

## ANATOMICAL STUDY OF NERVES OF THE INGUINAL REGION IN THE ADULT HUMAN CADAVERS

### Anatomy

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### ABSTRACT

Studies show that recurrences range from 0.5 – 8% following primary herniorrhaphy and 4 -21% following a repair of recurrent hernia. (Bailey and Love's, 24th Ed). If meticulous care is not taken towards identifying the nerves in the region, it is likely that the patient will report back to the surgeon with agonizing pain in the nerve territory soon after the surgery. The neuropathic pain after inguinal hernia repair is usually due to a neuroma of ilioinguinal, iliohypogastric or genitofemoral nerve. (Ducic I, Dellon AL, 2004).

After observing these facts about the inguinal hernia it was planned to study the inguinal region by dissecting adult human cadavers and to compare few anthropometric parameters between patients with inguinal hernia and the normal adult population, so as to look for any correlation between the parameters studied and the development of inguinal hernia

### KEYWORDS

Anatomy, Study Nerves, Inguinal, Human.

### INTRODUCTION

Abdominal wall is the site of opposing physical forces that may eventually result in the appearance of hernias, which have both social and economical consequences. Hernia by definition is the protrusion of a viscus or part of a viscus through an abnormal opening in the walls of its containing cavity. The external abdominal hernias are the most common form of hernias. Among all spontaneous external abdominal hernias inguinal hernia is the most commonly encountered type.

Inguinal hernia, referred to as the 'bread and butter of surgeons' implying its frequency in the general surgical practice, forms around 75% of the abdominal hernias. Inguinal hernia is of two basic types: indirect and direct. In the indirect variety hernial sac enters the canal through the deep inguinal ring and travels down the canal on the outer aspect of the spermatic cord. Whereas in the direct hernia hernial sac enters the canal directly forwards through the posterior wall of the inguinal canal.

If we look into the statistics of the inguinal hernias, studies show that indirect variety is the most common of all forms of hernias. It is more common in the young whereas a direct hernia is more common in old age. Males are 20 times more affected than females. In the adult males 65% of the inguinal hernias are indirect type of which 55% are right sided and 12% bilateral. The direct inguinal hernia forms 35% of the inguinal hernia in the adult males and it is seen that at presentation 12% of these will have a contralateral hernia in addition. It is also observed that there is a four fold increase in the future development of contralateral hernia among these patients. A direct hernia is always acquired since the hernial sac passes through a weakness or defect in the fascia transversalis.

Inguinal hernia as already mentioned is not only the bread and butter but is also a challenge for the surgeons as it is observed that postoperative recurrences are not very rare. Studies show that recurrences range from 0.5 – 8% following primary herniorrhaphy and 4 -21% following a repair of recurrent hernia. (Bailey and Love's, 24th Ed). If meticulous care is not taken towards identifying the nerves in the region, it is likely that the patient will report back to the surgeon with agonizing pain in the nerve territory soon after the surgery. The neuropathic pain after inguinal hernia repair is usually due to a neuroma of ilioinguinal, iliohypogastric or genitofemoral nerve. (Ducic I, Dellon AL, 2004).

After observing these facts about the inguinal hernia it was planned to study the inguinal region by dissecting adult human cadavers and to compare few anthropometric parameters between patients with inguinal hernia and the normal adult population, so as to look for any correlation between the parameters studied and the development of inguinal hernia.

### AIMS AND OBJECTIVES

- Aim of the present study was to compare course of the nerves encountered in the region

### MATERIALS AND METHODS

#### Dissection of the inguinal canal

A total of 23 (21 in The Oxford Medical College, Hospital & Research Centre, Bangalore and 2 Kanachur Institute of Medical Sciences, Deralakatte, Mangalore) formalin fixed adult human cadavers belonging to both the sexes were dissected bilaterally for the inguinal region in the department of Anatomy.

#### Dissection was done layer by layer.

Iliohypogastric and ilioinguinal nerves were identified and their course was observed.

Then a lateral incision was given to the internal oblique where it was arching over from the anterior wall to form roof of the canal, so as to expose the posterior wall completely.

At the same time distance between the anterior superior iliac spine to lateral femoral cutaneous nerve was measured.

All these parameters were tabulated and statistically analysed using Chi-square test and student's unpaired 't' test

### OBSERVATIONS and RESULTS

**Table 1: Measurements of the distance between ASIS to LFCN**

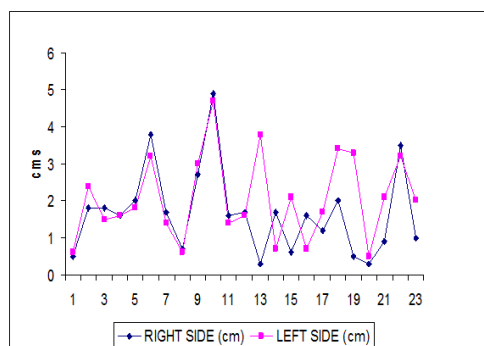
| Sl. No. | Sex | Right Side<br>(cm) | Left Side<br>(cm) |
|---------|-----|--------------------|-------------------|
| 1       | M   | 0.5                | 0.6               |
| 2       | M   | 1.8                | 2.4               |
| 3       | M   | 1.8                | 1.5               |
| 4       | F   | 1.6                | 1.6               |
| 5       | F   | 2                  | 1.8               |
| 6       | F   | 3.8                | 3.2               |
| 7       | M   | 1.7                | 1.4               |
| 8       | M   | 0.7                | 0.6               |
| 9       | M   | 2.7                | 3                 |
| 10      | M   | 4.9                | 4.7               |
| 11      | M   | 1.6                | 1.4               |
| 12      | M   | 1.7                | 1.6               |
| 13      | M   | 0.3                | 3.8               |
| 14      | M   | 1.7                | 0.7               |
| 15      | M   | 0.6                | 2.1               |
| 16      | F   | 1.6                | 0.7               |
| 17      | M   | 1.2                | 1.7               |
| 18      | F   | 2                  | 3.4               |
| 19      | M   | 0.5                | 3.3               |
| 20      | M   | 0.3                | 0.5               |
| 21      | M   | 0.9                | 2.1               |
| 22      | M   | 3.5                | 3.2               |
| 23      | M   | 1                  | 2                 |

M-Male

F-Female ASIS-Anterior superior iliac spine

LFCN- Lateral femoral cutaneous nerve

### The distance between ASIS to LFCN on either side



**Table 2: Comparison of the mean distance between the ASIS to LFCN on either side**

| Side  | No | Mean  | Std Deviation | t          |
|-------|----|-------|---------------|------------|
| Right | 23 | 1.670 | 1.158         | 1.13700    |
| Left  | 23 | 2.057 | 1.151         | p=0.262 ns |

LFCN-Lateral femoral cutaneous nerve.

ASIS-Anterior superior iliac spine.

ns – not significant.

- In the present study 23 adult human cadavers were dissected to study the inguinal region, bilaterally. Out of 23 cadavers dissected, 18 were male and 5 were female cadavers.

Observation of the course of the commonly encountered nerves of the region i.e. iliohypogastric, ilioinguinal, genital branch of genitofemoral and lateral femoral cutaneous nerves was done. Majority of the cadavers studied, showed a normal course for these nerves. But in one of the cadavers ilioinguinal nerve was found to be missing on one side (Fig 11). One more cadaver showed the absence of iliohypogastric nerve on either side (Fig 12). In three cadavers after reflecting the external oblique aponeurosis, in addition to ilioinguinal and iliohypogastric nerves, extra nerves were found (Fig 13-15). One of these showed plexiform appearance. One inguinal region showed a single nerve piercing the internal oblique and then dividing into two branches (Fig 16). The superior branch followed the course of iliohypogastric nerve and the inferior branch followed the course of ilioinguinal nerve and left the canal after passing through the superficial ring. In all the cadavers studied the genital branch of the genitofemoral nerve followed the normal course. The lateral femoral cutaneous nerve at its exit from the abdomen was identified. The distance of this nerve from the ASIS was measured in all the cadavers.

### DISCUSSION

Course of the nerves encountered in the inguinal region

Rosenberger RJ, Loeweneck H, Meyer G, in 2000, in their study result mention that both the femoral and genital branches of the genitofemoral nerve may penetrate the abdominal wall lateral to the deep ring and ilioinguinal nerve and the lateral femoral cutaneous nerve may run immediately lateral to the anterior superior iliac spine.

In 2002, Liu WC et al. in their study result state that all the genital branches passed through the ventral aspect of the internal ring. Almost all these branches entered the ring and continued within the spermatic cord. In only 3% the genital branch was found to run outside the spermatic cord.

In 2002, Al-dabbagh AK studied 'Anatomical variations of the ilioinguinal and iliohypogastric nerves and risks of injury in 110 hernia repairs'. In this study the course of one or both the nerves was found to be a variant in 64 of 110 (58.2%) explorations. The variations included:

- A single stem for both the nerves over spermatic cord in 24 of 64 cases, with variation in the subsequent course.
- Absence of one or both the nerves in 8 of 64 cases.
- Accessory ilioinguinal or iliohypogastric nerves in 3 of 64 cases.
- Aberrant origin of the ilioinguinal nerve from the genitofemoral nerve in 2 of 64 cases.
- Acute inferolateral angulation of the ilioinguinal nerve at its exit from the superficial ring in 20 of 64 cases.

- Similar direction of the ilioinguinal nerve but in a plane superficial to the external oblique aponeurosis and proximal to the superficial ring in 18 of 64 cases.

Distance between the LFCN to ASIS as the nerve is exiting from the abdomen

Oskar C Aszmann, Evan S. Dellon and A. Lee dellon (1997) dissected 52 human cadavers to investigate the anatomy of lateral femoral cutaneous nerve (LFCN) and identified five different types of locations:

**Type A:** LFCN located posterior to the anterior superior iliac spine (ASIS), across the iliac crest (4%).

**Type B:** Anterior to the ASIS and superficial to the origin of sartorius but within the substance of inguinal ligament (27%).

**Type C:** Medial to the ASIS, ensheathed in the tendinous origin of sartorius muscle (23%).

**Type D:** Medial to the origin of sartorius, located in an interval between the tendon of sartorius and thick fascia of iliopsoas muscle deep to the inguinal ligament (26%).

**Type E:** Most medial and embedded in loose connective tissue deep to the inguinal ligament (20%).

In their study Hospodar PP, Ashman ES and Traub JA (1999) state that the course of the LFCN is highly variable and the nerve was found most commonly at 10-15 mm from the ASIS and as far medially as 46 mm. During ilioinguinal surgical approach, if the lateral femoral cutaneous nerve is not encountered immediately adjacent to the anterior superior iliac spine, dissection upto 5 cms medial to the ASIS may be necessary to locate the nerve.

Rosenberger RJ, Loeweneck H, Meyer G (2000), their study results reveal that lateral femoral cutaneous nerve may run immediately lateral to the anterior superior iliac spine.

### CONCLUSION

Majority of the inguinal regions studied showed a normal course for the ilioinguinal, iliohypogastric and genital branch of the genitofemoral nerve.

In the present study LFCN, at the point of exit from the abdomen, was found to be at a distance of 0.3 cms to 4.9 cms medial to the ASIS. This finding is in accordance with the findings of the previous studies done. This suggests that during the surgical approach of the ilioinguinal region, awareness that the LFCN may cross the surgical site is the only way to prevent injury to this nerve.

### REFERENCES

- Al-dabbagh AK. Anatomical variations of the inguinal nerves and risk of injury in 110 hernia repairs. Surg Radiol Anat. 2002; 24(2): 102-107.
- Chevallier JM, Wind P, Lassau JP. Damage to the inguinofemoral nerves in the treatment of hernias: An anatomical hazard of traditional and laparoscopic techniques. Ann Chir. 1996; 50(9): 767-775.
- Hospodar PP, Ashman ES, Traub JA. Anatomic study of the lateral femoral cutaneous nerve with respect to the ilioinguinal surgical dissection. J. Orthop Trauma. 1999; 13(1): 17-19.
- Liu WU, Chen TH, Shyu JF, Chen CH, Shih C, Wang JJ, Kung SP, Lui WY, Wu CW, Liu JC. Applied anatomy of the genital branch of the genitofemoral nerve in open inguinal herniorrhaphy. Eur J Surg. 2002; 168(30): 145-149.
- Marks SC Jr, Gilroy AM, Page DW. The clinical anatomy of laparoscopic inguinal hernia repair. Singapore Med J. 1996; 37(5): 519-521.
- Oskar C. Aszmann, Evan S. Dellon and A. Lee Dellon. Anatomical course of the lateral femoral cutaneous nerve and its susceptibility to compression and injury. Plastic and Reconstructive Surg. 1997; 100(3): 600-604.
- Thomas G. Liszka, A. Lee Dellon and Paul N. Manson. Iliohypogastric nerve Entrapment Following Abdominoplasty. Plastic and Reconstructive Surgery. 1994; 93(1): 181-183