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General Surgery

LOW LYING PUBIC TUBERCLE IN PATIENTS WITH INGUINAL HERNIA – A REVIEW

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ABSTRACT The hernia is quite a common problem of today's civilization. There are various risk factors for the development of inguinal hernia but the anatomical cause of inguinal hernia is still not known. The aim was to undertake a review about the relationship of low lying pubic tubercle in patients with inguinal hernia. A literature search was conducted using PubMed, Ovid MEDLINE, Embase and Web of Science databases up to 3 Dec 2019. Inclusion criteria for studies were patients with inguinal hernia and the controls were age and gender matched normal individuals. A total of 14 studies met the inclusion criteria and were included in the analysis. In all the studies, patients with inguinal hernia and same number of age, gender and BMI matched normal individuals taken as controls were studied. The anthropometric measurements of pelvis like SS line, ST line were measured and the ST and SS line were longer in patients with inguinal hernia ($p<0.005$) when compared with controls (age and gender matched). Conclusion: Based on the results of study, it can be concluded that low lying pubic tubercle plays a major anatomical risk factor in the development of indirect inguinal hernia.

KEYWORDS : Inguinal hernia, pubic tubercle, low lying, etiology, review

INTRODUCTION

A hernia means "to bud or to protrude"- Greek, “rupture”- Latin. The hernia is defined as “an abnormal protrusion of the viscous or a part of viscous through an opening, either natural or artificial with a sac covering it” [1]. The hernia is quite a common problem of today's civilization [2].

Inguinal hernias are more common than femoral hernia and other abdominal wall hernias in both men and women. Although femoral hernias are more common in women which accounts for less than 10 percent, they present clinically with complications (like incarceration, strangulation) more often than inguinal hernias [3]. Groin hernias were the third leading cause of ambulatory care visits for the gastrointestinal complaints in 2004 and the visit rates have not changed appreciably since 1975 [1].

There are various risk factors for the development of inguinal hernia such as chronic cough, chronic constipation, old age and prostatism, history of previous hernia repair, smoking, defective collagen synthesis, heavy weight lifting, and previous right lower quadrant incision. But the anatomical cause of inguinal hernia is still not known [1].

The low lying pubic tubercle is said to be associated with a narrow origin of internal oblique muscle from the lateral inguinal ligament which fails to protect the deep inguinal ring and thus result in inguinal herniation [3]. In patients with low lying pubic tubercle, the obliquity of the inguinal canal gets decreased, arching of conjoint tendon gets narrowed, and the shutter mechanism of internal oblique muscle gets diminished leading on to the ineffective defence mechanism ending up in inguinal hernia [1].

The low lying pubic tubercle has been significantly associated with a longer inguinal ligament, larger supra inguinal angle which may account for greater area of supra inguinal space and deficient function of shutter mechanism [4]. The success of hernia repair is measured primarily by the permanence of operation, fewest complications, minimal costs and earliest return to normal activities. This success depends largely on the surgeon's understanding of the anatomy of the surgical area [7].

METHODS

A literature search was conducted using PubMed, Ovid MEDLINE, Embase and Web of Science databases. The key search MeSH indexed words used were (('low lying pubic tubercle' OR 'pubic tubercle') AND inguinal hernia AND 'pelvic anthropometry). The search was limited to articles published in the English language. Duplicate articles were identified and removed. Reviews, letters, commentaries and case studies were also excluded. Further studies that did not meet inclusion criteria were excluded based on full-text review.

DISCUSSION

Epidemiology

Inguinal Hernias are more common in men when compared with women. Men are 20 times more likely to undergo inguinal hernia repair when compared with women [4]. The lifetime risk of developing inguinal hernia is approximately 26 percent in men but less than 5 percent in women [9]. Indirect inguinal hernia (defect in an internal inguinal ring) is the most common type of hernia irrespective of age and sex. Both indirect inguinal and femoral hernias occur more commonly on the right side. This is attributed to the delay in atrophy of the processus vaginalis after the normal slower descent of the right testis to the scrotum during fetal development [4].

Age

In one review, the median age at presentation for inguinal hernia was 60 to 79 years of age for women compared with 50 to 69 years of age for men [3]. Some studies have shown that age distribution is bimodal, peaks at early childhood and old age [5]. This was explained on the basis that most of the patients in the lower socio-economic group will not go to the hospital during their initial presentation, instead opting for treatment only when the disease becomes the hinderance for their occupation or daily activities. The peak age at presentation for indirect hernia is 40 to 60 years of age. Direct inguinal hernia accounts for 30 to 40 percent of groin hernias in men [7].

Risk Factors

The risk factors for inguinal hernia are old age, male sex, caucasian race, chronic cough, obesity, prostatism, chronic constipation, history of hernia or prior hernia repair, abdominal wall injury, smoking, family history of hernia, defective collagen synthesis, heavy weight lifting, and previous right lower quadrant incision [9]. In women, a retrospective review of data study from the National Health and Nutrition Examination Survey (NHANES) showed that rural residence and greater height were independently associated with a higher incidence of acquired inguinal hernia in women. Although women accounted for only 8 percent of all groin hernias, represented 30 percent of repairs in the low BMI (<20) group [6]. Obesity is a negative risk factor for groin hernia in males and females. A large observational study from a Swedish hernia register involving 49,092 patients found a lower prevalence of groin hernia in obesity than in the general population (5 versus 10 percent). A possible explanation is that increased difficulty in detecting inguinal hernias in obese individuals [7].

Classification

Defence Mechanism of Inguinal hernia

The defence mechanisms of the inguinal canal are a) Obliquity of the inguinal canal b) Arching of conjoint tendon c) Shutter mechanism of internal oblique muscle d) Ball valve mechanism due to contraction of cremaster muscle which plugs to superficial ring e) Slit valve mechanism- when external oblique muscle contracts, intercrural fibres of superficial ring appose [1]. The principle of all the study were based on the first three of the above-said defence mechanisms. In patients with low lying tubercle, the structural anatomy is altered i.e., the obliquity of the inguinal canal gets decreased, arching of the conjoint tendon gets narrowed, greater area of supra inguinal space and the shutter mechanism of internal oblique gets diminished leading onto the ineffective defence mechanism ending up in the development of inguinal hernia[9]. In patients with low lying pubic tubercle, the origin of an internal oblique muscle is far away from inguinal ligament and its lower fibres don't cover the deep inguinal ring and the patient develops an inguinal hernia [5].

The Relationship between Inguinal Hernia and the Position of Pubic Tubercle

Lopez-Cano et al. did a cadaveric study and studied the position of pubic tubercle, area of suprainguinal space, length of inguinal ligament, diameter of internal ring in patients with inguinal hernia [1]. The measurements were made clinically, he observed that the angle made by the fibres of the internal oblique and transversus abdominis was >23.9 degree in patients with inguinal hernia, pubic tubercle length was >7.5cm, a diameter of the internal ring was 2.2cm, and the inguinal ligament length >11.8cm. The mean cut off value for ST-segment (vertical distance between pubic tubercle and interspinal line) was 7.5cm [1]. He concluded that patients with inguinal hernia had low lying pubic tubercle (>7.5cm) and longer inguinal ligament, the greater angle made by superior border of suprainguinal space and inguinal ligament at its medial insertion [1]. Keith A also stated that patients with inguinal hernia have a greater length of the inguinal ligament and larger angle by the fibres of the internal oblique and transversus abdominis muscle may account for greater area of supra inguinal space [12]. Harris and White stated that the greater the length of the inguinal ligament, the more tendency to develop inguinal hernia as higher the position of fibres of the internal oblique and transversus abdominis muscle may prevent adequate closure of internal inguinal ring and defective shutter mechanism [11]. Radojevic calculated the angle which was created between the interspinal line and Malgaigne's line and he concluded that a larger angle increases the risk of development of an inguinal hernia [6].

Ajmani stated that in patients with inguinal hernia, the origin of internal oblique was far away from the pubic tubercle and its lower fibres did not cover the deep inguinal ring allowing the hernial sac to push out when the intraabdominal pressure is raised and cause inguinal hernia [6]. Agrawat et al. did a clinical study; the maximum in the age group of 46-55 years in patients with inguinal hernia and the same number of age and gender-matched individuals were taken as controls [7]. The mean values observed in the study were ST-line (vertical distance between pubic tubercle and interspinal line)- 9.06cm and SS line(distance between both anterior iliac spine)-26.30cm. The mean cut off value for the ST segment in the study was 7.5cm. He observed that pubic tubercle was low lying (ST>7.5cm) in patients with inguinal hernia [7].

Thaer M Farhan did a clinical study in patients with inguinal hernia, in the age group of 25-40 years and the same age and gender-matched individuals were taken as controls. The mean values observed during his study in group cases were SS line of 23.30cm, ST line of 7.8cm [5]. The mean cut off value for ST-segment was 7.5cm. He observed that in patients with low lying pubic tubercle (ST segment>7.5cm), there is an unusual origin of internal oblique muscle which is far away from external half of the inguinal ligament and the lower fibres not covering the internal ring, leaving the internal ring unprotected during abdominal muscle contraction which result in the development of indirect inguinal hernia [5]. He concluded that patients with low lying pubic tubercle must be cautious in doing their daily activities and enable the surgeon to do herniorrhaphy for posterior wall and reinforcement for the internal inguinal ring by mesh because of unprotected deep inguinal ring and defective shutter mechanism [5].

Sehgal et al did a clinical study in patients with an inguinal hernia with age and gender-matched individuals were taken as controls. The mean cut off value for ST-segment was 7.5cm and he observed that 73.6% of cases and 16% controls had low lying pubic tubercle with ST-segment >7.5cm. He concluded that patients with low lying pubic tubercle highly predisposes to the development of an inguinal hernia [13].

Arun Babu did a study on those with inguinal hernia and the same number of age, gender, BMI matched individuals were taken as controls. The mean values observed in his study were the SS line of 26cm in cases and 25.8cm in controls [4]. The Mean ST line was 10.4cm in cases and 10.3cm in controls which was statistically significant ($p < 0.001$) [4]. He concluded that patients with inguinal hernia have low lying pubic tubercle. He explained that the narrow origin of internal oblique muscle from lateral inguinal ligament fails to protect the deep inguinal ring, obliquity of inguinal canal gets decreased, arching of conjoint tendon gets narrowed, shutter mechanism of the internal ring gets diminished and cause an inguinal hernia [4]. The identification of anthropometric characteristics of the pelvis enables the surgeon to perform surgical techniques appropriately [4].

Senthilvel et al. did a study on patients with inguinal hernia and age, gender and BMI matched individuals were taken as controls. The mean value of the ST line in the study group was 7.34cm which was significantly greater ($p=0.001$) than the controls with the mean value of 6.93cm. The mean cut off value for ST-segment was 7.5cm. He concluded that low lying pubic tubercle highly predisposes to the development of an inguinal hernia [8].

Jitendra Kumar M did a clinical study in patients with inguinal hernia, and the mean cut off value for ST-segment was 7.5cm. Ninety-two percent of the patients with inguinal hernia had ST-segment >7.5cm and only 8% of patients had ST-segment <7.5cm [14].Thomas AA et al did a case-control study to study the presence of low lying pubic tubercle in patients with indirect inguinal hernia. Age, gender, BMI matched individuals were taken as controls [9]. The mean cut off value for ST-segment was 7.75cm. He observed that the ST line was >7.75cm in 94.3% of patients with indirect inguinal hernia and statistically significant ($p<0.001$). He also observed that SS/ST, Height/ST, Weight/ST were also statistically significant but the SS line was not statistically significant. He concluded that low lying pubic tubercle is a major risk factor for the development of an indirect inguinal hernia [9].

CONCLUSION

Inguinal hernia is the common condition seen in our daily practice. There are various risk factors for the development of inguinal hernia but the exact anatomical cause is still not known. Based on the study results, low lying pubic tubercle (ST >7.5cm) is a major anatomical risk factor for the development of indirect inguinal hernia. But some of the studies did not establish the correlation of indirect inguinal hernia with low lying pubic tubercle, as the etiology of direct inguinal hernia is acquired due to weakness of transversalis fascia. So this study needs further research about the correlation of low lying pubic tubercle in patients with indirect inguinal hernia.

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