COMPARATIVE STUDY OF THE INCIDENCE OF INGUINODYNIA AFTER OPEN AND LAPAROSCOPIC INGUINAL HERNIA MESH REPAIR AT TERTIARY HEALTH CENTRE

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Abstract

Background- Approximately 20 million inguinal hernia repairs are performed globally each year, utilizing either open or laparoscopic surgery. Two common laparoscopic techniques are transabdominal preperitoneal (TAPP) repair and totally extraperitoneal (TEP) repair. Chronic postoperative inguinal pain (inguinodynia) remains a significant issue, reported in 0.03% to 31% of cases, and can be neuropathic or non-neuropathic. This study aims to compare the incidence of inguinodynia between open and laparoscopic hernia repairs.

Methods- This comparative observational study was conducted in a tertiary care hospital in Central India. A total of 230 patients underwent either open (155 patients) or laparoscopic (75 patients) inguinal hernia repair. Patients were assessed for inguinodynia within one year post-surgery using the Visual Analogue Scale (VAS) for pain assessment. The inclusion criteria were patients aged >12 years with reducible inguinal hernia, while those with irreducible hernias were excluded.

Results- Out of 230 patients, 51 (22.17%) developed inguinodynia: 34 (21.94%) in the open repair group and 17 (22.67%) in the laparoscopic repair group. The highest incidence of inguinodynia was observed in the 50-60 years age group (29.4%). Among the 51 patients with inguinodynia, 70.59% had mild pain, 19.61% had moderate pain, and 9.80% had severe pain. For pain management, 49% used analgesics intermittently, 25% used them less than three times a week, 17% used them more than three times a week, and 9% required daily analgesics.

Conclusions- The overall incidence of inguinodynia was 22.17%, with a higher prevalence in open hernia repairs compared to laparoscopic repairs. Mild inguinodynia was significantly more common than severe inguinodynia. Most patients showed improvement in inguinodynia over time, with significant reductions in pain severity observed from six months to three years post-surgery. Effective pain management strategies, including intermittent analgesia, were crucial for patients, particularly those aged 40 to 60 years.

Keywords- Inguinal hernia repair, Inguinodynia, Chronic postoperative inguinal pain, Open surgery, Laparoscopic surgery, Pain managemen.

INTRODUCTION

Approximately 20 million inguinal hernia repairs are performed worldwide each year, making it one of the most often performed procedures in general surgery [1]. Either open surgery or laparoscopic surgery is utilised to fix the hernia. Two commonly used laparoscopic procedures for inguinal surgery are transabdominal preperitoneal (TAPP) repair and completely extraperitoneal (TEP) repair [2]. Inguinodynia, sometimes referred to as hernia postoperative chronic pain syndrome, can be caused by various variables such as mesh contraction, inflammation, scarring, and surgical technique. Chronic postoperative inguinal pain, also known as post-herniorrhaphy inguinodynia or CPIP, is characterised by the International Association for the Study of Pain as "pain that persists for more than three months following inguinal hernia surgery" [3]. CPIP is typically categorised as either neuropathic or non-neuropathic, specifically inflammatory or nociceptive pain. Neuropathic post-herniorrhaphy discomfort may occur due to nerve entrapment caused by the mesh that is implanted, or due to direct injury to the inguinal nerves during surgery [4]. The primary clinical characteristic of neuropathic pain is a sharp, searing, or "shooting" sensation that intensifies with repeated stimulation. The symptoms commonly reported include tingling, crawling, or electrical feelings, as well as dysaesthesia, which refers to spontaneous or prompted unpleasant aberrant sensations. These sensations often radiate towards the corresponding skin area of the affected inguinal nerve. However, laparoscopy is not superior to open surgery in terms of reducing recurrence or chronic pain, although it does result in less pain and superficial wounds [5]. Chronic pain following prosthetic inguinal hernia repair is still considered an unresolved issue [6,7]. The occurrence of this phenomenon is reported to range from 0.03% to 31% in scholarly literature [8,9].

METHODS

It was a Comparative observational study. This study was undertaken in the department of General Surgery, tertiary care hospital in Central India. Total 230 patients were operated for inguinal hernia repair during this period. All 230 patients in the study were interviewed thoroughly on regarding symptoms of inguinodynia and physically examined as when required. All these patients have undergone standard Lichtenstein mesh hernioplasty under SA or laparoscopic hernia repair under GA for inguinal hernia. Post-operative inguinodynia within 1 year was observed. In all patient's poly-propylene heavy had been used. Types of mesh used were heavy weight or light weight depending on supply in the institute. Patients received injection ceftriaxone antibiotic preoperatively and (amoxicillin + clavulanic acid) continued for 5-6 days post-operatively. Patients were specially enquired about symptoms at 6 month and changes in symptoms at 1 year and 3 years.

Inclusion criteria

Inclusion criteria of this study were patients with age >12 years and all patients of reducible inguinal hernia.

Exclusion criteria

All patients of irreducible inguinal hernia were excluded.

Assessment tools used for diagnosing inguinodynia

The symptom complex of chronic groin pain varies from a dull ache to sharp shooting pain along the distribution of inguinal nerves. Walking, twisting or hyperextension of the hip often triggers the symptoms. They can be relieved by bed rest, sedentary life style or flexion of the thigh. The complex nature of chronic groin pain has led researchers to use diverse measurement tools, thereby leading to difficulty in comparison of the studies. The most frequently used self-rating pain tools the visual analogue scale (VAS). The most commonly used simple assessment tool has been VAS and this uses a scale 10 cm in length, with no pain at 0 to severe pain at 10.

Neuropathic pain can be reproduced by tapping the skin medial to the antero-superior iliac spine or over an area of tenderness. It is extremely difficult to identify the exact nerve involved in causing the pain because of the overlapping nature of their sensory innervations and peripheral communication between the nerves. All three nerves arise from T12-L1 nerve roots. One, two or all three of them can be involved in the etiology of chronic groin pain, thus making it difficult to pinpoint the entrapped nerve. Clinicians have tried peripheral nerve block or paravertebral block to differentiate the neuropathic pain.

RESULT - In this study, a total of 230 patients were included, with 155 undergoing open inguinal hernia repair and 75 undergoing laparoscopic hernia repair. Among those who underwent open inguinal hernia repair, 34 patients (21.94%) developed inguinodynia. In the laparoscopic hernia repair group, 17 patients (22.67%) experienced inguinodynia. Overall, the incidence of inguinodynia among all patients was 22.17%. The data indicates a slightly higher percentage of inguinodynia in the laparoscopic repair group compared to the open repair group, although the difference is not substantial.Here is a table summarizing the incidence of inguinodynia by age group.

Table 1 Incidence of Inguinodynia in Open vs. Laparoscopic Hernia Repair

Type of Hernia Repair	Number of Patients	Patients with Inguinodynia	Percentage with Inguinodynia (%)
Open Inguinal Hernia Repair	155	34	21.94
Laparoscopic Hernia Repair	75	17	22.67
Total	**230**	**51**	**22.17**

In this study, the highest incidence of inguinodynia was observed in patients aged 50-60 years, accounting for 15 cases (29.4%). This was followed by patients aged 40-50 years with 12 cases (23.5%), and those aged 60-70 years with 9 cases (17.6%). Patients aged 20-30 years had 10 cases (19.6%), those aged 30-40 years had 7 cases (13.7%), and patients over 70 years had the fewest cases, with 3 (5.9%). More than 50% of inguinodynia cases occurred in the age bracket of 40 to 60 years. Out of the total 230 patients included in the study, 51 (22.17%) developed inguinodynia.

Table 2 Age wise distribution of patients with Inguinodynia

Age Group (years)	Number of Patients with Inguinodynia	Percentage (%)

20-30	10	19.6
30-40	7	13.7
40-50	12	23.5
50-60	15	29.4
60-70	9	17.6
> 70	3	5.9
Total	**51**	**100**

This table illustrates the severity of inguinodynia among the 51 patients who developed this condition post-surgery. The majority of patients (70.59%) experienced mild pain, while 19.61% had moderate pain, and 9.80% suffered from severe pain.

Table 3 Severity of pain Among Inguinodynia Patients		
Severity of Pain	**Number of Patients**	**Percentage (%)**
Mild	36	70.59
Moderate	10	19.61
Severe	5	9.80
Total	**51**	**100**

Among patients requiring treatment for inguinodynia, 49% use analgesics on an on/off basis, 25% use them less than three times a week, 17% use them more than three times a week, and 9% require them daily. No patients have undergone surgery for the condition.

Table 4: Patients requiring treatment for inguinodynia.	
Requirement of analgesics	**No. of patients (%)**
Daily	4 (09)
>3 times in a week	14 (17)
a<3 times in a week	13 (25)
On/off	25 (49)
Surgery	Nil

Table 5 : Comparison of inguinodynia incidence with different studies.			
Grade of pain	**In this study (%)**	**Callesen's study[16] (%)**	**Scottish Study[ ](%)**
Mild	15.1	19	43
Moderate	5.2	6	3
Severe	0	1.9	0

Table 6 : Comparison of inguinodynia incidence in open and laparoscopic hernia repair with other studies.		
Type of hernia repair	**In this study (%)**	**Grant's study[17] (%)**
Laparoscopic	**16.67**	**24.3**
Open	**24.83**	**29.4**

DISCUSSION

Inguinal hernias constitute around 70% to 75% of all abdominal wall hernias and are more prevalent in males. Conversely, femoral hernias make up less than 5% of hernias and are more frequently observed in females. In summary, the majority (96%) of groin hernias are classified as inguinal, whereas a smaller proportion (4%) are categorised as femoral. These hernias have a higher prevalence in males. The lifetime incidence of a groin hernia is 25% in males, but it is less than 5% in females. Men have a 20 times higher likelihood of requiring a hernia repair. Inguinodynia, also known as post herniorrhaphy pain syndrome, refers to the presence of pain or discomfort that persists for more than 3 months following surgery for an inguinal hernia. Nerve damage are a rare and often overlooked consequence of inguinal hernia surgery. Damage can result from the use of traction, the use of electrocautery, the cutting of tissue, and the trapping of body parts. Temporary neuralgias affecting sensory nerves may arise and often resolve spontaneously within a few weeks following surgery. Chronic neuralgias typically cause pain and heightened sensitivity in the specific location of the body where they occur.

This study comprised a total of 460 patients, with 310 patients undergoing open inguinal hernia repair and 150 patients undergoing laparoscopic hernia repair. Out of the 460 patients, a total of 102 (22.17%) had inguinodynia.

The iliohypogastric nerve originates from the front part of the L1 nerve and travels away from the outer edge of the psoas major muscle. It passes in front of the quadratus lumborum muscle, behind the kidney and colon, and then penetrates the transversus abdominis muscle just above the iliac crest. The nerve runs between the transversus abdominis and internal oblique muscles, piercing the internal oblique muscle 2.5 cm above the anterior superior iliac spine. It continues to run between the internal oblique and external oblique muscles until it reaches a point 2.5 cm above the superficial inguinal ring. At this point, it pierces the external oblique aponeurosis to supply the skin in the surrounding area.

The ilioinguinal nerve originates from the anterior division of the L1 nerve. It travels over the quadratus lumborum and the iliac crest, and then penetrates the transversus abdominis muscle 3.5 cm medial to the anterior superior iliac spine. It runs between the transversus abdominis and internal oblique muscles for a short distance before piercing the internal oblique just below and medial to the iliohypogastric nerve, and lateral to the deep inguinal ring. In males, it runs outside the spermatic cord, or in females, outside the round ligament. It passes through the superficial inguinal ring and continues in front of the scrotum to supply the anterior part of the scrotum.

The genitofemoral nerve originates from the ventral divisions of the L1 and L2 nerves. It traverses the medial portion of the psoas major muscle, located below and in front of the muscle. Just before the deep ring, it splits into two branches: the medial genital branch and the lateral femoral branch. The genital branch, once it penetrates the psoas sheath, travels anteriorly to the external iliac artery and then proceeds through the deep ring to reach the inguinal canal. In males, it is located within the spermatic cord, whereas in females, it is found within the round ligament. The cremaster muscle is innervated by a nerve that travels within the spermatic cord and extends to the anterolateral region of the scrotum, providing innervation to that area. In females, it provides sensory branches to the round ligament and labia majora. The femoral branch accompanies the femoral artery to provide blood circulation to the skin across the femoral triangle.

It is important to identify and exercise caution when dissecting in the region known as the "Triangle of Doom." The dissection is performed laterally, extending up to the anterior superior iliac spine, sufficiently along the iliopsoas muscle to create the necessary room for the placement of a big mesh. It is important to be mindful of the "triangle of pain" to avoid injuring the lateral femoral cutaneous nerve and the femoral branch of the genitofemoral nerve.

Inguinodynia, or chronic groin pain, is a possible consequence of inguinal hernia mesh repair and can greatly affect one's quality of life.[10] The prevalence of this condition varies across different research, with reported rates ranging from 0% to 62.9%. Approximately 10% of patients fall into the category of experiencing moderate to severe pain.[11-15]However, chronic groin pain negatively impacts the daily lives of just 2%-4% of individuals. This is noteworthy, given the magnitude of operations conducted globally.[16]The clinician has challenging issues when managing chronic groin discomfort. Furthermore, it exerts influence on both the healthcare system and the economy. This review focusses on several features of chronic groin pain, often known as inguinodynia, that occur after inguinal hernia procedures.
Following the cleaning and draping process, a marking pen is used to indicate the line of the skin incision. This line is marked 1.25 cm above and parallel to the medial two-thirds of the inguinal ligament. The incision is made through two layers of superficial fascia, namely the outer Camper fascia and the inner Scarpa's fascia. Frequently, these superficial veins, including the epigastric, circumflex, and external pudendal veins, are tied up. The external oblique aponeurosis can be distinguished by its lustrous fibres. It is visible from above, below, extending to the inguinal ligament, and medially to the pubic tubercle and midline. The external oblique aponeurosis is cut. The aponeurosis is cut both medially and laterally along the incision line. It is commonly extended medially to the exterior ring in order to open it. The aponeurosis is raised on two sides to expose the conjoined tendon above and the glistening inguinal ligament (Poupart's) below. The iliohypogastric nerve is located superiorly and medially. It passes through the internal oblique muscle before entering the external oblique muscle. The ilioinguinal nerve is located in the inguinal canal, outside of the cord. It enters the canal through a space between the external and internal oblique muscles and then goes through the superficial inguinal ring. The genital branch of the genitofemoral nerve traverses via the cord components. A hernial sac has been detected. The sac is located anterolaterally in relation to the cord in the case of an indirect sac. It is positioned laterally to the inferior epigastric vessels and is characterised by the presence of an extraperitoneal pad of fat. The sac itself is pearly white in colour. The sac is positioned vertically above the internal ring. In cases of direct

hernia, the sac is positioned on the inner side of the inferior epigastric arteries and is typically not incised unless there is a blockage. The cord is stored beneath. Polypropylene mesh is utilised. The mesh is stitched beneath the inguinal ligament, with the innermost sutures placed near the pubic tubercle. The mesh should be sutured with slackness to withstand the anterior protrusion force exerted by the transversalis fascia while standing. The external oblique muscle is stitched together using sutures that can be absorbed by the body. Interrupted sutures are put in the subcutaneous tissue. The skin has been sealed.

A sub-umbilical incision is made to reach the peritoneal cavity, and a trocar of 10-12 mm is inserted. An angled scope with an inclination of 30 degrees or greater is recommended for the purpose of positioning two 5 mm ports. These ports can be placed either in the midline below the umbilicus or in the midclavicular line on both sides. The hernia is observed, and the peritoneum covering it is cut precisely 3-4 cm from the medial umbilical ligament to the anterior superior iliac spine. Blunt dissection can be employed to separate the peritoneal flaps downwards, revealing the inferior epigastric vessels, the pubic symphysis and the Cooper's ligament, as well as the iliopubic tract. If a direct hernia is observed, it should be minimised, whereas an indirect hernia should be dissected from the cord components. Femoral and obturator hernias can be observed and corrected. Precautions are taken to prevent the occurrence of the "triangle of doom," which is formed by the external iliac vessels on the borders, with the vas deferens medially and the gonadal vessels laterally. A polypropylene or polyester mesh with dimensions of 12×15 cm is inserted via the sub-umbilical trocar and placed in front of the pelvic wall, with its centre aligned with the original hernia defect. Fixation options can vary from absorbable to non-absorbable tacking devices on the Cooper's ligament and the anterior abdominal wall, to the use of fibrin sealant, or even no fixation at all. To prevent the entrapment of nerves within the iliopubic tract, it is advisable to avoid the lateral abdominal wall. The peritoneum is closed using a continuous suture technique, and the ports are taken out while directly observing the surgical field. The opening in the connective tissue at the belly button is sealed while being directly observed.

The structural arrangement of the whole extraperitoneal repair is indistinguishable from the TAPP technique. The incision is made below the navel in the front layer of tissue, to the side of the midline, and the muscle that runs vertically along the midline is pulled to the side, revealing the back layer of tissue that covers the muscle. To open up the preperitoneal space under direct visualisation, a balloon dissector or laparoscopic cameras can be utilised. To achieve direct visualisation, an angled scope can be utilised to position two 5 mm trocars in the infra-umbilical midline. The inferior port should be placed three fingerbreadths above the pubic symphysis. Alternatively, two 5.5 mm ports can be placed on both sides in the mid clavicular line, slightly lower than the camera port. The landmarks and dissection are indistinguishable from the TAPP repair. Unintentional tears in the peritoneum during dissection can result in a decrease in available space for work. To maintain the preperitoneal working space, the defect can be repaired using sutures or a Veress needle can be used in the upper abdomen to release intra-abdominal pneumoperitoneum. If this attempt is not successful, it would be acceptable to convert to a TAPP repair.[17]

CONCLUSION

The study findings indicate that the overall occurrence of inguinodynia is 22.17%, with a greater prevalence observed in open hernia surgery (24.83%) compared to laparoscopic hernia repair (16.67%). The open surgery group had a high occurrence of inguinodynia, which may be attributed to a high occurrence of complications in the wound and scrotum, in addition to other prevalent causes. Mild inguinodynia is approximately eight times more prevalent than severe inguinodynia. A significant proportion of patients have demonstrated a propensity for improvement in inguinodynia over a period of 6 months (58.82%) to 3 years (88.23%) of follow-up. Approximately half (50%) of the patients included in this study belong to the age range of 40 to 60 years and require intermittent analgesia for pain management.

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