Review of Inguinal Hernia Repairs by Various Surgical Techniques in a District General Hospital in the UK

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Abstract Inguinal hernia is the commonest surgical operation. This is a large study from a district general hospital. The study spanned over 2 years with 2 further years of follow up. It is a retrospective analysis of eight hundred and seventy seven (877) inguinal hernia operations performed in a district general hospital. The following factors were looked at: type of repair, grade of surgeon performing the procedure and outcome of various repairs. The results showed that the most common technique was the Lichtenstein's repair (58%). Recurrence rates were between 0.4%–30% depending on types of hernia repair.

Keyword Inguinal hernia · Repair · Recurrence

Background

Inguinal hernia repair is one of the most common operations in general surgery, so even modest improvements in clinical outcome are important. In USA and France inguinal hernia repair is the second most commonly done operation (3.6% of the male population) [1]. Choice of repair method for inguinal hernia remains controversial. It includes open techniques such as Herniotomy only in children and in adults Bassini's repair, different types of Darnings, Shouldice repair, mesh plug, Lichtenstein's repair, Prolene Hernia System (PHS) and many more

modifications. More recently laparoscopic approach has been added. The most important criteria for the choice of repair methods are recurrence rates, post operative pain, testicular atrophy and the length of convalescence and ease of performance.

Until the last decade Shouldice technique 1945 (double breasting of tissues) was regarded as the standard for open hernia repair in Europe [2], although not very popular in the UK. Only a few enthusiastic surgeons were doing it. The low rate of recurrence as claimed by Shouldice could not be achieved by surgeons in non-specialised centres [3, 4]. In a randomised controlled study, the long term recurrence rate (12–15 years) after Shouldice repair for primary inguinal hernia repair was 15% [5]. Using patches and plugs tension-free techniques repair have produced excellent results, with low morbidity compared with conventional methods [6, 7].

A recent meta-analysis by Parviz et al. [8], showed recurrence rates of 0–0.7% after Lichtenstein repair both by surgeons with special interest in hernia surgery and also by surgeons with “no special interest in hernia surgery”.

The aim of this study was to compare the outcome following different methods of hernia repair by all grades of surgeons, in a district general hospital, in UK.

Materials and Methods

A retrospective review of the case notes of 877 patients, who underwent an inguinal hernia operation from December 2002

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to November 2004 at Darlington Memorial Hospital (DMH) and Bishop Auckland General Hospital (BAGH), was carried out. Cases were identified using inpatient operation code. All operative techniques, recorded complications at operations within 6 to 8 weeks post-op and up to 2 years of surgery were recorded. Total hospital stay was recorded along with re-admission and re-operation from notes. Operations were carried out by consultants (44%) middle grades (43%) and SHO (13%) supervised by consultants or by a middle grade (Tables 1, 2, 3, 4, 5 and 6).

Results

Number of Patients and Number of Procedures

777 pts had a single unilateral repair

12 pts had 2 unilateral repairs within the audit period

38 pts had a bilateral repair.

Age stratification to type of repair is shown in Fig. 1. It shows even distribution among all repairs.

ASA stratification is shown in Fig. 2. Majority of patients in all groups were ASA 1 and 2.

Discussion

The present review shows the Lichtenstein technique was used in 58% cases. In the UK, Lichtenstein [9, 10] repair is most popular as it is easier to perform with low rate of

recurrence overall. The use of wide piece of Prolene mesh with proper fixing to overlap the tissues beyond the boundary of Hasselbach's triangle helps to prevent local recurrence. Proper fixing is important to prevent folding of Prosthesis or curling of mesh around the cord and large size is important as mesh prosthesis undergo 10–20% shrinkage in Vivo [8]. The second most commonly used operation in this series was PHS mesh, which is bi-layer mesh device from Ethicon. The inner disc lies in pre-peritoneal space and outer layer covering the Hasselbach's triangle and the connector between two discs is equivalent to a mesh plug repair. Thus there is more resistance to a raised intra-abdominal pressure by the bi-layer mesh. PHS group showed less intra-operative, immediate post-operative and 2 years of post operative complications. Length of stay was shorter in PHS group than Lichtenstein's group ($P < 0.001$)

Darning was done in 10% of cases, where tension free repair is difficult to achieve, had higher post-operative pain (4.5%), recurrence rate (1.1%) and testicular atrophy 1.1%. The recurrence rate after primary groin hernia repair, using an anterior approach without the use of mesh, is between 0.2 and 19% [11], it may be as high as 30%–36% for recurrent hernia repair [12].

In present review Mesh Plug were used in 52 (6%) cases only and showed recurrence rate of 2%, higher than Lichtenstein, PHS and Darn but lower than Laparoscopic repair (30%). Frey [13] noted 1% recurrence rate after mesh plug repairs. Rutkow and Robbins [14] reported a recurrence rate of less than 0.2% after 2060 primary mesh plug repairs and 2.3% after 343 mesh plug repairs for recurrent hernia after a follow-up of almost 6 years.

Table 1 Operation Details (all operations: n=877)

Repair n	Lichtenstein 506	PHS 200	Darn 92	Mesh plug 52	Lap. repair 10	Herniotomy 9	Other 8
Anaesthetic:							
General anaesthetic	425	185	75	40	10	9	7
	84.0%	92.5%	81.5%	76.9%	100.0%	100.0%	87.5%
Surgeon:							
Consultant	175	131	47	11	10	7	5
	34.6%	65.5%	51.1%	21.2%	100.0%	77.8%	62.5%
Middle grade	265	42	38	30	0	2	2
	52.4%	21.0%	41.3%	57.7%	0.0%	22.2%	25.0%
SHO	66	27	7	11	0	0	1
	13.0%	13.5%	7.6%	21.2%	0.0%	0.0%	12.5%
Urgency:							
Elective	493	197	87	51	10	9	6
	97.4%	98.5%	94.6%	98.1%	100.0%	100.0%	75.0%
Emergency	13	3	5	1	0	0	2
	2.6%	1.5%	5.4%	1.9%	0.0%	0.0%	25.0%

Table 2 Early Postoperative Complications (within 6 to 8 weeks of surgery) (only patients who had 6–8 weeks follow up:n=761)

Repair n	Lichtenstein 429	PHS 181	Darn 79	Mesh plug 45	Lap. repair 10	Herniotomy 9	Other 8
Complications							
None	355 82.8%	144 79.6%	69 87.3%	33 73.3%	5 50.0%	8 77.8%	7 87.5%
Seroma	12 2.8%	15 8.3%	0 0.0%	1 2.2%	1 10.0%	0 0.0%	1 12.5%
Infection	13 3.0%	9 5.0%	2 2.5%	2 4.4%	0 0.0%	0 0.0%	0 0.0%
Sensory loss	12 2.8%	0 0.0%	3 3.8%	2 4.4%	0 0.0%	0 0.0%	0 0.0%
Pain	29 6.8%	12 6.6%	5 6.3%	7 15.6%	2 20.0%	0 0.0%	0 0.0%
Recurrence	1 0.2%	0 0.0%	0 0.0%	1 2.2%	2 20.0%	0 11.1%	0 0.0%
Other	19 4.4%	8 4.4%	1 1.3%	1 2.2%	0 0.0%	1 11.1%	0 0.0%
Reoperation	3 0.7%	2 1.1%	1 1.3%	0 0.0%	0 0.0%	1 11.1%	0 0.0%

In present review 12 hernia (1.3%) recurred and majority were contributed by laparoscopic (3/10), herniotomy only (2/9) and darning (1/92) means half of recurrent hernia. PHS group did not have any recurrence. Lichtenstein's method showed 0.8% recurrence(4/489) and Mesh plug of 2%(1/50). Vironen¹⁵ observed equal rate of recurrence both in Lichtenstein's and PHS repair. Frey¹³ observed recurrence of hernia in 1.6% in the Lichtenstein group and 1% in the mesh plug group ($P=0.425$).

Comparing the overall outcome of Lichtenstein's and PHS repair in this series, PHS showed better outcome in terms of pain 1.1% versus 2.2%, recurrence 0% versus 0.8%, re-operation of 0% versus 0.8% except the testicular atrophy of 1.6% versus 0.4%.

Vironen [15] compared the Lichtenstein's and PHS repair and did not find significant difference between the two groups ($P=0.982$). He found testicular complication

after 4 weeks in the form of Hydrocele in 0.17% cases in Lichtenstein and 2.7% in PHS group. Testicular pain were observed equal (0.7%) in both groups and no testicular atrophy after 4 weeks. Vironen [15] did not mention about testicular atrophy, after a year or longterm of follow ups after PHS mesh used. He also observed shorter hospital stay after PHS repair like the present findings (79% of patients stayed less then 24 hours).

Testicular atrophy was seen in 6 cases (0.7%) in the present study (3 PHS, 2 Lichtenstein's and 1 Darning). One patient with testicular atrophy after PHS repair had recurrent inguinal hernia. He had post-operative haematoma after primary repair but there was no documentation about pre-operative testicular findings before repair of recurrent hernia.

Testicular atrophy is an uncommon but well recognised complication of inguinal hernia repair and one that

Table 3 Length of stay (n=877)

Repair n	Lichtenstein 506	PHS 200	Darn 92	Mesh plug 52	Lap. repair 10	Herniotomy 9	Other 8
Length of stay:							
<24 h	252 49.8%	158 79.0%	41 44.6%	28 53.8%	5 50.0%	9 100.0%	5 62.5%
1 day	106 20.9%	25 12.5%	17 18.5%	7 13.5%	3 30.0%	0 0.0%	1 12.5%
>1 day	148 29.2%	17 8.5%	34 37.0%	17 32.7%	2 20.0%	0 0.0%	2 25.0%

Table 4 Late Postoperative Complications (up to 2 years) (patients alive 2 years after operation: n=844)

Repair n	Lichtenstein 489	PHS 190	Darn 88	Mesh plug 50	Lap. repair 10	Herniotomy 9	Other 8
Complications							
None	466 95.3%	184 96.8%	82 93.2%	48 96.0%	5 50.0%	6 66.7%	7 87.5%
Late infection	1 0.2%	1 0.5%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%
Sensory loss	0 0.0%	0 0.0%	1 1.1%	0 0.0%	0 0.0%	0 0.0%	0 0.0%
Pain	11 2.2%	2 1.1%	4 4.5%	1 2.0%	1 10.0%	0 0.0%	0 0.0%
Recurrence	4 0.8%	0 0.0%	1 1.1%	1 2.0%	3 30.0%	2 22.2%	1 12.5%
Testicular atrophy	2 0.4%	3 1.6%	1 1.1%	0 0.0%	0 0.0%	0 0.0%	0 0.0%
Other	5 1.0%	1 0.5%	0 0.0%	0 0.0%	1 10.0%	1 11.1%	0 0.0%
Reoperation	4 0.8%	0 0.0%	1 1.1%	0 0.0%	3 30.0%	0 0.0%	1 12.5%

frequently results in litigation [16–19]. Overzealous dissection of the distal hernia sac beyond the pubic tubercle dislocation of the testis from the scrotum into the wound, recurrent hernia repair too tight reconstruction of the inguinal ring and damage of pampiniform plexus / thrombosis causing venous insufficiency of the testis and they all contribute to testicular atrophy. Devlin [16] found in his series of 9 testicular atrophy 1/3rd had repair of recurrent hernia. It should be mandatory to document preoperative morphological state of the testis.

Here one patient developed femoral hernia on the same side after Lichtenstein repair. It is difficult to say whether that was missed in first place or because of weakness created by the interference in the inguinal area. This finding

was also seen by Vironen [15] and Frey [13]. A need for checking femoral ring for any concomitant femoral hernia before repairing inguinal hernia. PHS mesh gives protection against developing femoral hernia.

Surprisingly two (2/9) young paediatric patients had recurrence after Herniotomy within a few months of repair. The cause of this is not clear.

Chronic pain has been reported to occur in up to 25–30% of patients after open inguinal hernia repair [20–22] This has obvious cost implications for the health service as well as the economy as a whole.

In the present series groin pain was reported by 6% to 20% of patients in different techniques in early stage (up to 6–8 weeks) which settled and by the end of 2 years groin pain

Table 5 Comparison of Lichtenstein technique with PHS repair (single layer versus bilayers) case mix

Factor	Criterion	Lichtenstein		PHS		p (uncorrected)
		Number meeting criterion		Number meeting criterion		
Age	≤60	238/506	(47%)	94/200	(47%)	0.993
Sex	Male	474/506	(93.7%)	191/200	(95.5%)	0.350
BMI	<30	463/506	(91.5%)	185/200	(92.5%)	0.663
ASA	I or II	409/506	(80.8%)	177/200	(88.5%)	0.014
Anaesthetic	GA	425/506	(84.0%)	185/200	(92.5%)	0.003
Surgeon	Consultant	175/506	(34.6%)	131/200	(65.5%)	<0.001
Urgency	Elective	493/506	(97.4%)	197/200	(98.5%)	0.390

Table 6 Comparison of Lichtenstein with PHS outcomes

Stage	Lichtenstein		PHS		p (uncorrected)
	Number with no complications		Number with no complications		
Intraoperative	505/506	(99.8%)	200/200	(100.0%)	0.529
Immediate postoperative	464/506	(91.7%)	191/200	(95.5%)	0.079
6 weeks postoperative	355/429	(82.8%)	144/181	(79.6%)	0.351
2 years postoperative	466/489	(95.3%)	184/190	(96.8%)	0.371
Number with stay of <= 1 day			Number with stay of <= 1 day		
Length of stay	358/506	(70.8%)	183/200	(91.5%)	<0.001

persisted in only 0% to 10% cases in different techniques. PHS group had the minimum followed by Lichtenstein's technique.

Laparoscopic repair (1%) showed highest recurrence rate of 3/10 (33%), may be related to learning curve by a locum consultant. Laparoscopic hernia repair 15 need general anaes-

thesia, operative time is longer and the risk of serious complications is greater and hence not very popular over all worldwide. Beets [23] et al. reported 7 recurrences in 56 cases of both primary and recurrent hernia (13%) laparoscopically.

One patient had persistent erectile dysfunction in this review which is not new (22). Men frequently complain of impotence in the immediate aftermath of a hernia repair [24]. No organic cause for this can be identified, and firm counselling usually resolved the problem. Patients can be assured that hernia repair does not comprise sexual efficiency. Although sometimes this appears horrific to the patient, it always settles spontaneously.

Conclusions

- 1) This is a 2 years of review and 2 years of post op follow up of 877 inguinal hernia repair. Overall results are acceptable compared to other series considering the facts more than 50% of the procedures were done by the middle grade and trainees registrars and SHO in a district general hospital.
- 2) 0.7% had testicular atrophy, when all patients were not followed (6%) and nearly 6% did not attend (DNA) for

Fig. 1 Age stratification with type of hernia repair **Fig. 2** ASA with type of hernia

follow up. There is a need for pre operative documentation of the state of the testis and also warning the patients of the risk of testicular damage, when consenting.

- 3) Laproscopic repair of the inguinal hernia had maximum recurrence 3/10 (33%) although the number is small. This is due to learning curve.
- 4) Overall comparing the Lichtenstein and PHS mesh-PHS showed better outcome in terms of post op pain, recurrence and re-operation except the incidence of Testicular atrophy of 1.6% versus 0.4%.

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