

## Original Research Article

# Is inguinal hernia repair safe for testicular atrophy? Our 10 year results

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### ABSTRACT

**Background:** We aimed to determine the incidence and predictors of testicular atrophy (TA) in patients undergoing inguinal hernia repair at our hospital.

**Methods:** The total patient number is 578. The patients were divided Group-1 (developed testicular atrophy) and Group-2 (did not develop testicular atrophy). The testicles were evaluated with Scrotal Color Doppler Ultrasonography (SCDU) in preoperative and postoperative third month.

**Results:** Median age in the Group - 1 and Group - 2 respectively is 64,0±12,3 (47-81) and 48,9±17,4 (18-89) (p=0.037). TA developed in 5.01% (29/578) of the patients. We determined that TA developed more often in the patients who are over the age of 40 (p=0.007), in secondary cases (p<0.001), in open repair (p<0.001), those who do not use perioperative narcotic and Nonsteroidal Anti-Inflammatory Drugs (NSAIDs) (p<0.001), those who use perioperative antispasmodic drugs (p=0.017), those having a rheumatic disease (RD) and diabetes mellitus (DM) (p<0.001). Results of multivariate analysis, testicular atrophy development increases when perioperative NSAID is not used (OR:13.24; 95% CI:4.19-41.87; p<0.001), perioperative narcotic is not applied (OR:13.91; 95% CI:4.35-44.55; p<0.001) and RD exists (OR:0.10; 95% CI:0.03-0.35; p<0.001).

**Conclusions:** Advanced age, DM and rheumatic disease, not using perioperative NSAIDs, narcotic drugs and antispasmodic drugs increases the risk of testicular atrophy.

**Keywords:** Erectile function, Inguinal hernia, Scrotal color doppler ultrasonography, Testicular atrophy

### INTRODUCTION

Inguinal hernia is a frequently seen surgical pathology. Therefore, inguinal hernia repair (IHR) operation is performed often.<sup>1-4</sup> Following IHR, postoperative urinary retention (POUR) postoperative testicular atrophy (POTA), inguinal pain, hypoesthesia may develop.<sup>5-8</sup> POTA is not a frequently seen pathology.<sup>7</sup> However, it may cause psychological effects, erectile dysfunction (ED) if there is a problem in the opposite testicle functions, loss of libido, and infertility in younger ages in patients. In addition, any damage to the lymphatic vessels of the spermatic cord during the operation may cause hydrocele, and damage of the genital branch of the genitofemoral

nerve may cause hypoesthesia in the internal face of femur and external genitalia.<sup>7,8</sup> POTA may cause many factors such as an increase in morbidity, continuous hormone replacement in some cases, and prolonged hospitalization.<sup>9</sup> Studying the risk factors that cause POTA may help to reduce the complication rate. Many studies have been carried out to investigate predictive factors of POTA development. We realized that the use of Nonsteroidal Anti-Inflammatory Drugs (NSAIDs) and Antispasmodic drugs, type of hernia (direct, indirect, combined, recurrent), comorbid diseases such as Diabetes Mellitus (DM) and Rheumatic disease in the previous studies. We studied the effect of the stated and other factors on POTA and testicular atrophy.

## METHODS

The study included the male patients over age of 18, who underwent open and laparoscopic inguinal hernia repair at Lokman Hekim University Akay Hospital between January 2010 and January 2020. The ethics committee approval was received from the Medical Ethics Committee of Lokman Hekim University Faculty of Medicine (No.2020037).

The patients included in the study were operated by three surgeons who had more than 20 years of professional experience. Patient data were retrospectively collected. The total number of patients was 578. The follow-up time was three months in 210 patients, nearly six months in 140 patients and 12 months and longer in 218 patients. The information regarding whether the patients developed testicular atrophy in the early postoperative period (in postop first 3 months) could be accessed for all patients. All available data could be reached only in 218 patients. Therefore, all patients were included in the calculation of the POTA rate, whereas 218 (for whom all available data could be reached) patients were included in the evaluation of the predictive factors for POTA. The patients were evaluated with Scrotal Color Doppler Ultrasonography (SCDU) preoperative and postoperative third month, and the size of the testicles were compared with the size of the opposite testicle.

### *Ultrasound and testicular volume*

Ultrasound procedures were carried out with the patient in the supine position. Patients underwent B-mode ultrasonography (Siemens S3000 ultrasound machine (Acuson Corporation, Siemens, Mountain view, CA, USA, scrotal examinations were performed using a linear-array 9L4 frequency transducer with testicular software settings with 50 frames per second, Mechanical Index 1.2, Dynamic range 70, Advanced SieClear™ spatial compounding 5) and testicular volume was calculated as  $\pi / 6 \times \text{length (L)} \times \text{height (H)} \times \text{width (W)}$ . According to the European Society of Urogenital Radiology testicular atrophy is defined as a volume of less than 12 ml.

The patients were asked about Erectile Function (EF) and Loss of libido. The hormonal examination was carried out just for the patients with EF and loss of libido. While evaluating EF, International Index of Erectile Function (IIEF) evaluation form, Luteinizing hormone (LH) for hormonal examination, Follicle-stimulating hormone (FSH), and total testosterone (TT) were examined upon the request of the urologist.

The patients were divided into two groups: Group-1 (patients who developed testicular atrophy following inguinal hernia repair) and Group-2 (patients who did not develop testicular atrophy following inguinal hernia repair). In our study, we investigated the relationship between testicular atrophy development and age, type and localization of the hernia, duration of operation and

anesthesia, use of perioperative NSAID and antispasmodic drugs, presence of DM and Rheumatic diseases in the evaluation carried out in the postoperative third month in the patients having an inguinal hernia repair. We evaluated the postoperative complications according to Clavien Scale.

### *Surgical technique*

Laparoscopic inguinal hernia repair was performed with the totally extraperitoneal (TEP) technique using 3 trocars, whereas open inguinal hernia repair was performed with an inguinal incision. General anesthesia was used in both techniques. In both techniques, polypropylene mesh (3.5 5.0 in) was used to cover all inguinal defects and coapted to Cooper's ligament and the anterior abdominal wall with spiral titanium tacks.

### *Statistical analyses*

Descriptive statistics for the continuous variables were expressed with mean, standard deviation, median and minimum-maximum values, whereas categorical variables were expressed with frequency (n) and percentage (%) values. Categorical variables were compared using the Chi-square or Fisher's exact test. Mann-Whitney U test was used to compare continuous variables that did not exhibit normal distribution with two-level variables. Multivariate logistic regression analysis was conducted to determine the factors predicting urinary retention, wherein odds ratios were calculated in 95% confidence intervals. IBM SPSS 23.0 was used for all analyses and  $p < 0.05$  was considered statistically significant.

## RESULTS

The number of patients included in the study was 218. The number of patients was 29 (13.3%) in Group 1 and 2 in Group 189 (86.7%). The median ages were  $64.0 \pm 12.3$  (47-81) and  $48.9 \pm 17.4$  (18-89) in Groups 1 and 2, respectively ( $p = 0.037$ ). The preoperative secondary case number is 43 (19.7%), bilateral inguinal hernia case number 88 (40.4%), the number of patients diagnosed with combined inguinal hernia (direct+indirect inguinal hernia) is 66 (30.3%), and the number of patients having an open repair is 87 (39.9%). The number of patients diagnosed with DM is 63 (28.9%). Antispasmodic drugs were used in perioperative 52 (23.9%) patients, NSAID were used in 172 (78.9%) patients, a Narcotic Analgesic was used in 53 (24.3%) patients. Mesh grafting was applied to all of the patients.

5.01% (29/578) of the patients developed testicular atrophy (Table 1). Just one (64 age) of the patients who developed testicular atrophy had complaints of EF, Loss of libido, however, hormonal examination results were normal (FSH:7,23 mIU/ml; LH:5.81 mIU/ml; Testosterone:10.7 nmol/l). None of the patients exhibited Clavien grade 4 and grade 5 complications. One patient developed hydrocele in the postoperative sixth month.

**Table 1: Medical and sociodemographic characteristics of the participants.**

Variables	Frequency (%)
<b>Age (in years)</b>	
<40	79 (36.2)
>40	139 (63.8)
<b>Case status</b>	
Primary	175 (80.3)
Secondary	43 (19.7)
<b>Side operated</b>	
Right	61 (28.0)
Left	69 (31.7)
Bilateral	88 (40.4)
<b>Diabetes mellitus</b>	
Yes	63 (28.9)
No	155 (71.1)
<b>Laparoscopic vs. open repair</b>	
Laparoscopic	131 (60.1)
Open repair	87 (39.9)
<b>Operative time</b>	
<60 min	127 (58.3)
>60 min	91 (41.7)
<b>Anesthesia time</b>	
<60 min	97 (44.5)
>60 min	121 (55.5)
<b>Perioperative narcotic use</b>	
Yes	165 (75.7)
No	53 (24.3)
<b>Perioperative antispasmodic use</b>	
No	166 (76.1)
Yes	52 (23.9)
<b>Type of hernia</b>	
Direct	58 (26.6)
Indirect	94 (43.1)
Direct+Indirect	66 (30.3)
<b>Testicular atrophy status</b>	
Yes	29 (13.3)
No	189 (86.7)
<b>Rheumatic disease</b>	
Yes	23 (10.6)
No	195 (89.4)
<b>Perioperative NSAID use</b>	
Yes	172 (78.9)
No	46 (21.1)

NSAID=nonsteroidal anti-inflammatory drug

The demographic and clinical characteristics of the patients who developed postoperative testicular atrophy were statistically evaluated. The preoperative average testicle volumes of the patients who developed and did not develop testicular atrophy were similar (23 (20.25) and 23 (20.25), respectively;  $p=0.068$ ).

We detected that testicular atrophy develops more often in the patients over the age of 40 ( $p=0.007$ ), in secondary

cases ( $p<0.001$ ), in those who undergo open repair ( $p<0.001$ ), in those who do not use perioperative narcotic drugs ( $p<0.001$ ), in those who use perioperative antispasmodic drugs ( $p=0.017$ ), those who do not use perioperative NSAIDs ( $p<0.001$ ), those with a rheumatic disease ( $p<0.001$ ) and those diagnosed with diabetes mellitus ( $p<0.001$ ). In addition, hospitalization duration (Mean rank= 39.45) of the patient who developed testicular atrophy was found to be higher compared to those who did not develop testicular atrophy (Mean rank=104.53) ( $p<0.001$ ) (Table 2).

**Table 2: Univariate analyzes results used to determine independent risk factors that cause postop testicular atrophy.**

Variables	Total	Group I Testicular atrophy exists (n=29)	Group II Testicular atrophy does not exist (n=189)	P value
<b>Age (years), N (%)</b>				0.007
<40	79(100)	4(5.1)	75(94.9)	
>40	139(100)	25(18.0)	114(82.0)	
<b>Case status, N (%)</b>				<0.001
Primary	175(100)	9(5.1)	166(94.9)	
Secondary	43(100)	20(46.5)	23(53.5)	
<b>Side operated, N (%)</b>				0.196
Right	61(100)	5(8.2)	56(91.8)	
Left	69(100)	13(18.8)	56(81.2)	
Bilateral	88(100)	11(12.5)	77(87.5)	
<b>Diabetes mellitus, N (%)</b>				<0.001
Yes	63(100)	20(31.7)	43(68.3)	
No	155(100)	9(5.8)	146(94.2)	
<b>Laparoscopic, open repair status, N (%)</b>				<0.001
Laparoscopic	131(100)	0(0)	131(100)	
Open repair	87(100)	29(33.3)	58(66.7)	
<b>Anesthesia time, N (%)</b>				0.244
<60 min	97(100)	10(10.3)	87(89.7)	
>60 min	121(100)	19(15.7)	102(84.3)	
<b>Operative time, N (%)</b>				0.718
<60 min	127(100)	16(12.6)	111(87.4)	
>60 min	91(100)	13(14.3)	78(85.7)	
<b>Perioperative narcotic use, N (%)</b>				<0.001
Yes	165(100)	7(4.2)	158(95.8)	
No	53(100)	22(41.5)	31(58.5)	
<b>Perioperative antispasmodic use, N (%)</b>				0.017
No	166(100)	17(10.2)	149(89.8)	
Yes	52(100)	12(23.1)	40(76.9)	
<b>Type of hernia, N (%)</b>				0.242
Direct	58(100)	4(6.9)	54(93.1)	
Indirect	94(100)	15(16.0)	79(84.0)	
Direct+Indirect	66(100)	10(15.2)	56(84.8)	
<b>Rheumatic disease<sup>†</sup>, N (%)</b>				<0.001
Yes	23(100)	14(60.9)	9(39.1)	
No	195(100)	15(7.7)	180(92.3)	
<b>Perioperative NSAID use, N (%)</b>				<0.001
Yes	172(100)	9(5.2)	163(94.8)	
No	46(100)	20(43.5)	26(56.5)	
Length of hospital stay, median (range)	1(1,2)	1(1,2)	1(1,2)	<0.001
Preop testicle size (cc) median (range)	15(13,22)	23(20.25)	23(20.25)	0.068

<sup>†</sup>Fisher's exact test. NSAID=nonsteroidal anti-inflammatory drug

We included in the multivariate regression analysis significant variables found in univariate analyzes to determine the independent risk factors that affect Testicular Atrophy development.

According to the results of multivariate analysis, testicular atrophy development increases when perioperative NSAID is not used (OR:13.24; 95% CI:4.19-41.87; p value <0.001), when perioperative narcotic is not applied (OR:13.91; 95% CI:4.35-44.55; p value <0.001) and in the

presence of a rheumatic disease (OR:0.10; 95%CI:0.03-.35; p value <0.001) (Table 3).

**Table 3: The results of multivariable logistic regression analyses for testicular atrophy.**

Testicular atrophy	Factor	P value	OR	95% CI
Perioperative narcotic use	No	<0.001	13.91	4.35-44.55
Rheumatic disease	Yes	<0.001	0.10	0.03-0.35
Perioperative NSAID	No	<0.001	13.24	4.19-41.8

NSAID=nonsteroidal anti-inflammatory drug

## DISCUSSION

In the present study conducted with 218 patients, the rate of POTA following IHR was 5.01%. This rate was reported to be 0.5% in the study carried out by Reide et al.<sup>7</sup>

Hospitalization duration (Mean rank= 39.45) of the patients who developed testicular atrophy was found to be higher compared to those who did not develop testicular atrophy (Mean rank=104.53) (p<0.001). When we reviewed the previous studies, we found out that this parameter was not controlled.

In the study carried out by Singh et al, a clinically significant impairment was reported in the testicle functions of the patients who had open repair with mesh.<sup>9</sup> According to the result of this study, testosterone level significantly reduced and FSH, LH levels significantly increased. In the study carried out by Akbulut et al, it was concluded that the impairment in testicle function is higher in the patients who had laparoscopic TEP with mesh compared to the patients having an open repair.<sup>10</sup> In the present study, we could not evaluate the effects of using a mesh on testicular atrophy as inguinal hernia repair was performed with meshes in all patients. However, we determined that the patients who underwent open repair had a higher rate of testicular atrophy (p<0.001).

According to the results of the study carried out by Akbulut et al and Wantz et al, wide dissection increases the impairment risk of the supply to the testicles.<sup>10,11</sup> When we reviewed surgical operation reports of the patients who we included in the study, we found out that wide dissection was avoided and that surgical margin for the dissection was selected as inguinal ligament (in superior), pubis (in inferomedial), aponeurosis of the transverse muscle (in lateral) in all patients. Therefore, we did not investigate the effect of dissection width on testicular atrophy.

Unlike other studies, in our study, we determined that advanced age, DM and rheumatic disease history, not using perioperative Nonsteroidal Anti-Inflammatory

Drugs (NSAIDs) and narcotic drugs, and not using antispasmodic drugs increases the risk of testicular atrophy.

The fact that our study was carried out retrospectively and the patient numbers in the groups are different is the limitation of our study.

## CONCLUSION

In conclusion, advanced age, DM and rheumatic disease history, not using perioperative NSAIDs and narcotic drugs, and not using antispasmodic drugs increases the risk of testicular atrophy. We think that preoperative information and evaluation of the opposite testicle would be beneficial in the patients having these characteristics.

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## REFERENCES

- Jenkins JT, O'Dwyer PJ. Inguinal hernias. *BMJ*. 2008;336:269-72.
- Hall MJ, Schwartzman A, Zhang J, Liu X. Ambulatory surgery data from hospitals and ambulatory surgery centers: United States, 2010. *Natl Health Stat Rep*. 2017;102:1-5.
- Devlin HB. Trends in hernia surgery in the land of Astley Cooper. In: Soper NJ (ed) *Problems in general surgery*, vol 12. Lippincott Raven, Philadelphia. 1995;12:85-92.
- Kingsnorth A, LeBlanc K. Hernias: inguinal and incisional. *Lancet*. 2003;362:1561-71.
- Haskell DL, Sunshine B, Heifetz CJ. A study of bladder catheterization with inguinal hernia operations. *Arch Surg*. 1974;109:378-80.
- Goldman G, Leviav A, Mazor A, et al. Alpha-adrenergic blocker for posthernioplasty urinary retention. Prevention and treatment. *Arch Surg*. 1988;123:35-6.
- Reid I, Devlin HE. Testicular atrophy as a consequence of inguinal hernia repair. *Br J Surg*. 1994;81:91-3.
- Zieren J, Beyersdorff D, Beier KM, Müller JM. Sexual function and testicular perfusion after inguinal hernia repair with mesh. *Am J Surg*. 2001; 181:204-6.
- Singh AN, Bansal VK, Misra MC, Kumar S, Rajeshwari S, Kumar A, et al. Testicular functions, chronic groin pain, and quality of life after laparoscopic and open mesh repair of inguinal hernia: a prospective randomized controlled trial. *Surg Endosc*. 2012;26(5):1304-17.
- Akbulut G, Serteser M, Yucel A, Degirmenci B, Yilmaz S, Polat C, et al. Can laparoscopic hernia repair alter function and volume of testis?

Randomized clinical trial. *Surg Laparosc Endosc Percutan Tech.* 2003;13:377-81.

11. Wantz GE. Testicular Atrophy as a sequela of inguinal hernioplasty. *Int Surg.* 1986;71:159-63.

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