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PROLENE HERNIA SYSTEM REPAIR OF INGUINAL HERNIAS

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Fifty five males with 60 inguinal hernias who required mesh hernioplasty were chosen for repair using the Prolene Hernia System (Ethicon, Inc.). We found the procedure to be rather simple, rapid, theoretically and practically effective in reducing the rate of postoperative pain and recurrence. It requires a short learning curve and has minimal postoperative complications.

Keywords: Inguinal hernia, Prolene, Mesh, PHS

PATIENTS AND METHODS

The study was performed in the Kasr Al Aini Teaching Hospital, Cairo University, on 55 male patients with 60 inguinal hernias. Patients were submitted to history taking and general and local examination to evaluate the type and number of hernia, and associated medical problems. All patients underwent herniotomy and mesh hernioplasty using the Prolene Hernia System (PHS) [(1).]

The PHS is made of undyed polypropylene knitted filaments. It is sterile and preshaped in the form of 3 parts, each comprises a separate type of tension-free repair of inguinal hernias. These layers are the on-lay patch, connector and underlay patch (Fig. 1).

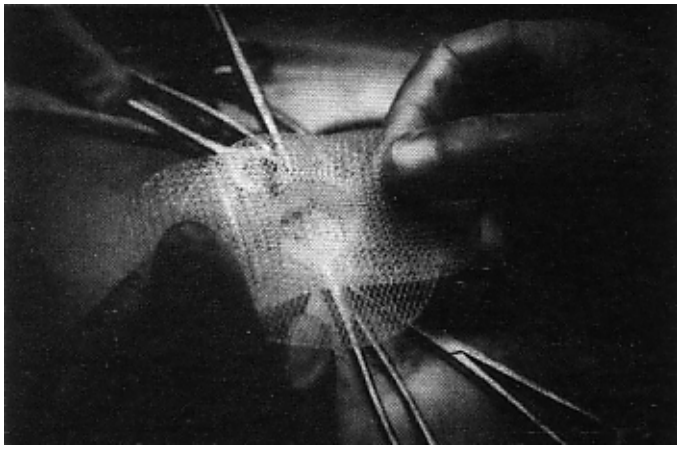

Fig. (1): Structure of the PHS.

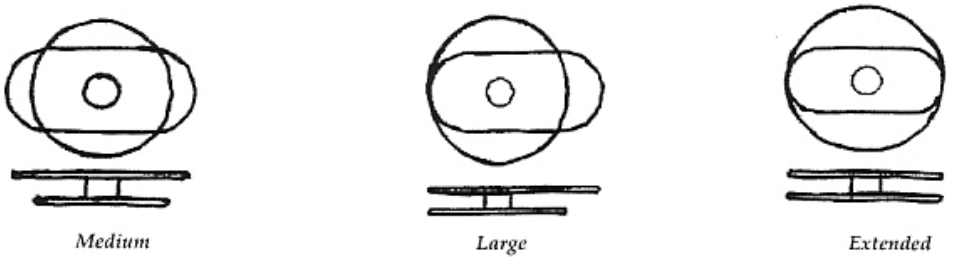

Fig. (2) :Different sizes of the PHS.

The on-lay patch (Fig. 2), is oblong in shape and measures 4.5 x 10.0 cm in the medium and large-sized mesh, and measures 5.5 x 12.5 cm in the extended type. It covers the whole inguinal canal floor, overlaps the pubic tubercle and provides the security of conventional mesh repair. The connector is a cylindrical plug, measures 1.91 cm in diameter and 1.27 cm in thickness. It is hollow from the anterior aspect to make the plug less bulky, thereby minimizing patient discomfort, while the part that is related to the underlay mesh is supported by six radial condensations of Prolene fibers to avoid bulging anteriorly and to support the defect in the deep ring. The connector has an additional function in securing the mesh in place and avoiding its migration. The underlay mesh is circular with a diameter of 7.5 cm in the medium-sized mesh and is 10 cm in the large and extended types. This part of the mesh is laid in the preperitoneal space and spread to cover the entire myopectineal orifice.

After preoperative preparation, a prophylactic antibiotic (Amoxycillin-Flucoxacillin 500 mg) is administered with the induction of anesthesia. Conventional exposure of the inguinal canal is performed, the external oblique aponeurosis is dissected from the arching fibers of the internal oblique to provide room for placement of the on-lay portion of the mesh. After dissection of the indirect inguinal sac, some traction is placed on it to gain access to the preperitoneal space, which is then easily opened. The peritoneum is separated from the fascia transversalis cranially, medially, caudally and laterally to create room for the underlay mesh. This space is opened by the forefinger which follows the sac through the internal ring. The space can also be opened by a sponge on a clamp or under vision by placing a retractor in the internal ring. Herniotomy is then performed.

The on-lay part of the mesh is grasped down to the connector by a sponge forceps so that its longer dimension lies parallel to the inguinal ligament (Fig. 3). Insertion of the forefinger in the internal ring cranial and medial to the cord will elevate the anterior abdominal wall and facilitate insertion of the mesh. The PHS is inserted directing the tips of the forceps towards the umbilicus. The connector part of the mesh must lie caudal and medial to the cord so that the underlay mesh can be spread evenly. The on-lay part of the mesh is then extracted from the internal ring, the forceps is removed, and the forefinger is placed in the preperitoneal space to spread the underlay mesh. No sutures are used in the underlay part of the mesh. The on-lay mesh is then spread, and a snip may, or may not, be made in its cranial and lateral aspect to allow passage of the cord without a kink. Once the mesh is in place, one finds it secure and immobile. Closure of the inguinal canal by suturing the external oblique will further fix the mesh in place. However, it could be secured by 3/0 Vicryl stitches to the pubic tubercle, inguinal ligament and arching fibers of the internal oblique (Fig. 4). The wound is closed in layers with or without drainage.

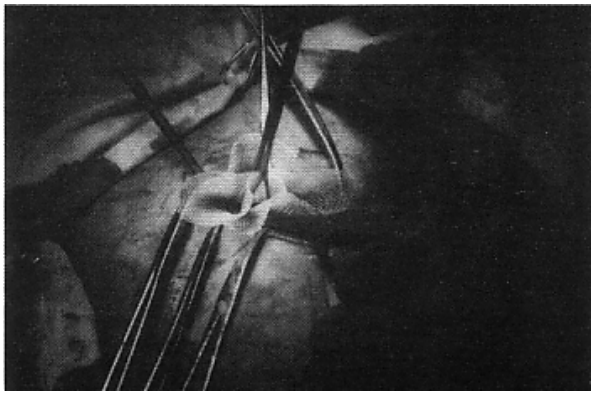

Fig. (3): Insertion of the mesh through the internal ring

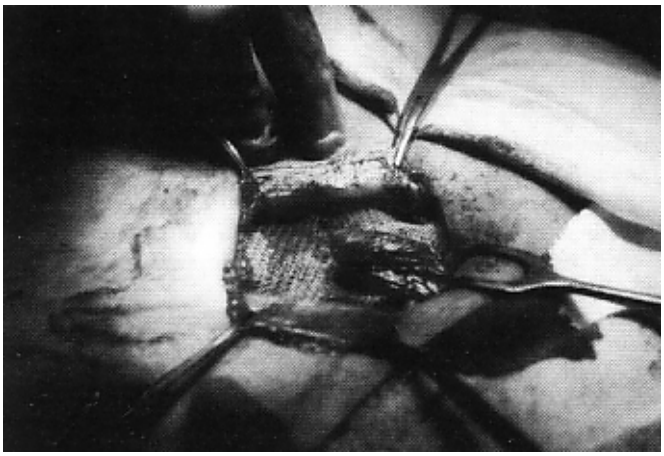

Fig. (4): Completed Repair.

For direct hernias, the transversalis fascia at the neck of the sac is incised circumferentially and the sac excised or inverted, then the preperitoneal space is opened and the PHS inserted in the defect using the same principles described above.

Postoperatively, orders were given to get the patient out of bed as soon as he can, drink clear fluids the evening of the operation and eat a regular diet the next day. Drains (if used) were removed next morning, Antibiotics were continued for 48 hours, and pain killers were prescribed PRN.

Patients were followed-up to detect postoperative pain, swelling, seromas, hematomas, wound infection, wound healing and recurrence. Follow-up extended from 3 months to 2 years.

RESULTS

All our patients were males with age range of 21 to 74, 90% were smokers. There were 46 indirect, 8 direct, 4 pantaloon, 1 strangulated femoral and 1 recurrent oblique inguinal hernia. Five patients had bilateral hernias that were fixed in the same sitting. Four patients had associated medical problems in the form of Bronchial Asthma in 2, Diabetes in 1, and liver impairment with ascites in 1. The latter presented to our casualty department with an irreducible left oblique inguinal hernia and also gave symptoms suggestive of BPH.

The average operative time for repair of the hernia was 20-30 minutes, skin to skin.

Two patients developed wound infection, one was diabetic. The infection in both cases was mild, subcutaneous and resolved after administration of Co-Amoxyclav PO without the need to open the wound or remove the mesh. Three patients developed seromas that resolved after aspiration. The postoperative pain was mild in most cases. None of the patients, except 6, required assistance to move freely out of bed during the first 24 hours from surgery. Hospital stay ranged from 1-3 days, and return to work was usually in 2 weeks.

None of our patients had retention of urine, scrotal edema, hematoma, wound sinus, nerve injury. Also none of them had recurrence of the hernia.

DISCUSSION

Amid [2] classified biomaterials used for mesh repair into four types; I, totally macroporous like Prolene, II, totally microporous like Gore-Tex, III, macroporous with multifilamentous component like PTFE (Teflon), and type IV submicronic pore size like Silastic. He concluded that the incidence of infection and seroma formation can be eliminated by using the type "I" prosthesis. Brenner [3] studied the physical difference between Prolene, Mersiline and Teflon meshes, and mentioned that Prolene was the superior mesh because it has the highest porosity thus inducing more in-growth of fibrous tissue than other meshes. He also stated that Prolene has the largest pore size, Marlex has the smallest and that Prolene has the best tensile and bursting strength.

Lichtenstein [4] was the first to describe the patch repair. Lichtenstein and Shore [5] were the first to describe the plug repair and Read [6] was the first to describe the preperitoneal repair. Gilbert [7] was the first to use something similar to the PHS in 1991. He placed 2 meshes, one preperitoneal and another in the inguinal canal. He did not use any sutures to fix them together or in place. The PHS has all types of repairs incorporated in a single mesh. It provides the advantages of the preperitoneal repair that blocks the myopectineal orifice completely, and is pushed by the

abdominal pressure against the abdominal wall and hence the abdominal pressure fixes the mesh rather than tends to dislodge it. This preperitoneal mesh is placed via a simple inguinal exposure that is familiar to the surgeon unlike the laparoscopic, midline or suprainguinal approach. The PHS also provides the plug repair, but with a simple suturless technique. Amid [2] described that one of the complications of the plug repair was it assuming a cartilage-like consistency and eroding into the bladder. This is not expected to happen in the PHS as the deep edges of the plug merge with the preperitoneal mesh which will prevent it from migration. The PHS also provides the patch repair which is familiar to most surgeons. In addition all these 3 repairs, being incorporated in a single mesh mechanism offers safety and there is no chance that one repair will disrupt from the other. Also the 3 repairs, or parts of the mesh offer stability to one another.

The normal length of the inguinal canal is 3.75 cm long from the deep to the superficial inguinal rings [8]. Peri et al. [9] described the variation of the inguinal canal anatomy in patients with herniae. Their study was done on 78 patients 45 with indirect and 33 with direct herniae. They found the length of the inguinal canal to be 4.7 cm. In the 45 cases with indirect herniae, the deep ring measured 1.5-7 cm, while in the 33 cases with direct herniae, the deep ring measured 1.5-2.5 cm. We can notice that the inguinal canal can vary in length in the presence of an indirect hernia as the deep ring will widen increasing the distance between it and the pubic tubercle.

The longer axis of the on-lay part of the PHS measures 10 cm in the medium and 12.5 cm in the extended type. (Fig.5) is a proportional diagrammatic representation of the length of the inguinal canal compared with the different layers of the PHS in its different sizes. Mathematically-speaking, the medium-sized PHS would be enough in cases with normal internal ring, i.e. Gilbert [10] type 1, 4 and 5. But if the deep ring is widened (Gilbert types 2 and 3) we expect the PHS to be shifted laterally and hence the inlay part will not cover the whole posterior wall of the canal. In this case, one can use the large or extended variety.

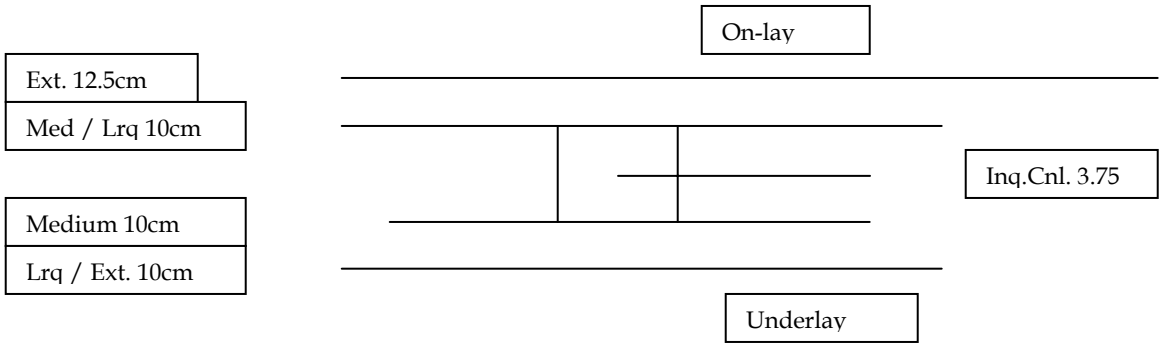

Fig. (5) :Diagrammatic proportional drawing of the cut section of the PHS comparing the length of the inguinal canal (Ing. Cnl.) (3.75 cm) to the lengths of the underlay and on-lay parts of the PHS in all its sizes, medium (Med), large (Lrg), and extended (Ext).

We noticed the technical ease for fixation of the PHS as compared with fashioning and suturing of the Prolene patch. The Prolene patch requires several technical skills. For example, it needs to be cut preliminary to fit the inguinal canal, half of the suturing is done with the cord retracted cranially, and the other half with the cord retracted caudally, and between these 2 halves one would have to pass the mesh and the suture from below the cord. The mesh is sutured to the pubic bone then continuously to the inguinal ligament (or iliopubic tract), this might, rarely, injure the vessels, and it might cause fraying of the inguinal ligament, is time consuming, and contributes to the postoperative pain. After reaching lateral to the internal ring, a part of the mesh will have to be removed, and a snip is performed to allow, passage of the cord. This snip is sometimes too much that one needs to take an extra suture to narrow it laterally after the mesh has been fixed. Then while suturing the mesh to the conjoint tendon (or the arching fibers of the transversus abdominis) the mesh would require a lot of fashioning so that it would not be redundant and would not be under tension. This suturing is also time consuming and contributes to the postoperative pain. Sometimes after fixation of the mesh it is found crumbled on itself and will need extra sutures or undoing and resuturing. All these pitfalls are absent in the PHS which makes it easier and faster to perform.

Murphy [11] Compared the operative time needed for PHS repair with the Lichtenstein Plug and Patch repair and noticed a slight but not significant reduction with the PHS

(25.4 vs. 27.2 minutes). Our operative time ranged from 20-30 minutes skin to skin. Our return to work was in 2 weeks. Most of our patients were manual laborers and this explains the longer time for return to work as compared with 7-10 days reported by Kurzer et al. [12].

Francoisi et al. (13) reported on Lichtenstein patch repair in 692 cases (647 primary and 45 recurrent). Their results are; mean hospital stay 2.3 days, complication rate of 6.2%, one case of periprosthetic infection which resolved after patch removal, 3 hematomas, 2 seromas, and 2 wound infections. Furthermore there was one recurrence and 25 nerve irritation. Our complication rate was 8.3%, 3 seromas, and 2 mild wound infections. No cases of periprosthetic infection, or hematomas

Table (1)*: Comparison between our results with those of Lichtenstein (14) and those of Francoisi (13).*

	Licht.Patch	*Francoisi*	*PHS*
Seroma	No	No	5%
Hematoma	2%	0.4%	No
Sinus	No	No	No
Infection	1.3%	0.4%	3.3%
Persistent pain > month	1.4%		No
Return to work	7-10 days		2 weeks
Recurrence	0.45%		No

Comparing our results with patch hernioplasty (Table 1) we can see that there is less hematoma formation, perhaps due to the minimal suturing required to fix the PHS. A little bit elevated rate of wound infection, however mild, and not necessitating mesh removal. There is also a higher incidence of seroma that responded rapidly to simple aspiration, and less postoperative pain.

CONCLUSION

The PHS is a good method of repair of inguinal hernias, it provides some advantages like, technical ease, minimal suturing, less postoperative pain, and triple mesh support. It, however, requires a short learning curve, is more expensive than the Prolene patch, and has a higher incidence of seroma formation.

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