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Research Article

Modified Darning's Plus Lichtenstein's Repairs for Inguinal Hernias: Report of Author's 14 Years' Experience

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Abstract

Background: In third world countries, inguinal hernia recurrence has been reported due to dissolution of counterfeit mesh. This study aims to achieve low recurrence rate by performing double (reinforced) inguinal hernia repair. **Methods:** This prospective, descriptive case-series study was conducted at author's different practice hospitals, which includes Fatima hospital-Baqai medical university, Shamsi Hospital, and Moazzum Hospital (Karachi, Pakistan) and University Hospital-Prince Sattam bin Abdulaziz University, (Alkharj, Saudi Arabia) from January 2007 to December 2020. All patients, who underwent modified inguinal hernia repair (Darning's repair plus Lichtenstein's repair) were enrolled in the study. The duration of operation and hospital stay, postoperative pain, postoperative complications and time to recurrence were noted. The inclusion criteria were all inguinal hernia patients including unilateral, bilateral, recurrent, obstructed or strangulated hernias. The cases with incomplete patients' data and patients who were lost to follow-up were excluded. **Results:** There were 529 patients in the series. The man age was 35.27 ±6.25 ±0.28 years. The mean operative time was 36.71 ±13.26 ±0.59 minutes and mean postoperative hospital stay was 1.14 ±0.72 ±0.03 days. The postoperative complication rate was 8.1%; spinal headache 17 (3.9%), urinary retention 12 (7.3%), urinary tract infection 03 (0.6%), wound infection 03 (0.6%), wound seroma 03 (0.6%), wound hematoma 02 (0.4%), chronic groin pain 01 (0.2%) and recurrence 0 (0%). The mortality rate was also zero. **Conclusion:** Modified (double) repair of inguinal hernia is a simple procedure to perform, with lower complication and recurrence rates.

Keywords: Inguinal Hernia; Darning's Repair; Lichtenstein's Repair; Hernioplasty; Herniorrhaphy; Modified Hernia Repair

Background

Inguinal hernia is a protrusion of a viscous or part of a viscous through either deep inguinal ring (indirect) or weakening of the posterior wall of inguinal canal (direct). It accounts for about 75-83% of all hernias and is more common in males [1,2]. The repair of inguinal hernia is the most common elective operation in general surgery [3]. Annually, about 700000 patients were being operated for inguinal hernia repair in USA [4].

The recurrence rate and the chronic groin pain are the two main benchmarks against which the success of any hernia surgery is evaluated [5]. Lichtenstein's repair is the most favored operation for inguinal hernia repair due to its low complication and recurrence rates [1,6]. Its recurrence rate is reported as 0.1-3% as compared to earlier hernia repair techniques of Bassini and Shouldice [2,7,8]. However, it does associated with complications like groin pain/discomfort, numbness and hematoma formation. These local complications can be reduced by using light-weight mesh and glue fixation (instead of suture fixation) [1,6]. But the low recurrence rates had also been reported following tension-free repairs [2]. Darning's repair is comparable to Lichtenstein's repair in terms of recurrence and other postoperative complications [9-11].

In third world countries, there is also issue of counterfeit mesh as reported earlier, by the author, two cases of inguinal hernia recurrence following mesh dissolution [12]. Following the successful outcome of these two cases, the author has adopted this technique of double repair in all subsequent inguinal hernia operations. With this background, the study aims at finding the outcome of this strategy in the long run, in terms of recurrence rate and postoperative complications.

Methods

The place of this study includes all of the author's practice hospitals including Fatima hospital (Baqai Medical University), Shamsi hospital, Moazzum hospital and University hospital (Prince Sattam bin Abdulaziz University) from January 2007 to December 2020. It was a prospective, descriptive-case series. The number of patients enrolled in the study was 529, who all undergone double inguinal hernia repair for either elective or emergency inguinal hernia, which forms the inclusion criteria. The cases with incomplete patients' data and patients who were lost to follow-up were excluded.

The ethical approval was obtained from the Baqai Medical University Ethics Committee and the study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments, 2013. An informed written consent was taken from all patients, who were counseled about the operative techniques and its potential advantages over other conventional hernia operations.

Operative Technique

All cases were operated under spinal anesthesia, and given antibiotic prophylaxis, 1 gm Cephradine, intravenously, at the time of induction of anesthesia. The patients were placed in supine position. The skin was prepared and draped. The incision was given about 2.5 cm above and parallel to the medial half of inguinal ligament. The sub-cutaneous fat and external oblique aponeurosis was incised in line, and its upper and lower flaps dissected to expose the internal oblique/conjoint tendon and inguinal ligament, respectively. The spermatic cord delivered and the cremasteric muscle/fascia incised, followed by gentle dissection of cord contents with the sac. The sac opened, its content reduced, neck trans-fixed and the remaining portion of sac excised.

Any bulging or weakness in the posterior was plicated with chromic catgut 00. The fixation started at pubic tubercle taking the lower edge of polypropylene mesh (leaving its 1 cm portion to project beyond pubic tubercle) with prolene 1.0. The Darning's repair then continued taking the lower edge of mesh with inguinal ligament till the medial edge of deep inguinal ring at which point Aberdeen's knot applied. The Darning's then completed reversed back to public tubercle. Prolene 00 suture continued laterally for two more bites along inguinal ligament and another Aberdeen's knot applied at lateral edge of deep inguinal ring. A slit made in the mesh to approximate the position of spermatic cord at deep ring. Laterally, about 3 cm mesh projected beyond deep ring and its two portions double-breasted. The mesh then laid flat on posterior wall and sutured with same prolene 00, starting laterally, going over the top and finally to end medially at public tubercle. Two to three interrupted sutures applied in the mesh centrally to reduce the dead space in posterior wall. The cord repositioned over mesh and external oblique aponeurosis closed over it using vicryl 00. The skin was closed using either subcuticular suture or interrupted sutures in emergency cases. All patients were given Diclofenac suppository 50 mg at the induction of anesthesia, and Bupivacaine (0.2%) was infiltrated into the wound.

Postoperative care

Diclofenac sodium 75 mg intramuscular injection was given 12-hourly for 24 hours, followed by oral diclofenac 50 mg 8-hourly for next 24 hours. The dressing was removed after 24 hours and the wound examined for any local complication. The patient was then discharged if there was no major complaint. The skin sutures were removed between 8-10 postoperative days. The patients were initially followed weekly for 4 weeks, then monthly for 3 months and finally quarterly for one year. They were then advised to visit surgery clinic in case of any problem/complication related to operation.

Outcome measures

The variables noted and analyzed were operative time, postoperative hospital stay, postoperative pain, postoperative complication and time to recurrence. The operative time was defined as the time between the placements of incision to the last suture applied. The severity of pain was defined using verbal rating scale (VRS). The statistical analysis was done using SPSS 24. The inferential statistics were calculated using chi-square and t tests, and p value of <0.05 was considered significant.

Results

The patients were enrolled from January 2007 to December 2020. During the 12 years study period modified (double) inguinal hernia repair was performed in 529 patients. Twenty-two patients which were excluded include: lost to follow-up within one year (19) and incomplete data (3). Thus 507 patients were included in the final analysis. The mean age was 35.27 ± 6.25 (range 17-62) years. Nearly all (except 3) patients were males, 504 (99.4%). The mean Body Mass Index (BMI) was 22.32 ± 1.30 (range 18.2-25.2). The remaining patient's and hernia characteristics were summarized in Table 1.

Characteristic	Variable	Number	Percentage
Occupation and substance abuse	Smoking	52	10.3
	Labor	389	76.7
	Office worker	93	18.3
	Student	25	4.9
Co-morbids	None	462	91.1
	Hypertension	21	4.1
	Diabetes mellitus	7	1.4
	Hepatitis B / C	7	1.4
	Previous abdominal operation	6	1.2
	COPD	3	0.6
	Ischemic heart disease	1	0.2
ASA Grade	I	462	91.1
	II	37	7.3
	III	1	0.2
	IV	0	0
	E	7	1.4
Hernia characteristics	Lump	483	95.3
	Pain	13	2.6
	Both, lump and pain	11	2.2
	Indirect	429	84.6
	Direct	63	12.4
	Both, direct and indirect	8	1.6
	Right	379	74.8
	Left	119	23.5
	Bilateral	9	1.8
	Complete	416	82.1
	Incomplete	91	17.9
	Uncomplicated	500	98.6
	Obstructed	5	1
	Strangulated	1	0.2
	Inflamed	1	0.2
	Primary	499	98.4
	Recurrent	8	1.6
	Omentocele	321	63.3
	Enterocele	177	34.9
	Sliding hernia	8	1.6
	Appendicele	1	1.2
	Acquired	494	97.4
	Congenital hernia	13	2.6

Table 1: The patient and hernia characteristics.

The presentation of 507 patients was as follows: indirect inguinal hernia 84.6%, direct inguinal hernia 12.4%, bilateral inguinal hernia 1.8%), elective 98.6% and emergency 1.4%. The associated comorbid diseases/conditions were found in 45 (8.9%) patients: hypertension 21 (4.1%), diabetes mellitus 7 (1.4%), hepatitis B/C 7 (1.4%), previous abdominal operation 6 (1.2%), chronic obstructive pulmonary disease 2 (0.6%) and ischemic heart disease 1 (0.2%).

Table 2 summarizes statistical analysis of independent operative and postoperative variables. The mean operative time was 36.71 ±13.26 ±0.59 minutes and mean postoperative hospital stay was 1.14 ±0.72 ±0.03 days, both statistically significant. The analysis of pain VRS at day 1, 8, 15, 30 and 90 were all statistically significant.

	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval		P value
				Lower	Upper	
Blood loss (ml)	11.56	6.10	0.27	11.02	12.08	< 0.01
Operative time (minutes)	36.93	9.12	0.41	36.14	37.74	< 0.01
Hospital stay (days)	1.17	0.79	0.04	1.10	1.24	< 0.01
Pain VRS score, day 1	4.85	1.60	0.07	4.71	4.99	< 0.01
Pain VRS score, day 8	3.48	0.85	0.04	3.40	3.55	< 0.01
Pain VRS score, day 15	2.06	0.90	0.04	1.98	2.13	< 0.01
Pain VRS score, day 30	0.77	0.79	0.04	0.70	0.84	< 0.01
Pain VRS score, day 90	0.02	0.18	0.01	0	0.04	0.012

Table 2: Analysis of independent operative & postoperative variables.

Table 3 summarizes early and late postoperative complications, which occurred in 41 (8.1%) patients. The most common complication was spinal headache (17, 3.4%) requiring conservation management with hydration and rest. Early wound complications were seroma, hematoma and wound infection, all settled with conservative wound management. Only one patient suffered chronic (persistent) groin pain, which last for about a year, but ultimately settled with rest and reassurance. There was no recurrence or mortality in this series.

Postoperative complications	No.	%
Spinal headache	17	3.4
Urinary retention	12	2.4
Urinary tract infection	03	0.6
Wound infection	03	0.6
Seroma	03	0.6
Hematoma	02	0.4
Persistent groin pain	01	0.2
Recurrence	0	0
Total	41	8.1

Table 3: Early & late postoperative complications.

Discussion

The dilemma of hernia recurrence, however small, remains after all the hernia repair evolutions from Bassini's repair to tension-free herniorrhaphy to hernioplasty to laparoscopic procedures [13]. The laparoscopic surgery is not yet established as standard in hernia surgery mainly because of its completely different approach to surgery as compared to open surgery. In terms of recurrence rate, there is no major difference between open and laparoscopic inguinal hernia repairs; however, laparoscopy has the advantage of less pain and early return to activity but the operative time is prolonged and there are risks of more serious complications [13]. Although associated with variable groin discomfort and small risk of recurrence, the Lichtenstein's repair remains the standard and favored inguinal hernia operation.

Should we accept this small risk of recurrence or continue evolution aiming for zero recurrence? Different studies has published varying degrees of recurrence (0.5-10%) for the same procedure, indicating that the recurrence is not entirely attributable to specific procedure [14]. In fact, it's a reflection of several technical errors like taking bites in inguinal ligament in same line, fixing mesh corner at pubic tubercle (not spreading more medially), taking only few fibers while fixing mesh to the conjoint muscle/tendon, not reinforcing

weakened posterior wall, not paying attention to widened deep ring and too short mesh lateral to deep ring. Unprepared patients like smokers, chronic cough and benign prostatic hypertrophy are likely to add the risk. As it is the most common elective general surgery operation, the postgraduate trainees are most often performing these operations (supervised by senior trainees or indirectly by consultants); the consultant themselves are occupied with more complex operations [15]. Other postoperative complications rate are also quite variable: chronic groin pain 0.7-62.9%, wound infection 1-7%[7] and urinary retention 0.2-22.2% [16-19].

Pukar and Lakhani reported a prospective series of double repair consisting of herniorrhaphy (continuous interlocking sutures using prolene 00) and Lichtenstein's repair; they reported recurrence rate of 0.21%, hematoma 0.21%, painful scar 1.05%, wound infection 0% and urinary retention 1.26% [14]. Their operative time varies from 38-48 minutes in the beginning to 12-18 minutes in the later part of series. In contrast, the mean operative time in this series was 36.93 minutes (range 15-135 minutes), with zero recurrence and comparable complication rate. We have slightly different technique for the herniorrhaphy part repair, as we performed Darning's repair incorporating the lower edge of mesh, with plication of loose posterior wall and narrowing of deep ring. The technique was adopted in view of the questionable supply of polypropylene mesh, as earlier two cases of recurrence were reported due to mesh dissolution [12]. Saha also reported double repair but he used the technique of onlay Darning's to secure the mesh and remove the dead space; he reported wound infection 1.6%, hematoma 0.8%, no groin discomfort and zero recurrence at 2 years [20]. The recurrence rate with each of these 2 repair techniques (Darning and Lichtenstein) were nearly similar, reported earlier as ranging between 0.8-4% and 0.1-5.9%, respectively [21, 22]. A more favorable outcome can be expected on combining these two repairs together, as being reported here and by Saha [20].

Further, as we incorporated the lower edge of mesh in darn, it in-folded the lower edge when the mesh laid flat over darn, which could be the explanation for lowered chronic groin pain in this series. Different mesh fixation techniques are in practice including sutures, staples, self-fixing meshes and fibrin or other glues [23]. Bressica et al reported fixation-free 3D multilamellar preperitoneal implant for open inguinal hernia repair, which completely obliterate the hernia defect, and had the advantages of shorter duration of operation, less postoperative pain and less morbidity as compared to other traditional repairs [24].

Conclusions

The double (Darning plus Lichtenstein's) repair of inguinal hernia is safe and quick procedure with favorable outcome in terms of recurrence and postoperative complications.

Limitations

Major limitation is non-randomized design and single surgeon series. Another limitation is short follow-up of one year, as it is practically impossible that the patient remains motivated to turn up to the clinic. Recurrence within 6 months is considered early recurrence, which is covered in this study; however, late recurrence can occur several years later. The other limitation is the issue of counterfeit mesh; so, with strict law enforcement, this issue will completely resolve.

What is Already Known?

- The Lichtenstein's repair of open inguinal hernia repair is considered the gold standard repair.
- Darning's repair of inguinal hernia offers comparable results in terms of recurrence in experts' hands.

What This Study Adds

- The double repair of inguinal hernia offers maximum advantages in terms of low hernia recurrence rates.
- The issue of counterfeit mesh can be addressed with reinforced surgical technique.

Competing Interest

The author declares no competing interests in this study.

Authors' Contributions

The sole author is responsible for the concept and design, data collection, interpretation and statistical analysis, literature search, manuscript writing and editing, critical revision and final approval for publishing.

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