

Significance of Accurate Defect Size Estimation and Overlapping of Mesh in Open Inguinal Hernia Repair

Estimation and Overlapping of Mesh in Open Inguinal Hernia Repair

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ABSTRACT

Objective: Importance of accurate defect size estimation and its relevance in open inguinal hernia repair.

Study Design: Descriptive prospective cohort study

Place and Duration of Study: This study was conducted at the Department of Surgery Abbasi Shaheed Hospital with one year duration February 2023 to February 2024.

Methods: 194 participants selected through consecutive sampling divided into two groups F1 and F2. 97 participants in each group. Ethical review board approved study. For defect size estimation European hernia society (EHS) classification is used in F1 and ultrasound and EHS classification in F2. Lichtenstein repair with mesh size 6x11cm opted. Overlapping of mesh, defect sizes, fixation of mesh, recurrence, seroma, wound dehiscence, transient testicular swelling, testicular atrophy & urinary retention are taken as variables analyzed through mean, median mode, relative risk, P-value, graph and charts. Statistical Package for social sciences (SPSS) used. Patients followed up on 10th day 3rd month and 6th month postoperatively.

Results: Mean age in F1 and F2 44 years, median 45 years and mode 50 years, standard deviation 15.868. In F1 defect sizes measured through EHS classification: no patients <1.5cm (01 finger breadth), 49.48% patients 1.5-3 cm (02 finger breadth), 50.5% patients >3cm (>2 finger breadth). In F2 group: 3% patients <1.5cm (01 finger breadth), 59.7% patients 1.5-3cm (2 finger breadth), 37.11% patients >3cm (>2 finger breadth). In Group F1: recurrence 2%, seroma 13%, wound dehiscence 11%, transient testicular swelling 3%, spinal headache 10%, testicular atrophy 1% and 3% patients had urinary retention. In Group F2: recurrence 1%, seroma 4%, wound dehiscence 3%, transient testicular swelling 1%, spinal headache 5%, no testicular atrophy, and urinary retention found in 1% patients.

Conclusion: Accurate defect size estimation has significant impact on outcome in open inguinal hernia repair furthermore, proper mesh implantation reduce postoperative complications.

Key Words: Lichtenstein repair, Inguinal hernia repair

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INTRODUCTION

In 20th century Lichtenstein introduce Tension free Mesh Repair of inguinal hernia. Lichtenstein repair is the most popular surgical technique of open inguinal hernia repair nowadays. After performing Lichtenstein repair 20-40% shrinkage of mesh occurs therefore importance of accurate estimation of defect sizes gain importance in open inguinal hernia repair.

The normal criteria of overlapping of mesh is 2cm beyond pubic tubercle 3-4 cm medial to hernia defect and 5-6 cm lateral to hernia defect. Mesh should be well enough extend 3-4 cm beyond Hasselbach's triangle. The ideal size of mesh uses in Lichtenstein repair is 7.5x15cm.¹⁻⁴ The ideal mesh should be of light weight, less dense and of large pores.⁵ In one study 9x15cm size mesh is considered suitable for Lichtenstein repair.^{6,7}

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METHODS

It is prospective cohort study. Ethical review board Abbasi Shaheed Hospital approved study. Sample size derived from formula & it has 194 participants. Consecutive sampling method used. All patients divided equally into two groups F1 and F2 with 97 participants in each group. In F1 we used European Hernia society (EHS) classification for estimation of defect size and in F2 we used ultrasound and EHS classification. Inclusion criteria is direct and indirect inguinal hernia, male gender, age 20-85. Exclusion

criteria: Recurrent, strangulated or obstructed inguinal hernia, female, age<20 years and > 85 years. Variables are age, number of patients having lateral inguinal hernia, medial inguinal hernia, defect sizes measured through ultrasound and European hernia Society(EHS) classification⁸, fixation of mesh, postoperative complications like recurrence, seroma, wound dehiscence, transient testicular swelling, spinal headache, testicular atrophy and urinary retention. Variables analysed through Mean, median, mode, Relative risk, P-value, graphs and charts. Statistical package for social sciences (SPSS) used.

RESULTS

Age range of both groups F1 and F2 is 20-85 years. Mean age of both groups 44.42 years, Median 45years and mode 50 years. The standard deviation(STD) is 15.80866.(Table 1) Majority of patients have age 20-40 years=45.9%, then 41--60years=38.1%, 61-80 years = 15.5%, and >80years:0.5%.

In F1 group 45 patients of age range 20-40 years,39 patients of age range 41-60 years,13 patients of age range 61-80 years (Figure 1).In F2 group 44 patients of age range 20-40years,35 patients of age range 41-60 years.17 patients of age range 61-80 years and 01 patient is of greater than 80 years. (Figure 1)

In group F1 42 patients had lateral inguinal hernia in which 25 patients had right lateral inguinal hernia and 17 patients had left lateral inguinal hernia. In F2 43 patients had lateral inguinal hernia in which 34 patients had right lateral inguinal hernia and 09 patients had left

lateral inguinal hernia .In Group F1 50 patients had medial inguinal hernia in which 30 patients had right medial inguinal hernia and 20 patients had left medial inguinal hernia. In Group F2 49 patients had medial inguinal hernia in which 25 had right medial inguinal hernia and 24 patients had left medial inguinal hernia. (Table-1)

In F1 01 patient had combine (Medial+Lateral) inguinal hernia and 04 patients had bilateral (Right+Left) inguinal hernia. In F2 02 patients had combine (Medial+Lateral) inguinal hernia and 03 patients had bilateral(Right+Left) inguinal hernia.

In Group F1 EHS classification is used to determine defect sizes, In Group F2 ultrasound used for defect size estimation showed 02 patients had defect sizes 1-1.5cm,63 patients had1.5-3cm,32 patients had >3cm defect size.

In Group F1 according to EHS classification used no patients of inguinal hernia had <1.5cm(01finger breadth) defect size,48 patients of inguinal hernia had 1.5-3cm(02 finger breadth) defect size,49 patients of inguinal hernia had defect size >3cm(>2 finger breadth).In Group F2,03 patients of inguinal hernia had <1.5cm(01 finger breadth) defect size,58 patients of inguinal hernia had 1.5-3cm(02 finger breadth)defect size,36 patients of inguinal hernia had >3cm(>2 finger breadth). EHS defect sizes of both groups have P-value: 0.001, mean of defect size through EHS classification is 2.39 cm, median is 2cm, mode is 2cm.Standard deviation recorded in defect sizes is 0.519 with variance 0.26.

Table No.1: Statistical analysis of Group F1 and F2

	Group F1	Group F2	Statistical Analysis
Patients no	97	97	
Age (Years)			
20-40	45 (46.39%)	44 (46.2%)	Mean:44 ,median:45
41-60	39 (40.2%)	35 (36%)	Mode:50,STD:15.868
61-80	13 (13.4%)	17 (17.5%)	
>80	0	01	
Lateral Inguinal Hernia	42 (43.2%) Right:25,Left:17	43(44.3%) Right:34,Left:09	
Medial Inguinal Hernia	50 (51.5%) Right:30,Left:20	49 (50.5%) Right:25,Left:24	
Bilateral inguinal hernia	04	03	
Combine inguinal hernia	01	02	
Defect Size in cm Ultrasound	Not done		P:0.001
1-1.5cm	-	02	
1.5-3cm	-	63	
>3ccm	-	32	
EHS Defect size in cm			P:0.001,skewness:0.139
01 Finger Breadth<1.5cm	00	03 (3%)	STD:0.519,Mean:2.39
02 Finger Breadth1.5-3cm	48 (49.48%)	58 (59.7%)	Variance:0.26,
>02 Finger Breadth>3cm	49 (50.5%)	36 (37.11%)	Median:2,Mode:2
Overlapping of mesh	97	97	

2cm over pubic tubercle,3-4cm medial to hernia defect and 5-6 cm lateral to hernia defect			
Fixation of Mesh			
Over edge	06	03	
0.5cm away from edge	91	94	
Postoperative Complication			
Recurrence	02	01	
Seroma	13	04	P=0.02,RR:1.61
Wound Dehiscence	11	03	P=0.02,RR:1.64
Transient testicular swelling	03	01	
Spinal headache	10	05	-
Testicular Atrophy	01	00	-
Urinary Retention	03	01	-

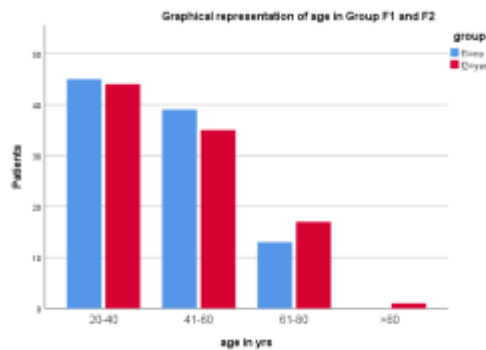


Figure No.1: Age distribution in group F1 and F2

When compared age with per-operative defect size estimation with help of EHS(European hernia society) classification system in groups F1and F2 we found age group 20-40 years: no patient had defect size <1.5cm(01finger breadth),64 patients had defect size 1.5-3cm(02 finger breadth),25 patients had defect sizes >3cm(>2 finger breadth).In age group 41-60 years: 02 patients had defect size <1.5cm(01 finger breadth),37 patients were defect size 1.5-3cm(02 finger breadth),35 patients were defect size >3cm(>02 finger breadth).In age group 61-80 years :01 patient had defect size <1.5cm(01 finger breadth),11 patients had defect size 1.5-3cm(02 finger breadth) and 18 patients had defect size >3cm(>02 finger breadth).In age group >80 years: 01 patient had defect size 1.5-3cm(02 finger breadth) (p=0.002).

We compared lateral and medial inguinal hernia with per-operative EHS classification dependant defect sizes in group F1 and F2. In patients with lateral inguinal hernia 02 patients had defect sizes less than 1.5cm(01 finger breadth),57 patients had defect size1.5-3 cm (02 finger breadth), 26 patients had defect size >3cm(>02 finger breadth). P-value is 0.001 which shows significant relationship between Per-operative EHS defect sizes and lateral inguinal hernia .In medial

inguinal hernia with respect to EHS defect size we found 01 patient had defect size<1.5cm (01 finger breadth), 49 patients had defect size 1.5-03cm (02 finger breadth), 59 patients had defect size >3cm (>02 finger breadth).P-value=0.001 which signifies positive association between two variables.

Total three patients had recurrence after the repair of inguinal hernia. In Group F1 02 and in F2 01 participant had recurrence of large defect size (>3.5cm) direct inguinal hernia.

In Group F1 13 patients and in F2 04 patients had inguinoscrotal seroma. The P value is 0.02 and Relative Risk is 1.61 which shows positive association and risk in exposed group .When compared inguinoscrotal seroma with EHS defect size it showed that inguinoscrotal seroma occurred in 17 patients in both groups out of which 15 patients had larger defect sizes according to EHS classification >3cm and 02 patients had inguinoscrotal seroma formation with hernia defect sizes1.5-3cm. The p-value is 0.001 which is significant and proves positive association between two variables.

In Group F1 11 patients had wound dehiscence and in F2 03 patient had wound dehiscence. P-value is 0.02 and Relative Risk is 1.64.which is positive association and explained risk in exposed group .When we compared wound dehiscence with EHS classification we found 14 patients had developed wound dehiscence in both groups in which 12 patients had defect size of >3cm and 02 patients had defect size of 1.5-3 cm. P-value is 0.001 which is significant and reflected association of large defect size and occurrence of wound dehiscence.

In Groups, F1 had 03 patients of transient testicular swelling and 01 patient of transient testicular swelling in F2.The reason for transient testicular swelling after Lichtenstein repair was hyper vascularity Postoperative colour doppler ultrasound proved hyper vascularity with no testicular damage and obstruction. Swelling

resolved conservatively by applying scrotal plaster and using tight underwears.

In Groups, F1 had 10 patients of spinal headache and in F2 05 patients had spinal headache. Spinal headache depends upon spinal anesthesia technique quality and proper dose of anesthetic given. All patients recovered by conservative treatment included bed rest, stimulants like coffee, tea, analgesic and gabapentin.

In group F1 01 patient reported testicular atrophy who had large indirect inguinal hernia with hernia defect size >3cm. Patient developed hematoma postoperatively which subsided within 01 month but reported testicular atrophy after 9 months. In F2 no patient had testicular atrophy. In this study 03 patients developed urinary retention in group F1 and 01 patient had urinary retention in group F2.

DISCUSSION

Lichtenstein repair procedure of choice in this study. Many studies advocated open mesh technique as procedure of choice for inguinal hernias.

Sensitivity of ultrasound 100% and 80% for diagnosis of indirect and direct inguinal hernia. respectively.⁹⁻¹⁰

This study correlated different defect sizes identified on ultrasound with the surgical findings and found it significant. Another study showed preoperative ultrasound had positive predictive value of 90.9% for identifying inguinal hernia in need of surgery. Positive predictive value for patients without visible swelling is 84.6%. Body Mass Index (BMI) was identified as most likely potential predictor of false positive ultrasound.

When compare age with lateral inguinal hernia in Group F1 and F2 we found significant relation between age and decreasing number of lateral inguinal hernia with the age >50 years.

When we compare age with medial inguinal hernia patients in Group F1 and F2 there is significant relation between age and medial inguinal hernia patients. Slightly increase number of medial inguinal hernia in age 40-85 years shows association of risk factors in development of medial inguinal hernia in patients

We compared age with per-operative defect size measured through EHS (European hernia society) classification system we found p value=0.002 which shows significant relation between defect sizes of various patients and age. There is increase in defect sizes at increasing age which shows age related changes, chronic cough, constipation, Benign prostatic hyperplasia (BPH), decreasing in immunity level, collagen deficiencies, autoimmune disorders have an impact on defect sizes in inguinal hernia patients.

When we compare lateral and medial inguinal hernia with per-operative EHS classification P-value=0.001 showed significant relationship between Per-operative EHS defect sizes and lateral inguinal hernia.

In medial inguinal hernia with respect to EHS defect size we found P-value=0.001 which signifies positive association between two variables.

Fixation of mesh is very important, proper fixation reduces postoperative complications. Kirks et al advocated suture placement 0.5cm distance away from the edge of mesh. Overlapping of mesh is mandatory in Lichtenstein repair. Proper overlapping needs proper mesh size and in Lichtenstein repair we use 6x11cm prolene mesh for overlap.¹¹ Ideal mesh should be less dense, light weight and large pore size. In one study rate of recurrence is 1.95%. Improper fixation and inadequate repair are the causes¹². In our study rate of recurrence is 1.5%.¹³ Patient's risk factors, large defect size>3.5cm and weak abdominal wall are the causes.¹⁴ One study showed increased rate of seroma formation 5.7%-8.5% in Lichtenstein repair due to mesh effect on surrounding tissue and known effect of Prolene on tissue. In another study 10% is the rate of seroma formation.¹⁵ In our study the rate of seroma formation is 8.5%. The cause of seroma formation is mesh effect and closure technique. The rate of wound dehiscence in open inguinal hernia mesh repair is 6.2% in one study.¹⁶ In our study the rate of wound dehiscence is 7%. Many factors contributing to wound dehiscence including mesh infection, wound infection, foreign body retention, improper closure technique, systemic diseases like diabetes mellitus, hypertension, smoking and malnutrition. According to one study rate of transient testicular swelling is 7%.¹⁶⁻¹⁷ In our study rate of transient testicular swelling is 2%. The cause of transient testicular swelling was hypervascularity on Doppler ultrasound with no testicular damage and obstruction and swelling subsided after wearing scrotal support in all cases.¹⁸ Postoperative headaches are common in patients undergoing Lichtenstein repair under spinal anesthesia.¹⁹ In our study 15 patients developed spinal headache. Main reasons are quality of anesthetic, spinal anesthesia technique, positioning of patient and hydration. All patients relieved by taking coffee, tea or analgesics and by taking gabapentin. Rate of testicular atrophy in our study is 0.6 It is an uncommon complication. Main causes found to be injury to pampiniform venous plexuses and collateral arterial plexuses. Rate of testicular atrophy is 0.3-0.5% in some studies.²⁰ In this study rate of urinary retention is 2% in which all four patients relieved after passing folleys catheter. In a study rate of urinary retention is 10%.²¹ The cause of urinary retention in our study is spinal anesthesia effect which is relieved by conservative measures.

CONCLUSION

Through our study it is evident that European Hernia society classification and ultrasound are key modalities in inguinal hernia defect size estimation. Measurement of defect size and use of large mesh 7.5x15cm in large

inguinal hernia with defect >3.5 cm may reduce recurrence.

Author's Contribution:

Concept & Design of Study: Muhammad Fahad
 Drafting: Muhammad Fahad
 Data Analysis: Muhammad Fahad
 Revisiting Critically: Azfaruddin Qureshi, Fareeda Islam
 Final Approval of version: By all above authors

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