

Mosquito Net: A Cost Effective Alternative to Prolene Mesh for Inguinal Hernia Repair

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Abstract

Context: Hernioplasty with use of synthetic mesh is the gold standard for Inguinal hernia repair. However high cost of synthetic mesh is the limiting factor for its use in poor resource countries. This is a study of use of mosquito net as a cheaper alternative to synthetic Prolene mesh for inguinal hernia repair. **Aims:** To study safety, efficacy and cost effectiveness of Mosquito Net as compared to Prolene mesh. **Settings and Design:** Comparative study by random selection, between Mosquito net and Prolene mesh for Inguinal hernia repair with 100 patients in each group. All patients underwent Lichtensteins Tension free Repair under Spinal Anaesthesia **Methods and Material:** Comparative study between Mosquito net and Prolene mesh was done in terms of sterilization, complications and cost effectiveness. **Statistical analysis used:** Proportionate test to compare Complication rate. **Results:** Out of 200 Inguinal hernia repairs done, Mosquito net was used in 100 patients and Prolene mesh in 100 patients. Sterilization was done by Routine Autoclave which did not change the properties of mosquito net. The complication rate of Mosquito net group was negligible and comparable to Prolene mesh. Also, Mosquito net is 5000 times cheaper than Prolene mesh. **Conclusions:** Mosquito net is a safe, easy to sterilize and cost effective alternative to synthetic Prolene mesh in poor resource countries.

Keywords: Mosquito Net; Prolene Mesh; Inguinal Hernia.

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Introduction

Tension free mesh repair is gold standard for Open Inguinal hernia surgery [1,2]. For hernia repair, Prolene mesh is widely used synthetic mesh [1]. The exorbitant cost of prolene mesh is limiting factor for its use [3,4,5]. To overcome this, many cheaper alternatives have been studied. Indigenous mosquito net is one of the cheapest and easily available alternative for prolene mesh. The main concern is its safety and efficacy. To study the safety, efficacy and cost effectiveness of mosquito net as compared to prolene mesh, we have studied factors like sterilization, complications and cost respectively.

Subjects and Methods

The study was conducted over a period of 2 years. It included 200 patients of inguinal hernia which were randomly selected. Out of 200 patients for hernia repair, we used prolene mesh in 100 patients and indigenous mosquito net in 100 patients. The age group of patients was from 20-80 years with mean age 50 years. Maximum number of patients belonged to the age group of 45 to 60 years. Out of 200 patients, there were 199 male patients and only one female patient. With random selection method, Mosquito net was used in 100 male patients. Prolene mesh was used in 99 male patients and 1 female patient. We have used commercially available Prolene mesh which is presterilized with ETO. Locally available Mosquito net sterilized by routine autoclave was used.

Composition and other properties of the mosquito net (the manufacturers Bangalore Mono Filaments Pvt. Ltd.)

a. The Fabric is made out of high density polyethylene.

- b. Melting index – 190° C/Q.16 kg – 1.gm/0 mt.
- c. Tensile strength 225 Kg/cm²
- d. Monofilament.

Material was cut into size of approximately 7.5 x 15 cm and then sterilized by routine autoclave at 121°C for 20 minutes. Standard technique of tension free posterior wall repair was used for both mosquito net and prolene mesh repair.

In our study, we have considered bilateral inguinal hernia as a single entity. In Prolene mesh group, 69% cases had indirect inguinal hernia and in Mosquito net group, 65% cases had indirect inguinal hernia. This indicates that indirect hernia is more common than direct hernia (Table 1).

In our study, 44.5% cases had Right Indirect hernia and 13% cases had Right Direct hernia while 22.5% had Left Indirect hernia and 6.5% had Left Direct Hernia. This indicates that Right sided Indirect inguinal hernia is more common (Table 2).

All patients underwent Lichtenstiens Tension free Repair for inguinal hernia under Spinal Anaesthesia, performed by a single surgeon.

Postoperative Complications like Seroma formation, Wound infection, Wound gape and Removal of mesh were compared. Follow up of each patient was done for 6 months. Recurrence rate within this period for both the materials was studied.

We have also compared the cost factor for a mesh of size 7.5 x15 cm , used in both groups. Local Ethical committee approval was taken and Written informed

consent was taken from the patients so each patient was aware of the new material being used for surgery. (Figure 1 and 2).

Results

Out of 200 patients operated for inguinal hernia , we used prolene mesh in 100 patients and mosquito net for 100 patients. The mosquito net was easily available. It was sterilized with routine autoclave at 121°C for 20 minutes and used. The physical properties of mosquito net i.e. size of mesh and pliability , did not change after autoclave. The complication rate and recurrence rate between prolene mesh and mosquito net was compared. (Table 3).

Statistical analysis was done by using Proportionate test. Seroma formation as a complication was seen in 3% cases of prolene mesh repair and 4% cases of mosquito net repair with p value = 0.70 which is statistically not significant. Superficial wound gape was seen in 1% cases of Mosquito net repair and not seen in prolene mesh repair, p value is 0.31 which is statistically not significant. The complication rate was found to be similar in both the groups and negligible considering the total number of patients. Though there were 4 patients of post operative seroma formation and 1 patient of postoperative wound infection in mosquito net group, it was managed successfully with conservative treatment. In both groups there is not a single case of deep wound gape or mesh removal. Postoperative Follow up of all patients was done for 6

Table 1:

	Prolene mesh	Mosquito net	Total
Direct	21	18	39
Indirect	69	65	134
Bilateral	09	15	24
Recurrent	01	02	3
Total	100	100	200

Table 2:

	Prolene mesh		Total	Mosquito net		Total
	Right	Left		Right	Left	
Indirect	46	23	69	43	22	65
Direct	15	6	21	11	7	18
Recurrent	01	00	01	1	1	02

Table 3:

Complications	Prolene	Mosquito	p value
Seroma	3	4	0.70
Sup. Wound gape	0	1	0.31
Deep wound gape	0	0	-
Removal of Mesh	0	0	-
Recurrence in 6 months	0	0	-

Table 4: Comparison of cost of prolene and mosquito net

Mesh	Size	Cost (in Rupees)	Cost comparison with mosquito net
Braun (Prolene mesh)	7.5 x 15 cm	1800	4500 times cheaper
Ethicon(Prolene mesh)	7.6 x 15 cm	1958	4895 times cheaper
Mosquito net	7.5 x 15 cm	3.94	-----

months. Within the period of 6 months, there was not as single case of recurrence in any of the group. The tremendous difference in the cost of both materials proves cost effectiveness of mosquito net (Table 4). Mosquito net is almost 5000 times cheaper than prolene mesh.

Discussion

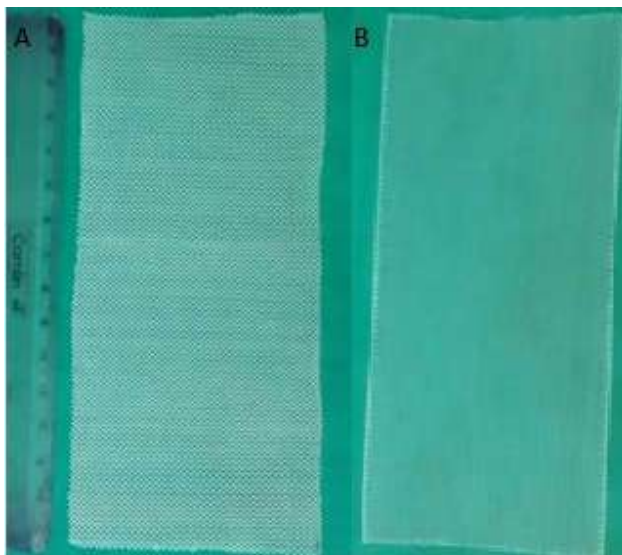


Fig. 1: A. Mosquito net (7.5 x 15 cm) . B. Prolene mesh



Fig. 2: A. Indirect inguinal hernia, B. Sac opened, C. Mosquito net fixation at Pubic tubercle, D. Mosquito net placement for posterior wall repair

Hernia disease is one of the most fundamental problems within the area of surgical needs [6]. Repair of hernia is the commonest surgery performed in all hospitals, inguinal hernia repair accounting for 10-20% of operations in general surgery [3,4].

Although there are many variants of hernia repair, the standard principle of reinforcement of the posterior wall, has not changed over the period 100 years. Conventional open repair relies on the suture line to close the hernial defect. But its major drawback is hernia recurrence, commonly the reason for 10 to 15% of reoperations. The previous methods of repairs are largely been replaced by methods using a synthetic mesh. Use of synthetic mesh reduces recurrence to less than 5% [2,7].

Today, the Gold standard for mesh repair is Liechtenstein’s Tension free hernioplasty. All over the world, most commonly used synthetic mesh for hernioplasty is Prolene mesh. But its high cost is a limiting factor for its use in the low socioeconomic group. In these settings, commercial mesh are unaffordable so patients have to either live with hernia and its complications or undergo herniorrhaphy with the risk of recurrence [4]. The solution to employ cheaper alternatives to commercial mesh to meet the overwhelming need and reduce economic burden of healthcare system will have significant advantage to the patients [2,6,8]. The search for effective technique, easily reproducible with low cost material is an aim to pursue [6].

Various other alternative materials like polyester cloth and mosquito net ,used for repair of hernias, have been studied in different resource limited settings. These are cost effective, easily available, inert and having properties similar to that of the prolene mesh.

A number of studies have examined the use of locally available sterilized mosquito net for hernia repair as an cheaper alterantive to commercial mesh [2,3,6,7-10]. Many previous studies have shown promising results with respect to tissue reaction, outcome and cost effectiveness [2,3,4,7,9].

Here, we have done a comparative study between prolene mesh and indigenous mosquito net for tension free inguinal hernia repair. The prolene mesh is made of polypropylene. The mosquito net is made of polyethylene. The use of both materials has been well established in clinical practice since 1958 and they have been found to be safe. Mosquito net belongs to the same category of material as prolene mesh so naturally has the same

Table 5: Comparison with various other studies

Study	n	Sterilization	Surgical site infection	Seroma	Scrotalodema/hematoma	Meshrejection/removal	Recurrence
Tongaokar	713	Autoclave	0.9%	0.1%	0.3%	0%	0%
Alberto Kiss et al	70	NA	0%	-	4%	0%	0%
Jenny Lofgren et al	151	NA	2.8%	0.7%	24.5%	0%	0.7%
Felix et al	130	Autoclave	4.61%	-	7.69%	0%	0%
Anil Darokar et al	37	ETO	0%	5.41%	0%	0%	2.7%
M.G.Clarke et al	96	Autoclave	2%	-	5%	0%	0%
Shillcut et al	113	NA	1%	-	4.4%	0%	0%
Our study	200	Autoclave	1% (M)	1% (P)	-	0%	0%
P- Prolene			0% (P)	4% (M)			
M- Mosquito net							

properties, strength and inertness required as a suitable biomaterial.

Suitability for Sterilization by Autoclaving

Autoclave is the safest and easily available method of sterilization for mosquito net. In majority hospitals in developing countries, only simple vertical sterilizers are available where temperature never exceeds 121°C [11]. The melting temperature of mosquito net is found to be 144-159°C. In any type of autoclave the temperature does not go above 132°C. Therefore, the mosquito net can be easily sterilized by any method of autoclaving which guarantees its sterilization. Autoclaving of the material does not hamper the property of material i.e. size and pliability

The net is made of monofilament fibers so unlike multifilament and braided materials it is less likely or unlikely to harbor bacteria. Therefore there is hardly any chance of infection due to the mosquito net which is also same for prolene mesh.

Few studies have shown that it can be steam sterilized by autoclave without any consequence like plasticization or shrinkage. Also physical properties are not altered by autoclave and it remains pliable and easy to handle [2,7,12].

Complications

Out of 100 patient, where prolene mesh was used, there was not a single case of rejection of mesh and all wounds healed well. In Prolene mesh group, there is evidence of seroma formation in 3 patients and it was managed conservatively. In mosquito net group, there was seroma formation in 4 patients and 1 patient had superficial wound gape. These cases were also managed conservatively. In all cases wound healed completely at postoperative day 14. There was not a single case of deep wound infection.

Out of 100 patients, where mosquito net is used there was not a single case of rejection of mesh or mesh

removal. We have done follow up of patients for 6 months. There is no recurrence in both studies.

Cost Effectiveness

Prolene mesh is used for inguinal hernia repair all over the world but its high cost is not suitable for the poor people. So various other alternative materials are used for repair of hernias like polyester cloth and mosquito net which are cost effective, easily available, inert. Major problems come in view of cost effectiveness of material. As cost of the prolene mesh used in repair of inguinal hernia is 3000 to 5000 times more than the costs of the mosquito net used in repair of the same inguinal hernia.

The cost of prolene mesh makes it a limiting factor for its use [1,5,13]. These findings are similar to the findings with trial of cheap indigeneous mosquito net for tension free hernia repair done by Dr. Tongaokar [14].

To prove the efficacy of mosquito net, the complications after use of mosquito net are studied by various groups [1,2,5,13].

The complication rate in different studies is comparable to that of high cost synthetic mesh. there is no recurrence in both groups over a period of 6 months [1,5,15] (Table 5).

Conclusion

Use of mosquito net is very cost effective and safe making it a humanitarian and economical solution. The application of mosquito net in Inguinal hernia surgery is another example of inexpensive technology which could meet an overwhelming need in Healthcare system with Limited resources. Thus, it is a safe, efficient and cost effective alternative to prolene mesh.

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