

Tension-free mesh hernia repair: review of 1098 cases using local anaesthesia in a day unit

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The technical problems, early complications and short-term results of a tension-free method of 1098 inguinal hernia repairs in 1017 patients have been assessed.

The operation was conducted under local anaesthesia, and the inguinal canal floor was reinforced by a polypropylene mesh. Patients were discharged home the same day.

There was no mortality, no urinary complications and one case of venous thrombosis. There was one recurrence after a primary hernia repair and two patients have developed recurrences after repair of a recurrent hernia. The overall sepsis rate was 0.9% and 1% of patients had persistent neuralgia. No prosthesis required removal. In all, 49.6% of office workers returned to work in 1 week or less and 61% of manual workers in 2 weeks or less.

The major advantages of the tension-free mesh repair under local anaesthesia are simplicity, substantial cost savings and very low rates of complications.

Most inguinal hernias in the UK are repaired under general anaesthesia in hospital by a variation of either a darn or Bassini type repair (1,2). The principle of the Bassini operation, originally described at the end of the nineteenth century, is based on union between muscle and ligament, while a darn technique places a latticework of nylon over the defect. Both methods require some months of limited activity and avoidance of heavy physical exertion. A modification of this technique based on similar principles was reported from the Shouldice Clinic (3) and by others (4) with significantly better results.

In the last 15 years, a different concept of inguinal hernia repair has been developed by Lichtenstein using a synthetic mesh placed without tension over the floor of the inguinal canal (5–7). We report our experience using this technique for the repair of inguinal hernias at the British Hernia Centre, London, a day-care clinic specialising in hernia repairs of all types; and at this stage we can answer important questions about the method's safety, technical ease, early failures and early complications.

Materials and methods

A total of 1017 consecutive inguinal hernia patients have been analysed. The age range was 18–92 years, with 78% of patients between 30 and 70 years; 97.5% were men and 89% were primary hernias. Of the patients, 8% had bilateral hernias; of these 82 patients, 79 were repaired at the same sitting, two preferred separate sessions and one patient with persistent back pain also had the hernias repaired separately. Neither age alone nor co-existing illnesses (cardiac, respiratory, etc) were considered a contraindication to operation. The great majority of patients (98%) were treated on a day-case basis using local anaesthesia and these are the procedures under review.

General anaesthesia in hospital was reserved for patients (2%) who presented major technical problems, such as gross obesity or large irreducible inguinoscrotal hernias.

Those patients who travelled 50 miles or more were advised to stay in a local hotel for the first postoperative night. Patients over 65 years of age and any who had cardiac or respiratory illnesses were monitored during the operation by a consultant anaesthetist. Local anaesthesia was administered by a standard technique of inguinal nerve block and local infiltration using a mixture of 0.5%

Present appointments: In private practice

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lignocaine hydrochloride and 0.5% bupivacaine hydrochloride, both without adrenaline; this was supplemented by intravenous midazolam.

Operative technique

Primary hernias

Indirect sacs (56%) were transfixed and excised, or inverted if the anatomy dictated; direct sacs (37%) were inverted and the bulging posterior wall flattened by imbrication or a pursestring suture.

The repair was done using the Lichtenstein method, details of which have been fully documented (5–7). Briefly, the technique consists of covering the entire posterior wall of the inguinal canal with a polypropylene mesh placed without tension; the inferior edge of the mesh is attached to the inguinal ligament and the remainder of the mesh overlaps the floor of the inguinal canal by 1–2 cm medially over the pubic tubercle and superiorly over the conjoint tendon. A new internal ring is fashioned by splitting the lateral portion of the mesh, thus creating two tails which surround the emerging cord to create a snug unyielding opening. The external oblique and subcutaneous tissues are closed in routine fashion using absorbable sutures. We found this method applicable in all cases of primary inguinal hernias. Bilateral hernias (8%) were repaired at the same operation unless the patient preferred separate repairs or chronic back or hip discomfort prevented lying for longer than 1 h.

Recurrent hernias (11%, $n=108$)

Even after multiple previous operations, repair was invariably carried out under local anaesthesia. The majority (73%, $n=78$) occurred at the medial end of the inguinal canal where there was usually a small, clearly defined defect with rigid margins. If the defect was less than 2.5 cm, a tightly rolled plug of polypropylene was inserted and sutured in place. The cord structures were not dissected routinely thus minimising the risks of testicular complications.

In 27% ($n=29$) the recurrent defect was larger than 2.5 cm, occupying most of the floor of the inguinal canal. This required a more extensive dissection and the floor of the canal was repaired in the same way as primary hernias.

Three recurrences were missed indirect sacs and were dealt with in the same way as primary hernias.

Postoperative recovery

On completion of the operation patients walked to the recovery room assisted by a nurse, rested in a reclining chair for 1.5 h and were offered light refreshments. Patients were not discharged until they had emptied their bladders and they were always accompanied by a responsible adult who was fully informed of possible postoperative problems. They were provided with co-proxamol tablets and two diclofenac sodium suppositories to take home and given a postoperative instruction sheet

and the surgeon's 24 h paging number. A letter was sent to the general practitioner the same day, and a follow-up examination by the surgeon arranged for 3 weeks later. Each patient was telephoned the following day by a nurse and about 1 in 10 asked to speak to the surgeon; a further 10% of patients telephoned during the first week with questions regarding swelling of the wound or persistent pain. Of the patients, 98% attended for re-examination between 2 and 4 weeks later (the exception being those living abroad), and were asked to fill in a detailed questionnaire regarding intra- and postoperative experiences, with particular emphasis on postoperative pain and the time of resumption of normal activities. Of the patients, 95% reported that they felt relaxed during the operation.

Results

We report data on 1017 consecutive inguinal hernia patients who returned completed questionnaires. A further 86 patients did not return the questionnaires postoperatively, despite repeated telephone calls and letters. However, out of the total of 1103 patients, 98% had been seen at least once postoperatively. As we offer to repair any recurrence without further cost to the patient we believe that there would be few if any recurrences in this group. Nevertheless, we have excluded this group from our analysis. There was a minimum of 6 months' follow-up. There was no mortality.

Postoperative course (Table I)

Anterior thigh muscle weakness due to partial femoral nerve anaesthesia occurred in six patients. This was sought routinely when walking from the theatre; if present, patients were supported when walking until full strength returned, usually within 3 h.

Wound haematoma occurred in ten patients, four of which needed aspiration.

In 19 patients there was early postoperative testicular and cord swelling with minimal pain and tenderness. All resolved within 10 days. In addition, there were two cases of testicular atrophy, both occurring after repair of recurrent hernia, one after a third and one after a fourth repair.

Table I. Postoperative complications

	No.	%
1 Anterior thigh muscle weakness	6	0.60
2 Urinary retention	0	nil
3 Venous thrombosis	1	0.1
4 Haematoma	10	1.0
5 Testicular and cord swelling	19	1.9
6 Testicular atrophy	2	0.2
7 Infection—superficial	21	2.1
—deep	3	0.3
8 Persistent wound pain	10	1.0
9 Recurrences	1	0.1

Three categories of infection were observed: superficial localised redness or a pustule appeared in 15 cases with rapid subsidence within days; redness, pain and swelling of the wound occurred in six cases, all of which resolved with antimicrobial chemotherapy, co-amoxycylav; three patients developed an abscess. These discharged pus and resolved with drainage and antimicrobial chemotherapy. None resulted in a persistent sinus and no prosthesis required removal.

Postoperative pain (Fig. 1)

Of the patients, 21.3% required no pain killers after the first night; 59.2% took oral analgesia for 1-7 days (13.2% up to 3 days and 46% for 4-7 days). Thus, after 1 week 80% of patients required no further analgesia. The mean time for taking oral analgesia was 6.3 days (SD ±5.5 days). Patients over 50 years of age took analgesics for a mean of 5.8 days (SD ±5.5 days); those 50 years and under for a mean of 7.5 days (SD ±5.2 days).

Neuritic-type pain in the groin at any point from the anterior superior spine to the upper scrotum and thigh persisted in 10 patients. This was managed by local anaesthetic infiltration using bupivacaine hydrochloride 0.5%, repeated once if necessary. If this failed, a steroid (triamcinolone) was injected. Pain of this type persisted beyond a 6-month period in eight patients and gradually disappeared over the next 12 months.

Recurrences

There was only one recurrence after a primary hernia repair. This occurred in an 82-year-old man, and was noted at a follow-up visit at 5 months; it was asymptomatic and has not been re-explored. There were two recurrences that occurred in patients who had presented to us with multiple previous recurrences and which we had repaired with a polypropylene plug. In both cases, at re-exploration the plugs were found to have been too small for the defect and our subsequent repairs required both a larger plug and a mesh onlay.

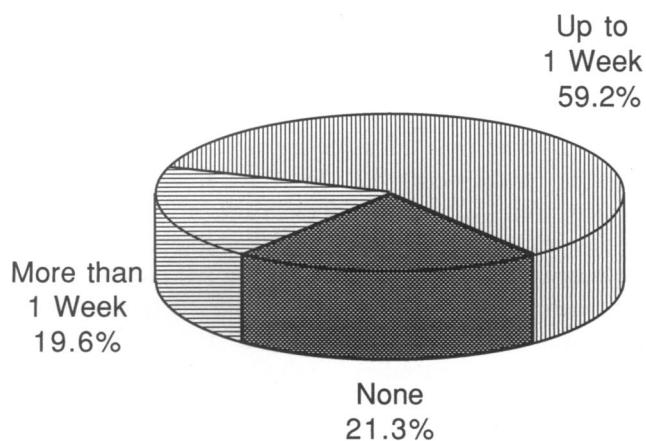


Figure 1. Postoperative pain.

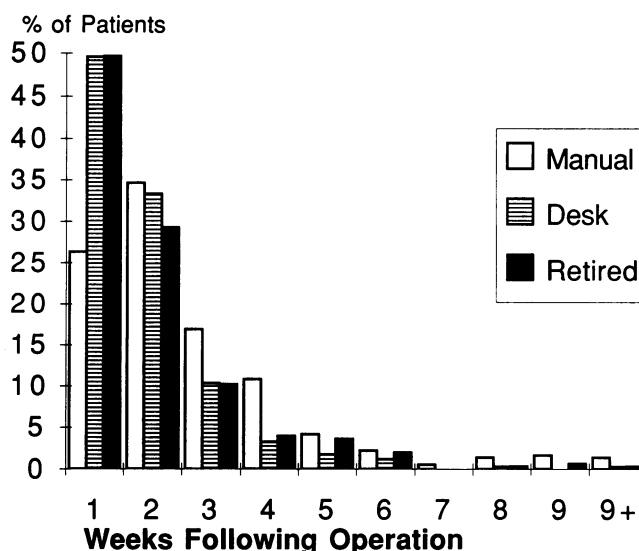


Figure 2. Return to work.

Return to work (Fig. 2)

Office workers (n=339) returned to work in a mean of 10 days (SD ±8.8 days), median 8 days, with 49.7% returning to work in 1 week or less. Manual workers (n=361) took a mean of 17 days (SD ±13.9 days), median time 14 days with 61% returning to work in 2 weeks or less. Retired patients (n=304) reported return to normal activities by a mean of 12 days (SD ±10.9 days), median 7 days.

Discussion

The methods and results of inguinal hernia repair have received increasing attention recently, both in the surgical world and in the lay press. This has been prompted by recognition of wide variations in technique and recurrence rates, and of significantly better results from specialised hernia centres abroad. This culminated in The Royal College of Surgeons of England's report on 'Clinical Guidelines on the Management of Groin Hernias in Adults' in 1992 (8).

The most widely used methods of primary inguinal hernia repair in British hospitals consist of a Bassini repair (2) which unites the conjoint tendon to the inguinal ligament or a darn (1) which places a latticework of nylon across the defect. These methods have a reported recurrence rate of between 5% and 15% (9) depending on whether the operation is performed by a single surgeon or by a group of surgeons and registrars of varying degrees of experience. These results, however, are invariably reported by surgeons with an interest in hernia repair and therefore the true recurrence rate in general hospitals is probably underestimated.

The results of the Shouldice method have demonstrated a considerably improved recurrence rate of 1-2% both in

Canada by Glassow (3) and in the UK by Devlin *et al.* (10) demonstrating what can be achieved by a specialist centre or unit practising a standard technique. The Shouldice technique has now become the standard against which to measure efficacy of hernia repair. Nevertheless, despite many reports of the superiority of this method over the Bassini type repair, the technique has not been widely adopted in the UK, only 20% of surgeons in a recent survey having adopted it (9). In reality, as Nyhus and Condon (11) have pointed out, the Shouldice technique is essentially a meticulous four-layer modification of the Bassini method and some, at least, of its success is derived both from the care necessary to define anatomic layers as well as personal expertise. We had practised the Shouldice technique for over 10 years with lower recurrence rates than previously with the darn method, but with the reservation that it was not always an easy technique, particularly in those with fat infiltrated tissues and poorly defined posterior walls. In these cases it was clear that the repair could only be completed as a conventional Bassini operation or by using some form of prosthesis.

Historically the use of a prosthesis to reinforce the posterior wall of the inguinal canal was first reported by McGavin in 1909 at the Greenwich Seamen's Hospital, London, who used silver filigree (12). He reasoned that it was unsatisfactory to attempt to create a strong barrier by suture alone in large, stretched, thinned-out posterior inguinal walls and that some degree of external reinforcement was necessary. Unfortunately, the filigree suffered stress fractures over the years and the successful application of prosthetic mesh had to await the introduction of an inert indestructible material such as polypropylene by Usher in 1964 (13).

Twenty years ago Lichtenstein challenged the concept of both the plication-darn technique and the Shouldice operation and later introduced a tension-free method of hernia repair for all inguinal hernias using a polypropylene prosthetic mesh which did not rely on muscle-tendon union (5,6,14). The long-term results of the Lichtenstein technique have been reported over the last 10 years, and in several recent series of over 10 000 cases have shown recurrence rates of 0.2% and infection rates of 0.03% (7,14,15).

Following a review of the literature and a number of visits to American and French hernia clinics we were persuaded that the tension-free technique using local anaesthesia provided a rational approach to inguinal hernia repair; the technique was also applicable to difficult large or recurrent hernias with results comparable with the Shouldice method and with a high degree of patient acceptance. We did not undertake a randomised, controlled trial, the accepted method of establishing superiority of one treatment method over another, as our first 100 hernia repairs using the Lichtenstein method confirmed that it was technically straightforward and had an extremely low incidence of immediate complications comparable with the reported Shouldice technique results. We therefore continued using this method.

There has been a general reluctance in the UK to use

mesh for uncomplicated primary hernia repair, based largely on the belief that infection is more likely when using a foreign body, and if it did occur it would be difficult or impossible to eradicate. The claim by Lichtenstein and others (7,14,16) that infection is extremely low (0.3%) and no more common than after standard Bassini type operations (1.3%) is confirmed in our series: there were 15 patients (1.5%) with superficial stitch pustules which resolved immediately after extrusion or removal of the offending subcuticular suture and there were 6 (0.6%) cases of deep infection—pain and induration which eventually resolved following oral antimicrobial chemotherapy. Three patients (0.3%) required drainage of pus by opening the original skin incision. Thus, the incidence of moderate and serious infection was 0.9%, though there was no long-term fistulous track or any necessity to remove a prosthesis.

In this series there were no cases of urinary retention, no pulmonary or cardiac complications and one deep venous thrombosis. We attribute this both to the improved immediate mobility afforded by a repair made without tension, and to the avoidance of general anaesthesia. The other considerable advantage of local anaesthesia to the surgeon is that intra-operative straining and coughing demonstrates the size of the defect and the adequacy of the repair. Weakness of the anterior thigh muscles occurred in six cases (0.6%); this has been reported previously with potentially serious consequences (16). It is probably due to local anaesthetic tracking along fascial planes, and recovery is complete within 6 h.

In all, 19 (1.9%) patients developed testicular tenderness and swelling of mild degree which subsided within 10 days, leaving a normal testis. We had two cases of testicular atrophy, both occurring after repair of recurrent hernias, one following a third and one a fourth time repair. Wantz (17,18) has produced convincing evidence that ischaemic orchitis after primary hernia repair is due to venous damage after extensive dissection of the cord and not to compression at the deep ring. We have avoided extensive cord dissection and divide large inguinoscrotal sacs in the canal; if the distal sac is adherent it is left open *in situ*. Testicular arterial damage may occur in association with the repair of recurrent hernias, when one or more of the three arterial supplies to the testis may already have been compromised by previous surgery (19,20). The mesh plug technique not only simplifies the repair of recurrent hernias but requires minimal cord mobilisation. In no case in this series was orchidectomy required.

The median time off work in two recent series was 45 days (21) and 7 weeks (22). In a third study, time off was reduced from 78 days in 1978 to 28 days in 1991 (23). Our median values were 8 days for desk workers and 14 days for manual work. The overall median (all patients) of 10 days demonstrates a considerable reduction in time off work after tension-free hernia repair. It could be argued that our patients attending a private clinic might to some degree be a self-selected group and therefore their motivation to return to activity and work may differ from an unselected group presenting to a district general

hospital of the NHS. Nevertheless, we feel that these periods may still be longer than required, being dictated more by patients' preconceived ideas and general practitioners' advice than by surgical necessity, as there is no evidence at all that limiting activity bears any relationship to later recurrence (20).

Both the darn and Bassini method are painful procedures and the deep suturing of muscle to ligament causes tension on muscular exertion, a major cause of postoperative disability. Using a tension-free method, both the intensity and duration of the pain is significantly less.

A median of 28 days was required for full return to more strenuous sports such as football and squash. It was felt important to stress in the letter to the general practitioner that the only physical activity to be avoided was driving until the pedals could be applied suddenly and comfortably usually by the 3rd or 4th day; and the earlier that muscle tone can be returned by walking, jogging and moderate exercise the more rapid the recovery.

The implications of day case treatment under local anaesthesia and early ambulation are considerable. The vast majority of patients, up to 98%, can return home the same day without incurring hospital bed costs. Advantages of the tension-free mesh repair include a rapid return to walking and normal household activities which is encouraging to the patient. This technique also allows early return to work, especially for manual workers in industry and the self-employed who are motivated to do so. However, the ultimate test of a hernia repair must be the long-term recurrence rate. In our series, the recurrence rate was 0.1% in primary hernia repair and 1.9% in recurrent hernias. The national figures for recurrences range between 5% and 15% for primary hernias (9), and only in those series where the surgeon is experienced and reporting from a unit with a special interest in hernia repair does the recurrence rate approach very low figures. While Kirk's view (24) that the best surgical results are dependent more on the surgeon than the technique has some validity, much of the failure rate in general hospitals stems from the inherent weakness of the Bassini concept of muscle-ligament union. The Shouldice Clinic has demonstrated the excellent results that can be achieved by a specialist hernia centre or unit, with long-term recurrence rates of less than 1% (3). Other specialist hernia centres have achieved similar results, most notably the Lichtenstein clinic (14,15), where the tension-free method of prosthetic repair provides the important advantage of early return to work. Our experience provides confirmation of these results.

Conclusions

The major advantages of the tension-free mesh repair under local anaesthesia are simplicity compared with the Shouldice method, substantial cost savings and very low rates of recurrence, infection and other complications.

Early return to work, office and manual, is practicable within 7 and 14 days, respectively. These results are more effectively achieved within a unit dedicated to hernia repair.

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