

## Why do we use drains in some inguinal hernia repairs?

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### Abstract

**Background and Aims:** There is no consensus among surgeons on the indication of putting drains in groin hernias. In this study we aimed to investigate the factors that are associated with drain usage by comparing the clinical characteristics of patients who had drains with the patients without drains in the repair of groin hernias.

**Material and Methods:** The data of all groin hernia repairs from January 2006 till February 2010 in Ankara Diskapi Research Hospital were collected prospectively. The type of presentation, age, gender, presence of coexisting diseases, type of hernia, American Society of Anesthesiologists (ASA) class, type of anesthesia, postoperative general complications, local wound complications, duration of operation, and length of hospitalization, recurrence and mortality were compared between the groups of patients with drains versus without drains.

**Results:** The drains were used in 66 (8.3%) of 795 open mesh repairs of inguinal hernias. The patients who had drains were older, had cardiovascular disease, higher ASA class, received anticoagulant regimens more often, had indirect type hernia more often, more recurrent hernias, more commonly had emergency operations, had complicated presentations such as incarceration and strangulation, therefore had resections more often, pulmonary complications, had local complications such as hematoma, had longer duration of the operations and stayed longer in the hospital when compared with the patients

without drains ( $p < 0.05$ ). Anticoagulant use, duration of the operation, recurrent hernias and ASA class were statistically significant independent variables predicting drain use in inguinal hernias ( $p < 0.05$ ). When femoral hernia repairs ( $n = 35$ ) were analysed; drains were associated with male gender and long operation time ( $p < 0.05$ ).

**Conclusions:** Drains are more commonly used in patients on anticoagulants, who had long duration of the operation, recurrent hernias and high ASA class. Drain use in selected patients seems to not increase infection risk but are associated with longer hospital stay.

**Key words:** drain, hernia repair, groin hernia, hematoma, infection, anticoagulant

### Introduction

Inguinal hernia is the commonest of all hernias and their repairs are the most common elective procedures performed by surgeons. Although elective hernia repairs have favorable outcomes, as they can be associated with certain complications such as seroma, ecchymosis, hematoma and wound infection. These complications have been well discussed in the literature however the usage of drains in these repairs and their association with complications has not been documented very well. Furthermore there is no consensus among surgeons on the need of drains for all types of hernias; where as some use drains indiscriminately and others rarely (1). Generally it is accepted that there is no indication for the routine use of drains in open repair of simple inguinal hernias. A seroma and hematoma that develops afterward can be treated by postoperative percutaneous puncture and drainage (2,3). However where

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dissection is difficult or when other complicating factors are present the usage of suction drainage is recommended (4).

In this prospective observational study we aimed to investigate the factors that are associated with drain usage by comparing the clinical characteristics of patients who had drains with the patients without drains in the repair of groin hernias.

## Material and Methods

We prospectively analyzed the groin hernias repairs in which suction drains were used and compared them with other groin repairs without drains from January 2006 till February 2010 in 4th Surgical Department of Ankara Diskapi Teaching and Research Hospital.

The repair technique for inguinal hernia was Lichtenstein operation which was previously described (5). The rest of the repairs by using all other techniques were excluded. Patients under age of 16 were also excluded.

Before the operation generally a bolus dose of a first generation cephalosporin (cephazolin sodium; Cefamezin, Eczacibasi, Istanbul, Turkey) was given intravenously at the induction of anesthesia. No patients were given any additional antibiotic postoperatively unless he or she developed a proven surgical site infection. Oral anticoagulants were discontinued 5 days before an elective surgery and were substituted with low-molecular-weight heparin (LMWH) (Enoxaparin, Clexan, Sanofi-Aventis, Paris, France) perioperatively.

All the repairs were performed by a surgeon or by a resident under supervision of a surgeon. The preference of placing a drain in-situ was only the surgeons' intraoperative decision. Two members of the study team (MA, ZE) were chosen as the independent monitors of the research. They collected the data from patients' files and operation reports and recorded on a prospective protocol form. The on-duty surgeons recorded the reason of the drain use in every single case. Only closed system suction drains with a silicon line were used. Drain was removed when its daily drainage was less than 30 ml.

All the patients were mobilized on the day of operation and their wounds were inspected daily till discharge by two monitors. The daily output and duration of drain, anticoagulant regimen, discomfort and pain due to the drain on the first postoperative day were analyzed in the drain group. On the first postoperative day non steroidal anti-inflammatory drugs were given twice a day. The pain and discomfort due to the drain was classified as severe (pain or discomfort requiring additional analgesia) or mild (mild pain or discomfort but do not need any analgesic) or none (no pain or discomfort due to the drain). Outpatient controls were also performed with clinical examination by the same researchers on day-7 and day-30. Surgical site infection as deep or superficial was confirmed with microbial culture for identification of the microorganism and therapeutic antibiotic regimen were given according to antibiogram results. The type of presentation, age, gender, presence of coexisting diseases, type of hernia, American Society of Anesthesiologists (ASA) class, type of anesthesia, postoperative general complications, local wound complications, duration of

operation, and length of hospitalization, recurrence and mortality was analyzed in both groups and compared with each other.

During this period, we also analyzed 7 femoral hernias undergoing different type of repair in which suction drains were used and compared them with 28 femoral repairs without drains and also compared with each other.

The results were analyzed statistically using SPSS for Windows program (SPSS, Chicago, Illinois). Comparisons of categorical variables between the two groups were performed by using the chi-square test with Yates' correction. Kolmogorov Smirnov test was used to test for the normal distribution of the numeric variables. Student t test and Mann Whitney U tests were used to compare the parametric and nonparametric variables between the two groups. Binary logistic regression was performed with the Backward conditional method to analyze the significant independent predictors of drain use as the dependent variable. Linear logistic regression was performed to analyze the significant independent predictors of duration of the hospital stay as the dependent variable. P values less than 0.05 were considered as significant. Data is presented as number of patients (%), mean  $\pm$  standard deviation or median (minimum-maximum) where appropriate.

## Results

During the above mentioned period, a total of 847 groin hernia repairs were carried out in 796 patients. Seventeen patients had hernioplasties other than open-mesh repair and therefore were not included into the analysis. Remaining 830 groin hernia repairs were carried out in 779 patients. Totally 795 tension free repairs of inguinal hernia were performed in 744 patients whereas other 35 of them were femoral hernias and different hernioplasties were performed. Bilateral inguinal hernias were recorded in 51(6.4%) of these, 723(91%) were elective hernia repairs and 72(9%) were emergency hernia repairs with complicated presentations.

The drains were used in 66 (8.4) of 795 open mesh repairs. This group repairs' daily output and duration of the drains, discomfort and pain on the first postoperative day due to their drain were summarized in *Table 1*. Eight patients were using coumadin and 14 patients were on acetylsalicylic acid preoperatively. The median (minimum-maximum) duration of the drains was 2 (1-7) days.

**Table 1.** The daily output and duration of the drains, discomfort and pain on the first postoperative day due to the drains were summarized. (n: number of repairs)

Postoperative	Daily Mean Drain Output		Pain & Discomfort	
	n*	ml	Postoperative	1 <sup>st</sup> day, n
1 <sup>st</sup> day	66	66 $\pm$ 42	Severe	7 (11%)
2 <sup>nd</sup> day	59	41 $\pm$ 38	Mild	20 (30%)
3 <sup>rd</sup> day	30	31 $\pm$ 30	None	39 (59%)

\*Number of drains retained due to high output on postoperative second and third day

**Table 2.** The characteristics of 66 patients with drains according to the type of the hernia. (n: number of repairs)

Clinical Characteristics	Type, n		
	Direct	Indirect	Mixed
Recurrent hernia	2	4	5
Anticoagulant Use	3	7	3
Large inguino-scrotal hernia	2	15	1
Complicated Presentation*	0	4	2
Recurrent hernia + Anticoagulant Use	1	3	2
Complicated Presentation* + Anticoagulant Use	1	2	0
Recurrent hernia + Complicated Presentation*	0	4	0
No clinical characteristic was specified	2	3	0
TOTAL	11	42	13

\*Incarceration/Strangulation

The clinical characteristics of 66 patients with inguinal hernias in whom drains were used are presented in *Table 2*. The frequency of recurrence, use of anticoagulants, large inguino-scrotal hernias and complicated presentation (incarceration, strangulation) were cross-tabulated with the hernia types in *Table 2*.

The comparison of the two groups (repairs with drains versus without drains) regarding demographics, clinical characteristics and the patients' outcome is shown in *Table 2*. There was only one recurrence in no-drain group. There was no mortality in both groups.

Sixty five out of the 66 (98%) patients in the drain group and 564 out of 729 (77%) patients without drains completed the follow-up ( $p < 0.001$ ). Mean/median follow up period was  $27 \pm 11$  for drain and  $31 \pm 14$  for non drain group ( $p = 0.037$ ).

The patients who had drains were older, had cardiovascular disease, higher ASA class, received anticoagulant regimens more often, had indirect type hernia more often, more recurrent hernias, more commonly had emergency operations, had complicated presentations such as incarceration and strangulation, therefore had resections more often, pulmonary complications, had local complications such as hematoma, had longer duration of the operations and stayed longer in the hospital when compared with the patients without drains ( $p < 0.05$ ) (*Table 3*).

When age, type of hernia, American Society of Anesthesiologists (ASA) class, recurrence, duration of operation, anticoagulant use and cardiovascular disease were accepted as covariates and drains were the dependent variable in the binary logistic regression analysis by backward conditional method; anticoagulant use, duration of the operation, recurrent hernias and ASA class were statistically significant independent variables predicting drain use in inguinal hernias ( $p < 0.05$ ).

The linear logistic regression, that was performed by using the hospital stay as the dependent variable and age, type of the hernia, recurrence, presence of resection, drains,

ASA class, anticoagulant use, emergency surgery, presence of strangulation as the independent variable by backward conditional method, revealed that presence of drains, ASA class, presence of strangulation were the independent statistically significant predictors of hospital stay ( $p < 0.05$ ).

When femoral hernia repairs ( $n = 35$ ) were analysed; drains were associated with male gender and long operation time (*Table 4*) ( $p < 0.05$ ).

## Discussion

The operative repair of inguinal hernias is the most common surgical procedure in general surgery (6). Until recently the standard procedure has been open musculo-aponeurotic repair using sutures under tension to close the defect but 'tension-free' repair using prosthetic mesh is becoming increasingly common in many countries (7). In this study we also found that we preferred open mesh hernia repair in 98% of cases. Studies have also demonstrated the superiority of tension-free methods over classical means of suture repair (8-10). Despite the frequency of it, there is little information about the use of drains in this procedure when extensive dissection or complicating factors were present.

The only successful treatment for abdominal wall hernias is operative repair and as with other surgical procedures, it is associated with possible complications. In order to decrease these complications putting a drain in dissection of inguinal area to prevent collection of body fluid is controversial. After laparoscopic total extraperitoneal inguinal hernia repair (TEP) drains reduce the incidence of seroma formation without increasing risk of infection or recurrence (11). However because all seromas invariably resolve and have no impact on post-operative recovery after TEP, expectant treatment with observation is also recommended (12). Besides in procedures with wide dissection of the subfascial preperitoneal space such as giant prosthetic reinforcement of visceral sac (Stoppa procedure) the use of drains do not provide any benefit (13). The use of drains in open tension free repair of inguinal hernias with using prosthetic material as it is the common procedure is rare. However when extraordinary situations such as extensive/difficult dissection, anticoagulation therapy and insufficient hemostasis are present in this common procedure, to best our knowledge the issue of use of drain has not been studied before. Logically, recurrent hernias and pantaloon (mixed) hernias usually require more dissection than other types of hernias. The higher drain requirement in this type of hernias in our study could be explained by the need for extensive dissection. The most common indication of drain use in this study was large inguino-scrotal hernias in which extensive dissection was needed.

Operative technique with synthetic mesh has revolutionized abdominal wall hernia repairs however their infections present a clinical problem. Surgeons tend to avoid putting drains especially when prosthetic material was used because of fear for introducing infection (11). In general it was reported that drains acts as a foreign body and increase the incidence of infection (14-17). In our study, the incidence of infection was

**Table 3.** The comparison of the patients who had drains with the patients without drains in open mesh repair of inguinal hernias. Data is given as number of patients (%), mean  $\pm$  standard deviation or median (minimum-maximum)

		Drain (n=66)	No drain (n=729)	P
Age (years)	57 $\pm$ 13	51 $\pm$ 16	0.001	
Gender	male/female	62/4	668/61	0.355
Type	Direct	11 (17%)	273 (37%)	0.002
	Indirect	42 (64%)	385 (53%)	
	Mixed (pantaloon)	13 (20%)	71 (10%)	
Recurrent hernia	20 (30%)	47 (7%)	<0.001	
Emergent surgery	14 (21%)	58 (8%)	0.001	
Coexisting Disease	Pulmonary disease	13 (20%)	94 (13%)	0.091
	Diabetes mellitus	2 (0.3%)	39 (5%)	0.320
	Cardiovascular	38 (58%)	209 (29%)	<0.001
	*Other	2 (0.3%)	43 (6%)	0.259
Complicated Presentation	Incarceration	14 (21%)	58 (8%)	0.001
	Strangulation	6 (9%)	4 (0.5%)	<0.001
Resection	Bowel	1 (0.2%)	1 (0.1%)	<0.001
	Omentum	3 (0.5%)	0 (0%)	
	**Other	1 (0.2%)	3 (0%)	
Postop Complications	Pulmonary	7 (11%)	4 (0.5%)	<0.001
	Cardiac	1 (1.5%)	2 (0.3%)	0.229
	Cerebrovascular	1 (1.5%)	2 (0.3%)	0.229
Local(Wound)	Hematoma	5 (7.6%)	2 (0.3%)	<0.001
	Infection	3 (4.5%)	18(2.5%)	0.250
Anticoagulant Use	22 (33%)	66(9%)	<0.001	
Preoperative Cephalosporin medication	59 (89%)	624 (86%)	0.405	
Anesthesia Type	General	47 (71%)	431 (59%)	0.367
	Regional	12 (18%)	230 (32%)	
	Local	7 (11%)	68 (9%)	
ASA Class	I	18 (27%)	386 (53%)	<0.001
	II	33 (50%)	283 (39%)	
	III-IV	15 (23%)	60 (8%)	
Duration of the operation (minutes)	80 (45-225)	60 (30-205)	<0.001	
Number of patients with follow-up	65 (98%)	564 (77%)	<0.001	
Duration of follow-up (months)	27@11	31@14	0.037	
Duration of hospital stay (days)	4 (1-14)	1( 1-16)	<0.001	

HT: Hypertension, \*Other Coexisting Diseases: Cancer, Cirrhosis, Chronic renal failure, Connective tissue disorder, Hyperthyroidism, Anemia, Benign prostate hyperplasia etc. \*\* Other resections: tuba ovary ,appendix etc.

higher with drains but the difference was not statistically significant. The relatively higher infection rate associated with the drains could be explained by the fact that the drains were used more commonly in high ASA class patients with more complicated presentation, had emergency operation. In addition patient's discomfort, pain and long hospital stay were the other assumed disadvantages of drains (18-23). In our study, 11% of patients complained of severe pain or discomfort related with drains. Drains in open mesh hernia repairs were also associated with longer hospital stay in our study. Besides postoperative percutaneous puncture and drainage of subcutaneous fluid or suspected mesh related abscess could be an alternative option (2,3). However in our opinion serum or blood that accumulates in dead spaces surrounding any prosthesis becomes an excellent media for infection. Suction drainage is therefore advisable to eliminate dead space as well as to remove

serum collections (24,25). On the other hand the presence of a closed suction drain beneath the external oblique aponeurosis would drain the collecting fluid and as well as its negative pressure would facilitate the collapse of the potential space. These effects definitely would lead to early adhesion formation and decrease in seroma formation.

In the current study, the factors predictive of suction drain requirement in open mesh repairs was investigated and it was found that anticoagulant use, duration of the operation, recurrent hernias and ASA class were statistically significant independent variables predicting drain use in inguinal hernias. The use of suction drainage in inguinal hernia patients who were on anticoagulant therapy due to prothrombotic diseases is another issue to be discussed further. Although therapeutic anticoagulation reduces the risk of thromboembolism, it increases the risk of intra and postoperative



**Table 4.** The clinical characteristics of the patients who had drains and who did not have drain during femoral hernia repair. Data is given as number of patients (%), mean  $\pm$  standrt deviation or median (minimum-maximum).

		Drain (n=7)	No drain (n=28)	P
Age (years)		50 $\pm$ 10	54 $\pm$ 17	0.702
Gender	male/female	6/1	11/17	0.036
Recurrent hernia		3 (43%)	6 (21%)	0.242
Emergent surgery		3 (43%)	6 (21%)	0.103
Coexisting Disease		5 (71%)	13 (46%)	0.225
Complicated Presentation	Incarceration	3 (43%)	20 (71%)	0.449
	Strangulation	3 (43%)	3 (11%)	
Resection	Bowel	0 (0%)	0 (0%)	0,256
	Omentum	2 (29%)	3 (11%)	
Postop Complications	Hematoma	1 (14%)	0 (0%)	0.113
	Infection	0 (0%)	(0%)	
Anticoagulant Use		0 (0%)	1 (4%)	0.800
Preoperative Cephalosporin medication		6 (86%)	24 (86%)	0.834
Anesthesia Type	General	4 (57%)	15 (54%)	0.236
	Regional	2 (29%)	10 (36%)	
	Local	1 (14%)	3 (11%)	
ASA Class	I	3 (43%)	14 (50%)	0.609
	II	4 (57%)	8 (29%)	
	III-IV	0 (0%)	6 (21%)	
Duration of the operation (minutes)		100 (70-190)	70 (35-115)	0.003
Duration of hospital stay (days)		2 (1-4)	1( 1-5)	0.104

bleeding. Schimitz et al. reported that in Bassini-Lotheissen inguinal hernia repair, patients receiving low dose subcutaneous heparin have a high rate of hemorrhagic complications, with 22% hematomas and 13.3% ecchymosis (26). Similar results were also reported by Mumme et al. including increased postoperative hematomas and subsequent increased surgical reintervention with anticoagulation in inguinal hernia surgery (27). Although Rodrigues et al. reported that the use of suction drainage with Stoppa procedure does not provide any benefit; they propose the use of it in situations without good hemostasis (13). As drains were used in patients on anticoagulant therapy, it is not surprising that increased risk of hematoma was observed in the patients with drains in our study. We can speculate that the incidence of hematoma would have been higher if the drains were not used in patients on anticoagulant therapy.

Surgery for inguinal hernia is considered clean and it has been estimated that the rate of postoperative infection should not be greater than 2% (28,29). However antibiotic prophylaxis is recommended for elective open mesh inguinal hernia repair as it was the routine surgery of this study (28,29). The infection incidence was minimal high and did not differ by drain usage but indeed we don't have adequate information about infection rates without antibiotic prophylaxis in this study. But still we can conclude that the use of drains in open mesh hernioplasty may not increase infection risk when antibiotic prophylaxis was present.

The major limitation of our study is that although the data was collected prospectively, allocation into the study groups was not randomised. The usage of drains was according to the surgeon's preference and therefore selection bias cannot be

excluded. Further randomized studies are required in order to clarify the role of drains in inguinal hernia repairs but unfortunately, it would be very hard to organize such studies, due to ethical concerns of not putting drains especially where indicated (much blood loss, and coagulopathies) (30). Since there is very limited data regarding the drain usage in open mesh hernia repairs it would be hard to change surgeons routine practice regarding drain preference until more data is available about the indication of drains in groin hernias. Another limitation of this study is the low number of patients especially in femoral hernia types.

We conclude that drains are required in selected patients undergoing open- mesh inguinal hernia repairs and are not associated with increased infection risk but are associated with longer hospital stay. Drains are more commonly used in patients on anticoagulants, who had long duration of the operation, recurrent hernias and high ASA class.

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