approach to inguinal hernia repair (A in Fig 2) the external oblique aponeurosis has to be incised in order to locate the site of hernia and reinforce it with a variety of procedures[6]. Most deficiencies in the anterior abdominal wall are in the deeper layers and in many cases the iliopubic tract is the only reliable structure in the plane of the original defect[7,8]. One anterior approach, a multilayered repair that uses the iliopubic tract as the plane of the deepest layer of reconstruction, has the lowest incidence of recurrence[9].

In the laparoscopic approach to this region (Fig 1 and L in Fig 2) the iliopubic tract is immediately deep to the peritoneum and readily accessible[10]. This has prompted its use as a primary anchoring site for sutures or staples[11]. While these procedures can produce a strong repair without injury to anterior structures, indiscriminate use of the IPT as an anchoring site can lead to complications[4].

The mechanism for one such complication, entrapment neuropathy of the lateral femoral cutaneous nerve (LFCN), has

Fig 1 – A laparoscopic view of the inferior margin of the right anterior abdominal wall with viscera retracted. The sites of direct (D) and indirect (arrow I) hernias are indicated. The anterior superior iliac spine (A) can be located by palpation externally. The large arrow indicates the plane of the section in Fig 2. B = bladder, IPT = iliopubic tract.

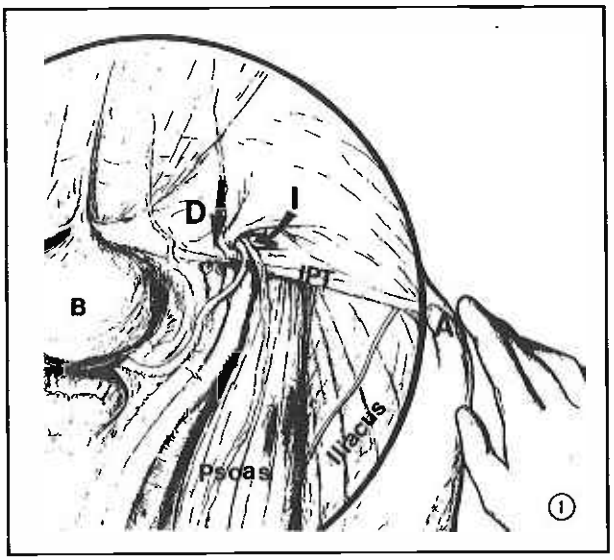
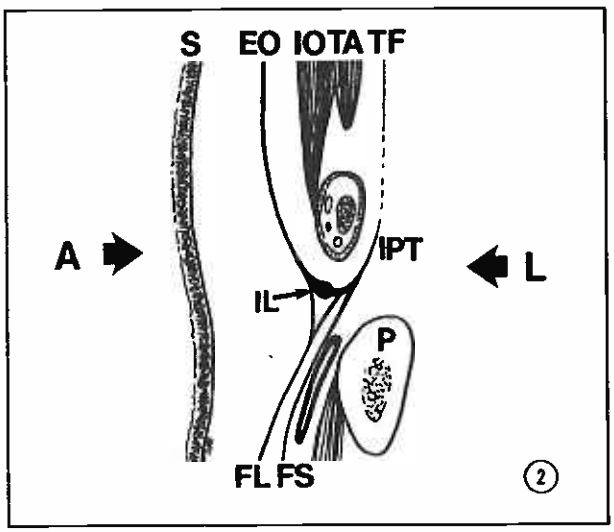
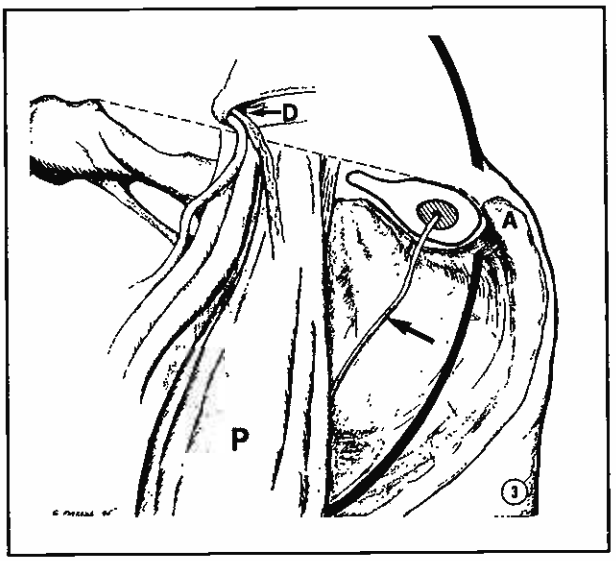


Fig 2 – Diagrammatic sagittal section showing the major components of the anterior abdominal wall at the site of the vertical arrow in Fig 1. A = anterior approach and L = laparoscopic approach to this region. S = skin, EO = external oblique aponeurosis, IO = internal oblique muscle, TA = transversus abdominis muscle, TF = transversalis fascia, IPT = iliopubic tract, IL = inguinal ligament, FL = fascia lata of thigh, FS = femoral sheath, P = pubic bone.



been recently studied by us[12]. The usual intrapelvic pathway of this nerve is well known[13] and is illustrated in Fig 3. It arises from the ventral rami of lumbar spinal nerves 2 and 3, emerges from the lateral border of the psoas major and passes into the thigh inferior to the iliopubic tract and medial to the anterior superior iliac spine to supply sensory innervation for the lateral thigh. However, the intraabdominal course of the LFCN is extremely variable. In the 114 specimens we studied, 5% were within 1 mm of the iliopubic tract itself and 11% were within

Fig 3 – A laparoscopic view of the pelvic skeleton and selected viscera to illustrate the variations in the course of the lateral femoral cutaneous nerve (arrow). The shaded area is one standard deviation of the position of this nerve and the irregular oval outline shows the range of positions of this nerve or its branches in the pelvis. The perspective is similar to Fig 1. P = psoas major muscle, D = deep inguinal ring, A = anterior superior iliac spine, dotted line = iliopubic tract.



1cm of the anterior superior iliac spine, a favorite site for staples when they are used for anchorage in hernia repairs[11]. The variability of the LFCN in relation to the iliopubic tract and the anterior superior iliac spine, is shown in Fig 3. In more recent studies, we have seen similar variation medially in the position of vessels coursing over the iliopubic ramus into the obturator foramen (Gilroy et al, unpublished observations). These data show that the variability of nerves and vessels in the vicinity of inguinal and femoral hernias must be understood to develop reliable laparoscopic approaches to this region.

DISCUSSION AND CONCLUSIONS

Laparoscopic techniques for inguinal hernia repair are currently being evaluated to determine their safety and efficacy[14]. To improve the success of this procedure, inguinal anatomy[6,10] from the laparoscopic perspective[15] must be understood in all its variations. Spaw and colleagues[14] have recommended that stapling be avoided in the area where the spermatic vessels and the ductus (vas) deferens form the apex of a "triangle of doom" in which lie the external iliac vessels hidden by peritoneum. They suggest that dissection of this area be avoided and stapling be used only medial to the vas deferens and lateral to the spermatic vessels. Seid and Amos[4] have broadened the "Triangle of Doom" into a "Trapezoid of Disaster" by considering the incidence of nerve entrapment neuropathies following laparoscopic hernia repair. At risk in addition to the spermatic vessels, vas deferens, and external iliac vessels, are the nerves from the lumbar plexus (lateral femoral cutaneous, genitofemoral and femoral), which leave the pelvis lateral to the internal inguinal ring and inferior to the iliopubic tract. Their paths through the abdomen may vary considerably, and the lateral femoral cutaneous nerve may be injured by placement of a staple or suture close to the anterior superior iliac spine or into the iliopubic tract[6].

These data illustrate once again that the development of reliable surgical technique can begin with a textbook analysis but that in the final analysis to minimize complications, it must

be based on the normal anatomical variation of vulnerable structures in that region. This is the contribution and challenge of clinical anatomy.

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