



THE ROLE OF LOW LYING PUBIC TUBERCLE IN THE DEVELOPMENT OF INGUINAL HERNIA –A CASE CONTROL STUDY

Dr. Senthilvel*	M.S., Assistant Professor, Department Of General Surgery, KAPV Govt. Medical College, Trichy *Corresponding Author
Dr. Vimal	M.S., Assistant Professor, Department Of General Surgery, KAPV Govt. Medical College, Trichy
Dr. Thangamani	Postgraduate, Department Of General Surgery, KAPV Govt. Medical College, Trichy

KEYWORDS :

INTRODUCTION

Hernia is the abnormal protrusion of a part or whole of the viscus through a normal or abnormal opening in the cavity that contains it.¹ There are two types of inguinal hernia, direct and indirect, which are defined by their relationship to the inferior epigastric vessels. Direct inguinal hernias occur medial to the inferior epigastric vessels when abdominal contents herniate through a weak spot in the fascia of the posterior wall of the inguinal canal, which is formed by the transversalis fascia. Indirect inguinal hernias occur when abdominal contents protrude through the deep inguinal ring, lateral to the inferior epigastric vessels;² this may be caused by failure of embryonic closure of the processus vaginalis. Inguinal canal is 3.75cm in length³ extends from deep to superficial inguinal ring. There are various defensive mechanisms of the inguinal canal to prevent the formation of hernia which are based on anatomical factors.

Anatomic variations of different structures facilitating herniation have been assessed by many authors. The origin of the internal oblique muscle from the inguinal ligament far away from the pubic tubercle and its lower fibers not covering the internal ring has been implicated in the indirect inguinal hernia⁴. The 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 triangle⁵. One important factor that determines the probability of an individual to suffer from an inguinal hernia is the location of the pubic tubercle⁶.

METHODS AND MATERIAL

Data Collection

All cases of inguinal hernia who presented to general surgery op at K.A.P.V medical college hospital Trichy

PERIOD OF STUDY: January 2015 to December 2016

RESULTS AND OBSERVATIONS

RESEARCH DESIGN:

Hospital based case control study

INCLUSION CRITERIA:

1. All cases of inguinal hernia who presented to general surgery op at K.A.P.V medical college hospital Trichy
2. Age more than 16 years

EXCLUSION CRITERIA:

1. Patients with obvious risk factors like obstructive uropathy, chronic cough etc
2. Patient with age less than 16 years as exact position of pubic tubercle cannot be forecasted due to the growth of skeletal system
3. Patient with congenital and acquired pelvic anomalies

METHOD OF DATA COLLECTION :

Measurements: The study subjects were asked to lie in supine relaxed position on hard bed. Keeping both their lower limbs straight, so that both the anterior superior iliac spine were at the same level. A line was drawn on the anterior abdominal wall. Connecting both anterior superior iliac spine which was given the name 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 mid point 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 were tabulated and analyzed using Chi-square test and student's t test. Similar measurement was done on controls as well.

Data Analysis: The data collected was entered in to Microsoft office excel 2007. An attempt was made to find any relationship between ST Line and SS Line measurement and height, weight, built, occupation and age with side of hernia of the patient. The ST and SS Line measurements of the case were compared with those of controls to find out whether there is tendency of having low lying pubic tubercle in case of inguinal hernia. An attempt was also made to observe any correlation between ST segment and height, weight of the patients. The quantitative variables were summarized as mean and standard deviation while qualitative variables as percentage and proportion. To the statistical significance between the two independent two groups student's t test while in more than two groups ANOVA (one way) was applied and to show correlation Pearson's correlation was applied. The difference was considered significant when p value was less than 0.05. The statistical package used was SPSS 17

AIMS AND OBJECTIVES

1. **Primary objective:** This study was designed to investigate the distance between the anterior superior iliac spines and the perpendicular distance of the pubic tubercle from the interspinal line
2. **Secondary objective:** To correlate the data to identify any risk factor for hernia

OBSERVATION AND DISCUSSION

OBSERVATION

The study was conducted at MGM General Hospital which is attached to KAPV Government medical college tiruchirapalli. Total 150 patients who are admitted at my hospital are chosen based on prefixed criteria. The controls are selected from the out patient department which matches with patient with regard to age, sex and bmi

Age

The patient with age more than 16 years are chosen. The lowest age was 17 years and highest age was 83 years. The distribution of cases is shown in the table below, the highest incidence was noted in 50-60 age group with 28%. The lowest incidence 20-30 age group with 5.3%

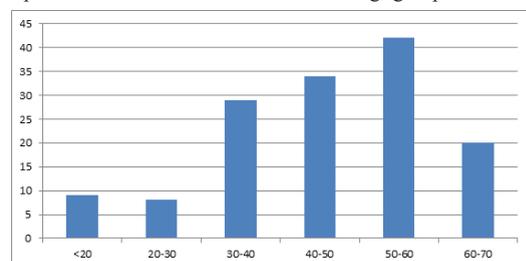


FIGURE 1 – AGE DISTRIBUTION

GENDER

The male show dominance among patient with incidence of 132 among 150, female form minority with rest 18 patients.

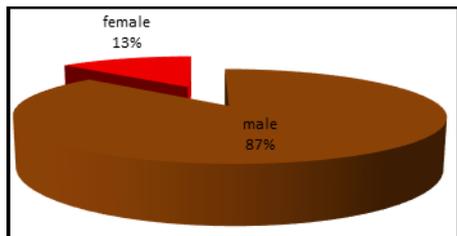


FIGURE 2 – GENDER DISTRIBUTION

BASED ON ANATOMY OF HERNIA

Based on the anatomy which was confirmed intraoperatively the hernia is divided into indirect, direct and pantaloon type with both components. Of this 150 hernia 19 hernia are bilateral, of bilateral type 12 has both component as direct and 7 both component indirect. In rest 40 patients have direct hernia and 86 have indirect hernia. 5 patients had pantaloon type.

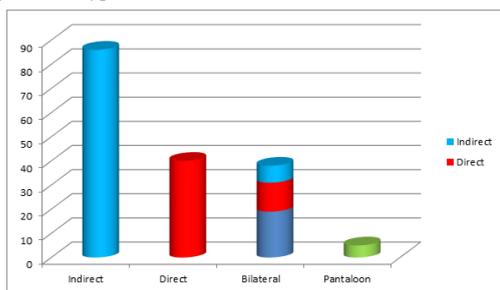


FIGURE 3 – TYPE DISTRIBUTION

Based on clinical presentation

The most common clinical presentation is painless swelling in the inguinal region which form main complaint in 89 patients, pain is the second prominent complaint which form 37 out of 150 patients. In rest 24 patient pain and swelling both were presenting complaint.

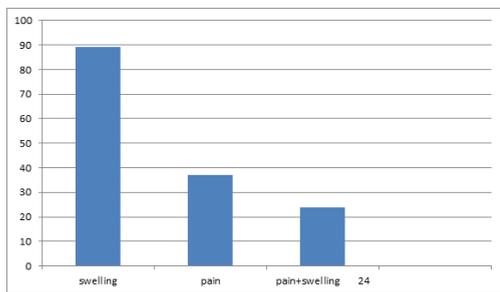


FIGURE 4 – SYMPTOMS DISTRIBUTION

Based on complication

Complication which I come across in my studys are recurrence, obstruction, irreducibility and strangulation. Irreducibility was present in 27 patient, of this 27 patient 14 patient had features of obstruction like vomiting , constipation and abdominal distention. The features of strangulation present in 4 patient with severe pain, tenderness and redness in the skin over inguinal region. Recurrence was found in only 3 patients

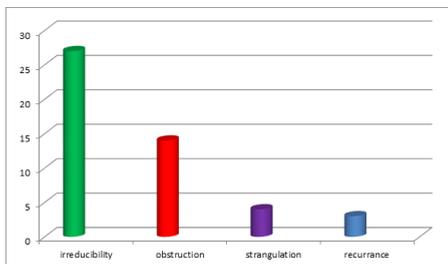


FIGURE 5 - COMPLICATIONS

Duration of disease

Of the 150 patients, 73 patients present within one year, 37 patient between one and two year. 28 patient between 2nd and 3rd year. In rest the symptoms are present for more than 3 years.

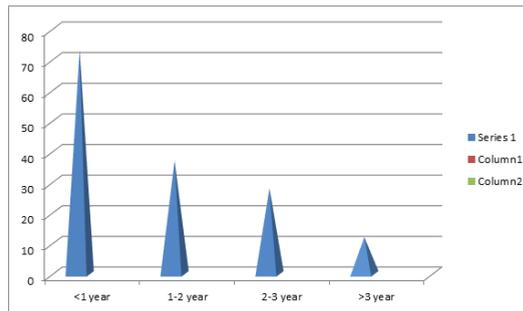


FIGURE 6 - DURATION

Associated systemic disease

Most common systemic disease which was present in my patient was hypertension in 32 patients, followed by diabetic in 21 patients. Both diabetic and hypertension were present in 7 patients. The other diseases like cad, cva, ckd etc were present in 9 patients The patients with other chronic diseases like connective tissue disorder, copd, asthmatics, bph were excluded from the study.

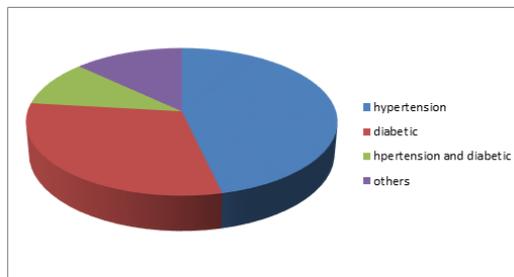


FIGURE 7 - ASSOCIATED CONDITIONS

BASED ON PARITY

Of the 18 females included in our study all of them were parous womens.

BASED ON THE SITE OF LESION

Of the 150 patients 99 patient pathology was on right side and on 32 patient the hernia was on left side. In rest that is on 19 patient the lesion was bilateral.

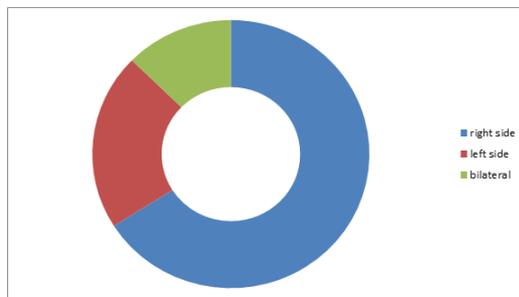


FIGURE 8 – SIDE DISTRIBUTION

RESULT

The following tables depict the various results

TABLE 1 - RESULTS

	n	Mean	S.D	t	df	Statistical inference
Age						
Study	150	47.59	14.604	.000	298	1.000>0.05
Control	150	47.59	14.604			Not Significant
SS LINE						
Study	150	23.1243	.22787	9.786	298	.000<0.01
Control	150	22.8721	.21842			Significant

ST LINE						
Study	150	7.3479	.18060	8.578	298	.000<0.01
Control	150	6.9304	.56811			Significant
MPLINE						
Study	150	5.3275	.19817	-11.3	298	.000<0.01
Control	150	5.6315	.26262	17		Significant

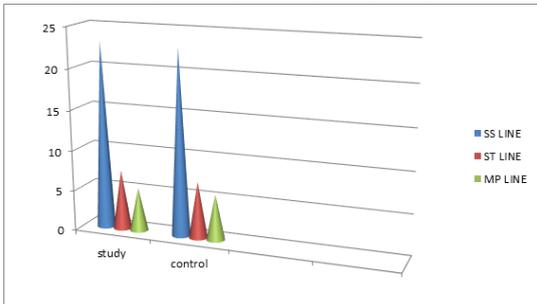


FIGURE –9

In my study there was 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. The t value was also significant (9.786). When it come to ST value the mean was 7.34 in the study group and mean was only 6.93 in the control group. The statistical significance was proved with t value 8.57. The average MP distance was 5.63 in control group which was much higher than study group with distance of 5.327.

TABLE 2

Sex	Study		Control		Total		Statistical inference
	n	%	n	%	n	%	
Male	130	86.7%	130	86.7%	260	86.7%	X ² = .000 df=1 1.000>0.05 Not Significant
Female	20	13.3%	20	13.3%	40	13.3%	
Total	150	100.0%	150	100.0%	300	100.0%	

In my study the male cases were predominant with percentage of 86.7%, the females was only minority with 13.3%. The control was choosen with similar age and sex, hence chi square test was not significant.

Table 3

Particulars	No.of respondents (n=150)	Percentage (100%)
Duration		
<1yr	73	48.7
1 to 2yrs	37	24.7
2 to 3yrs	28	18.7
>3yrs	12	8.0
Irreducible		
No	123	82.0
Yes	27	18.0
Obstructive Symptoms		
No	136	90.7
Yes	14	9.3
Strangulation Features		
No	146	97.3
Yes	4	2.7
Recurrence		
No	146	97.3
Yes	4	2.7
Hypertension		
YES	32	21.3
NO	118	78.7
Diabetes mellitus		
No	129	86.0
Yes	21	14.0
Any other chronic disease		
No	141	94.0
Yes	9	6.0
site of lesion		
RT	99	66.0
LT	32	21.3
Bilateral	19	12.7

BMI		
<18.5	10	6.7
18.5 to 24.99	135	90.0

This table shows the clinical profile of the patient admitted with hernia in my hospital.

Table 4

	n	Mean	S.D	SS	df	MS	Statistical inference
SS LINE							
Between Groups				.260	3	.087	f=1.694
<1yr	73	23.1349	.23878				.171>0.05
1 to 2yrs	37	23.0657	.20355				Not Significant
2 to 3yrs	28	23.1307	.21189				
>3yrs	12	23.2258	.24637				
Within Groups				7.477	146	.051	
ST LINE							
Between Groups				.068	3	.023	f=.694
<1yr	73	7.3453	.16722				.557>0.05
1 to 2yrs	37	7.3703	.16843				Not Significant
2 to 3yrs	28	7.3525	.22144				
>3yrs	12	7.2842	.19838				
Within Groups				4.792	146	.033	
MPLINE							
Between Groups				.070	3	.023	f=.591
<1yr	73	5.3203	.19381				.622>0.05
1 to 2yrs	37	5.3262	.20173				Not Significant
2 to 3yrs	28	5.3168	.20765				
>3yrs	12	5.4000	.20172				
Within Groups				5.781	146	.040	

Following tables show the ST, SS and MP measurements of the patient based on various headings. There was not much significant difference as t test was negative, proving that this values cannot be implicated in the complication of hernia and this exclude measurement bias.

This table clearly shows that even though SS, ST line are much more than mean control value, it dosent significantly differ from cases. That it has no role in predicting complication.

Table -5

Irreducible	n	Mean	S.D	t	df	Statistical inference
SS LINE						
No	123	23.1220	.22456	-.263	148	.793>0.05
Yes	27	23.1348	.24660			Not Significant
ST LINE						
No	123	7.3497	.18103	.251	148	.802>0.05
Yes	27	7.3400	.18185			Not Significant
MPLINE						
No	123	5.3263	.19615	-.159	148	.874>0.05
Yes	27	5.3330	.21093			Not Significant
Strangulation Features	N	Mean	S.D	t	df	Statistical inference
ST LINE						
No	146	23.1260	.22687	.549	148	.584>0.05
Yes	4	23.0625	.29341			Not Significant
SS LINE						
No	146	7.3479	.18222	.005	148	.996>0.05
Yes	4	7.3475	.12285			Not Significant
MPLINE						
No	146	5.3271	.19970	-.128	148	.898>0.05
Yes	4	5.3400	.15078			Not Significant

Table 6

Recurrence	n	Mean	S.D	t	df	Statistical inference
ST LINE						
No	146	23.1205	.22791	-1.231	148	.220>0.05
Yes	4	23.2625	.20532			Not Significant
SS LINE						
No	146	7.3440	.17981	-1.632	148	.105>0.05
Yes	4	7.4925	.16919			Not Significant
MPLINE						
No	146	5.3292	.20027	.638	148	.525>0.05
Yes	4	5.2650	.08103			Not Significant

DISCUSSION

The causation of inguinal hernia is varied with evolutionary, congenital, environmental, genetic factors, job and also the general state of health all contributing to its development⁷. The low lying pubic tubercle predisposes to the development of inguinal hernia. Africans have a higher incidence of inguinal hernia as compared to Europeans⁸ since the Africans has comparatively more oblique pelvis (low lying pubic tubercle) than the Europeans. Sehgal et al (2000) in their study have classified the subjects as (Group I) "High lying pubic tubercle" i.e. those with ST line less than or equal to 7.5 cm and (Group II) "Low lying pubic tubercle" i.e. those with ST line more than 7.5 cm. They found out that in 73.6% of cases and only 16% of controls belonged to Group II and concluded that the low lying pubic tubercle was a predisposing factor for inguinal hernia. The change in posture from pronograde to upright has caused reduction in efficiency of shutter mechanism of inguinal canal leading to the development of inguinal.

In the present study cases the mean value of ST line in our study group is 7.34 ± 0.1806 which is significantly greater ($p=0.001$) than the controls the mean value being 6.93 ± 0.568 . The average mp line was 5.63 in controls which is significantly higher than case of length 5.32, suggestive of horizontal or flat inguinal canal than oblique. Lopez-Cano et al (2005) have mentioned that the 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.

The shutter-like mechanism at the internal inguinal ring is provided by contraction of the arching fibers of the internal oblique muscle⁹, which, when shortened, approximate themselves to the inguinal ligament and compress the spermatic cord. The unusual origin and insertion of internal oblique and transversus abdominis muscle, results in an ineffective shutter mechanism of the inguinal canal.

Conclusion

Based on the study it made following conclusions
 The inguinal hernia was more common in 50-60 age group¹
 The males are commonly affected than females²
 The right side inguinal hernia is predominant over left side.⁸
 The indirect type predominate over direct type³
 The most common complication seen is irreducibility⁵
 The most common systemic disease associated is hypertension⁷
 The most common clinical presentation was swelling⁴
 Most patients present within 1 year of disease onset.⁶
 SS line, ST line were higher in cases.
 MP line was higher among the controls.

References:

1. Khan MA, Lo AY, Maele DM. Paraduodenal hernia. *The American surgeon*. 1998 Dec 1;64(12):1218.
2. Wechsler RJ, Kurtz AB, Needleman L, Dick BW, Feld RI, Hilpert PL, Blum L. Cross-sectional imaging of abdominal wall hernias. *American Journal of Roentgenology*. 1989 Sep 1;153(3):517-21.
3. Hansen NL, Ciritis A, Otto J, Busch D, Kuhl CK, Kraemer NA. Utility of Magnetic Resonance Imaging to Monitor Surgical Meshes: Correlating Imaging and Clinical Outcome of Patients Undergoing Inguinal Hernia Repair. *Investigative radiology*. 2015 Jul 1;50(7):436-42.
4. López-Cano M, Munhequete EG, Hermosilla-Pérez E, Armengol-Carrasco M, Rodríguez-Baeza A. Anthropometric characteristics of the pubic arch and proper function of the defense mechanisms against hernia formation. *Hernia*. 2005 Mar 1;9(1):56-61.
5. Abdalla R, Mittelstaedt W. The importance of the size of Hessert's triangle in the etiology of inguinal hernia. *Hernia*. 2001 Sep 1;5(3):119-23.
6. Abrahamson J. Etiology and pathophysiology of primary and recurrent groin hernia formation. *Surgical clinics of north America*. 1998 Dec 1;78(6):953-72.
7. Hockenberry MJ, Wilson D. *Wong's Nursing Care of Infants and Children-E-Book*. Elsevier Health Sciences; 2014 Jan 30.
8. Van Wessem KJ, Simons MP, Plaisier PW, Lange JF. The etiology of indirect inguinal hernias: congenital and/or acquired?. *Hernia*. 2003 Jun 1;7(2):76-9.
9. Rains AJ. A contribution to the principles of the surgery of inguinal hernia. *British Journal of Surgery*. 1951 Nov 1;39(155):211-26.
11. McEntee G, Pender D, Mulvin D, McCullough M, Naeeder S, Farah S, Badurdeen MS, Ferraro V, Cham C, Gillham N, Matthews P. Current spectrum of intestinal obstruction. *British journal of surgery*. 1987 Nov 1;74(11):976-80.
12. Gray SW, Skandalakis JE, Soria RE, Rowe JS. Strangulated obturator hernia. *Surgery*. 1974 Jan 1;75(1):20-7.
13. Dallemagne B, Weerts JM, Jehaes C, Markiewicz S, Lombard R. Laparoscopic Nissen fundoplication: preliminary report.
14. Pattison EM, Kahan J. The deliberate self-harm syndrome. *American journal of Psychiatry*. 1983 Jul;140(7):867-72.
15. Leber GE, Garb JL, Alexander AI, Reed WP. Long-term complications associated with prosthetic repair of incisional hernias. *Archives of surgery*. 1998 Apr 1;133(4):378-82.
16. Ng LK, Nimmannitya J. Massive cerebral infarction with severe brain swelling: a clinicopathological study. *Stroke*. 1970 May 1;1(3):158-63.