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Case Report

Role of progressive preoperative pneumoperitoneum in the management of giant inguinoscrotal hernia-case report

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ABSTRACT

Managing a giant inguinal hernia/ incisional/ ventral hernia had its own complications. The overtime adaptation of peritoneal cavity to a lower abdominal pressure was one of the most important factors responsible for these complications. Surgical repair is also quite a challenge because of the massive contents in sac, adhesions and concomitant fibrosis. In order to reduce the complications like intra-abdominal hypertension, cardiorespiratory problems and to increase the abdominal wall compliance, many techniques were described. Progressive preoperative pneumoperitoneum is a well described technique for the repair of giant inguinal hernia/ incisional/ ventral hernia with loss of domain which helps in conditioning the abdominal wall in the preoperative period, increasing the likelihood of primary closure and decreasing the incidence of compartment syndrome.

Keywords: Giant inguinoscrotal hernia, Hernia with loss of domain, Progressive preoperative pneumoperitoneum, PPP

INTRODUCTION

Giant inguinoscrotal hernias are defined as hernia extending below patient's mid-thigh in the standing position.[1] Trakarnsagna et al classified giant inguinoscrotal hernia as shown in Table 1.[3] The starting point of any giant inguinoscrotal hernia is a simple inguinal hernia in which the defect size grows as a result of patient's effort, lifestyle and negligence, eventually allowing a great portion of small intestine, colon, omentum and other organs to enter the hernial sac. Patient would usually present at a later date after developing difficulty in walking, sitting, defaecating, urinary incontinence, skin ulcers and difficulty in sex life. Here we had discussed a case of 53 years old male who had an asymptomatic left giant inguinoscrotal hernia which had been growing for a period of 10 years with history of irreducibility for the past 2 years, which on presentation had a Tanaka index of 0.39. Other than difficulty in walking and sitting, patient had no other complaints and had no other known co-morbidities. Patient was a non-smoker and a non-alcoholic. Patient had no history of any surgeries in the past.

Table 1: Trakarnsagna classification of giant inguinoscrotal hernia.

Type	Extent
1	Lower end reaches the midline between mid-thigh and supra-patellar area
2	Lower end reaches the upper end of patella
3	Lower end advances below patella

What's the role of this novel procedure?

Patient had a huge irreducible inguinoscrotal hernia which if tried a simple reduction, posed a great risk of developing abdominal compartment syndrome and respiratory complications in the post operative period and problems in reducing the contents itself intra operatively

due to the strong adhesions because of the chronicity. Options available to tackle these complications are large or small bowel resection before reducing the contents, hug technique, diet technique, abdominal wall lengthening and tissue expanders.[4-8] All these techniques needs a certain level of expertise and has its own complications, while some of them being a costlier option. Creating a progressive preoperative pneumoperitoneum helps in reducing the entire hernial contents with ease and avoids the complications of other proposed techniques and has the advantage of being the cheaper option, which doesn't need much of an expertise for its creation and monitoring.

CASE REPORT

A 53 years old male patient was admitted for his complaint of a left scrotal swelling for 10 years. The swelling was reducible for the first 8 years and was irreducible for the past 2 years. The swelling did not pose him any discomfort until recently he developed difficulty in walking and sitting. Clinical examination of the patient revealed a 35×60×18 cm left inguinoscrotal mass which was irreducible and painless to palpation and movement, with an anteroposterior diameter of 35 cm and a laterolateral diameter of 60 cm. According to Trakarnsagna classification it was a grade 1 giant inguinoscrotal hernia. Patient had no known co-morbidities and all relevant blood investigations came out to be in normal range. CT abdomen and pelvis of the patient revealed a left inguinoscrotal hernia with both small and large bowel as content and a Tanaka index of 0.39. Since it was a giant inguinoscrotal hernia with loss of domain, progressive preoperative pneumoperitoneum was planned due to its advantages. One week prior to surgery, progressive pneumoperitoneum generation technique was performed. In our case, we used a central venous catheter for creating pneumoperitoneum. After an initial puncture with a metallic veress needle in palmers point under USG guidance, the blunt tipped inner cannula of verress needle is removed and through the outer cannula, a 3-way central venous catheter was introduced into peritoneal cavity and its position confirmed with ultrasonography. Room air was injected into peritoneal cavity via the central line using a 50 ml syringe with variable volumes as shown in Table 2 depending on the patient's pain tolerance in the first 3 days and measured the IAP using uroflowmetry method before and after room air injection as shown in Table 2. We noticed a stabilization in IAP after 3rd day and in the subsequent days we injected a variable amount of air which was sufficient to maintain that stablized IAP level which helped in keeping the patient pain free after the 3rd day, once we know the maximum level of IAP that can be reached in this patient and not injecting any more of room air than required. In this patient, we were able to achieve a maximum intra-abdominal pressure of 18.2 with tolerable abdominal and scrotal pain. Patient's abdominal girth was increased from 90 to 93.5 cm as shown in Table 3 by the end of pneumoperitoneum creation. Patient's Scrotal girth was maintained from an initial 60 cm, between 60-65 cm with tight scrotal bandage and support to avoid scrotal pain. Urine output was monitored daily which showed an average output of 1100 ml daily. Patient was also put on anticoagulant prophylaxis due to the risk of IVC thrombosis as suggested by previous studies.[8] Other than tolerable abdominal and scrotal pain, patient only complained of loss of appetite. At the end of day 7, another CT abdomen and pelvis was taken which showed a marked difference in abdominal wall muscles with increased pliability post procedure.

Figure 1: CAPD insertion for pneumoperitoneum creation.

Table 2: Volume injected and IAP measurements pre and post pneumoperitoneum creation.

Day	Pre insufflation IAP (mm Hg)	Air insufflated (ml)	Post insufflation IAP (mm Hg)
1	6	2000	14.7
2	12.6	2100	17.5
3	15.4	2100	18.2
4	-	0	-
5	16.1	900	18.2
6	16.1	500	18.2
7	16.8	600	18.2

Table 3: Abdominal girth pre and post pneumoperitoneum creation.

Day	Abdominal girth (pre procedure) (cm)	Abdominal girth (Post procedure) (cm)
1	90	92
2	91	93
3	92	93
4	92	93
5	92	93
6	92	93
7	93	93.5

Scrotal girth was maintained from an initial 60cm, between 60-65 cm with tight scrotal bandage and support.

Figure 2: Scrotal support to prevent scrotal wall expansion.

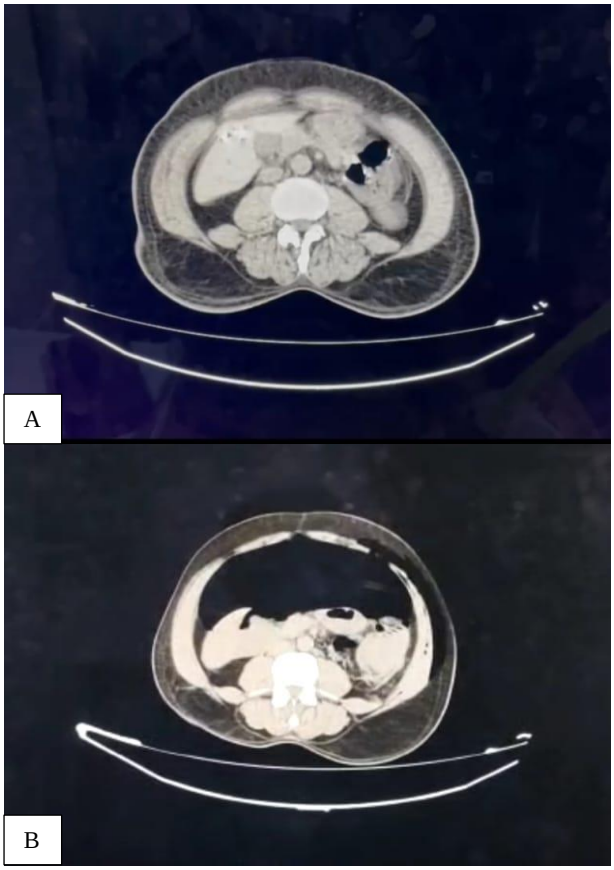

Figure 3 (A and B): CT image pre and post pneumoperitoneum creation. Pre pneumoperitoneum creation and post pneumoperitoneum creation

Patient was then taken up for left Lichtenstein tension free hernioplasty with a J shaped skin incision under general anesthesia to monitor the pulmonary plateau pressure. Hernial sac opened and the contents found to jejunum, ileum, caecum with appendix, ascending colon and transverse colon. After an omentectomy and widening the neck of sac by a superolateral incision, entire contents were reduced. Left orchidectomy done. Excess sac was excised. Sac closed and posterior wall strengthening done. Mesh placed and wound closed in layers. Patient was kept on elective ventilation for a day in view of elevated pulmonary plateau pressure upon wound closure and postoperatively patient's vitals, urine output, intra-abdominal pressure and pulmonary plateau pressure were monitored. Patient passed flatus on 2nd post operative day and stools on 3rd post operative day. Patient had fluctuating increased intra-abdominal pressure for the first five postoperative days which progressively decreased in the upcoming days reaching a normal level by tenth postoperative day as shown in Figure 3. Even with increased intra-abdominal pressure, abdominal perfusion pressure was maintained more than 80 mm Hg and hence no intervention was warranted. DT was removed on 5th postoperative day and sutures were removed by 14th postoperative day.

DISCUSSION

Creating a progressive preoperative pneumoperitoneum

The suitable scenarios are giant hernias with loss of domain, eventrations larger than 10 cm, hernial sac with volume more than 10 L and the unsuitable scenarios are patients with decompensated disease like heart or lung failure, multiple eventrations, high risk of intestinal complications, high risk of developing dyspnea.[2] The original technique suggested was intermittent punctures in the abdominal cavity for air suffocation which is subsequently replaced by placing an intraperitoneal cathether, silicon foley's catheter or central venous catheter.[1-4] The gases used includes room air [slowest absorption rate], carbon dioxide, nitrous oxide. The advantages of creating a pneumoperitoneum are pneumatic lysis of adhesions, allows reduction of hernial contents, improves respiratory function, facilitates surgery by separation of hernial sac and its contents and the disadvantages are abdominal pain and discomfort, scrotal pain and discomfort, suppressed renal function due to high intra-abdominal pressure, IVC thrombosis [Due to compression]. The only documented complication of this technique is air embolism.[3]

Comparison with previous studies

Even though this technique has been in practice since 1940, no study has concluded the optimal gas, duration, frequency or volume for pneumoperitoneum creation. Study by Piskin et al had documented painless pneumoperitoneum creation with an epidural analgesia with constant one litre volume injection with $_{N2O}$ and concluded target abdominal girth diameter of 11 cm for successful pneumoperitoneum creation which was acquired in different days for different patients.[8] Study by Musgrove et al used room air for pneumoperitoneum creation and used patient's pain tolerability as the

parameter to determine the volume to be injected each day.[9] Our study with the measurement of IAP, helps in creating a painless pneumoperitoneum from 3rd day without the complications of an epidural catheter with a fair increase in abdominal girth optimal enough for an ease in reduction of hernial sac contents.

CONCLUSION

Progressive preoperative pneumoperitoneum greatly helped in the repair of giant inguinoscrotal hernias with loss of domain. Patient's pain and intra-abdominal pressure monitoring helped in deciding the amount of air which can be insufflated each day. Progressive pneumoperitoneum creation with room air and central venous catheter was one among the cheapest options available with greater benefits. Gradual enlargement of Abdominal cavity in the preoperative period increased the likelihood of fascial closure and decreased the likelihood of compartment syndrome. The likelihood of expected post operative complications of a giant inguinoscrotal hernia repair was also greatly reduced by preoperative preparation of patient with progressive preoperative pneumoperitoneum.

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