

Comparative Study of Different types of Mesh Fixation during Laparoscopic Repair of Inguinal Hernia

General Surgery

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ABSTRACT

Background: Prevalence of inguinal hernia worldwide is 15%–45% at different ages that requires surgical repair. At present, inguinal-protrusion (hernia) is a common surgical method with mesh repair. The modern mesh type includes a variety of materials, and surgical options include using fixation mesh, sutures, rigging or staples, self-meshes and fibrin-fixation, or other types of glue.

Aim of the work: To assess and compare the efficacy of mesh fixation using fibrin glue, tacks and sutures during laparoscopic repair of inguinal-protrusion.

Patients and methods: Randomized-study involved; 15 male-patients presented with inguinal-protrusion (hernia) at Al-Azhar university hospitals using laparoscopic trans-abdominal pre-peritoneal repair. According to the mesh fixation method, Patients were divided into three different groups: Group 1: using fibrin glue, Group 2: using staple, and Group 3: using sutures.

Results: Age were no statistically significant difference between groups. Operative time was highly statistically significant difference between groups there were no intra-operative complications in all groups. Post-operative pain score shows highly statistically significant differences between groups in all follow up time except after 6 months there were no statistically significant differences between groups. Early post-operative, hospital stay, Economic Cost complications were no statistically significant differences between groups. There was no Recurrence found at follow up in all groups.

Conclusion: Our study revealed that fibrin glue method is considered comparable, cost effective method for mesh fixation. According to our findings; observed that fibrin glue have fast recovery, less hospital stay, cost effective, less complications and low recurrence rate.

Keywords: Fibrin glue; Inguinal hernia; Pre-peritoneal; fixation; Trans-abdominal.

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INTRODUCTION

Inguinal hernia is a peritoneal sac protrusion through a weak point within the groin area which often contains abdominal content and is traditionally treated with surgery (Mizrahi et al., 2012). Inguinal hernia is the most common abdominal wall hernia. However about 50 % of patients with inguinal hernia is unaware of this, repair of inguinal hernia is one of the most commonly performed surgical procedures worldwide.¹ Inguinal hernia repair is the commonest operation in general surgical practice as hernias occur in about 1–5% of the general population.² The prevalence of inguinal hernia ranges from about 110 per 10 thousands-male patients aged between 16 to -24 years-old to 2 thousands per 10 thousands male-patients with 75-years old or older in males.⁵

Males are more commonly affected by inguinal hernia than females. The male to female ratio is approximately 9 to 1.⁶ There are many risk factors that may contribute to the occurrence of inguinal hernia like pregnancy, history of hernia or prior hernia repair, obesity, male gender, older age.⁷ Surgery is the first-line treatment option for patients with inguinal hernia which is usually reserved for patients with either large bulges through a small hole, painful hernia, high risk for complication such as strangulation and incarceration.⁸

Current repair techniques for inguinal hernias are Tissue-suture repairs and Tension-free prosthetic repairs which include Anterior repairs (Lichtenstein repair and its modification, Patch and plug repairs and Double-layer devices) and Posterior repairs.⁹ Laparoscopic repair of inguinal hernias has been around for more than two decades.¹⁰ Inguinal hernias can be repaired laparoscopically using a variety of

techniques, including trans-abdominal-ligation, laparoscopy, total extra-peritoneal-ligation, and intra-peritoneal-ligation.¹¹

Also as reported by Aiolfi *et al.*;¹² Minimally invasive laparoscopic transabdominal preperitoneal repair and totally extraperitoneal repair techniques were associated with reduced early postoperative pain, return to work/activities, chronic pain, hematoma, and wound infection compared to the Lichtenstein tension-free repair technique.¹² Presently, inguinal-protrusion mesh repair is the most-commonly used surgical method. There are different types of mesh-fixation included; sutures, staples, self-fixing gauze, fibrin or other adhesives.¹³

This study purposes to assess and compare efficacy of mesh fixation using fibrin glue, stapels and sutures during laparoscopic repair of inguinal hernia.

PATIENTS AND METHODS

This study is prospective-observational study assumed from May 2021 to November 2021 in 15 adult male patients with inguinal hernia. These patients were admitted from outpatient surgical clinics to Al-Azhar University Hospitals. Patients aged 15-70 with inguinal hernia, patients with inguinal swelling only, and cases undergoing laparoscopic repair of inguinal hernia were included. Patients with recurrent hernia, patients with inguinoscrotal hernia, patients with obstructed and strangulated hernia, patients with types of hernia other than inguinal, significant breast involvement, not suitable for general anesthesia and patients taking anticoagulants were excluded. Included patient were divided into three groups: Group 1: Net fixation with fibrin glue, Group 2: Net fixation with staple and Group 3: Net fixation with sutures. Clinical history: a detailed history was obtained, including name, age, occupation, residence, and particular habits of clinical significance.

Current context: including complaints analysis; starts evaluates body systems, sinus problems, bowel problems like constipation, and urinary problems. Family history: the presence of hernias and other family diseases. Local examination of the thigh and scrotum to confirm the diagnosis of the hernia, its nature, and the presence of complications. Laboratory tests: complete blood tests, blood tests, liver and kidney function tests, fasting blood sugar. X-ray examination: ultrasound of the pelvis and abdomen. Specific studies: Electrocardiograms have been ordered in patients over forty-years of age.

Fifteen-patients underwent laparoscopic inguinal-hernio-plasty for pre-peritoneal repair. Patient lying-down on the operating-table and a urinary-catheter were applied. Cover the patient and rub the entire abdomen, thighs, penis and scrotum. The camera port is inserted below the navel using an open technique and five-mm ports are inserted flush with the navel on either side of the rectal sheath. The stomach swells with carbon dioxide at a pressure of fourteen-mmHg. First, exploratory laparoscopy is performed to identify the groin and important anatomical landmarks such as the epigastria-vessels, umbilical-cord, lesion-triangle, and pain. Dissection of the peritoneal lobe begins near the ASIS and extends medially to the midline, after which the lumen is created by dissection of the peritoneum from the transverse fascia. A polypropylene mesh sheet measuring 11 x 6 cm is rolled into a tubular shape and passed through the umbilical cord holes with a diameter of ten-mm. The grid is placed in three different ways, one for each group of patients; Fibrin glue, pins and threads.

In the fibrin glue group, two-ml of fibrin reinforcers are used to secure the mesh, in the staple group, the mesh is stapled, while in the 2/0 suture group, polyproline suture is used. The peritoneal flap is closed with 2/0 Vicryl sutures. Remove the door and close the skin.

Antibiotics and analgesia was maintained with an oral non-steroidal anti-inflammatory drug at discharge. Postoperative pain was assessed using a visual analogue scale and patients were asked to rate their pain at various intervals. Early postoperative complications such as scrotal edema, hematoma, wound infection, seroma and urinary retention. Hospital stay after surgery (in hours). All patients were followed up as an outpatient at 1 week and then 1, 4 and 6 months later using a standardized telephone script.

Data were calculated and analyzed using IBM SPSS Version 20.0 (Armonk, NY: IBM Corp). Qualitative data were described in numbers and percentages. Quantitative data were described by time interval (minimum and maximum), mean and standard deviation. The significance of the obtained results was evaluated at the 5% level. Chi-square test for categorical variables to compare between different groups. ANOVA test: for quantitative variables, usually used to compare two study groups. Kruskal-Wallis H-Test: Compare two study groups for anomalous quantitative variables.

RESULTS

		Age	
Mean± SD		44.13±11.7	
Median (Range)		45.0 (15-70)	
		N	%
Occupation	Manual worker	9	60.0
	Teacher	1	6.7

Smoking	Office clerk	3	20.0
	Retired	2	13.3
	No	6	40.0
	Ex-smoker	2	13.3
	Smoker	7	46.7
	Total	15	100.0

Table 1: socio-demographic data distribution among studied group

Operative time in Group (I) was ranged between 50-65 min with mean±S.D. 57.80±6.512 min while in Group (II) was ranged between 58-72 min with mean±S.D. 64.00±5.292 min and in Group (III) was ranged between 65-84 min with mean±S.D. 73.80±6.680 min. There were highly statistically significant differences between groups (Table 1).

Operative time	Group (I)	Group (II)	Group (III)	P Value
Min.-Max.	50-65	58-72	65-84	<0.001*
Mean± S.D	57.80±6.512	64.00±5.292	73.80±6.680	
P1		0.034*	<0.001*	
P2			0.001*	

Table 2: Comparison between groups as regard to patient’s Operative time

P: p value for comparing between the studied groups

P1: p value for comparing between group (I) and other group P2: p value for comparing between group (II) and each of group (III) *: Statistically significant at P <0.05

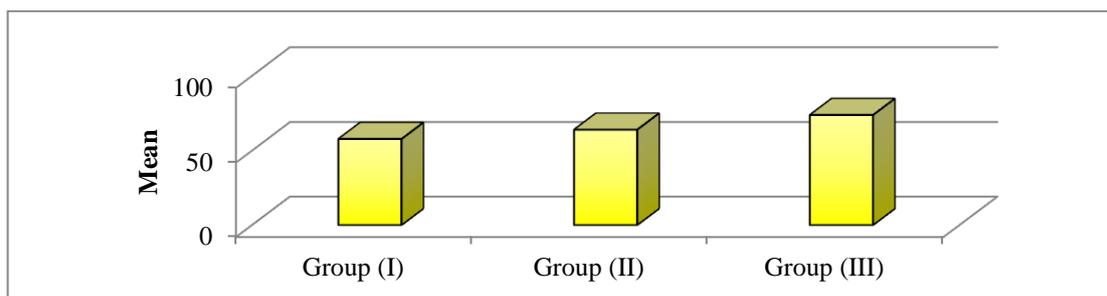


Fig. 1: Comparison between groups as regard to patient’s Operative time

Post-operative pain score (VAS score) show highly statistically significant differences between groups with high score in group (III) and the lowest score was in group (I) in all follow up time except after 6 months there were no statistically significant differences between groups.(Table 3; Figure 2)

Post-operative pain score (VAS score)	Group (I)	Group (II)	Group (III)	P Value
Early post-operative	3.00±0.667	3.60±0.843	4.40±1.075	0.010*
After 1 week	1.80±1.033	2.20±1.398	3.00±0.667	0.034*
After 1 month	0.40±0.516	1.20±0.789	2.00±0.667	0.001*
After 4 months	0	0.40±0.516	0.80±0.789	0.015*
After 6 months	0	0	0.20±0.422	0.126

Table 3: Comparison between groups as regard to patient’s post-operative pain score (VAS score)

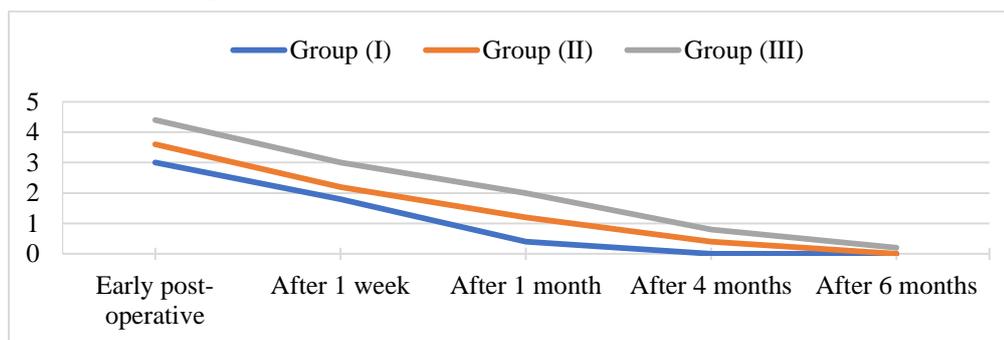


Fig. 2: Comparison between groups as regard to patient’s Post-operative pain score (VAS score)

Post-operative pain score severity	Group (I) (n=5)		Group (II) (n=5)		Group (III) (n=5)		P Value
	No.	%	No.	%	No.	%	
Early post-operative							
No Pain	0	0	0	0	0	0	0.314
Mild	4	80.0	3	60.0	1	20.0	
Moderate	1	20.0	2	40.0	3	60.0	
Severe	0	0	0	0	1	20.0	
After 1 week							
No	1	20.0	1	20.0	0	0	0.702
Mild	4	80.0	3	60.0	4	80.0	
Moderate	0	0	1	20.0	1	20.0	
Severe	0	0	0	0	0	0	
After 1 month							
No	3	60.0	1	20.0	0	0	0.092
Mild	2	40.0	4	80.0	5	100	
Moderate	0	0	0	0	0	0	
Severe	0	0	0	0	0	0	
After 4 months							
No	5	100	3	60.0	2	40.0	0.122
Mild	0	0	2	40.0	3	60.0	
Moderate	0	0	0	0	0	0	
Severe	0	0	0	0	0	0	
After 6 months							
No	5	100	5	100	4	80.0	0.343
Mild	0	0	0	0	1	20.0	
Moderate	0	0	0	0	0	0	
Severe	0	0	0	0	0	0	

Table 4: Comparison between groups as regard to patient’s Post-operative pain score severity

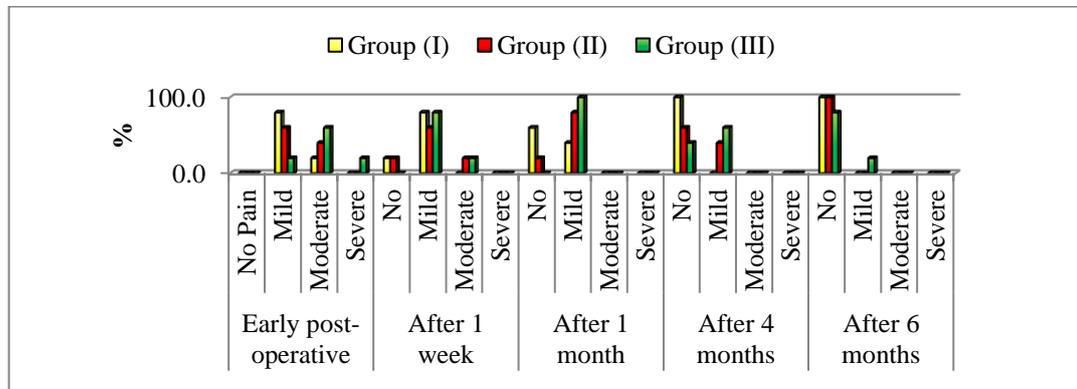


Fig. 3: Comparison between groups as regard to patient’s post-operative pain score severity

Early post operative complications	Group (I) (n=5)		Group (II) (n=5)		Group (III) (n=5)		P Value
	No.	%	No.	%	No.	%	
Scrotal edema	1	20.0	1	20.0	1	20.0	1.000
Wound infection	1	20.0	1	20.0	1	20.0	1.000
Hematoma	0	0	0	0	2	40.0	0.099
Seroma	1	20.0	1	20.0	1	20.0	1.000
Urine retention	0	0	0	0	0	0	-----

Table 5: Comparison between groups as regard to patient’s Early post operative complications

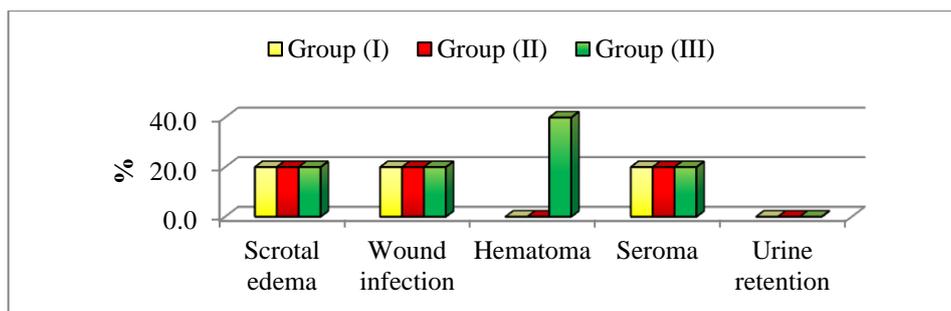


Fig. 4: Comparison between groups as regard to patient's early post operative complications. Hospital stay (hrs) in Group (I) was ranged between 4-7 hrs with mean±S.D. 5.60±1.075 hrs while in Group (II) was ranged between 4-7.5 hrs with mean±S.D. 5.90±1.350 hrs and in Group (III) was ranged between 4-10 hrs with mean±S.D. 6.60±2.271 hrs.

Hospital stay (hrs)	Group (I) (n=5)	Group (II) (n=5)	Group (III) (n=5)	P Value
Min.-Max.	4-7	4-7.5	4-10	0.648
Mean± S.D	5.60±1.075	5.90±1.350	6.60±2.271	

Table 6: Comparison between groups as regard to patient's Hospital stay (hrs)

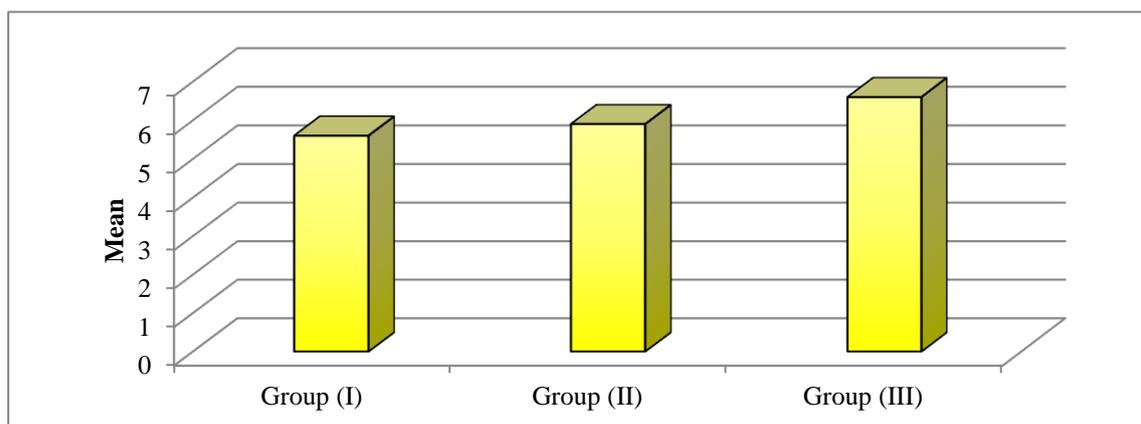


Fig. 5: Comparison between groups as regard to patient's Hospital stay (hrs)

	Group (I) (n=5)	Group (II) (n=5)	Group (III) (n=5)
Economic Cost	Intermediate	High	Low

Table 7: Comparison between groups as regard to patient's Economic Cost

Return to normal activity	Group (I) (n=5)	Group (II) (n=5)	Group (III) (n=5)	P Value
Min.-Max.	3-6	3-7	4-8	0.291
Mean± S.D	4.60±1.075	4.40±1.578	5.40±1.578	

Table 8: Comparison between groups as regard to patient's Return to normal activity

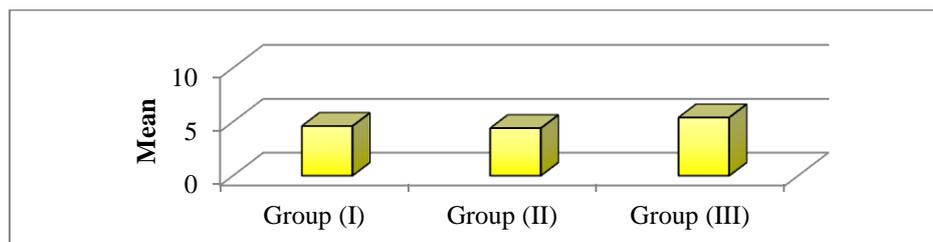


Fig. 9: Comparison between groups as regard to patient's Return to normal activity

DISCUSSION

Regarding the demographics of the study patient group, age in group (I) ranged from 23 to 67 years with a mean \pm SD 44.60 ± 15.357 years in group (II) ranged from 37 to 61 years with a mean \pm SD $49, 40 \pm 8.682$ years and in group (III) it ranged from 28 to 50 years with a mean \pm SD. 38.40 ± 8708 years. There were no statistically significant differences between the groups. In addition, patients in all groups were male. In our study, Group (I) operating time in terms of operating time ranged from 50 to 65 minutes with a mean \pm SD. 57.80 ± 6.512 minutes in group (II) ranged from 58 to 72 minutes with a mean \pm SD 64.00 ± 5292 minutes and in group (III) ranged between 65-84 minutes with a mean \pm DT 73.80 ± 6.680 min. There was a statistically significant difference between the groups. The longest operative time was in group III. While the shortest time was observed in group I (fibrin glue group). This means that the fibrin glue technique is technically more feasible.

The study of Morales-Conde,¹⁴ reported that fibrin fixation required the shortest operative time, while the study of Ferrarese et al.,¹⁵ reported that fixation with an adhesive mixture was associated with shorter operative time than suture. While Molegraaf et al.,¹⁶ reported no statistical difference between fibrin glue and stapler in terms of operating time.

The postoperative pain score (VAS score) shows statistically significant differences between the groups with a high score in group (III) and the lowest score in group (I) during the follow-up period, except at 6 months.

In accordance with our findings with Wei et al.,¹⁷ reporting mean hospitalization and pain scores at all follow-ups were better for the fibrin sealing group than for staplers. In addition Ladwa et al.,¹⁸ reported significantly higher postoperative pain with the suturing technique than with the fibrin glue method.

Also Nizam et al.,¹⁹ talked about it. However, when comparing postoperative groin pain, a meta-analysis in favor of adhesive fibrin mesh fixation was associated with less postoperative pain than staples or staplers. This study is in opponent with our findings regards to chronic-pain

Seroma is one of the most-commonly complication after laparoscopic management of ventral hernia, and its incidence is quite variable (0.5 to 78%). There was no prevalence of postoperative urinary retention, serum conversion, hospitalization, and hematoma conversion among group I and group II with no significant differences. In eleven studies, no hematoma was formed in the fibrin in viscous groups, and two cases were formed as compared into previous study.²⁰

In our study of economic cost groups (II), the highest costs of all groups (III) had the lowest costs of the groups and (I) intermediate costs. I

Return to normal activity in group (I) was between 3 and 6 days with a mean \pm SD of $4.60 \pm 1,075$ days, those in group (II) varied between 3 and 7 days with

a mean \pm SD of $4.40 \pm 1,578$ days and in group (III), ranged from 4 to 8 days with a mean \pm SD of $5.40 \pm 1,578$ days. In comparison with a previous study, observed that there is no significant-differences among groups.²¹

CONCLUSION

Our study revealed that fibrin glue method is considered comparable, cost effective method for mesh fixation. Early return to normal life, less hospital stay, cost effective, less complications, recurrence rate.

Conflict of interest : none

REFERENCES

1. Buyukasik K, Ari A, Akce B, Tatar C, Segmen O, Bektas H. Comparison of mesh fixation and non-fixation in laparoscopic totally extraperitoneal inguinal hernia repair. *Hernia*. 2017 Aug, 21(4):543-8.
2. Habeeb TA, Mokhtar MM, Sieda B, Osman G, Ibrahim A, Metwalli AE, Riad M, Khalil OM, Mansour MI, Elshahidy TM, Abdelhamid MI. Changing the innate consensus about mesh fixation in trans-abdominal preperitoneal laparoscopic inguinal hernioplasty in adults: short- and long-term outcome. Randomized controlled clinical trial. *International Journal of Surgery*. 2020 Nov 1;83:117-24.
3. Mathonnet M, Mehinto D. "[Indications for inguinal hernia repair]". *J Chir (Paris)(in French)*. 2007; 144 Spec No 4: 5S11-4.
4. Kingsnorth A, LeBlanc K. "Hernias: inguinal and incisional". *Lancet*.2003; 362 (9395): 1561-71.
5. Mohammad, H., FIAD, A., Nour, H., Hamed, A. Short Term Outcome of Laparoscopic Trans-Abdominal Preperitoneal (TAPP) Inguinal Hernia Repair Without Mesh Fixation, a Comparative Study. *The Egyptian Journal of Hospital Medicine*. 2020; 81(3): 1644-7.
6. Simons MP, Aufenacker T, Bay-Nielsen M, Bouillot JL, Campanelli G, Conze J, de Lange D, Fortelny R, Heikkinen T, Kingsnorth A, Kukleta J, Morales-Conde S, Nordin P, Schumpelick V, Smedberg S, Smietanski M, Weber G, Miserez M. "European Hernia Society guidelines on the treatment of inguinal hernia in adult patients". *Hernia*. 2009; 13 (4): 343-403.
7. Kaul A, Hutfless S, Le H, Hamed SA, Tymitz K, Nguyen H, et al. Staple versus fibrin glue fixation in laparoscopic total extraperitoneal repair of inguinal hernia: a systematic review and meta-analysis. *Surg Endosc*.2012, 26:1269-78.
8. Lukong C. Surgical Techniques of Laparoscopic Inguinal Hernia Repair in Childhood: A Critical Appraisal. *J Surg Tech Case Rep*. 2012; 4(1): 1-5.
9. McCormack K, Wake BL, Fraser C. Transabdominal preperitoneal (TAPP) versus totally extraperitoneal (TEP) laparoscopic

- techniques for inguinal hernia repair: a systematic review. *Hernia*. 2005; 9:109–14.
10. Ruhl CE, Everhart JE. "Risk factors for inguinal hernia among adults in the US population". *Am. J. Epidemiol.* 2007; 165 (10): 1154–61.
 11. Aiolfi A, Cavalli M, Del Ferraro S, Manfredini L, Bonitta G, Bruni PG, Bona D, Campanelli G. Treatment of Inguinal Hernia: Systematic Review and Updated Network Meta-Analysis of Randomized Controlled Trials. *Ann Surg.* 2021 Jan 8; Publish Ahead of Print.
 12. Sanders DL, Waydia S. A systematic review of randomised control trials assessing mesh fixation in open inguinal hernia repair. *Hernia*. 2014;18:165–76
 13. Choi BJ, Jeong WJ, Lee SC. Fibrin glue versus staple mesh fixation in single-port laparoscopic totally extraperitoneal inguinal hernia repair: a propensity score-matched analysis. *Int J Surg.* 2018;53:32–7.
 14. Morales-Conde S. A new classification for seroma after laparoscopic ventral hernia repair. *Hernia*. 2012 Jun;16(3):261-7.
 15. Ferrarese A, Marola S, Surace A, Borello A, Bindi M, Cumbo J, Solej M, Enrico S, Nano M, Martino V. Fibrin glue versus stapler fixation in laparoscopic transabdominal inguinal hernia repair: a single center 5-year experience and analysis of the results in the elderly. *International Journal of Surgery.* 2014 Oct 1; 12:S94-8.
 16. Molegraaf M, Kaufmann R, Lange J. Comparison of self-gripping mesh and sutured mesh in open inguinal hernia repair: a meta-analysis of long-term results. *Surgery.* 2018;163:351–60.
 17. Wei K, Lu C, Ge L, Pan B, Yang H, Tian J, Cao N. Different types of mesh fixation for laparoscopic repair of inguinal hernia: A protocol for systematic review and network meta-analysis with randomized controlled trials. *Medicine (Baltimore).* 2018 Apr;97(16):e0423.
 18. Ladwa N, Sajid MS, Sains P, Baig MK. Suture mesh fixation versus glue mesh fixation in open inguinal hernia repair: a systematic review and meta-analysis. *International Journal of Surgery.* 2013 Mar 1;11(2):128-35.
 19. Nizam S, Saxena N, Yelamanchi R, Sana S, Kardam D. Mesh fixation with fibrin glue versus tacker in laparoscopic totally extraperitoneal inguinal hernia repair. *ANZ Journal of Surgery.* 2021 Oct;91(10):2086-90.
 20. Jensen, K. K., Henriksen, N. A., & Jorgensen, L. N. Inguinal Hernia Epidemiology. *Textbook of Hernia.* 2017; 23–7.
 21. Kaul, A., Hutfless, S., Le, H. et al. Staple versus fibrin glue fixation in laparoscopic total extraperitoneal repair of inguinal hernia: a systematic review and meta-analysis. *Surg Endosc.* 2012; 26, 1269–78.