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THE RELATIONSHIP OF THE ILIOINGUINAL NERVE TO THE SPERMATIC CORD WITHIN THE INGUINAL CANAL IN SUDANESE CADAVERS

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ABSTRACT

Background: Ilioinguinal nerve frequently injured during lower abdominal surgeries especially during inguinal hernia repair. **Objective:** To identify the variations of ilioinguinal nerve related to the spermatic cord. **Materials and method:** A multi-centric prospective cross-sectional study (January 2015−September 2017) was carried out at the department of anatomy at 11 Medical Colleges, in Khartoum state. All cadavers satisfied the inclusion criteria were enrolled into the study. The inguinal canal was opened by an oblique incision on the apponurosis of the external oblique muscle parallel to the inguinal ligament. Different relations of the nerve to the spermatic cord were observed. The data was collected using a predesigned questionnaire and analyzed statistically using SPSS version 21.0 for Windows. **Results:** The ilioinguinal nerve was identified bilaterally in 77 cadavers resulting in 154 ilioinguinal nerves. It was related to the spermatic cord in seven patterns. 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. In 27 (17.5%) specimens the nerve was related to the anteriolateral side of the cord. While in 11 (7.1%) specimens the nerve seen to pass lateral to the cord. In one specimen the nerve on the left side, it was incorporated into the spermatic cord (0.6%) this relation. In 19 (12.3%) specimens the nerve seen to pass deep to the cord. **Conclusion:** Cadaveric dissection of the nerve topography delineates variations not commonly cited in anatomical textbooks.

KEYWORDS: Ilioinguinal nerve; Inguinal canal; Spermatic cord; Dissection.

INTRODUCTION

Groin hernia repair is the most frequently performed operation in general and pediatrics surgery. The health effects of inguinal hernia on the community are tremendous, since people apparently are at high risk for the development of inguinal hernia. The cumulative incidence of hospital admissions with inguinal hernia was 13.9 per cent for men and 2.1 per cent for women.[1,2]

Clinical diagnosis and surgical procedures require a thorough knowledge not only of the normal gross anatomy of the structures within a region but also of the common and less common anatomical variations of the structures located within it. Recent and continuing advances in surgical procedures have made the need for such detailed knowledge ever-more important.[3]

The ilioinguinal nerve (IIN) is the most common neural pain generator in the groin, followed by the genitofemoral nerve (GFN), and iliohypogastric nerve (IHN).[4]

The current study highlighted the relationship of the ilioinguinal nerve to the spermatic cord within the inguinal canal in Sudanese cadavers.

MATERIAL AND METHODS

A multi-centric prospective cross-sectional study (January 2015−September 2017) was carried out at the department of anatomy at 11 Medical Colleges, in Khartoum state, Sudan. Ethical clearance was obtained prior to conduct the study.

All cadavers with intact inguinal region within the study period were enrolled into the study. Due to the possibility of disturbed anatomy cadavers with previously dissected ilioinguinal nerve, and specimen with pathology, surgical incision, or traumatic damage were excluded from the study.

The parts of the external oblique apponeurosis were reflected laterally and inferiorly, and then-after, the inguinal ligament, inguinal canal with its contents, and the superficial inguinal ring were exposed. The inguinal canal was opened by an oblique incision on the apponurosis of the external oblique muscle parallel to the inguinal ligament. Different relations of the nerve to the spermatic cord were observed.

During dissection each anatomical details was documented photographically.

The data was collected using a predesigned questionnaire containing the study variables and analyzed statistically using SPSS version 21.0 for Windows. All quantitative data were presented as mean ± standard deviation (SD). Chi-square test (χ 2) was used to compare the differences between the right and left nerves with confidence level of 95%. A p value <0.05 considered to be significant.

RESULTS

The ilioinguinal nerve was identified bilaterally in 77 cadavers resulting in 154 ilioinguinal nerves.

It was related to the spermatic cord in seven patterns as shown in table 1.

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%)**

P=0.5

These seven patterns were seen in left side, whereas in the right side only 4 patterns were observed (Figures 1 and 2).

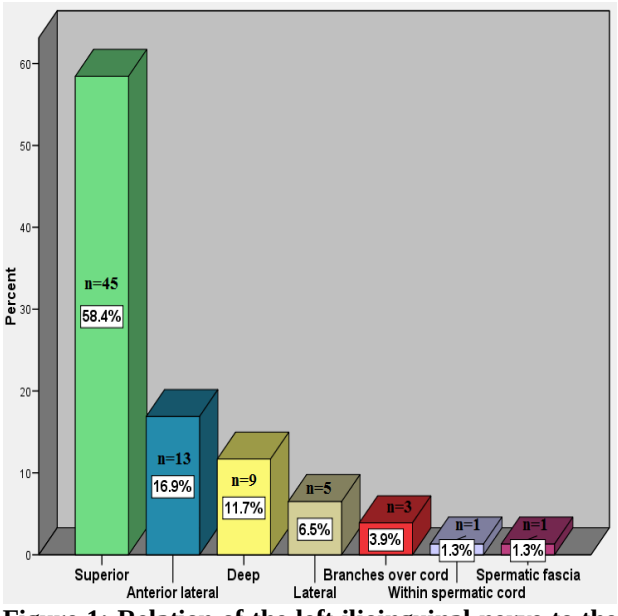

Figure 1: Relation of the left ilioinguinal nerve to the spermatic cord among the study group (n=77).

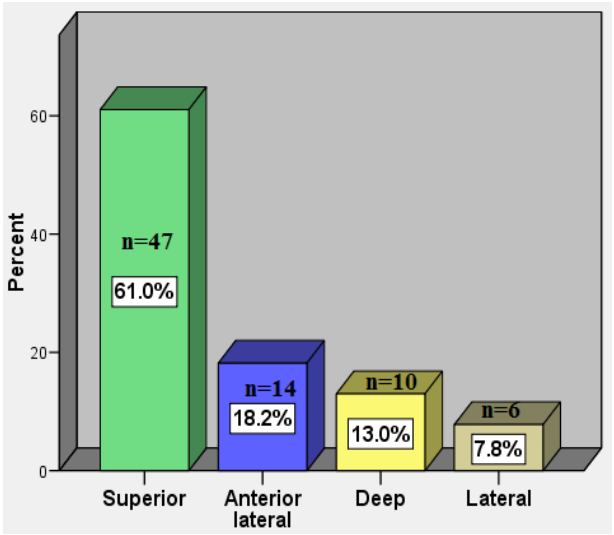

Figure 2: Relation of the right ilioinguinal nerve to the spermatic cord among the study group (n=77).

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 and 4).

Figure 3: Right and left ilioinguinal nerves over the spermatic cord.

Figure 4: Right and left ilioinguinal nerves lateral to the spermatic cord.

In 27 (17.5%) specimens the nerve was related to the anteriolateral side of the cord (Figures 5); this relation was observed on the right and left sides in 14 (9.1%) and 13 (8.4%) respectively.

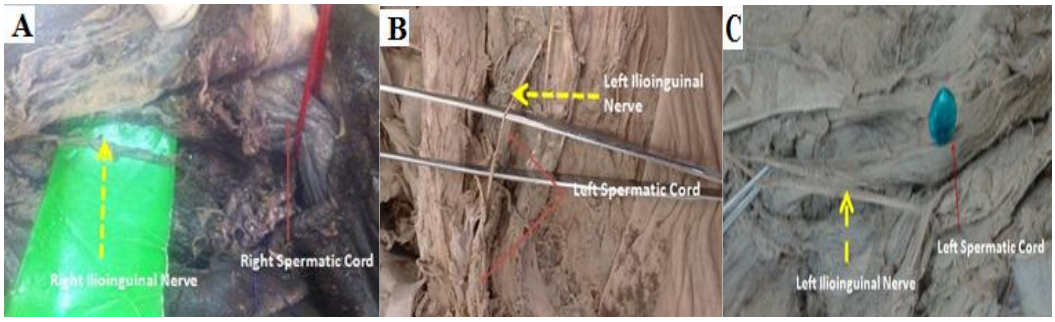

Figure 5: *A, B;* Right and left ilioinguinal nerve incorporated into the spermatic cord, *C;* Left ilioinguinal nerve anteriolateral to the spermatic cord

While in 11 (7.1%) specimens the nerve seen to pass lateral to the cord (Figures 4, 5); this relation was observed on the right and left sides in 6 (3.9%) and 5 (3.2%) respectively.

In one specimen the nerve was incorporated into the spermatic cord (0.6%) this relation was observed on the left side (Figure 5 C).

In 19 (12.3%) specimens the nerve seen to pass deep to the cord (Figures 7 A), this relation was observed on the right and left sides in 10 (6.5%) and 9 (5.8%) respectively.

In one specimen the nerve was incorporated into the spermatic fascia (0.6%) this relation was observed on the left side (Figure 6 B).

Whereas, in 3 specimens (1.9%) the nerve gave its cutaneous branches over the cord on the left side (Figure 6 C).

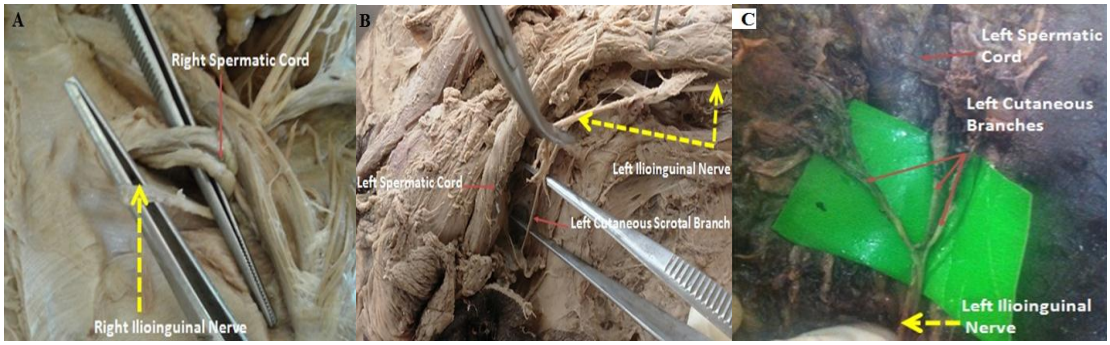

Figure 6: *A;* Right ilioinguinal nerve deep to the spermatic cord, *B;* Left ilioinguinal nerve deep to the spermatic cord giving cutaneous branch to the scrotum, *C;* Left ilioinguinal nerve giving branches over the spermatic cord.

DISCUSSION

Regional nerves of the inguinal region have gained importance because of their anatomical variation and vulnerability to injuries. Although some variations and absence of the IIN rather frequent.[5] Variations in the anatomical course of the ilioinguinal nerve require that diligence is taken in their proper recognition.[6]

The study showed that the ilioinguinal nerve was identified in all dissected cadavers. In contrast, the incidence of absent IIN reported in literature ranged between 2% and 22.2% as shown in table 4.1.[7-13]

Table 4.1: Reported incidence of absent IIN in literature.

Study	*Year*	*Examined region*	*Absent IIN*	*Percent*
Bergman et al.,[7]	1975	200	5	2.5
Avsar et al.,[8]	2002	24	1	4.2
Al-Dabbagh[9]	2002	110	8	7.3
Wijsmuller et al.,[10]	2007	18	4	22.2
Assane et al.,[11]	2010	100	7	7
Deepti et al.,[12]	2014	60	5	8.3
Sushma et al.,[13]	2015	50	4	8
Current study	2017	154	—	—

The current study revealed that the IINs were related to the spermatic cord in seven patterns. It was travelling superficial or superior to spermatic cord in 59.7%, whereas, in 17.5% the nerve was related to the anteriolateral side of the cord, and in 12.3% specimens the nerve seen to pass deep to the cord.

One of the earliest studies related to the anatomy of the IIN was conducted by Moosman and Oelrich (1977), at Michigan University,[14] when they found that 148 of 424 cadaveric dissections did not follow the normal course of the IIN through the inguinal canal but rather travelled posterior or within the coverings of the spermatic cord (or round ligament).

Later on, the study followed by Papadopoulos and Katritsis (1981),[15] described IIN as being located a mean of 0.64 cm from the midpoint of the inguinal ligament. Additionally, in 1983, Salama et al., at Paris University,[16] discovered that only 12 of 25 postmortem specimens and genital branches arising from IIN that followed the pathway depicted in standard anatomical texts.

Furthermore, Mandelkow and Loeweneck (1988), Germany.[17] in their study they reported lateral relation of the nerve to the cord in 10%. While Das SS. et al.[18] reported the deep relation of the nerve to the cord in a 50 years old male cadaver. Whereas, Al-Dabbagh (2002), at Trafford General Hospital in Manchester,[9] and J Salama et al., (1983), at Paris University,[16] were reported superior relation of the nerve to the cord respectively.

LIMITATIONS OF THE CURRENT STUDY

Study included only male cadavers. This is created because of lack of female's cadavers during the study period.

CONCLUSION

The results of the current study suggests to examine the possibilities of the nerve course variations, to be taken into consideration for the best way to identify it when surgical procedures are performed in the lower portion of the abdomen and especially in inguinal canal region.

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