



Primary inguinal hernia repair utilizing the mesh 'plug' technique

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Received 4 April 1999; accepted 30 June 1999

Abstract

'Tension-free' mesh repairs, as popularised by Lichtenstein, are being used increasingly in the management of primary inguinal hernia. Introduced more recently, the mesh 'plug' technique may enhance further the benefits of such repairs. Twenty six males attending for unilateral, primary, inguinal hernia repair were randomised to have either a Lichtenstein 'patch' repair or to undergo a mesh 'plug' repair. Ease of technique and operating time were recorded. Patients were given a visual analogue pain-scoring sheet and were asked to record the number of analgesic tablets taken each post-operative day. Patients were reviewed in clinic at 1 and 6 weeks post-operatively, when they were asked their time to return to 'normal' activity and time to return to work. Any post-operative complications were noted. The tension-free mesh 'plug' repair requires minimal tissue dissection, no herniotomy and is technically straightforward. Patients experienced less post-operative discomfort and returned to 'normality' more quickly. The results suggest that the mesh 'plug' technique has advantages over the Lichtenstein 'patch' repair. A larger trial of this technique should now be undertaken to confirm the results of our pilot study and to assess long term recurrence rates. © 2000 Elsevier Science B.V. All rights reserved.

Keywords: Inguinal hernia repair; Mesh plug; Lichtenstein repair

1. Introduction

Inguinal hernia repair remains one of the most commonly performed operations worldwide. In the USA, more than 700 000 operations are performed for primary groin hernias and over 50 000 for recurrent hernias each year [1]. In the UK, over 80 000 groin hernia operations are carried out each year [2,3]. Over the past decade, the mostly tension-free mesh 'patch' repair, popularised by Lichtenstein, has attracted many converts. It is said to promote a greater degree of patient comfort with a low recurrence rate approaching that of the 'gold standard' Shouldice repair [4]. Within a similar timeframe, there has been also a significant move towards Day Case surgery, with its perceived advantages of a patient's preference for an early return to the home environment, a reduced waiting list time and improved cost efficiencies [5].

Despite these 'advances', there remains still a significant dissatisfaction amongst patients undergoing inguinal hernia repair [6]. It still holds true that what is required is an operation of technical simplicity that has few complications, causes minimal discomfort and disability and has a low recurrence rate. Even with modern repair techniques and in a Day Surgery setting, it is recorded that some (15–40)% of patients have procedure-related complications or require post-operative reassurance from their general practitioners (or the hospital team) or overall, are disappointed or dissatisfied with their procedural outcome [6]. Most often, their main concern is a prolonged period of post-operative discomfort, with resultant time off work or an inability to return to their normal activities.

At present the mesh 'plug' technique for inguinal hernia repair is less well known in the UK. We thought it appropriate to assess this method of inguinal hernia repair within a randomised, controlled pilot trial, against the currently employed Lichtenstein 'patch' repair.

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2. Patients and methods

Twenty six male patients attending for unilateral, primary, inguinal hernia repair, who fulfilled the criteria for Day Surgery as laid down in the guidelines issued by the Royal College of Surgeons of England were studied [7,8]. Patients with recurrent inguinal hernia, those on warfarin, as well as those unable to complete the post-operative pain assessment sheet, were excluded from the study. Informed, written consent was obtained from each patient following a full explanation of the trial. The study was approved by the local Ethics Committee.

Patients were randomised to one of two groups; Group A — the new mesh ‘plug’ repair (PerFix[®] Plug, Bard Ltd, UK; Fig. 1), or Group B — the currently employed Lichtenstein ‘patch’ repair. The study was carried out in the Day Surgery Unit of the Middlesex Hospital, London.

The PerFix[®] Plug was used. Its fluted outside layer, combined with its internal configuration of (eight) mesh petals, maintains its overall shape and prevents it collapsing in on itself. The fluted design (in extra-large, large, medium and small sizes) allows the plug to fit easily different shapes of defect, with the opened petal-end facing outwards from within the deep inguinal ring or beneath the transversalis fascia.

All patients were operated upon by either one consultant or two senior registrars and anaesthetised by one of two anaesthetists (a consultant or a senior registrar). Prior to operation, the purpose of the trial was explained to the patient and informed consent obtained. Patients were provided with a standard visual analogue pain-scoring sheet for post-operative use and were instructed as to its use.

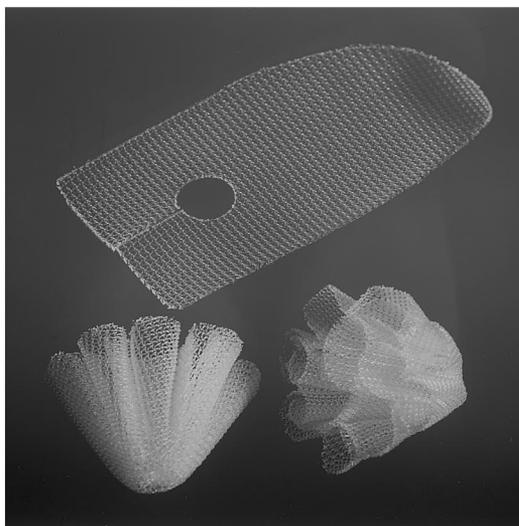


Fig. 1. The PerFix[®] plug (Bard Ltd.) and onlay patch for inguinal hernia repair.

Patients received a standard general anaesthetic, without pre-medication. Immediate post-operative analgesia was with a single 100 mg diclofenac suppository given per-operatively (with separate pre-operative consent). All patients received a single dose of antibiotic intravenously at induction of anaesthesia (1.5 g cefuroxime).

For those patients entered into Group A (the mesh ‘plug’ repair), the operation was performed as described by Rutkow and Robbins [1]. The inguinal canal was opened in standard fashion keeping tissue dissection to a minimum. For an indirect hernia, the cremaster muscle was split longitudinally. The indirect sac was dissected free, to well inside the deep inguinal ring and then reduced en masse. Herniotomy was not undertaken routinely. A PerFix plug was inserted, tapered end first, through the deep inguinal ring and positioned beneath the crura of the muscle fibers. The PerFix plug was next secured to the crura of the deep inguinal ring with two or three interrupted, absorbable sutures. With a direct hernia, the sac was dissected free and the base of the sac circumscribed to create an opening into the pre-peritoneal plane where the plug was sited following invagination of the sac and its contents. The plug was then inserted tapered-end first through the transversalis defect and secured to the edges of the defect using three or four interrupted, absorbable sutures. The ‘velcro-like’ reaction of the PerFix plug to the surrounding tissues helps to hold the plug in position.

We opted to add an onlay patch of mesh as practised by Rutkow and Robbins, although this is not considered an integral part of the mesh ‘plug’ technique. This patch was simply laid in position covering the transversalis fascia and not sutured. The on-lay patch is included within the package in which the PerFix plug comes.

For those patients entered into Group B (the Lichtenstein ‘patch’ repair), the hernia sac was dissected free. In the event of an indirect hernia, the sac was transfixed at its base with an absorbable suture and excised. In the event of a direct hernia, the sac was pushed back ‘en masse’ and the transversalis fascia plicated with an absorbable suture. In both situations a piece of prolene mesh was cut to size and placed over the transversalis fascia, around the cord structures and sutured into place with a 2/0 prolene stitch.

In all patients, the wound layers were closed with absorbable sutures. Bupivacaine (20 mls, 0.5% without adrenaline) was used along the wound edges and to block the ilio-inguinal nerve.

Patients were provided with a three-day supply of analgesic tablets (Co-proxamol) and instructions on whom to contact in the event of a complication or concern. Patients were reviewed in the outpatients’ clinic at 1 week and 6 weeks.

Table 1
Results of the mesh 'plug' repair compared with the Lichtenstein 'patch' repair

	Operating time (mins)	Ease of operation*	Return to work (days)	Return to normality (days)	Pain score**	Analgesia (no. of tablets)
Lichtenstein mean (+/-SD)	38 (7)	4.6 (2.1)	29 (18)	35 (12)	3.9 (1.8)	19 (10)
Mesh plug mean (+/-SD)	29 (6)	2.7 (0.9)	22 (13)	25 (11)	2.1 (1.5)	13 (9)
<i>P</i> value	0.01	0.02	0.4	0.04	0.01	0.15

* Score out of ten (zero being the easiest and ten the most difficult — by visual analogue scale).

** Score out of ten (zero being no pain and ten the worst pain experienced ever).

3. Analysis of data and statistics

In this study we compared the mesh 'plug' technique with the 'Lichtenstein' repair with respect to the following outcome measures:

1. The time taken to complete the repair (from initial skin incision to skin closure)
2. Per-operative comments made by the surgeon as to the technical ease of the operation
3. Initial post-operative comments made by the patients as to how they felt prior to them leaving the Day Surgery Unit
4. Pain scores and analgesic requirements during the first 7 post-operative days
5. Complications of surgery, e.g. haematoma formation, wound infection, etc. were recorded during the first 6 weeks following the procedure
6. At the second outpatient visit (at 6 weeks), a record was made of the time taken to return to 'normal' activities and/or work
7. A record as to whether the hospital staff or a general practitioner had been contacted

Statistical analysis was carried out using a two-tailed, unpaired, Student's *t*-test (non-parametric). Differences were considered significant if the *P* value was less than 0.05.

4. Results

Twenty six males with primary inguinal hernia were randomised to have either the standard Lichtenstein 'patch' repair or the PerFix® 'plug' repair (13 in each group) over a 6-month period. The mean age was similar in the two groups: for Group A, it was 52 years (range: 24–79 years) and for Group B, it was 44 years (range: 18–64 years). There were 15 patients with an indirect inguinal hernia and eleven patients with a direct inguinal hernia (confirmed at operation). The two types of hernias were approximately equally distributed between the two groups. There were 14 patients with a right inguinal hernia and 12 with a left inguinal hernia, with approximately equal distribution between the two groups.

The results are summarised in Table 1. There were significant differences in the operating time, technical ease of the operation, time to return to 'normal' activities and overall pain scores. Although patients who had the PerFix® 'plug' repair felt better earlier, we were not able to show a significant difference in the time taken to return to work. Unfortunately, no record was made as to whether patients were employed or 'self-employed'. The pain scores were significantly higher in the Lichtenstein patch group (*P* = 0.01), whereas the mean analgesic requirement was lower in the PerFix® 'plug' group, although the difference did not reach statistical significance.

All patients were discharged home from the Day Case Unit on the same day (except one from the Lichtenstein 'patch' group, who stayed overnight because of post-operative vomiting). When asked in the recovery room, prior to discharge, as to how they felt, all patients except one in the Lichtenstein 'patch' group (who required the admission overnight), either felt well with no pain or had minor discomfort only. One other patient from the Lichtenstein 'patch' group presented at the 1-week follow-up visit with a wound haematoma requiring evacuation under general anaesthesia. Two patients (one from each group) had seromas requiring no specific intervention. There were no wound infections noted in either group and no early recurrences were seen in either group at the 6 week follow-up visit. One patient from the Lichtenstein 'patch' group contacted his General Practitioner to obtain a further prescription for analgesia, while one patient from the mesh 'plug' group made an enquiry as to when to return to work.

5. Discussion

Bassini performed the first inguinal hernia repair in 1884 [9,10]. Using his technique, the recurrence rate remained at approximately 10% for many years and post-operative pain was often quite severe.

Surgeons at the Shouldice Hernia Clinic in Toronto, Canada, achieved very low recurrence rates with what

is currently the 'gold standard' technique (0.8% at 5 years in 78 000 cases) [11]. However, recurrence rates should perhaps not be considered the only criterion for comparison between different hernia repair techniques. The Shouldice technique is far from simple and, as with the Bassini repair, suffers from the problem of suture line tension and the approximation of normally unopposed tissues. The more extensive tissue dissection and the manner of repair required, may cause more post-operative pain and hence, a slower post-operative recovery. These aspects of the technique limit its popularity, despite the low recurrence rates, and often lead to 'short cut' variants in the method of repair.

The surgical profession has not accepted widely the new laparoscopic methods of mesh repair, with its use at present, limited to laparoscopic enthusiasts. In a prospective comparison, open tension-free 'plug' hernia repair was found to be superior to laparoscopic repair [12]. The laparoscopic repair is technically more difficult, has a lengthy 'learning curve' and is associated with more complications. In addition, the laparoscopic technique is costly and is driven by sponsoring industry rather than support from prospective, randomised, controlled studies [13]. Similarly, pre-peritoneal mesh repairs have not gained widespread acceptance.

The Lichtenstein repair is simpler technically than the Shouldice repair and in part, addresses the problem of suture line tension, while achieving a low recurrence rate — approaching that of the 'gold standard' Shouldice repair [4]. The use of a mesh 'plug' to repair a primary inguinal hernia is said to offer further advantages over the standard Lichtenstein repair. In fact, Lichtenstein and co-workers were the first to use the mesh 'plug' technique for hernia repair in 1974. They recommended the use of the plug for the repair of both femoral and recurrent inguinal hernias. In a large series of 1402 of recurrent inguinal hernias, followed-up for more than three years, they reported an impressively low recurrence rate of 1.6% [14–16].

The mesh 'plug' technique of primary inguinal hernia repair is completely tension-free, with the sphincter-like action of the internal ring and the 'flap-like' valve action of the inguinal canal being preserved. Dissection is kept to a minimum, and with no tissue-to-tissue approximation, post-operative discomfort is reduced hence speeding up the return to 'normal' activity. In the mesh 'plug' technique, the repair of an indirect inguinal hernia necessitates that the dissection is carried high up the internal ring in order to accommodate the plug.

Rutkow and Robbins are notable and strong advocates of the mesh 'plug' technique. Originally, they used a hand-rolled hernia plug, then developed a pre-formed mesh plug. In a preliminary report they compared their mesh 'plug' repair with a conventional sutured repair and concluded that minimal dissection and 'no tension' led to greater patient comfort, more

rapid rehabilitation, a low recurrence and minimal complications [17]. In a follow up report, they quoted a recurrence rate of 1% for primary inguinal hernias and 2% for recurrent inguinal hernias at 5 years [18,19].

In our small pilot study we compared the mesh 'plug' technique with the Lichtenstein repair. Our results suggest that the mesh 'plug' technique offers advantages over the Lichtenstein repair. The mesh 'plug' repair necessitates minimal dissection and is technically straightforward. Patients seemed to experience less post-operative discomfort and returned to 'normality' more quickly. We highlight therefore, the need for a larger trial of this technique, which should be undertaken to confirm the results of our pilot study and to assess further long term recurrence rate.

Acknowledgements

We thank the Theatre Staff at the Middlesex Hospital Day Surgery Unit for their co-operation and support. We wish to thank T.R. Cheatle, J.M.F. Clarke and J.F. Colin at the Norfolk and Norwich Hospital for their constructive criticism during the preparation of the manuscript.

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