HOW TO PREVENT INGUINODYNIA - AFTER TENSION-FREE INGUINAL HERNIA REPAIR – OUR EXPERIENCE

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Abstract:
Inguinodynia is persistence of pain for more than 3 months after inguinal hernia operation. Chronic pain may be associated with hyperesthesia or hypoesthesia. This pain may be mild, moderate or severe. Inguinodynia may even effect quality of life. Pain may resolve on its own or after conservative treatment. Sometimes it persists and conservative methods fail then various other modalities of treatment are considered including re-exploration and neurectomy. We performed all 396 inguinal hernia repair by a modified Lichtenstein tension-free procedure. In our series of 396 cases inguinodynia happened only in 3 cases, a real low incidence. Some researchers have reported the incidence of inguinodynia as high as 19 percent 1 year after operation. No case required re-exploration, removal of mesh or neurectomy in our series.

Keywords: Chronic pain, Inguinal hernia, Inguinodynia, inguinal hernia repair

Introduction:
Inguinodynia is pain or discomfort lasting greater than 3 months after surgery. Pain after inguinal hernioplasty for few days and 1 to 2 week is normal but more than 3 months should be considered abnormal and ways to find a solution whether conservative or operative should be considered. However, the International Association for the study of pain (IASP) described chronic groin pain as “groin pain reported by patient at or beyond 3-months following inguinal hernia repair".1 Major consensus currently has been to take 3 months as a cut-off point to differentiate between patients with post-operative pain and chronic groin pain due to various causes.2 Chronic groin pain after groin hernia can be very disturbing and specially if neuralgia is associated with hyperesthesia. It can really lead to anxiety, stress and even depression. Sometimes chronic groin pain, post hernia surgery can be a problem difficult to manage and may require a neurologist’s opinion. Callesen T and associate found an incidence of inguinodynia 19% after doing Lichtenstein procedure in 419 patients after a follow-up of 1 year.3

The causes of inguinodynia after groin hernia surgery are direct nerve injury during operation or ingrowth of mesh into nerves or spermatic cord or taking nerve in a suture. If operative treatment is advised for a chronic inguinodynia, mesh excision and or triple neurectomy are considered by some surgeons with good results according to them.4,5,6,7 Some surgeons believe that while performing inguinal hernia repair neurectomy of all 3 or 1 or 2 nerves solves the problem of inguinodynia. A previous systematic review by Wijsmuller et al8 in 2007 showed no significant difference in pooled mean percentage of patients with chronic groin pain following either ilio-inguinal nerve preservation or division.

Reassurance and conservative treatment with anti-inflammatory medications and local nerve blocks are preferred initially, as commonly the symptoms will resolve spontaneously. When groin exploration is required, neurectomy and neuroma excision are performed. The results are often less than satisfying.9 To prevent nerve damage, external inguinal ring should not be made too tight or small to avoid constriction of ilio-inguinal nerve. Suturing of external oblique fascia should be done very carefully, avoiding entrapment of nerves. Nigam’s Inverted Curtain Hernioplasty (Nich) is a minimal dissection tension-free hernioplasty for inguinal hernias. It is based on the principles of Lichtenstein’s tension-free hernioplasty. It is a simple technique using minimum number of sutures with least recurrence and complications. In this technique polypropylene mesh covers hernia prone area of inguinal floor with almost
no tension at suture line and there is no nerve damage or entrapment.

**Materials and Methods**

A total of 396 repairs were done (primary uncomplicated indirect, direct and bilateral inguinal hernias), by Nigam’s Inverted Curtain Hernioplasty (NICH) between March 1, 2000 and March 1, 2020 (Table I), in Max Hospital and some other hospitals of Gurugram, Haryana, India. Informed consent was taken from all patients. All patients were operated by same NICH Technique.

All patients were prepared for the procedure in the conventional method and surgery was performed under local, spinal or general anaesthesia. After the skin incision, the external oblique aponeurosis was incised above the midline of superficial inguinal ring. The area where the mesh was to be placed (the mesh bed) was prepared by making space between external oblique aponeurosis and internal oblique muscle with finger wrapped up with gauze. This procedure should be done slowly without much force as ileohypogastric nerve can get damaged here. Care is taken avoid injury to ileoinguinal, ileohypogastric nerves. Both nerves are identified, preserved and checked for damage or entrapment.

Indirect inguinal hernia sacs were transfixed and excised. If a large inguinoscrotal sac was present then sac was cut in inguinal canal and distal part of sac was not dissected out and was left intact. Direct inguinal hernia sacs were reduced and plicated. In all cases a 15 cm x 15 cm polypropylene mesh was used and 2-0 polypropylene suture was used to fix the mesh. Then the mesh was cut and shaped according to the space available and size of Myopectineal orifice of Fruchaud. No suture is applied to fix the main body of mesh, which remains free like an inverted curtain. Any change of posture, from lying position to standing or walking and running will not put any extra focal strain on the mesh causing maldistribution of tension, leading to wrinkles and dead space formation. The external oblique aponeurosis was then closed with 2-0 polypropylene suture in a semi double breasting manner. The margin of the upper flap was sutured with the lower flap one cm inferior to the margin, on the outer surface. The wound was closed in the conventional manner. Povidone-iodine solution soaked gauze dressing was applied over wound in every case. Patient was discharged within 24 hours. Ambulation was not restricted. Patients were advised to take oral antibiotics and analgesics for 3 to 5 days. Patients were called for follow-up on the 8th post-operative day. Sutures were removed on the eighth to tenth post-operative day.

**Results**

A total of 396 cases of inguinal hernia were treated with tension-free repair. Incidence of inguinodynia was found minimal. All patients were operated by NICH technique. Post-operative discomfort was treated with anti-inflammatory drug ibuprofen, 400 mg thrice daily. 384 patients (96.96%) returned to work from the 4th to 12th post-operative day depending on their occupation.

In this study, male patients (92.42%) were found more than female patients (07.57%). Indirect inguinal hernia cases were maximum (75.75%) and direct inguinal hernia cases were less (24.24%). Most of the patients were operated under spinal anesthesia (55.55%). (Table I)

| Table 1: Patients and hernia characteristics | Number of cases | Percentage of cases |
|---------------------------------------------|-----------------|---------------------|
| Demographics and Characteristics            |                 |                     |
| Mean age                                    | 42              |                     |
| Male                                        | 366             | 92.42%              |
| Female                                      | 30              | 07.57%              |
| Right Side                                  | 294             | 74.24%              |
| Left Side                                   | 90              | 22.72%              |
| Bilateral                                   | 12              | 03.03%              |
| Indirect inguinal hernia                    | 300             | 75.75%              |
| Direct inguinal hernia                      | 96              | 24.24%              |
| Under local anaesthesia                     | 68              | 17.17%              |
| Under spinal anaesthesia                    | 220             | 55.55%              |
| Under epidural anaesthesia                  | 30              | 07.57%              |
| Under general anaesthesia                   | 78              | 19.69%              |
| (n=396)                                     |                 |                     |
Three patients (0.75%) developed post operative neuralgia (due to nerve damage or irritation) which continued for more than 3 months after operation and then gradually subsided. The cause was not known. No case (0%) required removal of mesh due to infection or any other reason. No patient required neurectomy. No (0%) serious complication was observed in this series. Most of the patients who developed minor haematomas and bruising were on aspirin.

Chronic Groin Pain or inguinodynia is a potential complication following inguinal hernia mesh repair and has significant impact on quality of life. In our series, the incidence of inguinodynia was a merely 0.75%. (Table 2)

| Post-operative complications                                      | Number of cases | Percentage |
|-------------------------------------------------------------------|-----------------|------------|
| Stitch Abscess                                                   | 10              | 2.52%      |
| Minor haematoma                                                  | 16              | 4.04%      |
| Seroma                                                            | 6               | 1.51%      |
| Minor wound infection                                            | 6               | 1.51%      |
| Wound infection requiring surgery                                 | 0               | 0%         |
| Haematoma requiring surgery                                      | 0               | 0%         |
| Brusing around incision                                          | 4               | 1.01%      |
| Post-operative discomfort and mild pain (less than 3 months)     | 8               | 2.02%      |
| Neuralgia(due to nerve damage or irritation) (more than 3 months)| 3               | 0.75%      |
| Removal of prosthesis due to infection or other causes           | 1               | 0.25%      |

(n=396)

**Discussion**

Researchers have found the incidence of inguinodynia after inguinal hernia repair different in different studies. Bay-Nielsen et al concluded that one year after inguinal hernia repair, pain is common (28.7%) and is associated with functional impairment in more than half of those with pain. Cunningham J et al studied three hundred fifteen patients and found that at 1 year, 62.9% of patients had groin or inguinal pain and 11.9% of patients had moderate to severe pain; 53.6% had pain and 10.6% of patients continued to report moderate to severe pain postoperatively.

Pain often resolves with conservative measures. Following complete evaluation of patient and attempts at non surgical treatment, surgery may be considered. Thorough history and detailed physical examination are essential to go further. However, only 2%-4% of the patients are adversely affected by chronic groin pain in their everyday life. This is significant, considering the volume of the operations performed world wide.

Causes of inguinodynia are mainly related with the nerves of inguinal region. Three nerves are involved in inguinodynia i.e. ilioinguinal nerve, iliohypogastric nerve and genital branch of genitofemoral nerve. These nerves can be damaged either by trauma during dissection or retraction of tissues, or nerve entrapment from post-operative fibrosis, mesh-related fibrosis or sutures used to fix the mesh. Ilioinguinal nerve is the most commonly injured nerve in open inguinal hernia repair while incising the external oblique aponeurosis and fascia are incised over blunt instrument introduced through superficial inguinal ring bit by bit and not in a single go to avoid damage to this nerve. It is damaged during tack fixation in laparoscopic surgery. Post-operative pain is now recognized as an important long term complication of inguinal hernia repair.

Iliohypogastric nerve is more commonly injured in open hernia repair than in laparoscopic repair while separating external oblique aponeurosis from internal oblique muscle. It is also injured during laparoscopic repair during forceful fixation of mesh by tacker medial to anterior superior iliac spine. Genital branch of genitofemoral nerve is usually injured or entrapped in inguinal or femoral area due to forceful fixation of mesh with tracker or while reducing the sac. Injury to genital branch is avoided by keeping the easily visible blue external spermatic vein (the blue line) with the spermatic cord while it is being lifted from the inguinal floor.

Other cause may be mesh material reaction, pubic tubercle suture, mechanical pressure of mesh or venous congestion or mesh-related inflammation of the spermatic cord. It becomes very difficult to identify the nerve out of 3 nerves to be the cause of pain as all 3 nerves originate from T12-L1 nerve roots. The general consensus has been to
identify all 3 nerves during open inguinal hernia repairs to avoid iatrogenic injury and consequent chronic groin pain.\textsuperscript{23} If mesh is avoided in inguinal hernia repair then recurrence rate increases. Light weight meshes have been shown by some studies cause less inguinodynia incidence as compared to heavy weight mesh but use of light weight mesh can increase the recurrence rate. Surgeons have tried glue instead sutures or staples to attempt to reduce inguinodynia incidence.

Randomized trial in which bilateral hernias received sutured fixation of the mesh on one side and glue fixation on the opposite side showed less inflammatory reaction and therefore post-operative pain on the glue fixed side with no increased recurrence rate.\textsuperscript{24} Results should be interpreted cautiously due to relatively short follow up time in studies. A major, multicentre randomized, controlled trial is required to validate these findings.\textsuperscript{25} Ten patients (2.52\%) in this series complained of postoperative discomfort and pain for 2-3 weeks which subsided gradually with analgesics. There is evidence that 30\% of patients of various hernia surgery have some degree of discomfort or pain even one year after operation. The cause of pain is usually not known in these cases\textsuperscript{26}. These patients had neuralgia which lasted for more than three months. Study shows that “The tension free repair” (regardless of the approach) is associated with minimal discomfort which results in a faster recovery and return to normal activities\textsuperscript{27}.

In this series the follow-up was up to five years. NICH leaves most of the mesh free and without sutures so as to avoid maldistribution of tension on the mesh affecting nerves, nerve entrapment, nerve injury, nerve irritation and dead space formation. NICH enjoys the advantages of both the suture and suture less mesh hernioplasty. Less number of sutures\textsuperscript{28,29} has these advantages and also when patient stands, walks and runs there is no tension on mesh or on nerves. Several large studies indicate that excellent results from open tension-free operation are less dependent on the experience of the surgeon, and more on the simplicity of the operation and a short learning curve.\textsuperscript{28,30} NICH is a simple procedure developed by the authors. It is an easy, less time-consuming and economical technique giving good results in relation to post-operative pain, discomfort, inguinodynia, complications and recurrence. Further studies on this technique should be done to validate the advantages and make it a routine procedure for open repair of primary uncomplicated inguinal hernia.

**Conclusion**

NICH involves minimal tissue dissection and least number of sutures. These two factors are responsible for low incidence of inguinodynia. Two sutures are used to fix the mesh with inguinal ligament. Third suture is used to make an artificial deep inguinal ring in the mesh as well as used to narrow the natural deep inguinal ring but not too tight, to further avoid recurrence and nerve entrapment. No suture is applied in main body of mesh which remains free like an inverted curtain covering the whole hernia susceptible region of groin. Prolene mesh is used which completely covers the potential weak area on the floor of inguinal region irrespective of the size of the area in small and big frame persons.

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