

Original Research Article

Patterns of Anatomical Relation between Spermatic Cord and Ilioinguinal Nerve

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Abstract: The aim of this study was to identify the anatomical variations in the inguinal course of the ilioinguinal nerve. The study was conducted in Khartoum state – Sudan on 77 formalin embalmed cadavers which were dissected bilaterally to expose ilioinguinal by transperitoneal approach, in Sudanese male cadavers, age ranging from 24-56 years. Ilioinguinal nerves were related to the spermatic cord in seven patterns. These seven patterns were seen in left side, whereas in the right side only 4 patterns observed. It was travelling superficial to spermatic cord in 92 (59.7%), on the right and left sides in 47 (30.5%) and 45 (29.2%) respectively. In 27 (17.5%) specimens the nerve was related to the anteriolateral side of the cord, this relation was observed on the right and left sides in 14 (9.1%) and 13 (8.4%) respectively. In 19 (12.3%) specimens the nerve seen to pass deep to the cord, this relation was observed on the right and left sides in 10 (6.5%) and 9 (5.8%) respectively. In 11 (7.1%) specimens the nerve was related to the lateral side of the cord, this relation was observed on the right and left sides in 6 (3.9%) and 5 (3.2%) respectively. In 3 specimens (1.9%) the nerve gave its cutaneous branches over the cord on the left side. In one specimen (0.6%) the nerve is incorporated in to the spermatic fascia, this relation was observed on the left side. Whereas, in one specimen (0.6%) the nerve is incorporated in to the spermatic cord, this relation was observed on the left side.

Keywords: ilioinguinal nerve, formalin, spermatic fascia

INTRODUCTION

The ilioinguinal nerve originates from L1 ventral ramus and emerges from the lateral aspect of upper part of psoas major muscle just below the iliohypogastric nerve, passes obliquely across quadratus lumborum and the upper part of iliacus and enters transversus abdominis muscle near the anterior end of the iliac crest. It pierces the internal oblique muscle and supplies it and then traverses the inguinal canal below the spermatic cord. It emerges with the spermatic cord from the superficial inguinal ring to supply the proximal medial skin of the thigh and the skin over the root of the penis and upper part of the scrotum in males, or the skin covering the mons pubis and the adjoining labium majus in females [1].

The nerve may be injured predominantly during inguinal hernia surgery, appendectomy and Pfannenstiel incision which produces paraesthesia over

the skin of the genitalia [2-4]. Entrapment of the nerve during surgery may cause troublesome recurrent pain in its cutaneous distribution area.

The chronic groin pain (inguinodynia) is a potential complication following inguinal hernia mesh repair and has significant impact on the quality of life [5]. The incidence varies among studies, ranging between 0% and 62.9%, with 10% of patients fitting in the moderate to severe pain group [6-10]. However, only 2%-4% of the patients are adversely affected by chronic groin pain in their everyday life. This is significant, considering the volume of the operations performed. The main reasons hypothesized for chronic groin pain are intra-operative nerve damage, post-operative fibrosis, or mesh-related fibrosis. The chronic groin pain has been classified as either neuropathic or nonneuropathic pain [11].

The three nerves potentially involved are the ilioinguinal nerve, iliohypogastric nerve and genital

branch of the genitofemoral nerve. These nerves can be damaged either by trauma during dissection or retraction of tissues, or nerve entrapment from post-operative fibrosis, mesh related fibrosis or sutures used to fix the mesh. Some studies suggested that the injury is mainly due to inadequate dissection, failure to visualize and protect the nerves, and failure to recognize the aberrant location and anatomic variations of the nerves. Any partial or complete transaction of the nerve leads to neuroma formation and consequent pain along the distribution of that nerve [11]. While some studies showed there was less incidence of chronic groin pain with identification of all 3 nerves during open inguinal hernia repair compared to no nerve identification [12, 13].

MATERIAL AND METHODS

A cadaveric study which was conducted in the department of anatomy of several faculties of medicine in Khartoum state-Sudan during the period of May 2015 to August 2017 on 154 inguinal nerves which were embalmed in formalin, cadavers ranging from 24-56 years, dissection performed bilaterally to observe formation, emergence and distributions of the nerve, dissection was completed by anatomist by making a horizontal incision which was made from anterior superior iliac spine (ASIS) on apponeurosis of external oblique muscle to linea alba in midline and from this point vertically down to pubic symphysis. The triangular flap of external oblique apponeurosis was reflected laterally and inferiorly to expose inguinal ligament, inguinal canal with its contents. The nerve was exposed through anterior approach after removal of peritoneum and abdominal viscera. The nerve has been identified on the lateral border of psoas major muscle. The muscles of the posterior abdominal wall were exposed by removing their fascial coverings and the psoas major muscle was detached from the intervertebral discs and vertebral bodies, the removal of psoas from the transverse processes of the lumbar vertebrae was carefully completed, disentangling the ventral rami of the nerve from its substance, the nerve and its branches was exposed. All possible formation of the nerve was photographed. The observations so made were recorded and compared with standard texts as well as with accessible literature

RESULTS

Ilioinguinal nerves were related to the spermatic cord in seven patterns as shown in table 1. These seven patterns were seen in left side, whereas in the right side only 4 patterns observed (Figures 1, 2).

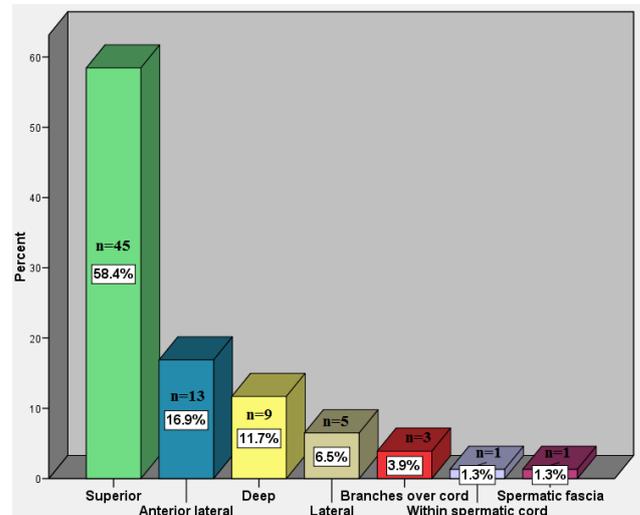


Fig-1: Relation of the left Ilioinguinal nerve to the spermatic cord among the study group (n=77)

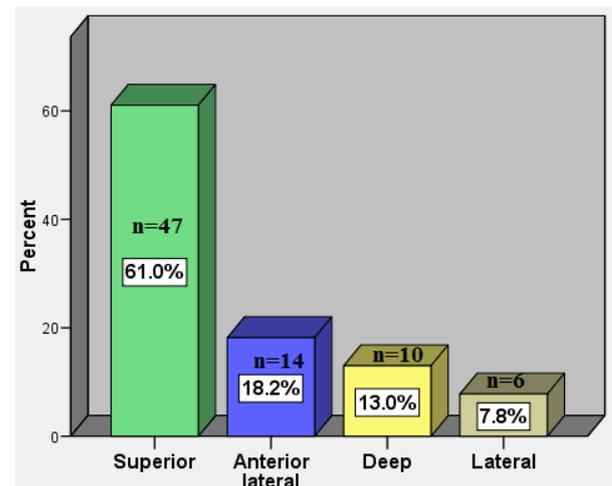


Fig-2: Relation of the right Ilioinguinal nerve to the spermatic cord among the study group (n=77)

It was travelling superficial or superior to spermatic cord in 92 (59.7%) specimens, this relation was observed on the right and left sides in 47 (30.5%) and 45 (29.2%) respectively (Figures 3, 4, 5).

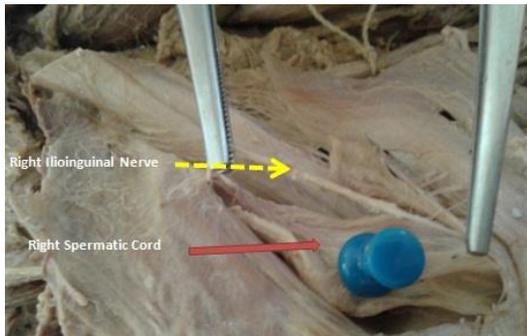


Fig-3: Right Ilioinguinal nerve superficial to the spermatic cord



Fig-6: Right Ilioinguinal nerve lateral to the spermatic cord

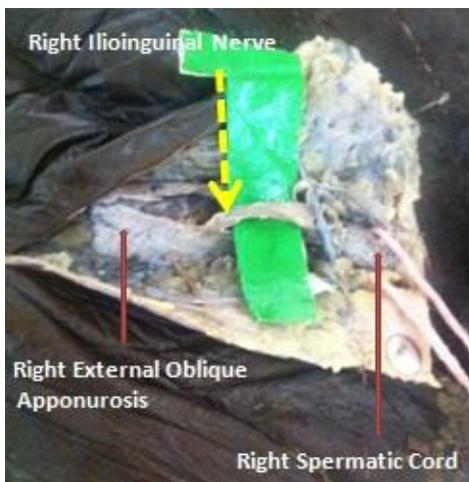


Fig-3: Right Ilioinguinal nerve superficial to the spermatic cord

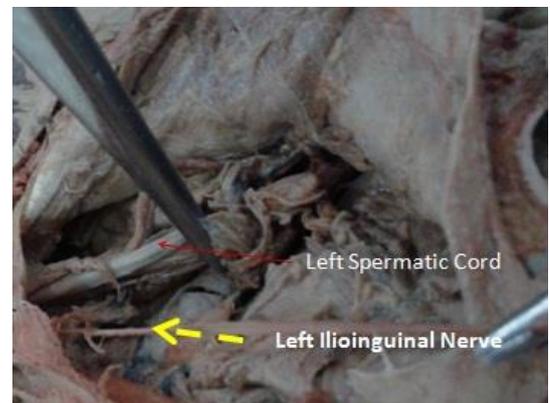


Fig-7: Left Ilioinguinal nerve lateral to the spermatic cord

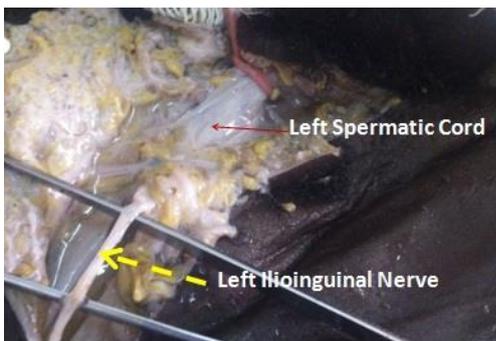


Fig-5: Left Ilioinguinal nerve superficial to the spermatic cord

In 11 (7.1%) specimens the nerve was related to the lateral side of the cord (Figures 6, 7); this relation was observed on the right and left sides in 6 (3.9%) and 5 (3.2%) respectively.

While in 19 (12.3%) specimens the nerve seen to pass deep to the cord (Figures 8, 9); this relation was observed on the right and left sides in 10 (6.5%) and 9 (5.8%) respectively.

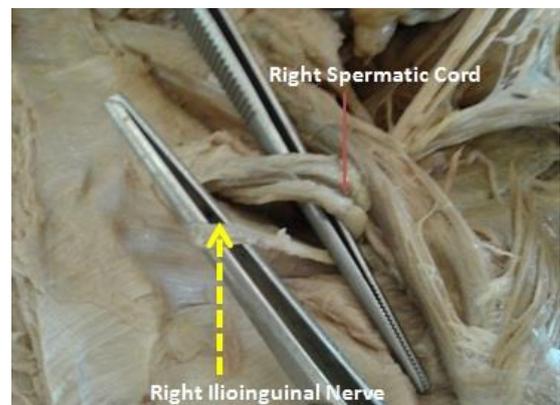


Fig-8: Right Ilioinguinal nerve deep to the spermatic cord

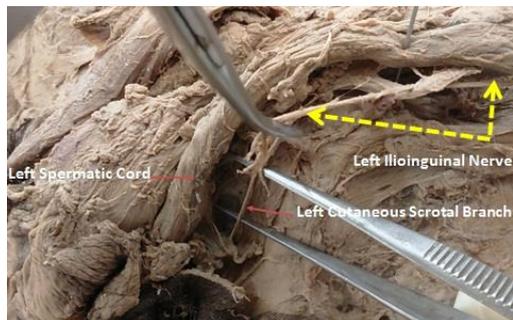


Fig-9: Left Ilioinguinal nerve below the spermatic cord and giving cutaneous branch to the scrotum

In one specimen (0.6%) the nerve gave is incorporated in to the spermatic fascia (Figure 10), this relation was observed on the left side.

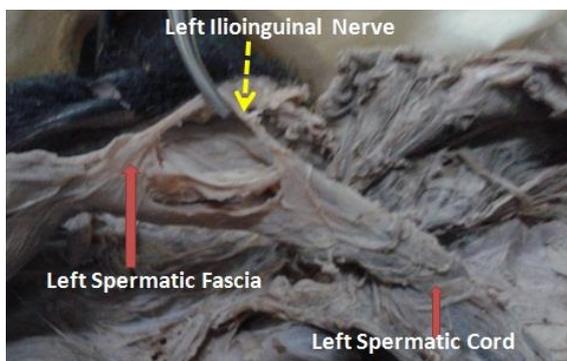


Fig- 10: Left Ilioinguinal Nerve incorporated into the spermatic fascia

Whereas, in one specimen (0.6%) the nerve gave is incorporated in to the spermatic cord (Figure 11), this relation was observed on the left side.



Fig-11: Left Ilioinguinal nerve incorporated into the spermatic cord

Whereas, in 3 specimens (1.9%) the nerve gave its cutaneous branches over the cord on the left side (Figure 12).

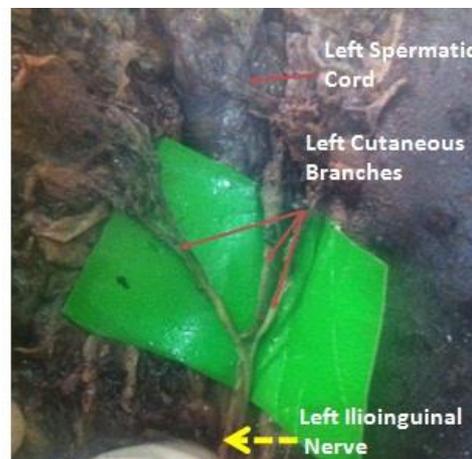


Figure 12: Left Ilioinguinal nerve giving branches over the spermatic cord

In 27 (17.5%) specimens the nerve was related to the anteriolateral side of the cord (Figures 13, 14); this relation was observed on the right and left sides in 14 (9.1%) and 13 (8.4%) respectively.



Fig-13: Right Ilioinguinal nerve anteriolateral to the spermatic cord

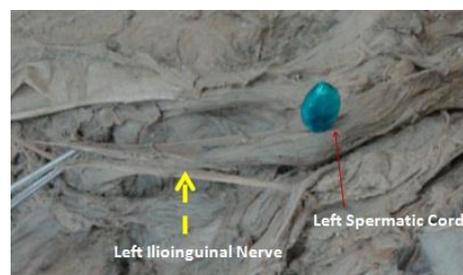


Fig-14: Left Ilioinguinal nerve anteriolateral to the spermatic cord

Table 1: Relation of the Ilioinguinal nerve to spermatic cord in the right side versus left side

| The side | Relation to spermatic cord | | | | | | | Total |
|--------------|----------------------------|------------------|------------------|--------------------|------------------|------------------|-----------------------|-------------------|
| | Superior | Anterior lateral | Deep | Branches over cord | Spermatic fascia | Lateral | Within spermatic cord | |
| Right | 47 (30.5%) | 14 (9.1%) | 10 (6.5%) | 0 | 0 | 6(3.9%) | 0 | 77 (50%) |
| Left | 45 (29.2%) | 13 (8.4%) | 9(5.8%) | 3(1.9%) | 1(0.6%) | 5(3.2%) | 1(0.6%) | 77 (50%) |
| Total | 92(59.7%) | 27(17.5%) | 19(12.3%) | 3 (1.9%) | 1 (0.6%) | 11 (7.1%) | 1 (0.6%) | 154 (100%) |

DISCUSSION

H. Mandelkow *et al* [14] studied 44 cadavers and reported lateral relation of the nerve in (10%). SS Das *et al*, [15] reported the deep relation of the nerve to the cord in a 50 years old male cadaver.

A.K.R. Al-dabbagh *et al* [16] and J Salama *et al* [17] were reported superior relation of the nerve to the cord respectively. The result of this study shows seven modes of relation of the ilioinguinal nerve to the spermatic cord, superior relation in (59.7%), anteriolateral relation in (17.5%), deep relation in (12.3%), lateral relation in (7.1%), the nerve gave cutaneous branches over the cord in (1.9%), the nerve incorporated in the cord in (0.6%), and incorporated in the cord fascia in (0.6%).

CONCLUSION

Concluding, a clear understanding of the anatomical locations of the ilioinguinal nerve, during lower abdominal surgery, is pivotal in preventing nerve damage and subsequent complications. As highlighted by this paper, the topography of this nerve shows considerable variation. This must be taken into account when identifying this nerve.

Seven patterns of ilioinguinal nerve relations to the spermatic cord, 91 specimens (59%) related superiorly, 27 specimens (17.5%) anteriolateral. 20 specimens (13%) deep, 11 specimens (7.1%) lateral, 3 specimens (1.9%) give branches over the cord, one specimen (0.6%) incorporated within the cord, and one specimen (0.6%) lies within the spermatic fascia.

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