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# Minimal Dissection: No Fixation Technique For Inguinal Hernia Repair

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***Abstract:*** *Standard procedure for Inguinal hernia repair remains controversial, despite advances in technique and materials. Conventional implants are typically static (passive) and do not move in concert with the groin's motility. Inguinal hernia repair with mesh fixation on dynamic groin structures are not tension free, and are associated with tissue tearing, bleeding, hematoma, and nerve entrapment–all of which might contribute to post operative complications. The poor quality of tissue ingrowth within static meshes/plugs embodies another crucial issue in prosthetic hernia repair. The regressive tissue leads to shrinkage and reduction of the mesh surface area which is a significant cause of recurrence and discomfort. To improve inguinal hernia repair, a new 3D ProFlor self-retaining implant has been developed by G Ameto from Itlay. It achieved excellent outcomes in the porcine model, and demonstrated that the dynamic compliant movement and recoil of the 3D prosthetic structure within the groin's natural tissues allowed for the critical cyclical physiologic loading that is missing with other implants. In the present study the technique of inguinal hernia repair with the help of ProFlor implant is been discussed. The use of this new 3D implant represented a faster and simpler surgical approach to inguinal hernia repair. The procedure was based on the centrifugal expansion of the device, whose design features converted ejection forces into gripping forces, and avoided the need for suturing the implant (eliminating a cause of complications related to prosthesis fixation).*
***Keywords:*** *Inguinal hernia repair, 3D ProFlor implant*

## I. Introduction

Inguinal hernias are the most common type of hernia. These hernias result through a weak spot or tear in the lower abdominal wall, often in the inguinal canal.

This type of hernia is more common in men than in women. This is because a man's testicles descend through the inguinal canal shortly after birth, and the canal is supposed to close almost completely behind them. Sometimes, the canal does not close properly and leaves a weakened area prone to hernias.

Inguinal hernia repair remains a source of passionate debate today.Despite advances in techniques and materials, high complication rates, patient discomfort, chronic pain, and recurrence of hernia are associated with the surgical procedure[1,2]. The large variety of techniques and materials employed in the treatment of inguinal protrusions demonstrate that no gold standard exists.

A current clinical dilemma is whether static implants should be used to treat a weakened motile barrier. The dynamic structures of the herniated inguinal region are currently managed with static solutions, such as passive and motionless meshes/plugs–a strategy that appeared to be at odds with the physiology of the groin. Consequently, there was a high incidence of complicationsthat were associated with the techniques employed to repair inguinal protrusions.

For example, static implants were often sutured or fixated with stitches or tacks on the myotendineal structures of the groin, and fixation of prosthetic devices was generally considered to be sources of tissue tear, bleeding, hematoma, and nerve entrapment [2, 7-10]. It was hypothesized that an ideal implant should possess dynamic compliance and avoid fixation.

Another factor is the low quality of tissue ingrowth within the conventional implants employed to date. The stiff scar plate that typically resulted from the patient's biologic response to static implants was considered the source of tissue shrinkage that ultimately reduces the surface covered by the prosthesis.

Hypothetically, this increased the risk of recurrence due to loss of coverage of the hernia defect by the shrunken mesh. Moreover, the disordered stiff, hard scar tissue that incorporated the implant was thought to involve nervous structures that resulted in patient distress and/or chronic pain over time. Notably, the discomfort upon movement described as "sand paper effect" resulted from friction between the hardened, wrinkled implant and the mobile myotendineal groin structures. Thus, an enhanced biologic response and superior quality of tissue incorporation was another endpoint that to be theorized and might be important.

It was also believed that the widespread approach that utilized flat meshes to correct defect coverage was inadequate. In anecdotal cases (especially in recurrent direct hernias), despite the apparent correct placement of mesh, the visceral protrusion still arose in the interstitium between inguinal floor and the overlying mesh. The clinical consequence was a bulge in the groin, concomitant to discomfort and pain.

Therefore, a dynamic (not static) treatment approach was proposed. In the present study, devices and procedures that characterized the experiences in dynamic hernia repair are described.

## II. Material And Methods

**2.1 The implant system**

The implant possesses a multi-lamellar shaped central core of specially worked polypropylene strips that are formed on 2 floating rings to create an open 3D structure with inherent recoil. The two edges of the petals are comprised of reinforced polypropylene that offers resiliency to the structure. The lateral aspect of the core is made of soft, lightweight, large porous, polypropylene construction; this composition facilitates the gripping of the hernia border to the lateral aspect of the implant core. A flat, large porous, low-weight polypropylene disk helps protect the hernia repair and, facing the peritoneum, stabilizes the implant.

The rationale of the implant's unique 3D geometry is its ability to transform expulsion forces into lateral gripping forces. Thus the advantages of it are:

- Low Recurrence Rate
- Low Postoperative Pain
- Early Resumption to Work
- Easy to Learn
- Can be Done Under Local / Spinal Anesthesia
- Shorter Operative Time
- Less Post-Operative Complications

**2.2 Selection of Mesh**

The selection of the type of mesh depends on minimum dissection required for placement, minimal or no fixation of mesh, ease of placement, minimal or no seroma/haematoma formation, minimal post operative discomfort-in form of immediate or late post operative pain, and preferably nil recurrence.

### 1.3 Various Types of Mesh in Use

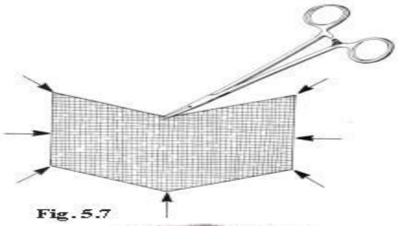
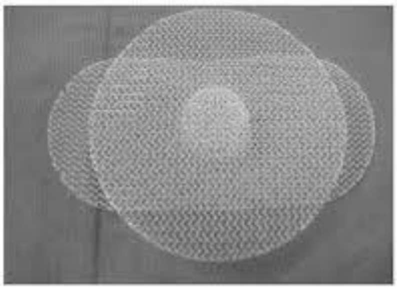


Fig. 5.7



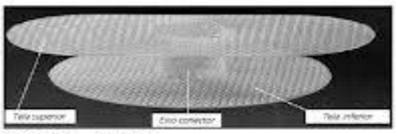
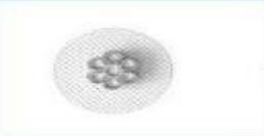
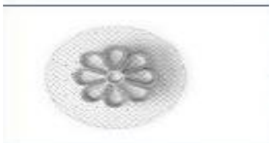



Figure 1 - PHS Mesh

**2.4 ProFlor - Range**



25 mm (25/60)



40 mm (40/70)

25 mm Extended (25/100)

40 mm Extended (40/100)

## III. Discussion

Although treatment of inguinal protrusions includes one of the most common surgical procedures performed today, there have been no significant changes in technique and material for decades. Currently, no gold standard exists, and high post-operative complication rates, and discomfort and chronic pain characterize its treatment.

In an effort to utilize current and forward- looking concepts in the physiology/ biodynamics of the inguinal region, pathogenesis of protrusion disease, and emerging technology, we have developed an operative schema that improved patient outcomes in inguinal hernia repair.

**3.1 Procedural steps in indirect hernia repair.**

After skin incision and opening of the oblique internal aponeurosis, dissection and elevation of the cord onto a rubber band followed. This defined the hernia sac location and internal ring. (*Explanatory comments are provided initalics.*)

• ***Removal of adhesions and scar tissue.***

At this stage, meticulous removal of adhesions and scar tissue around the internal inguinal ring was performed.

*This step was very important because fibrosis and adhesion brides between the sack and internal inguinal ring impaired the shutter mechanism of the muscular structure of the ring* [11]*. Therefore, adesiolysis helped to reactivate the sphincterial function of the internal ring. It was also important to avoid visceral protrusion when the abdominal pressure increased.*

• ***Preparation, ligation, and amputation of the sac.***

*Although hernia sac amputation is a controversial strategy in static hernia repair, it is recommended by some clinicians*[12,13]*. Sac amputation was a crucial maneuver during our procedure that incorporated the 3D dynamic implant. In fact, returning the entire hernia sack into the peritoneal cavity might lead to immediate or early recurrence if the procedure is not carried out under certain conditions (ie, when the implant is too small for the hernia opening). Also, if the sack was cut off (and a small implant used), the flat sutured peritoneal sheath would not re-form a sacculation for several weeks or months. During this period the stabilizing* *properties of the preperitoneal disk maintained the implant in place, allowing tissue ingrowth within the dynamic implant. As a result, a definitive 1.5-cm thick barrier formed within a few weeks and impeded further protrusion along the previous hernia gateway.*

• ***Finger-guided dissection.***

Before releasing the sack stump into the abdominal cavity, we performed a finger-guided dissection of the parietal peritoneum from the posterior abdominal wall. The dissection achieved proper placement to accommodate the preperitoneal disc of the implant (Fig. 1 & 2).

*The dissection of the peritoneal sheath from the posterior abdominal wall (to achieve a broad space for the deployment of the preperitoneal disk) was a mandatory step. In addition to its stabilizing effect facing the peritoneal sheath, the preperitoneal disk was intended for posterior coverage of the Hesselbach'striangle(to protect the fossa inguinalis media from future direct hernia protrusion that might mimic a recurrence).*

*Despite the presence of epigastric vessels close to the medial border of the internal ring, injury to these vascular structures did not occur since they were readily detachable from the peritoneal sheath.*

• ***Preparation of the 3D implant.***

The 3D implant was at least 10-15% wider than the hernia opening to ensure that the prosthesis remained in the hernia defect through centrifugal expansion after release into the hernia opening.

The implant was compressed with the thumb and forefinger. The implant core remained compressed into the forcep, while the preperitoneal disk was fully deployed in extra peritoneal plain.

• ***Positioning***.

The implant was positioned into the hernia opening, with special care that the spermatic cord was pulled laterally from the hernia opening (for indirect hernia). The delivery tool was then advanced into the hernia opening until its flange stopped against the muscular wall (Fig. 3). Additional moderate pushing/turning of the device facilitated better deployment of the preperitoneal disk. The device was slightly pulled back until no more compression was exerted, but remained in tight contact with the ring. The preperitoneal disk remained beyond the hernia opening.

*Because the olive ring of the implant was larger than the hernia opening, the introduction of the device provoked dilation of the muscular frame of the internal ring that allowed the reactivation of the internal ring's shutter mechanism –which might otherwise be blocked by fibrotic degeneration in indirect hernia protrusion [3]. The fibrotic fibers impaired the sphincterial activity of the internal ring, and dilation helped to break the rigid fibers that impeded the movement of this muscular structure [11]. The impaired shutter mechanism has been described as a common pathogenetic factor for the etiology of indirect hernia [13, 14].*

• ***Stresstesting***.

At this stage, the procedure has been completed. The implant fully obliterated the hernia defect, and the preperitoneal disc interfaced the peritoneum against the posterior aspect of the abdominal wall. To ensure the effectiveness of the self-retaining placement of the 3D implant, the surgeon could apply a stress test. If the procedure was performed under local anesthesia, the patient was invited to cough. By coughing, the squeezing action of the internal ring converted the ejection forces into gripping forces, and allowed the implant to firmly grip the internal ring.

In cases of procedures in general anesthesia, the surgeon gripped the central ring of the implant core with forceps and attempted to remove the implant with moderate force.

*During the stress tests, the implant can be ejected after powerful coughs, shots, or a strong pull with forceps. Testing did not affect the effectiveness of the procedure, since the implant bumped against the sutured fascia and held the device in place after wound closure (due to anteroposterior buffer effect). Moreover, our experimental data in porcine demonstrated that tissue incorporation occurred within few hours, being that the implant glued into the hernia opening by the advancing tissue incorporation [14].*

• After checking for hemostasis, the external oblique was sutured (Fig. 7). Skin closure was done.

**Fig. 1- Dissection to accommodate preperitoneal Disc of implant (Before releasing the sac stump into the abdominal cavity).**

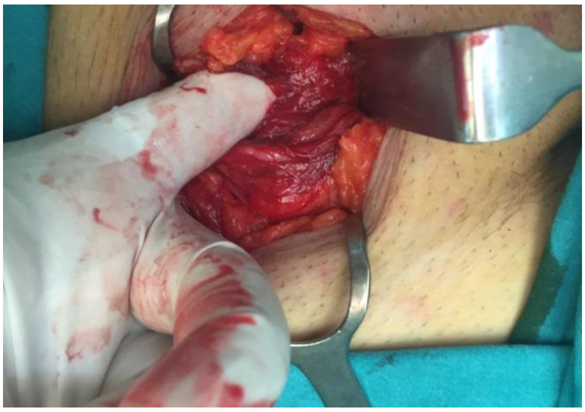


**Fig. 2- Dissection of the peritoneal sheath from the posterior abdominal wall (after releasing the sac stump into the abdominal cavity).**

**Fig. 3- The 3D implant positioned into the hernia opening, until its flange stopped against the muscular wall.**

**Fig. 4- Positioning of implant in progress.**

**Fig. 5- Positioning of the implant almost complete.**

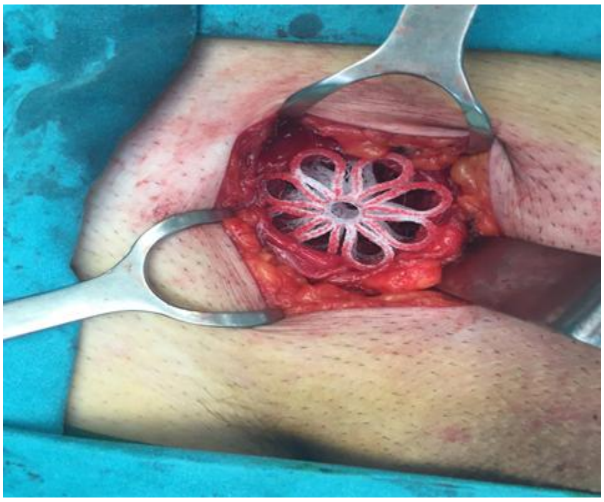


**Fig. 6- Co- planer alignment of the 3D implant to the anterior aspect of the hernia opening.**

**Fig. 7- After positioning the implant, external oblique aponeurosis was sutured.**

**3.2 Procedural steps in direct hernia repair (Fig. 8, 9, 10 & 11)**

• ***Dissection of the sac.***

After opening the externus aponeurosis and elevating the cord onto a rubber band, a dissection of the sac from the groin structures to the hernia opening in the fascia trasversalis was performed. Removal of any adhesions and scar tissue around the hernia opening was undertaken.

• After full isolation of the hernia sac, the trasversalis fascia was breached (as wide as necessary) to detach the peritoneal sacculation (with contents) around its posterior aspect.

• ***Finger-guided dissection.***

A fingerguideddissection (or mechanical adesiolysiswith mounted pad) of the parietal peritoneum from the posterior abdominal wall was performed to accommodate the placement of the preperitoneal disc of the implant. The released sack was then replaced into the abdominal cavity.

***Preparation of the 3D implant.***

Preparation of the 3D implant for delivery into the hernia opening was performed as described above for indirecthernia.

• ***Implantation***.

The delivery of the implant was performed as described above for indirect hernia.

• ***Positioning***.

Specific attention was accorded to the deployment of the preperitoneal disc to cover the internal ring to avoid future protrusion of indirect hernia.

• ***Stresstesting***.

After positioning the implant into the hernia frame, a stress test was mandatory. If the procedure was carried out under local anesthesia, the stress test was performed by inviting the patient to cough one or more times. If the procedure was performed under general anesthesia, a stress test assessed the self-retaining behavior of the implant by having the surgeon slightly pull the implant outward by gripping the small central ring of the core with forceps.

*Observations on stresstesting were applicable as noted for indirecthernia.*

• After checking for hemostasis, the external oblique was sutured. Skin closure was subdermal, and avoidance of wound drains occurred.

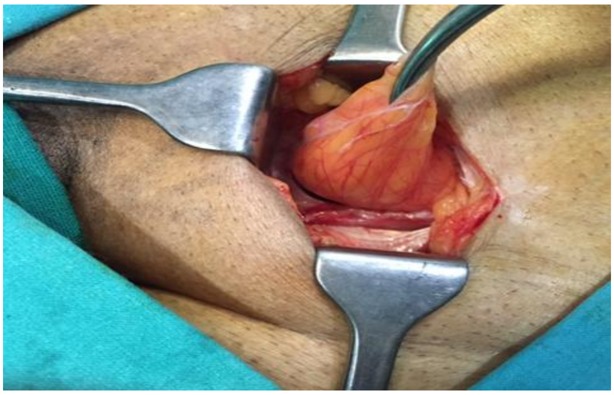


**Fig. 8- Hernial bulge seen clearly after external oblique aponeurosis incision made.**

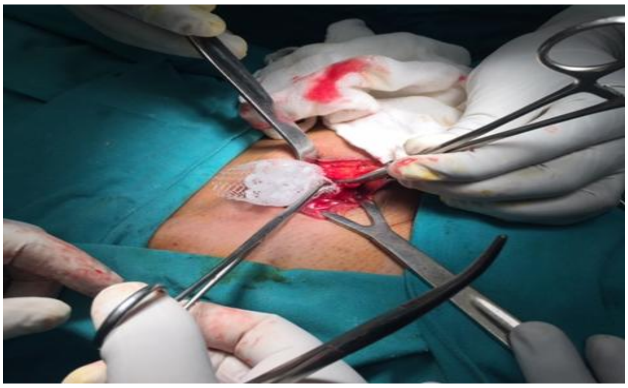


**Fig. 9- Placement of 3D implant in direct Hernia.**

**Fig. 10- Positioning of implant in direct Hernia.**

## IV. Sampling

- A total of 260 cases with Proflor implant
- Majority of them were males (Only Two Females)
- Age range was 25 – 90 yrs
- All patients were discharged within 24 hrs
- All these patients were done either under LA, Spinal or short GA

**4.1 Distribution of Hernia**

- Left – 42%
- Right – 40%
- Bilateral – 14%
- Recurrent – 4%
- Direct – 73%
- Indirect – 27%

**Results And Follow Up:**

- The follow up was done between the Period of 2 week to 3 years
- Mild to Moderate pain was perceived by the patient during first three days which becameNil to Mild after 4 days.
- Patient was able to go Back to work in 3 days to One week
- Only one case of reoccurrence was observed.

## V. Conclusion

We report a newly developed repair technique for the surgical treatment of inguinal hernia. This technique incorporated current physiologic concepts, pathogenesis, emerging devices, and new procedures. The surgical community might utilize it as an additional option to improve and actualize the technical aspects of hernia repair procedures.

Therefore, the advantages of using this technique is that-

- It is easy to deploy
- It takes less time for completion of operation (about 12min)
- Post operative pain is very low in both short & long term
- It minimizes thelongterm discomfort to a considerable extent.
- It has minimal recurrence.

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