Ropensity Score Analysis Between The Transabdominal Preperitoneal And Open Lichtenstein Repair Techniques For Inguinal Hernia Repair

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Worldwide, inguinal hernia repair is still the most commonly performed surgical procedure [1]. The open Lichtenstein repair (OLR) is considered the most widely used procedure. The transabdominal preperitoneal (TAPP) inguinal hernia repair is becoming more popular because it benefits patients [2-4] in terms of being minimally invasive, resulting in less pain and affording an early recovery [1]. Postoperative chronic pain is the most common complication and is still under debate. Therefore, evaluation of the risk factors and predictive factors would allow for more preventive strategies [5] to ameliorate patients' quality of life. . Different factors that contribute to pain are complex and not well understood [16], and the conclusions among studies are thought to be inconsistent. Many studies that aimed to investigate postoperative pain are based on the patient's recollection of their preoperative pain levels, and the limitation of nonmatched subjects presents increased selection bias and confounding factors. The veracity and reliability of the different, available conclusions can be affected by the inaptitude to control for the entire potential variable.

Therefore, in the present study, we used propensity score matching (PSM) to determine the risk factors related to postoperative pain developed after hernia repair using TAPP and OLR techniques.

Materials and methods

A retrospective analysis based on prospectively collected data from an electronic database of 1974 patients who underwent hernia repairs was conducted. However, only 824 patients met our criteria and were enrolled in the present study. The inclusion criteria were (1) patients over 18 years of age, and (2) patients with primary unilateral hernia who received treatment with either TAPP or OLR hernia repair.

The exclusion criteria were as follows: patients with less than 5 years of follow-up; those who underwent a different repair technique; patients younger than 18 years of age; and those with irreducible hernia or bilateral hernia, or who received emergency operations as indicated in fig 1.

The patients underwent detailed laboratory examinations, including CT and MRI of the abdomen.

The main preoperative demographics recorded were the patients' age, gender, the type of work, the type of mesh used, operation time, hernia location, duration of hospital stay, persistent sensation loss, the postoperative complication of foreign body sensation, BMI, gender, hernia grade I to III according the European hernia society (EHS) classification (grade I [GI]: 1.5 cm, GII: 1.5-3 cm, GIII >3 cm).

Figures

Fig. 1

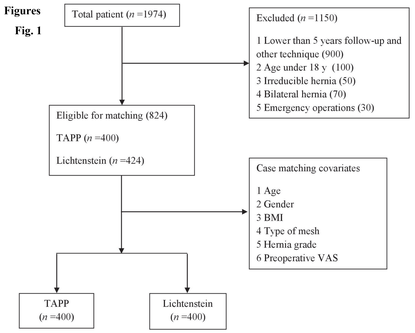


Table 2 Characteristics of patients who underwent TAPP versus Lichtenstein for inguinal hernia repair after propensity score matching

Characteristics	Total (n=800)	TAPP(n=400)	Lichtenstein(n=400)	Statistic(χ^2/Z)	P *
Age(year) [b]	53.0(36.0,64.0)	47.0(31.0,61.0)	57.0(45.0,66.0)	-6.787	**<0.001**
Gender				0.174	0.677
male	694(86.8)	345(86.3)	349(87.3)		
female	106(13.3)	55(13.8)	51(12.8)		
BMI(kg/m^2) [b]	26.0(24.4,30.0)	25.3(24.2,27.5)	26.3(25.3,32.0)	-5.351	**<0.001**
Smokers	179(22.4)	94(23.5)	85(21.3)	0.583	0.445
Comorbidity				13.144	**0.004**
0	622(77.8)	297(74.3)	325(81.3)		
1	61(7.6)	38(9.5)	23(5.8)		
2	47(5.9)	33(8.3)	14(3.5)		
3	70(8.8)	32(8.0)	38(9.5)		
Type of work				82.459	**<0.001**
retired	221(27.6)	93(23.3)	128(32.0)		
student	92(11.5)	77(19.3)	15(3.8)		
sedentary	91(11.4)	67(16.8)	24(6.0)		
light physical	178(22.3)	81(20.3)	97(24.3)		
heavy physical	218(27.3)	82(20.5)	136(34.0)		
Hernia location				3.134	0.077
left	379(47.4)	177(44.3)	202(50.5)		
right	421(52.6)	223(55.8)	198(49.5)		
Hernia grade				4.899	0.086
grade I	362(45.3)	195(48.8)	167(41.8)		
grade II	315(39.4)	152(38.0)	163(40.8)		
grade III	123(15.4)	53(13.3)	70(17.5)		
Type of mesh				13.006	**<0.001**
polyester	397(49.6)	173(43.3)	224(56.0)		
polypropylene	403(50.4)	227(56.8)	176(44.0)		
Foreign body sensation within 3 months	165(20.6)	62(15.5)	103(25.8)	12.835	**<0.001**
Scrotal invasion	205(25.6)	114(28.5)	91(22.8)	3.470	0.063
Post operative complications					
Wound edema	57(7.1)	22(5.5)	35(8.8)	3.192	0.074
Wound infection	70(8.8)	19(4.8)	51(12.8)	16.031	**<0.001**
Numbness	90(11.3)	29(7.2)	61(15.3)	12.820	**<0.001**
Persistent sensation loss	142(17.8)	54(13.5)	88(22.0)	9.898	**0.002**
Pain interfere with sports	152(19.0)	63(15.8)	89(22.3)	5.491	**0.019**
Recurrence after 1 year [f]	6(0.8)	3(0.8)	3(0.8)		1.000
Recurrence after 5 years [f]	3(0.4)	1(0.3)	2(0.5)		1.000
Preoperative VAS [b]	9.0(0.0,24.0)	6.5(0.0,22.8)	11.0(0.0,25.8)	-3.794	**<0.001**
Postoperative VAS 3m [b]	1.0(0.0,12.0)	0.0(0.0,3.0)	2.5(0.0,22.0)	-8.829	**<0.001**
Postoperative VAS 1y [b]	3.0(1.0,13.0)	3.0(1.0,12.0)	3.0(1.0,14.0)	-0.292	0.771
Postoperative VAS 2y [b]	1.0(0.0,8.0)	0.0(0.0,5.0)	1.0(0.0,11.8)	-2.625	**0.009**
Postoperative VAS 3y [b]	1.0(0.0,6.0)	0.0(0.0,2.0)	4.0(1.0,9.0)	-12.243	**<0.001**
Postoperative VAS 4y [b]	3.0(0.0,9.0)	1.0(0.0,5.0)	5.0(2.0,15.8)	-10.228	**<0.001**
Postoperative VAS 5y [b]	3.0(0.0,7.0)	1.0(0.0,6.0)	4.0(0.0,9.0)	-4.916	**<0.001**
Operative time (min) [b]	57.0(50.0,67.0)	65.0(57.0,80.0)	50.0(43.0,57.0)	-16.522	**<0.001**
Hospital stay (day) [b]	6.0(4.0,8.0)	5.0(4.0,6.0)	8.0(6.0,9.0)	-15.634	**<0.001**
Follow up (month) [b]	60.0(60.0,61.0)	60.0(60.0,61.0)	60.0(60.0,61.0)	-0.849	0.396

TAPP: transabdominal preperitoneal; BMI: body mass index; VAS: visual analogue scale; m: month; y: year.

Values are shown as mean (standard deviation).

a: Chi-square test or independent samples Mann-Whitney U test.

b: Values are shown as median (interquartile range).

f: Fisher's exact test.

Fig. 2

Table 1 Visual Analogue Scale score before and after inguinal hernia repair

	Preoperative VAS <30 (n =645)	Preoperative VAS >30 (n =179)	P *
Percent	78.3	21.7	
Pre VAS	7.38(8.72)	46.62(9.39)	<0.001
Post VAS(3m)	4.14(8.32)	28.15(20.50)	<0.001
VAS difference(3m-pre)	-3.25(12.08)	-18.47(15.25)	<0.001
Post VAS(1y)	4.99(6.55)	22.46(15.66)	<0.001
VAS difference(1y-pre)	-2.40(11.25)	-24.16(12.16)	<0.001
Post VAS(2y)	3.00(5.69)	20.68(14.53)	<0.001
VAS difference(2y-pre)	-4.38(10.61)	-25.94(9.89)	<0.001
Post VAS(3y)	2.74(4.79)	22.06(14.94)	<0.001
VAS difference(3y-pre)	-4.65(9.80)	-24.56(9.46)	<0.001
Post VAS(4y)	4.20(6.45)	23.77(15.13)	<0.001
VAS difference(4y-pre)	-3.19(10.29)	-22.85(9.67)	<0.001
Post VAS(5y)	3.48(5.28)	23.50(14.98)	<0.001
VAS difference(5y-pre)	-3.90(9.88)	-23.12(9.75)	<0.001

VAS: visual analogue scale; Pre: preoperative; Post: postoperative; m: month; y: year.

Values are shown as mean (standard deviation).

a: Independent samples Mann-Whitney U test.

Fig. 3

Table 3 Univariate analysis of predictors for Visual Analogue Scale score difference between preoperative and three months after inguinal hernia repair (after propensity score matching)

Characteristics	Total (n=800)	Statistic(Z/H)	P *
Age (year)		-0.477	0.633
≤50	356(44.5)		
>50	444(55.5)		
Gender		-0.032	0.974
male	694(86.8)		
female	106(13.3)		
BMI (kg/m^2)		-1.433	0.152
≤20	19(2.4)		
>20	781(97.6)		
Smokers	179(22.4)	-0.044	0.965
Type of work		0.923	0.921
retired	221(27.6)		
student	92(11.5)		
sedentary	91(11.4)		
light physical	178(22.3)		
heavy physical	218(27.3)		
Hernia location		-0.927	0.354
left	379(47.4)		
right	421(52.6)		
Hernia grade [a]		14.836	**0.001**
grade I	362(45.3)		
grade II	315(39.4)		
grade III	123(15.4)		
Operation		-2.918	**0.004**
TAPP	400(50.0)		
Lichtenstein	400(50.0)		
Type of mesh		-4.416	**<0.001**
polyester	397(49.6)		
polypropylene	403(50.4)		
Foreign body sensation within 3 months	165(20.6)	-1.983	**0.047**
Scrotal invasion	205(25.6)	-2.262	**0.024**
Operative time (min)		-3.435	**0.001**
≤60	483(60.4)		
>60	317(39.6)		

BMI: body mass index; TAPP: transabdominal preperitoneal.

a: Independent samples Mann-Whitney U test or independent samples Kruskal-Wallis H test.

Fig. 4

Table 4 Multivariate analysis of predictors for Visual Analogue Scale score difference between preoperative and three months after inguinal hernia repair (after propensity score matching)

Characteristics	β	95%CI	P *
Hernia grade			
grade I	ref		
grade II	-1.16	(-3.271,0.955)	0.282
grade III	-5.65	(-8.524,-2.783)	**<0.001**
Operation			
TAPP	ref		
Lichtenstein	3.028	(1.069,4.987)	**0.002**
Type of mesh			
polyester	ref		
polypropylene	-3.44	(-5.400,-1.489)	**0.001**

β: regression coefficient; CI: confidence interval; ref: reference

a: multiple linear regression.

Fig. 5

Results

Patient population and clinicopathological characteristics

A total of 1974 patients with inguinal hernia defects underwent hernia repair in our hospital between 2008 and 2018. Among these, only 824 underwent either TAPP or OLR hernia repair. TAPP was performed in 400 patients, and OLR was performed in 424 patients. The two groups were balanced in 400 pairs for further statistical analysis.

The differences in age and BMI were different between the two groups (P<0.001 and P<0.001, respectively). The type of mesh showed a significant difference between the two groups (P<0.001), and foreign body sensation (P<0.001) and persistent sensation loss (P=0.002) were also different between the two groups.

Only hernia grade (P=0.001), operation type (P=0.004), the type of mesh (P<0.001), foreign body sensation within 3 months (P=0.047), scrotal invasion (P=0.024), and operative time (P=0.001) were risk factors. Age, BMI, type of work, and hernia location did not exhibit any risk factors.

hernia grade III (CI: -8.524, -2.783; p<0.001), OLR operation type (CI: 1.069, 4.987; P=0.002), and the type of polypropylene mesh (CI: -5.400, -1.489; P=0.001) were independently associated with chronic pain.

Conclusion

The TAPP repair technique demonstrated better performance in terms of decreased postoperative chronic pain development than did the OLR technique.. However, more prospective clinical studies with a large number of patients are needed to determine the surgeon choice in the development of post operative pain .