

INGUINAL HERNIA REPAIR USING MOSQUITO NET CLOTH INSTEAD OF POLYPROPYLENE MESH- A RANDOMIZED CONTROLLED TRIAL

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ABSTRACT

Inguinal hernioplasty is the technique of using prosthetic material for repair of inguinal hernia. It is the most common method used for repair of inguinal hernia worldwide. In tension free hernioplasty, instead of suturing anatomic structures that are not in apposition, the entire defect is reinforced by a sheet of mesh. In industrialized and developed countries allopathic meshes are routinely used for inguinal hernia repair. However in under developed and developing countries, they may be quite expensive to a majority of the population. The routine used polypropylene mesh is very costly. Whereas a good quality mosquito net, is very much similar to the synthetic mesh for hernia repair available in the market and is very cheap. The net is made of copolymer of polypropylene and polyethylene and can be sterilized by autoclaving. The present study was undertaken to find out whether mosquito net can be used as an alternative to polypropylene mesh. A prospective study was conducted in the department of General Surgery at M.R. Bangur Hospital, Kolkata. Patients aged between 20 years to 60 years admitted for inguinal was chosen for the study. A total of 60 patients chosen. The data were statistically analyzed for prevalence of hernia among both the sexes, post operative pain, and other post operative complications between the two test groups using Chi-Square tests. So, it was concluded that Polyester mosquito net mesh represents a cost-effective alternative to hernia repair in developing countries, with short term complications like those of polypropylene mesh hernia repair.

Keywords: Inguinal Hernia, Polypropylene Mesh, Mosquito Net, Tension Free Hernia Repair, Hernioplasty, Lichtenstein Technique, Complications of Inguinal Hernia Repair.

[Journal of Science & Technology \(JST\)](#)

ISSN 2582 6921

Volume 2 Issue 4 [October - November 2021]

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INTRODUCTION

A variety of operative procedures have been described in the literature for hernia repair. There is controversy concerning which procedure is the most advantageous. The number of randomized prospective trials being reported is increasing. Whereas some surgeons continue to practice anatomical repair, the tide seems to have shifted to the use of some prosthetic material. Laparoscopic hernia repair is increasingly being done.

Weakening of the abdominal muscle tissue as one of the causes of abdominal hernia was suspected by as far back as 1800. The need for prosthetic reinforcement of weakened abdominal wall tissue was recognized by Billroth, who said “If only proper material could be created to artificially produce tissue of toughness and density of fascia and tendon, the secret of radical cure for hernia could be discovered.”

Lichtenstein group popularized the use of mesh and coined the term “Tension free Hernioplasty”. In tension free hernioplasty, instead of suturing anatomic structures that are not in apposition, the entire defect is reinforced by a sheet of mesh. The operation is therefore therapeutic as well as prophylactic; it repairs and protects the entire susceptible region of defect to herniation in future.

Today world over tension free mesh repair for hernia is the choice for adult groin hernia. In developed and industrialized countries synthetic polypropylene meshes are routinely used for hernia repair. However, in under developed and developing countries they may be quite expensive to a majority of the population.

So, this study was aimed to investigate whether locally available Nylon mosquito net might be a useful alternative to expensive commercial mesh implants for hernia repair.

The imported allopathic mesh is very costly. 15x7.5 cm mesh costs around Rs.1,200, while a 15 cmx15 cm mesh costs around Rs.3000 and more.

Whereas a good quality mosquito net is very much similar to the synthetic mesh for hernia repair available in the market. The net is made of copolymer of polypropylene and polyethylene and can be sterilized by autoclaving.

The cost for 15x7.5 cm mosquito net cloth works out to be only 45 paise, for 15x15 cm it costs 90 paise, and 30x30 cm it costs around Rs.3.60 only.

The objective of any hernia repair is acceptability, safety and efficacy of the surgery, to avoid recurrence and also acceptability to the patients in terms of affordability, pain, discomfort and other complications during follow up. The present study was undertaken with following aims and objectives: -

To find out the safety and efficacy of a good quality mosquito net mesh in clinical practice.

- ✓ To compare the results of mosquito net mesh repair and prolene mesh repair.
- ✓ To know the incidence of complication and compare between mosquito net mesh repair group and prolene mesh repair group regarding:
 - Hematoma
 - Seroma
 - Stitch abscess
 - Gross infection
 - Rejection
 - Recurrence

Thus, the study was done in order to find a low-cost alternative to commercially available polypropylene mesh which has the same efficacy and safety of a polypropylene mesh thus making surgery for inguinal hernia using a prosthetic mesh more practicable for underdeveloped and developing countries.

METHODS

A prospective study was conducted in the department of General Surgery in M.R.Bangur Hospital. Patients aged between 20 years to 60 years admitted for inguinal hernia was chosen for the study. A total of 60 patients chosen.

The patients with inguinal hernia had complaints of groin swelling in either right or left. In all of these, groin swelling were reducible. There was no history suggestive of obstruction or irreducibility.

After admission, history in details were taken and each patient examined clinically. In every patient cough impulse and reducibility noticed. Deep ring occlusion test was done in case of inguinal hernia.

In elderly patients with history of narrow stream of urine and chronic constipation, digital rectal examination was done to rule out enlarged prostate or other pathology of the rectum and anal canal. Other coexisting diseases were looked for.

All the patients were investigated for the following:

- ✓ Hemoglobin percentage.
- ✓ Total leukocyte count and differential count
- ✓ Erythrocyte sedimentation rate.
- ✓ Fasting and post prandial blood sugar.
- ✓ Serum urea and creatinine.
- ✓ Serology.
- ✓ Chest radiography.
- ✓ Electrocardiography.
- ✓ USG of KUB region in patients complaining of voiding problems to rule out prostatomegaly.

Investigations were done from the outpatient department. Patients were admitted one day before the scheduled date for operation. Permission from ethical committee was taken to carry out such study.

To carry out the study following measures were undertaken:

1. Every alternate patient was offered mosquito net mesh repair and written consent was taken. Those who refused were excluded from the study. Rest was given prolene mesh.
2. Informed written consent was taken from the patient only when they agreed for the study.

The mosquito net cloth was suitably cut in standard sizes and was autoclaved.

Regular follow up of the patients was done in surgery outdoor for a minimum period of one year.

Anaesthesia:

Inguinal hernia repair was performed under spinal anaesthesia.

Operative Steps:

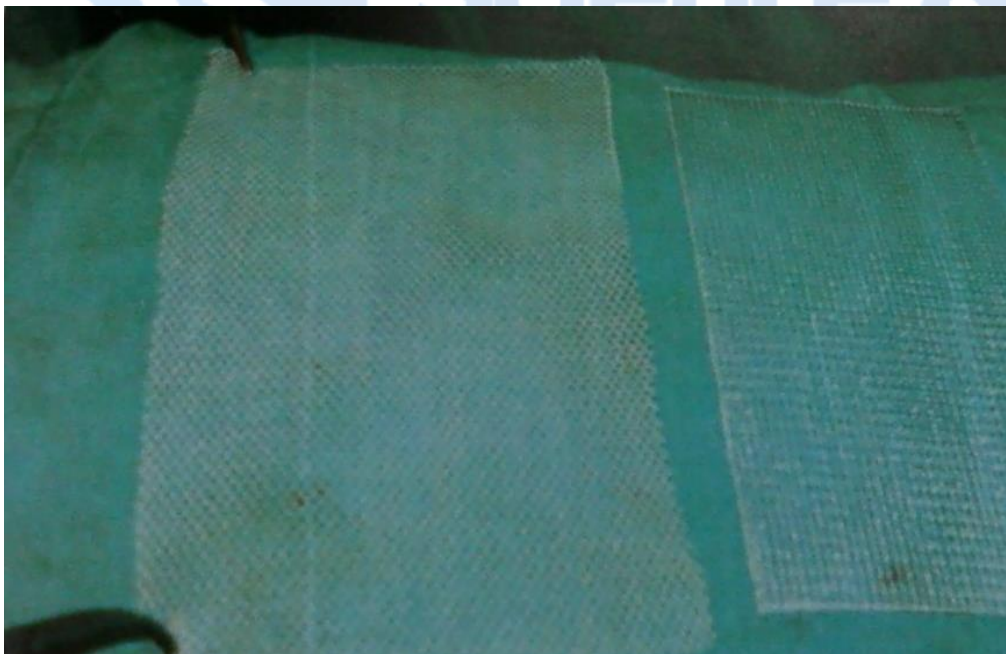
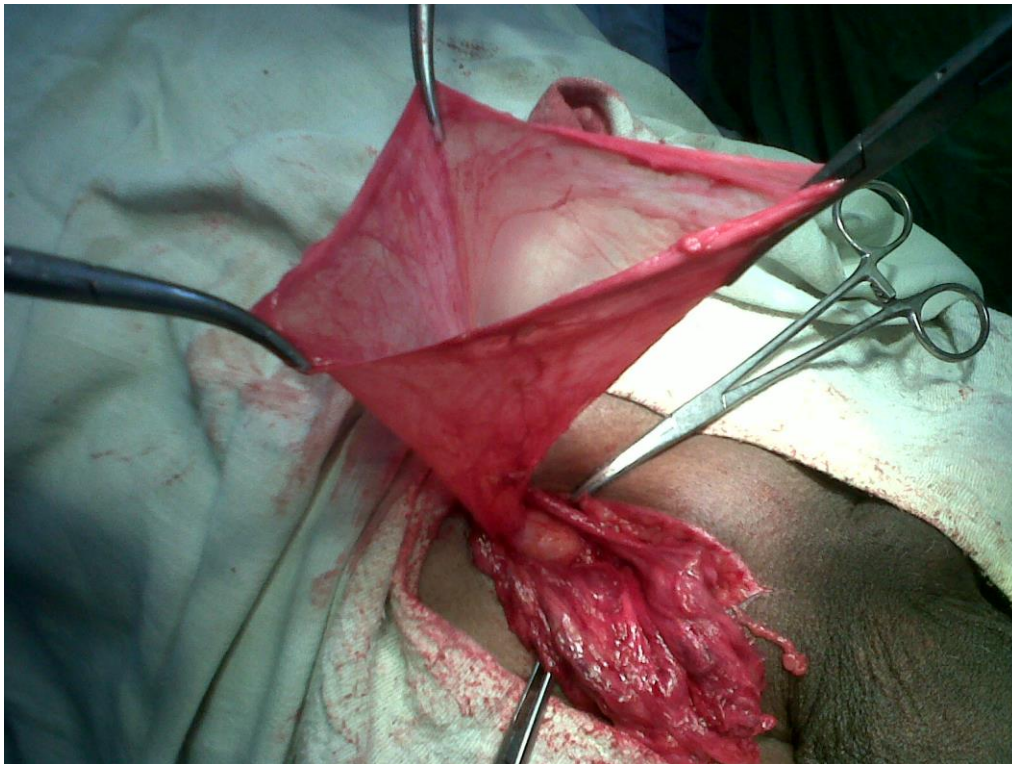
Preoperative Injection Augmentin (amoxicillin+clavulanic acid) (1.2 gm) IV (after proper skin test) were given at the time of induction of anesthesia to patients.

Inguinal Hernia Repair:

After anesthesia was complete, skin incision was given, and external oblique aponeurosis exposed. The external oblique aponeurosis is incised and the cord structure isolated. The hernial sac in case of indirect inguinal hernia was mobilized to the level of internal ring, transfixed and divided. At this point a mesh tailored to fit along the inguinal canal floor was placed, so that the curved end directly lies on top of the pubic tubercle. An incision was made on the mesh so that the cord is inserted between the tails of the mesh thereby creating a new and tighter internal ring. The tails were sutured together with non-absorbable suture (polypropylene) just proximal to the attachment of cord. The mesh was sutured with non-absorbable (polypropylene) interrupted fashion to the pubic tubercle inferiorly, conjoined tendon medially and inguinal ligament laterally.

The external oblique aponeurosis was closed with absorbable suture (polyglactin) and a new external ring is made. Skin incision was then closed with non-absorbable suture. Antiseptic dressing was applied.

Exposure of Hernail Sac in Inguinal Hernia Repair:



Pictures Showing Mosquito Net Mesh and Polypropylene Mesh

POST OPERATIVE MANAGEMENT

a) Mild pain:

This required 1-2 doses of injection diclofenac sodium in a day for the first 24 hours. This was changed to oral diclofenac (50 mg) twice a day.

b) Moderate pain:

It required at least 3 doses of injection diclofenac sodium for the first 48 hours. After 48 hours it required 1-2 doses of injection diclofenac along with oral paracetamol.

c) Severe pain:

This requires at least 3 doses of injection diclofenac sodium along with 1-2 doses of injection tramadol for the first 48 hours.

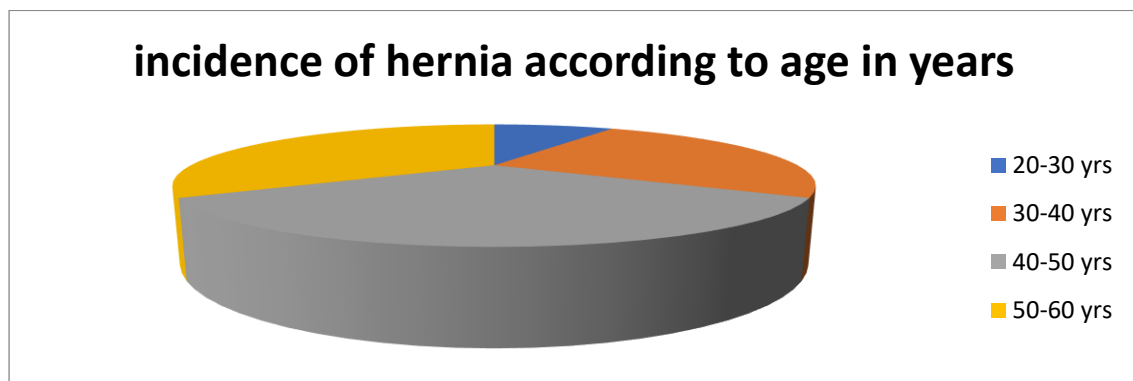
All the patients were given an oral analgesic and anti-inflammatory drug for 4-5 days. Appropriate antibiotic coverage was given.

Intravenous fluid was omitted in the evening and the patients were made ambulatory in the morning after surgery.

The first change of dressing was done after 48 hours after the operation in a strict aseptic manner to look for early post operative complications like seroma and hematoma. Skin stitches were removed on 7th post operative day.

The patients were advised to come for follow up after 2 weeks, 4 weeks, 3 months, 6 months and after 1 year of discharge. The patients were also advised to attend outdoor in case of any complications arose at any time between the scheduled dates for follow up. During follow up the patients were thoroughly examined for minor complications like stitch abscess etc., or major complications like recurrence.

RESULTS

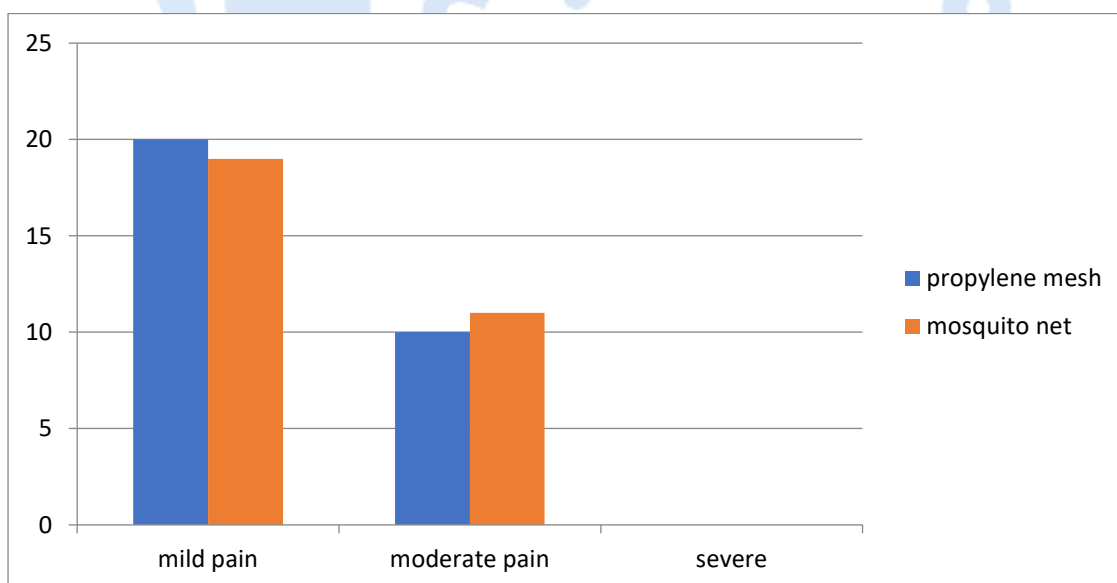


Type of inguinal hernia on clinical examination:

Types	No. of patients
Direct inguinal hernia	28
Indirect Inguinal hernia	32
Total	60

Type of inguinal hernia on per operative finding:

Types	No. of patients
Direct inguinal hernia	26
Indirect Inguinal hernia	30
Pantaloon hernia	4
Total	60



Severity of post operative pain in polypropylene mesh and mosquito net mesh hernia repair:**PAIN ASSOCIATED WITH MESH (Cross tabulation)**

Count

		MESH		Total
		mosquito net mesh	polypropylene mesh	
PAIN	mild	19	20	39
	moderate	11	10	21
Total		30	30	60

Chi-Square Tests

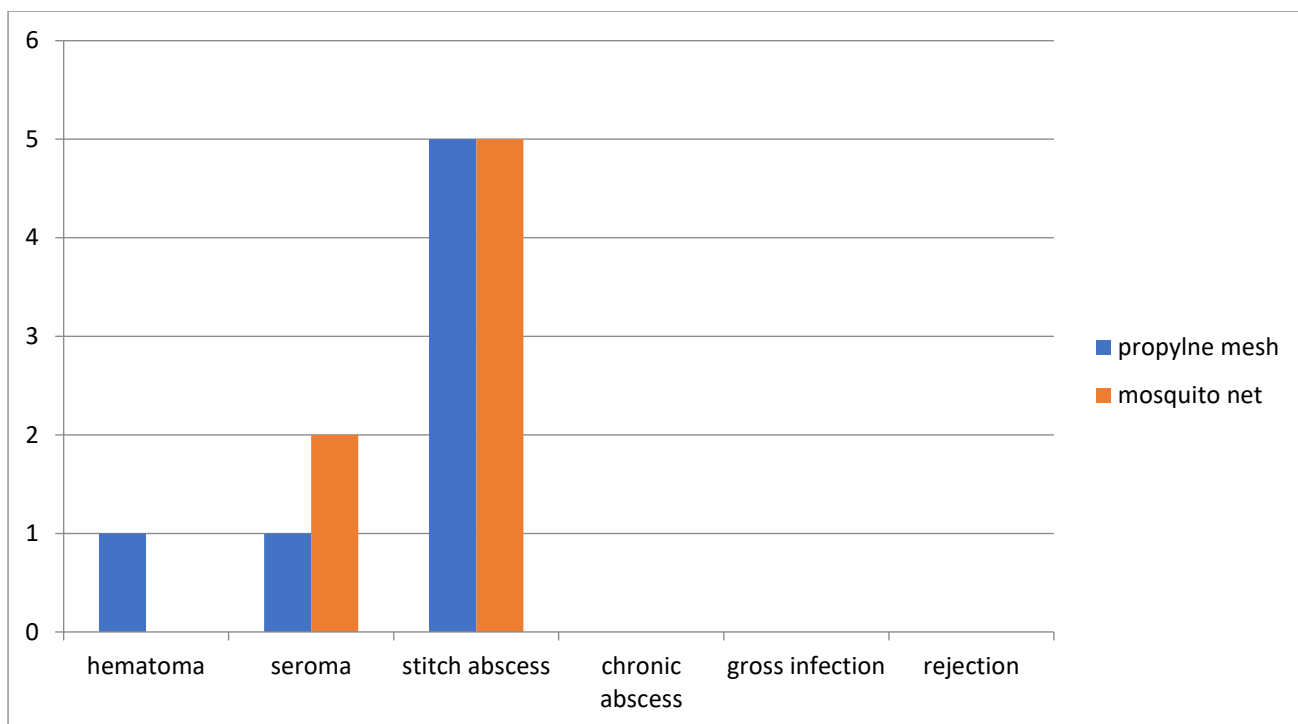
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.073(b)	1	.787
Continuity Correction(a)	.000	1	1.000
Likelihood Ratio	.073	1	.787
Fisher's Exact Test			
Linear-by-Linear Association	.072(c)	1	.788
N of Valid Cases	60		

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.50.

c. The standardized statistic is -.268.

Conclusion: $p > 0.05$ there is no significant difference in the severity of post operative pain with regard to mosquito net mesh and polypropylene mesh.



Post operative complications of poly propylene mesh and mosquito net mesh in hernia repair:

Complications associated with mesh:

Count

		MESH1		Total
		mosquito mesh	net polypropylene mesh	
complication	hermatoma	0	1	1
	seroma	2	1	3
	stitch abscess	5	5	10
Total		7	7	14

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	1.333(a)	2	.513	1.000
Likelihood Ratio	1.726	2	.422	1.000
Fisher's Exact Test	1.360			1.000
Linear-by-Linear Association	.178(b)	1	.673	1.000
N of Valid Cases	14			

Conclusion:

Based on Fishers's Exact test $p > 0.05$

There is no association between post operative complication and mesh type.

ANALYSIS

1. Incidence of hernia was more in the age group between 40- 60 years.
2. There is no significant difference with regard to post operative pain following hernia repair with mosquito net and polypropylene mesh.
3. There is no association between post operative complications and the type of mesh used for hernia repair.
4. Post operative complications following hernia repair was minor which included hematoma, seroma, and stitch abscess.
5. The hematoma required drainage and secondary stitch.
6. Seroma and stitch abscess resolved with antibiotics and regular dressing.
7. There were no cases of chronic infection or gross infection, recurrence, or rejection of mesh within a period of 1 year.
8. Most of the inguinal hernia patients returned to their normal activity within 1 week.

9. Patients were advised to avoid strenuous activity for a period of 6-8 weeks.

DISCUSSION

Hernia is a disease that has been known to mankind since ancient times. The earliest of groin hernia dates to 1500 BC. Various primitive procedures and trusses were enumerated by various physicians. Some of the physician like Celsus, Paul of Aegina and Guy de Chauliac described operative procedure for hernia repair.

It was Edorado Bassini of Italy who in late 19th century successfully described the operation for hernia repair with a very low recurrence and hence is regarded as the father of modern herniorrhaphy. Bassini's technique is considered a milestone in hernia repair.

The various techniques that can be used to repair groin hernia are:

1. Pure tissue repairs: like Shouldice operation, the Berliner approach, the Cooper ligament repair, the Wilkinsons and the Lichtenstein's classical pure tissue repair.
2. Darn repair: the Abrahamson Nylon darn repair.
3. Mixed tissue/ prosthesis repairs: The Lichtenstein plastic screen reinforcement, Gilbert tissue/ prosthetic repair.
4. Pure prosthetic repair: The Lichtenstein tension free repair.

The 'tension free repair' has become the dominant method of inguinal hernia repair. Recognizing that tension in a repair is the principal cause of recurrence, common practices in hernia management employ synthetic mesh prosthesis to bridge the defect, a concept first popularized by Lichtenstein.

Mesh repair of hernia is simple top perform, gives excellent results with recurrence rate of 1-2 %, low complication rates and early return to normal activity.

A variety of synthetic materials are available. Polypropylene has been used extensively and allows for in growth of native fibroblasts and incorporation into the surrounding fascia

But polypropylene meshes are costly. The polypropylene mesh commonly used for groin hernia repair costs around Rs.1200 to Rs.3000 or more. The cost becomes a huge factor for most of

the patients in underdeveloped and developing countries So this research was carried out to search for a cheap but effective material for hernia repair.

The present study was carried out to assess the acceptability of mosquito net as a synthetic mesh for hernia repair. This test was carried out at General Surgery Department of M.R.Bangur Hospital, Tollygunge. Total of 60 patients were chosen from age group 20-60 years.

Sex incidence:

In this study 57 were male patients and 3 were female patients.

Presenting symptoms:

The patients presented with complaints of abnormal swelling in the groin region which increased on lifting heavy weight and reduced on lying down.

Investigations:

All patients were admitted through General Surgery outpatient department. In all these patients' blood hemogram, sugar profile, renal profile, chest X-ray, ECG and USG (if required) were done. In chest X-ray 4 patients had emphysematous lung, out of these 2 had COPD. 10 patients were diabetic and were on anti-diabetic medicine. 20 patients had hypertension for which they were taking medications.

Operative findings:

The kind of inguinal hernia was noted after dissection. All variety of pantaloon hernia was diagnosed as indirect hernia on clinical examination.

Repair:

Out of 60 patients, 30 patients were given polypropylene mesh and the remaining 30 patients given mosquito net mesh.

Post operative complications:

In case of poly propylene mesh repair there was one case of hematoma which required drainage and secondary stitch. Besides that, there was 1 case of seroma and 5 cases of stitch abscess which resolved with proper medications.

In case of mosquito net mesh repair there was no case of hematoma, but there was case of seroma and stitch abscess which resolved with proper medications.

There was no case of gross infection, rejection, or recurrence within a period of 1 year.

The polypropylene mesh used for hernioplasty is synthetic pliable biologically inert and nontoxic. It does not undergo fragmentation. The other most important physical property is its melting point which is 335 deg Celsius and its softening point is 140 deg Celsius. Thus, it can be autoclaved easily. But the disadvantage is its price.

Composition and other properties of mosquito net cloth:

Report from the Automotive Research Association of India (ARAI) based in Pune.

1. Material under test is low density polyethylene.
2. Melting peak temperature is 122 degrees Celsius.
3. Breaking load in Newton (on 25 mm width sample) is 126.
4. Tensile strength is 225 Kg/cm².
5. Monofilament.

The material used in our study was easily autoclaved and thus can be used safely.

It maintained its strength and quality even after autoclaving.

Thus, by using a good quality mosquito net mesh in hernia repair, one can achieve almost equally good results as compared to that of polypropylene mesh and with almost negligible cost which is a boom for underdeveloped and developing countries.

CONCLUSION

So, it can be concluded that Polyester mosquito net mesh represents a cost-effective alternative to hernia repair in underdeveloped and developing countries, with short term complications like those of polypropylene mesh hernia repair.

Although initially there were difficulties in handling mosquito net mesh during hernia repair, but this problem was overcome successfully after doing 4-5 cases of hernia repair using mosquito net.

However, there is a need for further studies and longer-term outcomes before the widespread use of polyester mosquito net mesh can be recommended for use in hernia repair. But till date all of the studies done, showed that if this mosquito net could be properly sterilized, they could be used by surgeons in underdeveloped and developing countries to facilitate a tension-free hernia repair technique, with potentially lower recurrence rates. However focused training of local surgeons in both the technique and handling properties of each material would enhance this further.

RECOMMENDATIONS

1. Minor complications like hematoma could be avoided by using diathermy for achieving near complete hemostasis before closure of the wound.
2. Proper strict asepsis should be maintained to decrease the rate of stitch abscess.

Due to unfamiliarity with the mesh, it was initially difficult in handling the mesh which was overcome after 4-5 surgeries and following these few tips:

- 1) Cutting the mesh to a larger size than with standard commercial meshes.
- 2) Greater overlap at the repair margins, as well as bigger bites for each suture.

ACKNOWLEDGEMENTS

- 1) Dr. Kamal Krishna Maiti. (M.B.B.S, MS (SURGERY))
- 2) Dr. Asis Banerjee (M.B.B.S, MS (SURGERY))
- 3) Dr. Asim Chakraborty (M.B.B.S, MS (SURGERY))

- 4) Dr. Avijit Roy (M.B.B.S, MD (PSM))

CONFLICT OF INTEREST

There is no conflict of interest associated with this study.

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