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Research Article

Study of open inguinal hernia repair by mosquito net mesh versus polypropylene mesh

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ABSTRACT

Background: Inguinal hernia is one of the commonest medical problems and treatment with Lichtenstein repair using polypropylene mesh is considered as gold standard. In developing countries, cost of the prosthesis is a significant factor in health care delivery.
Methods: A clinical trial of 73 patients of inguinal hernia operated by Lichtenstein tension free technique from 1st January 2013 to 31st December 2014 was undertaken to evaluate the safety, complications and recurrence rate using Mosquito Net Mesh (MNM) and compared the cost benefit with conventional standard polypropylene mesh. 37 patients were operated with ETO sterilized MNM of size 7.5 cm by 15 cm whereas 36 patients were operated with commercial Polypropylene mesh of same size. The mean follow up of the patients was 20 months.
Results: The rate of hematoma formation was 0% and 0%, serous discharge was 5.41% and 11.11%, which resolved with conservative treatment in 3-5 days, seroma formation was 0% and 0%, superficial and deep infection was 0% and 0%, chronic pain was 2.70% and 2.77%, which was tolerable not requiring any treatment, and recurrence was 2.70% and 0% with MNM mesh and polypropylene mesh respectively. The cost benefit was 40%-50% of the total cost of the repair using MNM.
Conclusions: ETO sterilized MNM is a safe and very cost effective alternative to commercial mesh.

Keywords: Inguinal hernia, Mesh repair, Hernioplasty, Mosquito net mesh

INTRODUCTION

Inquinal herniorrhaphy is the most frequently performed abdominal operation accounting for 10-15 % of operations of General surgery.[1] Lichtenstein, in 1987, theorized that by using a mesh prosthesis to bridge the hernia defect, rather than to close it with sutures as with the Bassini and its modifications, tension is avoided. This ostensibly results in a less painful operation and a reduced incidence of suture pulling out, thus leading to lower recurrence rate.[2,3] Today, the gold standard of hernia repair in western countries is represented by the use of polypropylene meshes as prosthesis.[4] A Lichtenstein type of operation has now become the method of choice in most developed nations of the world, especially in the USA. In the developing world, the traditional Bassini operation is still being performed in most centers due largely to the scarcity and expensive nature of the commercial prosthetic mesh.[1]

Indian surgeons Reddy B.V. and Tongaonkar must be credited for popularizing the novel concept of using Mosquito Net Mesh (MNM) in open inguinal hernia repair in India. Similar studies using MNM have been conducted in parts of Africa[5] and have endorsed the use of locally available MNM as an effective alternative. Experimental studies on mice have documented that implanted pieces of mosquito net cloths, made of polyester, in tissues, are able to create an inflammatory

reaction, comparable to the reaction created by the most sophisticated polypropylene meshes.[6]

This is a clinical trial with MNM and conventional Polypropylene mesh in open inguinal hernia by Lichtenstein tension free repair.

The objective of the present study is to evaluate the safety, complications and recurrence rate of Lichtenstein tension free repair using MNM and compare the cost benefit with conventional standard mesh repair.

METHODS

Patients admitted to Dr. P.D.M.M. College and Hospital, for elective/ emergency open inguinal hernia mesh repair from 1st January 2013 to 31st December 2014 were randomly divided into two groups.

Type of study design - Randomized clinical trial

Group A: The study group was subjected to MNM repair using 15cm x 7.5 cm ETO sterilized mesh.

Group B: The control group underwent hernia repair using standard polypropylene mesh of size 15cm x 7.5cm.

The technique used in both groups was the same.

The criteria for inclusion were

a) Unilateral or bilateral inguinal hernia.
b) Direct or indirect hernia.
c) Primary hernia.
d) Reducible or irreducible hernia.

The exclusion criteria were

a) Patients not willing for MNM.
b) Strangulated hernia resulting in bowel resection.
c) Recurrent hernia.

Informed written consent was taken from all patients specifying differences between MNM and Polypropylene mesh. The surgical procedure was done under spinal anesthesia.

This study was carried out in Department of Surgery, Dr. Panjabrao Deshmukh memorial medical college, Shivaji Nagar, Amravati, Pin- 444604, Maharashtra, India.

Patients were followed in surgical clinic at 1st month, 6th month, 1st year and each year thereafter to see complications and recurrence.

Statistical analysis

Chi square and Fischer exact test were used to see the differences in two groups.

Anesthesia and technique protocol

Premedication was done by Inj. Midazolam 2.5mg + Inj. Ranitidine 50mg + Inj. Ondansetron 4mg.

Spinal anesthesia – Spinal anesthesia was given using 25G Topcon needle at L3-L4 or L4-L5 level with patient in lateral position. Drugs used were 0.5% hyperbaric bupivacaine (15mg) + Inj. Buprenorphine (0.15mg) or Inj. Clonidine (50 micrograms).

Antibiotic protocol

Each patient was given single dose of Inj. Amoxicillin-clavulanic acid 1.2 gms IV before induction of anesthesia.

Analgesia protocol

After surgery Inj. Diclofenac aqueous (75 mg) I.M. was given depending upon pain severity on demand of the patient.

Tab Paracetamol 500 mg + Ibuprofen 600 mg was given for 48 to 96 hours as a matter of routine.

RESULTS

Table 1: Distribution of age and hernia type.

No. of patients	Total (73)	Group A (37)	Group B (36)
Mean age	54.47 years (19yrs-84yrs)	55.64 years (32yrs-83yrs)	53.05 years (19yrs-84yrs)
Right hernia	40 (54.79%)	16 (21.92%)	24 (32.88%)
Left hernia	28 (38.36%)	18 (24.66%)	10 (13.70%)
Bilateral hernia	5 (6.85%)	3 (4.11%)	2 (2.74%)
Reducible	55 (75.34%)	32 (43.83%)	23 (31.51%)
Obstructed	18 (24.66%)	5 (6.85%)	13 (17.81%)
Obstructed reduced by taxis	10 (13.70%)	3 (4.11%)	7 (9.59%)
Obstructed hernia not needing resection	8 (10.96%)	2 (2.74%)	6 (8.22%)

A total of 73 patients were operated during the study period. 37 patients were in group A (MNM) whereas 36 patients were in group B (Polypropylene mesh).55 patients (75.34 %) had reducible hernia while 18 (24.66%) were obstructed but not strangulated. All patients were male. Their age ranged from 19-84 years

(mean age 54.47 years). 8 (10.96%) patients underwent emergency surgery.

Table 2: Symptoms duration.

Symptoms duration	Group A (37)	Group B (36)
0 – 12 Months	12 (32.43%)	23 (63.89%)
13 – 24 Months	10 (27.03%)	5 (13.89%)
25 – 36 Months	4 (10.81%)	1 (2.78%)
37 – 48 Months	1 (2.70%)	(0.00%)
>48 Months	10 (27.03%)	7 (19.44%)

Chi square = 8.44; p value = 0.07

The observed differences are not statistically significant.

12 (32.43%) patients in group A and 23 (63.89%) patients in group B presented with inguinal swelling within 1 year.

10 (27.03%) patients in group A and 7 (19.44%) patients in group B presented with inguinal swelling after 4 years.

Table 3: Associated diseases and co-morbid conditions.

	Group A (37)	Group B (36)	p value
Hypertension	5 (13.51%)	8 (22.22%)	0.33
Diabetes mellitus	0 (0.00%)	1 (2.78%)	0.24
COPD	11 (29.73%)	8 (22.22%)	0.32
IHD	18 (48.65%)	12 (33.33%)	0.09
Weak anterior abdominal wall	20 (54.04%)	21 (58.33%)	0.35
Hydrocele	0 (0.00%)	2 (5.56%)	0.07
Lipoma of the cord	1 (2.70%)	2 (5.56%)	0.26

Table 4: Average cost of mesh during study period.

Brand	Cost of the mesh size 7.5 cms by 15cms.
Prolene (J&J) hernia mesh kit	Rs. 1958
Centennial	Rs. 1088
Trulene sutures (India)	Rs. 1191
Bard	Rs. 1440
Lotus	Rs. 1546
Mosquito Net Mesh	Rs. 40

Table 5: Doses of antibiotics received.

Doses	MNM (Group A) 37 patients	Polypropylene (Group B) 36 patients
1	36	34
4	1	1
8	0	1

Inj. Amoxcillin clavulanic acid 1.2 gms I.V.; Chi square = 1.04; p value = 0.59

The observed difference is not statistically significant.

Additional doses of antibiotics were given to the patients operated in emergency, depending on intra-operative findings.

Table 6: Doses of analgesics received.

Doses	MNM (Group A) 37 patients	Polypropylene (Group B) 36 patients
0	16 (43.24%)	16 (44.44%)
1	13 (35.14%)	9 (25.00%)
2	8 (21.62%)	11(30.56%)

Inj. Diclofenac aqueous 75mg I.M. was the analgesic given depending upon the pain severity and patient's demand.

Chi square = 1.187
p value = 0.55

The observed values are not statistically significant.

Table 7: Post operative complications.

Complications	MNM (Group A) 37 patients	Polypropylene (Group B) 36 patients
Retention of urine		
a) Emergency surgery	0 (2 patients)	4 (6 patients)
b) Elective surgery	0	0
Hematoma	0	0
Serous discharge	2 (5.41%)	4 (11.11%)
Seroma formation	0	0
Infection		
a) Superficial	0	0
b) Deep	0	0
Stitch abscess	0	9
Chronic pain	1(2.70%)	1 (2.77%)
Recurrence	1 (2.70%)	0
Mesh rejection	0	0

The incidence of hematoma formation, seroma formation, superficial and deep infection in Group A and Group B was 0%.

The incidence of serous discharge in group A was 2 (5.41%) whereas in group B it was 4 (11.11%) which resolved in 3-5 days with conservative treatment.

The incidence of chronic pain in Group A was 1(2.70%) and Group B was 1(2.77%). Pain was tolerable and analgesics were not needed.

The incidence of recurrence in MNM group was 1(2.70%) and in Polypropylene mesh group was 0%.

DISCUSSION

Inguinal hernia surgery is one of the most commonly performed surgeries the world over. There is almost unanimity regarding the efficacy of tension free mesh repair of the posterior wall of inguinal canal by Lichtenstein and Schulman's method of open inguinal hernia repair. It is easy to perform and has very low recurrence[7-9] and complication rates. Early return to activity with minimum pain and discomfort is the norm.

In the present study follow up period was between 7months to 30 months with a mean of 20 months. Both the groups were statistically comparable with age of presentation, symptoms duration, associated diseases and co-morbid conditions.

The incidence of hematoma formation in Group A and Group B was 0%. The incidence of serous discharge in MNM group was 2 (5.41%) whereas in polypropylene mesh group was 4 (11.11%) which resolved in 3-5 days with conservative treatment. The incidence of seroma formation was 0% in both the groups. The incidence of superficial and deep infection in both the groups was 0%.The incidence of chronic pain in Group A was 1(2.70%) and Group B was 1(2.77%). It was tolerable and pain relieving drugs were not needed.

The incidence of recurrence in MNM group was 1(2.70%) and in Polypropylene mesh group was 0%. In Lichtenstein series, the recurrence rate was <1% to 5%.[7-9]

In a series of 130 patients operated with MNM by Felix OO et al.[10]

The incidence of scrotal hematoma was 7.69%; superficial wound infection was 4.61 and no recurrence in 6 months of follow up.

Shillcutt SD et al[11] using the sterilized MNM recorded 4.4% of hematoma and 1.7% of wound infection that resolved with conservative treatment while working on 124 patients.

Kiss A et al[12] in a study of 70 patients treated with MNM, had 4% hematoma of the surgical scar, 3% incidence of superficial infection and 30 days follow up showed no major infection or rejection.

Even when compared with Lichtenstein repair, done with commercial prosthetic mesh in developed countries e.g. Scotland, 7% of their patients developed hematoma within 3 months after surgery[13] and 5-8% of the patients developed wound infections despite antibiotic prophylaxis.[2,13,14,15]

The clinical effectiveness of this material for hernioplasty is not in doubt. Also in a randomized double blind study in Burkina Faso, Freudenberg S et al[16] had shown that there was no significant difference in the short term clinical outcome of hernia treatment or surgeon's comfort in handling the MNM and the commercial mesh prosthesis.

Furthermore, Tongaonkar RR et al[17] has shown in their 10 year experience of using the mosquito net prosthesis in hernia that the mesh has a long term safety and efficacy, provided it is adequately sterilized.

The commercially available mesh used in Lichtenstein repair is costly. Cost of the commercial mesh ranges from Rs. 1088 to Rs 1546. Mesh cost constitutes 40% to 50% of the total hernia repair expenses, considering our study hospital provides services for free except for the medicines required (Table 4). Cost of repair would be substantially reduced by using MNM.

In this study doses of analgesics, post operative complications like retention of urine, hematoma formation, serous discharge, seroma formation, superficial and deep infection, stitch abscess, chronic pain, recurrence and mesh rejection in both the groups are comparable.

Overall results of this study are comparable with other series.

CONCLUSION

This study has shown that ETO sterilized MNM is a very cost effective alternative to the commercial mesh. Also the MNM has proven low complication rate, acceptable recurrence rate and a good safety profile. More widespread multi-centric use of MNM will be able to reduce the health care budget significantly considering the volume of hernia repair surgeries.

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