

Original article:

Morphometric Evaluation of Commencement of Inferior Epigastric Artery in Relation to Inguinal Ligament and its Significance in Surgeries of Inguinal Region

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Abstract

Background: The vascular territories of the superior and the deep inferior epigastric arteries have been a topic of research in previous research by dye injection, dissection, and barium radiographic studies. Hence; the present study was conducted for morphometric analyzing commencement of inferior epigastric artery (IEA) in relation to inguinal ligament.

Materials & Methods: The present study was conducted for morphometric analyzing commencement of inferior epigastric artery in relation to inguinal ligament. A total of 40 cadavers were dissected. Among them, 20 were males while the remaining were females. The dissections were performed in the area from the inguinal ligament to the upper part of the thigh. The onset and progression of IEA were seen in connection to the inguinal ligament, both above and below the ligament. Later, adequate stumps of the neurovascular bundle were preserved following the dislocation of the hip joint, tracing the origin of the inferior epigastric artery behind the inguinal ligament. Using a Vernier caliper, the origin's distance above or below the inguinal ligament was determined in millimeters.

Results: A total of 40 cases were analyzed. On the right side, IEA was above ligament in 37.5 percent while it was at the level of ligament in 55 percent of the cases. On the left side, IEA was above ligament in 47.5 percent while it was at the level of ligament in 47.5 percent of the cases. In case of right IEA, the mean distance of origin above the ligament was 18.31 mm while in case of left IEA it was 19.18 mm. non-significant results were obtained while correlating the IEA with inguinal ligament.

Conclusion: There are documented variations in the origin of the inferior epigastric artery. It might originate from the internal iliac artery or the femur artery. It is quite uncommon for IEA to originate below the inguinal ligament.

Key words: Inferior Epigastric Artery, Inguinal, Ligament.

INTRODUCTION

The vascular territories of the superior and the deep inferior epigastric arteries have been a topic of research in previous research by dye injection, dissection, and barium radiographic studies. By these means it was established that the deep inferior epigastric artery was more significant than the superior epigastric artery in supplying the skin of the anterior abdominal wall. Segmental branches of the deep epigastric system pass upward and outward into the neurovascular plane of the lateral abdominal wall, where they anastomose with the terminal branches of the lower six intercostal arteries and the ascending branch of the deep circumflex iliac artery. The anastomoses consist of multiple narrow "choke" vessels. Similar connections are seen between the superior and the deep inferior epigastric arteries within the rectus abdominis muscle well above the level of the umbilicus. Many perforating arteries emerge through the anterior rectus sheath, but the highest concentration of major perforators is in the paraumbilical area. These vessels are terminal branches of the deep inferior epigastric artery.¹⁻³ El-Mrakby HH et al undertook a study to assess microdissection of the artery, its main branches in 20 cadavers. The artery was found to be associated with two veins in most of the cases (90 percent). The lateral division of the deep inferior epigastric artery and the perforator vessels it gives are more dominant (80 percent of cases) than the medial perforators (20 percent of cases). The lateral perforators were greater in number (80) and more consistent than those that arose from the medial division (28). The musculocutaneous perforators are the most important perforators supplying the anterior abdominal wall. An average of 5.4 large perforators (>0.5 mm in diameter) were dissected in each case. The direct perforator vessels with their associated veins (microdissection) keep a consistent diameter before dividing at the subdermal level and end by contributing to the subdermal plexus.⁴ Hence; the present study was conducted for morphometric analyzing commencement of inferior epigastric artery (IEA) in relation to inguinal ligament.

MATERIALS & METHODS

The present study was conducted for morphometric analyzing commencement of inferior epigastric artery in relation to inguinal ligament. A total of 40 cadavers were dissected. Among them, 20 were males while the remaining were females. Data showed that all belonged to the age group of 40 to 60 years. Exclusion criteria for the present study included cadavers who had surgery or scar over lower abdominal wall, inguinal region and upper thigh region. The dissections were performed in the area from the inguinal ligament to the upper part of the thigh. The onset and progression of IEA were seen in connection to the inguinal ligament, both above and below the ligament. Later, adequate stumps of the neurovascular bundle were preserved following the dislocation of the hip joint, tracing the origin of the inferior epigastric artery behind the inguinal ligament. Once IEA was identified, it was then followed all the way to where it entered the rectus sheath. Viscera were removed in cases of high origin in the pelvis in order to identify the artery. It was noticed and documented where the inferior epigastric artery begins, whether from the external iliac artery or another artery, and how it relates to the inguinal ligament—either above or below, on both sides, and in both males and females. Using a Vernier caliper, the origin's distance above or below the inguinal ligament was determined in millimeters. All the results were recorded in Microsoft excel sheet and was subjected to statistical analysis.

RESULTS

A total of 40 cases were analyzed. On the right side, IEA was above ligament in 37.5 percent while it was at the level of ligament in 55 percent of the cases. On the left side, IEA was above ligament in 47.5 percent while it was at the level of ligament in 47.5 percent of the cases. In case of right IEA, the mean distance of origin above the ligament was 18.31 mm while in case of left IEA it was 19.18 mm. non-significant results were obtained while correlating the IEA with inguinal ligament.

Table 1: Correlation of IEA with inguinal ligament

IEA	Above ligament	At ligament	Below ligament
Right	15	22	1
Left	19	19	2
p-value	0.13	0.88	0.31

DISCUSSION

The inguinal portions of the internal oblique and transversus abdominis muscles are generally described as arising from the inguinal ligament. The surface marking of the deep inguinal ring (DIR) is commonly described as being located at either the middle of the inguinal ligament (MIL) or at the mid-inguinal point (MIP); there seems to be no consensus in previous studies in patients with inguinal hernias.⁵⁻⁹ Hence; the present study was conducted for morphometric analyzing commencement of inferior epigastric artery in relation to inguinal ligament.

A total of 40 cases were analyzed. On the right side, IEA was above ligament in 37.5 percent while it was at the level of ligament in 55 percent of the cases. On the left side, IEA was above ligament in 47.5 percent while it was at the level of ligament in 47.5 percent of the cases. In case of right IEA, the mean distance of origin above the ligament was 18.31 mm while in case of left IEA it was 19.18 mm. non-significant results were obtained while correlating the IEA with inguinal ligament. In a previous study conducted by Rockwell WB et al, authors assessed the anatomy of deep inferior epigastric artery. Thirty-four preserved cadavers were dissected, and 63 deep inferior epigastric arterial systems were removed and measured. The deep inferior epigastric artery was used as an arterial conduit to bypass across nine wrists in eight patients. The mean length from the external iliac artery to the point at which the vessel displayed an external diameter of 1 mm was 14.06 +/- 2.54 cm. The deep inferior epigastric artery has been used in nine clinical cases as an arterial conduit to bypass distal to the wrist. All nine bypasses were patent 1 year postoperatively, without donor-site complication. The deep inferior epigastric artery is a morphologically reliable and clinically useful source of arterial grafts.⁹

Reardon CM et al, in another study assessed anatomy of superficial inferior epigastric vessels in humans. In Taylor's classic dissection series the SIEA was 'absent' in 35% [Plast Reconstr Surg 56 (1975) 243]. In their series of 22 cadaver dissections (eight female, three male) the SIEA was identified in 20 and the vein (SIEV) in 21. In 15, the artery was located at the level of the inguinal ligament, within 1 cm of its midpoint. In 17, the origin, from the common femoral artery, was within 2 cm of the inguinal ligament. In 18, the SIEA arose as a common trunk with the superficial circumflex iliac artery, superficial external pudendal artery, and/or the deep circumflex iliac artery. Mean

SIEA calibre was 1.9 mm and the mean pedicle length from origin to inguinal ligament was 5.2 cm. Their findings suggested that the SIEA is more consistently present and larger in calibre than previously reported, and consequently may be of greater clinical use than previously believed.¹⁰ Eri Fukaya et al investigated 17 patients who had abdominal wall MDCTA in preparation for a free flap procedure using either the deep inferior epigastric perforator (DIEP), SIEA or the groin flap. The visibility and anatomical characteristics including the branching pattern, the diameter, course of travel and layers were noted. The SIEA was visible in 64.7% and, of these, 36.4% had a common trunk formation with the superficial circumflex iliac artery (SCIA), while 63.6% arose independently. The measured diameters were SIEA 1.6 0.4 mm, SCIA 1.4 0.4 mm, deep circumflex iliac artery (DCIA) 2.4 0.4 mm, DIEA 2.9 0.4 mm and superficial inferior epigastric vein (SIEV) 3.1 0.5 mm. The SIEA consistently coursed lateral to and deeper than the SIEV and also lateral to the DIEA. MDCTA provided detailed three-dimensional information of the superficial inferior epigastric vascular system including the course and size of the SIEA. The information on vascular anatomy obtained with the MDCTA is valuable in the preoperative planning of the free SIEA flap and should be performed routinely.¹¹

CONCLUSION

There are documented variations in the origin of the inferior epigastric artery. It might originate from the internal iliac artery or the femur artery. It is quite uncommon for IEA to originate below the inguinal ligament.

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