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## To determine the aspect of low lying pubic tubercle in development of inguinal hernia: A case control study

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### Abstract

**Background:** the most common surgical problem is hernia. It is common in both the sexes and the commonest site being the inguinal region. The prevalence of hernia is about 30%. The tubercle plays an important role in inguinal hernia. The measurements vary from person to person depending on the risk of developing inguinal hernia is also present. Prevention is a major step which specially in early adulthood.

**Aim:** To assess the liaison (relation) of pubospinal distance between cases and controls.

**Methods:** A case control study was carried out to evaluate the risk of low lying tubercle. All the subjects were evaluated who fulfilled the inclusion criteria. The sample size studied was 150 cases and 150 controls. Measurements of SS line, ST line and MP line were taken and evaluated for risk of inguinal hernia.

**Results:** the age group studied ranged from 17 to 65 years. 120 were male subjects and 30 female subjects. Major of the subjects had indirect hernia. The commonest complaint among the subjects was swelling. The measurements were taken in detail and analyzed for cases and controls. The role of SS, ST and MP lines were significant and proportional to developing inguinal hernia.

**Conclusion:** the end result of this study showed age group between 51-60 years inguinal hernia is common. More number of subjects had indirect inguinal hernia. With regard to measurements SS and ST line was higher in cases when compared to controls.

**Keywords:** Determine, low lying pubic tubercle, inguinal hernia

### 1. Introduction

One of the commonest surgical problems is hernia. Hernia occurs following disruption of fibro muscular wall. The most common site is inguinal region in both sexes.

Abnormal protrusion of a complete or part of the viscus through a normal or abnormal opening in the cavity that contains it is defined as hernia <sup>[1]</sup>.

The inguinal canal is 3.75cm in length and extends from deep to superficial inguinal ring <sup>[2]</sup>. Location of pubic tubercle is an important factor that determines the probability of a person to suffer from an inguinal hernia.

Few authors studied the pelvis in cadavers and found a positive correlation in the Fruchard's area and bony pelvis and concluded that it plays a very significant role in the development of hernia <sup>[3]</sup>.

Statistics shows indirect inguinal hernia is the most common of all forms of hernia; males have a seven fold risk than females. The prevalence of inguinal hernia has two pinnacles; first is seen in infants and second after the middle age. The prevalence of inguinal hernia is 30% mostly seen in the age group between 41-50 years <sup>[4]</sup>.

Complications of inguinal hernia include bowel obstruction, and bowel strangulation and the greatest risk being found among older persons. Inguinal hernia repair is a commonly performed procedure among both adults and children with inguinal hernias constituting more than 95% of all groin hernia repairs <sup>[5]</sup>. Various degree of incompleteness of the internal oblique muscle in the inguinal region lead to the essential predisposition to direct inguinal hernia. Other factors are an increase in the size of Hessert's triangle <sup>[6]</sup>.

Early identification of risk factors in early adulthood could help in the prevention of hernia. Pelvimetry with radiograph correlation is a simple and non-invasive method that can help in identification of risk factors and accordingly plan pre operatively the kind of hernia repair to be undertaken <sup>[7]</sup>.

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**2. Aim:** To assess the liaison (relation) of pubospinal distance between cases and controls.

### 3. Objectives

1. To evaluate the clinical profile of inguinal hernia.
2. To determine the pubospinal distance and its association with inguinal hernia.

### 4. Material and Methods

**4.1 Study design:** Case control study.

**4.2 Study period:** October 2018 to October 2019

### 4.3 Study population

Subjects above the age 16 reporting to the department of general surgery.

### 4.4 Inclusion criteria

- Subjects with inguinal hernia irrespective of sex and occupation were included in the study

### 4.5 Exclusion criteria

- Subjects with obvious risk factors like obstructive uropathy, intra-abdominal malignancies.
- Subjects with age less than 16 years as exact position of pubic tubercle cannot be forecasted due to the growth of skeletal system.
- Subjects with congenital and acquired pelvic anomalies

**4.6 Sample Size:** Considering the prevalence of inguinal hernia 30% [4] the sample size was calculated for our study using the formula

$$N = 4pq/L^2$$

- p= 30%
- q= 70% (100-p)
- L=25%

Sample size works out to 150 subjects with the above formula

### 5. Method and measurements

The study subjects were asked to lie in supine position. Keeping both their lower limbs straight, so that both the anterior superior iliac spine are at the same level. A line was drawn on the anterior abdominal wall. Connecting both anterior superior iliac spine which was denoted as SS Line and the length of SS Line was noted. Next the pubic tubercle on the side of hernia was marked by the palpation. Then vertical distance between this point and the SS Line was measured in centimeters. This line was designated as ST line. The midpoint between the anterior superior iliac spine and the pubic symphysis was marked as the midinguinal point and the distance from it to the centre of the superficial inguinal ring was measured, the inguinal ligament length was measured as well. All these measurement thus obtained and tabulated. Similar measurement was done on control as well.

**5.1 Study tools:** Pre-designed pre-tested questionnaire.

### 5.2 Study analysis

The collected data was coded, entered into Microsoft excel work sheer and exported to SPSS. Data was analyzed using SPSS version 21. Data is presented as percentage in categories and then presented as tables. Chi-square test, student t test and ANOVA used for test of significance.

**5.3 Ethical approval:** Institutional ethical committee approval

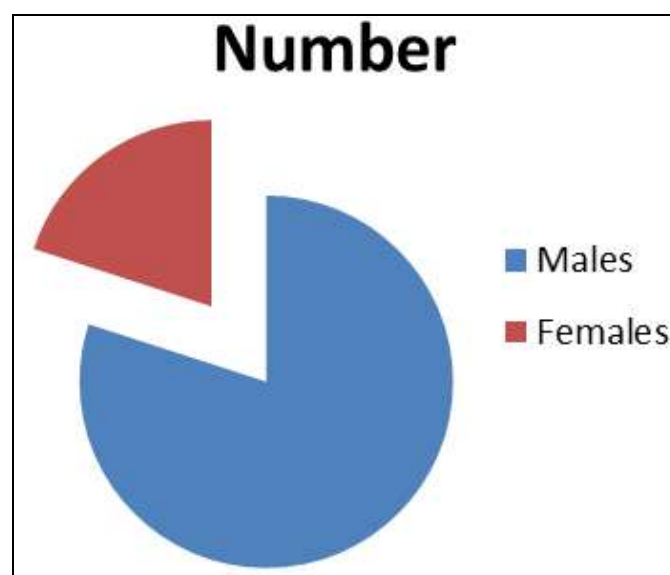
was obtained prior to the initiation of the study.

## 6. Results

**Table 1:** Distribution of subjects according to age (n=150)

Age group	Number	Percentage
< 20 years	08	5.3%
21-30 years	17	11.3%
31-40 years	29	19.3%
41-50 years	34	22.8%
51-60 years	42	28%
>60 years	20	13.3%
Total	150	100%

The case subjects were distributed as per their age. 42 Subjects between age group 51-60 years were the highest followed by 34 subjects between age 41-50. 29, 20 and 17 subjects were between age group of 31-40, >60 and 21-30 years. Eight subjects were below 20 years.



**Fig 1:** Distribution of subjects according to sex (n=150)

Figure 1 shows the sex distribution of the subjects (cases). 120 were males and remaining 30 females

**Table 2:** Distribution of subjects based on anatomy of hernia (n=150)

Anatomy	Number	Percentage
Bilateral	19	12.6%
Direct	40	26.7%
Indirect	86	57.3%
Pantaloons type	05	3.4%
Total	150	100%

The subjects were distributed based on the anatomy of hernia. 57.3% (86 subjects) had indirect hernia followed by 26.7% (40 subjects) had direct hernia. Subjects who had bilateral hernia were 19 and only 5 subjects had pantaloons hernia (table 2).

**Table 3:** According to the clinical presentation of the subjects (n=150)

Clinical presentation	Number	Percentage
Swelling	89	59.4%
Pain	37	24.6%
Swelling + pain	24	16%
Total	150	100%

Table 3 shows the clinical presentation, 59.4% had swelling and 24.6% had pain. 16% subjects had swelling and pain.

**Table 4:** Comparing the SS, ST and MP values with controls

Variable	Total	Mean	SD	p-value
Age				
Cases	150	47.59	14.6	p=1.054
Controls	150	48.66	15.3	
SS line				
Cases	150	23.12	0.22	p<0.001
Control	150	22.87	0.20	
ST line				
Cases	150	7.35	0.18	p<0.001
Controls	150	6.83	0.56	
MP line				
Cases	150	5.32	0.19	p<0.001
Controls	150	5.63	0.26	

In this study there were 150 cases and 150 controls. Among them the average SS value for case was 23.12 which was much above the average in control group which was 22.87. When it comes to ST value the mean was 7.35 in the study group and mean was only 6.83 in the control group. The average MP distance was 5.32 in control group which was much higher than study group with distance of 5.63. All the three lines were significant meaning the tubercle plays a vital role.

## 7. Discussion

The causation of inguinal hernia varied with evolution, congenital, environmental, genetic factors, job and also the general state of health contributing to its development. The low lying pubic tubercle predisposes (risk factor) to the development of inguinal hernia. Africans have a higher incidence of inguinal hernia when compared to Europeans since the Africans have a greater oblique pelvis (low lying pubic tubercle) than the Europeans.

Sehgal *et al.* [8] in their study have classified the subjects as (Group I & II)-High lying pubic tubercle with ST line  $\leq$  to 7.5 cm and Low lying pubic tubercle, those  $\geq$  7.5 cm. They concluded low lying pubic tubercle was a predisposing factor for inguinal hernia. The change in posture to upright has caused reduction in efficiency of shutter mechanism of inguinal canal leading to the development of inguinal.

Lopez-Cano *et al.* [9] mentioned low pubic arch group showed a significantly longer inguinal ligament and a higher angle made by the superior border of the suprainguinal space and inguinal ligament at its medial insertion. The lower the pubic tubercles anatomically located, the more often morphological variation are found in the external oblique, internal oblique, transversus, cremasteric muscles and the fascia transversalis.

A study done by Harris and White [10] found there is association between the length of inguinal ligament and inclination to develop inguinal hernia is directly proportional.

A positive correlation was found between weight and ST line ( $r=0.0975$ ) while ( $r=0.0384$ ) between height and ST line. Similar finding has been revealed by a case control study by Ajmani ML *et al.* [11].

The shutter-like mechanism at the internal inguinal ring is provided by contraction of the arching fibers of the internal oblique muscle, which, when shortened, approximate themselves to the inguinal ligament and compress the spermatic cord. The unusual origin and insertion of internal oblique and transverses abdominis muscle, results in an ineffective shutter mechanism of the inguinal canal.

This low lying pubic tubercle is very important before selecting the patient for any surgical correction. It is believed that higher the distance between the inguinal ligament and musculoaponeurotic arch the classical inguinal hernia will not be feasible such patient should be chosen for hernioplasty. So the proper demonstration of anatomy of inguinal region is very important before selecting the surgical technique.

## 8. Conclusion

Based on the present study following conclusions can be drawn. Inguinal hernia was more common in 50-60 age groups. The indirect type inguinal hernia is predominant over direct type. The most common clinical presentation was swelling. Most patients present within 1 year of disease onset. Measurements of SS line, ST line were higher in cases and MP line was higher among the controls.

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