

Tension-free inguinal hernia repair comparing 'darn' with 'mesh': A prospective randomized controlled clinical trial

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ABSTRACT

Background: Tension-free inguinal hernioplasty is sine-qua-non for a good hernia repair and is aptly fulfilled by both Lichtenstein's mesh and a correctly done Abrahamson's darn. Aims: This study compares the increasingly popular, yet costly, Lichtenstein's mesh repair with the classical Abrahamson's darn repair for inguinal hernia. **Materials and Methods:** A randomized, bias-free study was conducted on 240 patients with blinding adopted during the computation of results. All 240 patients, underwent 240 repairs after being randomized into 2 groups. 120 repairs were done with prolene mesh secured with 2-0 prolene sutures, while the other 120 patients underwent a 3-layered darn repair using 1-0 prolene sutures over a 2-0 prolene posterior bed. Duration of surgery and ergonomics were noted for each case. **Results:** The operative time was comparable (mean of 38 min for the darn group and 36 min for the mesh group), ($P > 0.5$; insignificant), using Fisher's exact 't' test being > 0.5 and hence insignificant. Postoperative complications were minimal in both series. Both groups recorded no recurrences till date. However, darning scored better than mesh when cost of the mesh and darn sutures were compared, other factors being similar. **Conclusion:** Mesh repair is definitely the more popular version of the two but in countries where cost factors still play a part and prevent many from seeking early treatment, a well constructed darn is an equally effective and less costly treatment option for inguinal hernias.

Key words: Abrahamson's darn, inguinal hernia, Lichtenstein's mesh repair, polypropylene sutures

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INTRODUCTION

Inguinal hernia repair, which accounts for 10-15% of all surgical procedures^[1] is doomed to failure unless rendered free of tension. Both Lichtenstein's technique of mesh repair and Abrahamson's technique of triple layered darn adopt the finer tricks of the trade, which include adequate dissection, perfect suture material selection and a meticulously performed tension-free repair.^[2]

The present study was conducted in a

developing country in which the socio-economic background makes cost a factor which prevents a substantial number of cases from seeking treatment before they develop some major complications. The two techniques were compared with respect to operative time taken, postoperative complications, recurrence rates and above all cost-benefit factors.

MATERIALS AND METHODS

This study was carried out in Central Hospital, L. W. O, Ministry of Labour, Govt. of India, Tarapur, Murshidabad, West Bengal from the period of January 2001 to January 2003. A total of 300 hernia patients were enrolled for the study but 60 bilateral cases were excluded. Hence, 240 patients in the age range of 18-76

years and presenting with 240 nonobstructive inguinal hernias were randomized into 2 groups of 120 each. 220 of them were primary hernias and 20 cases were recurrent hernias.

Inclusion criteria: Only patients with unilateral inguinal hernias (240), which were nonobstructive, reducible and either primary or recurrent were included in the study.

Exclusion criteria: All patients who had bilateral inguinal hernias (60) or presented with complications of inguinal hernia, i.e., obstruction, strangulation etc., were excluded from the study.

All patients had to have their clinical chemistry parameters like routine blood, blood sugar, serum urea /creatinine, chest X-ray, ECG and vitals checked and within normal limits to get clearance for surgery.

Patient selection bias was eliminated by strictly sticking to only the inclusion criteria; each patient being declared eligible for the study by three doctors separately.

All patients were randomized into two groups according to the technique listed in the sealed envelopes drawn from a closed box. The total number of envelopes was equal to the total number of operation theater (OT) patients for that day. Half of the envelopes were for the "darn" procedure and the other half for mesh.

The repair procedures were explained to all patients and duly signed, informed consent was obtained from them.

All patients received a single dose of Inj. cefuroxime 750 mg at the onset of anaesthesia and all of them were operated using a triple point, inguinal field block technique. Local anaesthesia consisted of 1% lignocaine with adrenaline mixture (20-30 ml in each case).

A skin crease approach following Langer's line was adopted in all cases. The incision was deepened, tackling subcutaneous neuro-vascular structures as usual till the external oblique aponeurosis was reached. The resulting slit was about an inch above the inguinal ligament, which provided a large lower leaf for optimal closure. A gentle sweeping action with the index finger under the aponeurosis helps to open this plane widely for an adequate darn or mesh insertion. The cremasteric fascia was always incised which helped mobilize the cord structures properly. A direct sac was always pushed back and the fascia transversalis repaired with 2-0 loosely wound continuous prolene sutures. An indirect sac on the other hand was opened only if it was deemed necessary, in which case it was transected at its neck and set free without ligating it and

the fascia transversalis repaired with 2-0 continuous prolene sutures.

In the "mesh" group, a sheet of polypropylene mesh (11 x 6 cm) was trimmed to fit the adequately dissected out space, with a slit cut laterally to accommodate the spermatic cord. The mesh overlapped the pubic tubercle by 1-2 cm medially and superiorly extended over the conjoint tendon to lie 2-3 cm lateral to the internal ring. The mesh was then fixed in position by continuous 2-0 prolene sutures starting along the internal surface of the inguinal ligament infero-medially and continuing laterally as far as the incision would allow. Three to four interrupted stitches helped fix the mesh superiorly. The two tails were now overlapped lateral to the internal ring and secured by two to three interrupted sutures making sure that the cord was not constricted.

In the "darn" group, a 1-0 monofilament prolene suture was used to reconstruct the inguinal bed with a tension-free darn starting with a good strong bite off the tough tendinous structures near the pubic tubercle and emerging out through the lateral edge of the rectus sheath with a bulky bite in between. The loosely interwoven bites continued laterally and the back-forming two to three rows of continuous stitches were placed in a staggered manner to spread the tension between the fibres of the inguinal ligament. The recurrence hotspot, "the critical medial angle", was repaired meticulously in each case. The Aberdeen knot was used to avoid a thick prolene knot at the end. A gap of 0.5-1 cm was maintained between the stitches to obtain a closely knit darn.

In both the groups, having checked for haemostasis meticulously and after replacing the safeguarded iliohypogastric nerve and the cord structures, the external oblique aponeurosis was closed with 2-0 continuous prolene sutures. The skin was apposed using 3-0 simple interrupted mersilk sutures.

Operative time taken from skin incision to skin closure was recorded in all cases of both groups.

Patients of both groups were routinely given oral analgesics, which they were advised to continue for 72 h into the postoperative period. All patients were observed for 4-6 hours and were discharged only when they emptied their bladders and felt comfortable and confident with themselves. Only a few had to be detained overnight. The emergency communication protocol was explained to all patients and necessary advice given to all on discharge.

The first reviews on the patients of both groups were carried out on the 7th postoperative day. Detailed records were kept concerning their pain profile, return to

normal activities and early postoperative complications in the form of superficial surgical site infections, wound gape, scrotal indurations, testicular atrophy, neuralgia, mesh/darn infection requiring withdrawal and recurrence. Stitches were removed on the 7th post-operative day for all save those who experienced early wound complications.

Patients were followed up at 1, 3, 6, 9, 12 and 18 months postoperation and evaluated for any residual complications and recurrences.

Statistical analysis was performed using the "T" test and 'exact Fisher analysis'. 95% confidence intervals were maintained and standard deviation, risk ratio, odds ratio and 'p' probability were calculated.

RESULTS

Patient details:

All patients in the study were males.

Only unilateral cases were taken up for the study.

There were 120 patients in each group, details of whom are tabulated in Table 1.

All 240 patients were operated under local anaesthesia using 1% lignocaine with adrenaline, 20-30 ml being used as part of a triple point inguinal field block technique in each case.

The duration of surgery from incision to closure for the 'mesh' series ranged from 30-40 min (mean -36.25 min), mean eq: 0.302, while that for the 'darn' series ranged from 35-42 mins (mean -38.00 min), mean eq: 0.317. The difference between the means was 0.0146 with 95% confidence intervals of $0.1024 < \text{diff} < 0.1315$ (Wald). The difference in operative time between the two groups was statistically insignificant ($P=0.596$, i.e., >0.05) using the T-test. The risk ratio (RR) (p1/p2) was 1.05 and its 95% confidence interval was $0.7182 < R.R < 1.5301$. Using the exact Fisher test ($P=0.107$),

the *P* value for the same or a stronger association being 0.44.

The postoperative courses for both groups were largely uneventful and were followed up meticulously. For ease of presentation, the postoperative course of both series is tabulated in Table 2.

It may be noted that the differences in the postoperative events between the two groups as shown in Table 2 were statistically insignificant and may best be regarded as chance occurrences.

15 patients in the 'mesh' group and 10 patients in the 'darn' group suffered some form of minor surgical site infection and minor complications described in Table 3. A superficial incisional variety of surgical site infections (SSIs), i.e., involving only skin and subcutaneous tissues was recorded twice as much in the 'mesh' group as compared to the 'darn' group, but was statistically insignificant. It is worthwhile to note here that the 'mesh' group had ten sedentary workers who were the ones who had to be goaded for early ambulation and seven of them suffered from superficial site skin infections. Major complications and recurrences were not recorded till date in any of the 240 patients [Table 3].

All patients in our series were regularly followed-up 1, 3, 6, 9, 12 and 18 months postoperation. Follow-up records dealt mainly with any residual complications and recurrences and were taken by trained OT staff. None of the patients have been lost in follow-up till date. Median follow-up in each group was 38 months (24-58 months).

The suture material cost per patient in the 'darn' series was Rs. 250-350, while that recorded for per patient in the 'mesh' series was Rs. 1900-2100. Keeping all other expenditures constant, the cost-effectiveness of the darn technique over the mesh is evident.

Table 1: Baseline characteristics of patients in the two groups

Clinical details	'Mesh' group	'Darn' group
Median age (range)	38 (18-70)	40 (18-76)
Hernia types:		
Direct: indirect		
Right: left	100:20	68:52
	98:22	60:60
Manual labourers:	110:10	120:00
Sedentary workers		

Table 2: Post-operative course in the two groups

Postoperative course	Mesh' group	Darn' group
Discharged on 1 st day: 2 nd day	115:05 (due to urinary retention)	120:00
Average duration of pain	2 days	2 days
Return to baseline activities	6 days (average)	5 days (average)
Return to heavy manual work	28 days (average)	22 days (average)

DISCUSSION

As a primary outcome in our series, we recorded no recurrences till date for both the 'darn' and 'mesh' group. Complication rates in both groups were very minimal as evident from Table 3. However what stands out in the study is the comparable outcome achieved with the darn procedure at such nominal operative costs when compared with mesh (Rs. 250-350 / patient for the Darn material; Rs. 1900-2100 / patient for mesh). This cost

Table 3: Complications in the two groups

Complications	'Mesh' group	'Darn' group
Superficial type surgical site infections	10 (12%)	5 (6%)
Deep incisional surgical site infections	0	0
Wound gape	0	0
Neuralgia	0	0
Scrotal indurations	5 (6%)	5 (6%)
Testicular atrophy	0	0
Mesh/darn infection	0	0
Recurrences	0	0

effective aspect of the darn (direct benefits), places it at a more favorable position than mesh among the lower socio-economic classes. A sizeable proportion of inguinal hernia patients from the lower socio-economic strata avoid operative treatment only to report with complications thereby increasing morbidity / mortality rates. Thus they end up having reduced quality-adjusted life years {QALY} and being less productive to their employers and society at large (indirect benefits).^[3] The strengths of the study lie in the clarity of its study design, the neatly tackled patient selection bias and randomization and blinding to accurately record the outcomes. In our opinion, our only limitation is the absence of a truly long follow-up period, i.e., 10-15 years. All our patients are still under surveillance and we hope to come up with detailed long-term follow-up results. Moloney^[4] achieved recurrence rates as low as 0.8% with inguinal darn repair, way back in 1958. Abrahamson^[5] was the first to point out the defects that could lead to high recurrence rates in darn repair. His series of > 1000 repairs reported in 1995 recorded recurrence rates as low as 0.8%.^[6] Lifschutz^[7] and Kingsnorth^[8] achieved similar results in recent times. Koukourou^[9] in 2001, compared the darn repair with mesh and reported no differences in early or late complications and achieved comparable recurrence rates. Kingsnorth in 1992 and Thapar^[10] in 2000 had already achieved better results with the darn technique in comparison with Shouldice's technique.

Operative time recorded in our trial was not only comparable but also better than the series' recorded in Table 4.

All patients were operated under local an aesthesia, thereby enhancing early ambulation, a reduction of

Table 4: Comparison of present study with work done in past

Series	Cases	Operative time
Moloney <i>et al</i> , 1958	645 Darns	45 mins.
Lifschutz and Juler, 1986	115 Darns	52 mins.
Thapar V <i>et al</i> , 2000	25:25 (Shouldice:Darn)	81 mins. Shouldice: Darn
Garg CP <i>et al</i> , 2004	30:30 (mesh), Suture: Staples	42.30:54 (mins) Staples: Suture
Present series	120:120 (Darn: mesh)	38.00:36 mins (Darn: Mesh)

operating time and early postoperative complications. This reduplicates results achieved by Kingsnorth *et al* in 1981^[11] and in 1992.^[8]

There were no major differences in the postoperative complications recorded between the two groups we studied. Only 12% of our mesh group recorded superficial surgical site infections in comparison with 6% in the darn group. Scrotal indurations recorded were 5% for both groups. Koukourou had recorded no differences in early or late complications. Qazi *et al*^[12] similarly recorded a postoperative infection incidence of 12% with darn and 8% with mesh repair. They however noted 6% scrotal hematomas in their darn repair group and 2% in their mesh group in contrast to our series, which recorded none. No case of nerve entrapment neuralgia was observed in our study.

There were no recurrences noted till date in any of the two groups under study. Our finding compare well with 0.8% recurrence rates of Moloney in 1958 and Abrahamson in 1997. More recently, Omer Farooq^[13] in 2005 reported 0.6% recurrence rates with darn repair. Mills^[14] in 1998 similarly recorded no recurrences with mesh repair.

CONCLUSIONS

Mesh repair for inguinal hernia is definitely the more popular version of the two but a well-constructed darn is equally effective and on the whole, a much less costly treatment option for inguinal hernias. We expect the young surgeons of our generation to appreciate the intricacies underlying a well-constructed darn or a well-placed mesh and tailor their treatment options likewise, making it both patient-friendly and cost effective. A mean 38 month follow-up period may not be adequate. The follow-up period has now increased to more than 60 months and no recurrences have as yet been recorded. A long-term study is desirable and is in progress to judge the efficacy of both the darn and mesh repair techniques in terms of recurrence and cost effectiveness.

REFERENCES

1. Ali M, Habiba U, Hussain A, Hadi G.. The outcome of darning method of inguinal hernia repair using polypropylene in a district general hospital. *J Postgrad Med* 42-5.
2. Amid PK, Shulman AG, Lichtenstein IL. A critical scrutiny of the open "tension-free" Hernioplasty. *Am J Surg* 1993;165:369-71.
3. Drummond MF, Jefferson TO. Guidelines for authors and peer reviewers of economic. *BMJ* 1996;313:275-83.
4. Moloney GE. Results of nylon darn repairs of hernia. *Lancet* 1958;1:273-8.
5. Abrahamson J. Factors and mechanisms leading to recurrence. *Probl Gen Surg* 1995;12:151-8.
6. Abrahamson J. Chapter on hernia, Maingot's Abdominal Operations, 10th International Edition. 2001. p. 503-6.
7. Lifschutz H, Juler GL. The inguinal darn. *Arch Surg* 1986;121:717-9.

8. Kingsnorth AN, Gray MR, Nott DM. Prospective randomized trial comparing the Shouldice technique and plication darn for inguinal hernia. *Br J Surg* 1992;79:1068-70.
9. Koukourou A, Lyon W, Rice J, Wattchow DA. Prospective randomized trial of polypropylene mesh compared with nylon darn in inguinal hernia repair. *Br J Surg* 2001;88:931-4.
10. Thapar V, Rao P, Deshpande A, Sanghavi B, Supe AN. Shouldice's herniorrhaphy versus Moloney's Darn herniorrhaphy in young patients (a prospective randomized study). *J Postgrad Med* 2000;46:9-12.
11. Kingsnorth AN, Britton BJ, Morris PJ. Recurrent inguinal hernia after local anaesthetic repair. *Br J Surg* 1981;68:273-5.
12. Qazi JA, Gulfam MA, Nawaid FK. Darning versus Prosthetic Mesh repair in cases of inguinal hernia. *Pak J Surg* 2005;21:72-5.
13. Farooq O, Batool Z, Bashir-ur-Rehman. Prolene Darn: Safe and effective method for primary inguinal hernia. *J Coll Physicians Surg Pak* 2005;15:358-61.
14. Mills IW, Mcdermot IM, Ratliff DA. Prospective randomized controlled trial to compare skin staples and polypropylene for securing the mesh in inguinal hernia repair. *Br J Surg* 1998;85:790-2.

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Announcement

Dr. J. C. Patel Birth Centenary Celebration Committee

The year 2008 is the Birth Centenary Year of Dr. J. C. Patel. Some of his students/admirers felt that it would be a good idea to celebrate this Centenary Year by organizing CMEs, Orations/Lectures, Conferences, etc. during the year. He was associated with many professional bodies, which meet regularly every year; during these annual meetings/ conferences, a lecture/symposium, etc can be organized as a part of Centenary celebrations. We would like to form a Dr. J. C. Patel Birth Centenary Celebrations Committee. All his past students/admirers are invited to join the committee (without any financial commitment). Kindly communicate your name, designation, postal address, telephone number and E-mail ID to Dr. B. C. Mehta at Flat 504, Prachi Society, Juhu-Versova Link Road, Andheri (w), Mumbai - 400 053 (drmehta.bc@gmail.com).