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Andreia Vanessa Almeida Pisco

Abdominoplastia com Preservação da Fáscia de Scarpa: Estudo Prospetivo Comparativo sobre Número de Drenos/ **Abdominoplasty with Scarpa Fascia Preservation: Prospective Comparative Study of Suction Drain Number**

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Abdominoplasty with Scarpa Fascia Preservation: Prospective Comparative Study of Suction Drain Number

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ASSINALE APENAS UMA DAS OPÇÕES:

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Ao meu avô, que me ensinou que a curiosidade anda a par com a felicidade, e que me mostrou que o conhecimento é a porta para o mundo. Por sempre ter acreditado!

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Abdominoplasty with Scarpa Fascia Preservation: Prospective Comparative Study of Suction Drain Number

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ABSTRACT

BACKGROUND: Abdominoplasty is becoming increasingly more common, with seroma being the most frequent complication. Suction drains are used very often as a method to prevent seroma formation and it has been suggested that techniques using Scarpa fascia preservation and closed-suction drains have lower seroma rates than other approaches. However few studies have addressed parameters that may affect drain efficiency. A prospective comparative study was conducted to determine if applying two or three closed-suction drains, after an abdominoplasty with Scarpa fascia preservation, has any effect on several outcomes.

METHODS: This was a single-center study conducted from September 2016 to March 2019. Patients were allocated according to choice to one of the two surgeons involved in the study, each responsible for one group: abdominoplasty with Scarpa fascia preservation with two closed-suction drains placed postoperatively (group A) or with three closed-suction drains (group B). A comparative analysis of selected variables was done between both groups, including time to drain removal, total and daily drain output, duration of hospital stay, emergency department visit, readmission to the hospital, secondary surgical procedure, and incidence of postoperative local and systemic complications.

RESULTS: A total of 73 abdominoplasties with Scarpa fascia preservation were performed in women (group A, 33 patients; group B, 40 patients). General characteristics of group A and B were similar. There were no statistically significant differences between groups in any of the determined variables, namely main outcomes (total and daily drain output, time to drain removal) or complications (local or systemic).

CONCLUSIONS: Our results suggest that using three closed-suction drains postabdominoplasty with Scarpa fascia preservation has no advantages in total and daily drain output, time to drain removal or complications when compared with the usual two drains approach.

Level of Evidence: Level II

KEY WORDS: abdominoplasty, Scarpa fascia preservation, suction drain, drain number, drain efficiency

INTRODUCTION

Abdominoplasty is amongst the most common cosmetic surgical procedures, and like the majority of surgical interventions, it has seen several innovations in the past few decades, mainly in order to reduce complications and improve patient satisfaction.[1-6] Being seroma the most frequent complication associated with abdominoplasty, with an incidence ranging from 5 to 50%,[4, 6-14] this is often the focus when evaluating new techniques and approaches.

Suction drains are frequently used postabdominoplasty, as a method to prevent seroma formation.[4, 13, 15-17] The widest survey on abdominoplasty, by Matarasso et al., reported that 98% of inquired surgeons used suction drains on their approach.[15] In the largest clinical series published, with 1008 abdominoplasties over an 11 years period, all 6 surgeons involved used suction drains.[4]

It has been shown that using abdominoplasty with Scarpa fascia preservation has several important advantages, as it significantly reduces drain output and time to drain removal, as well as seroma rates,[6, 18-22] while also avoiding long drainers completely and providing identical aesthetic results.[6, 22] Quaba et al. reported that techniques using Scarpa fascia preservation and closed-suction drains in the postoperative period have the lowest seroma rates in the literature (0 to 2.5%), when compared with studies using traditional abdominoplasty with drains (5 to 19%), progressive tension sutures without use of drains (0.2 to 8.8%) or Scarpa fascia preservation and no use of drains (7.7%).[5] Two clinical series analysing techniques using Scarpa fascia preservation and no-drains have both failed in accomplishing seroma rates as low as the ones registered with the use of Scarpa sparing techniques with drains.[5, 23] Several studies have shown that using

progressive tension “quilting” sutures significantly reduces the rates of seroma[2, 14, 24] and renders drains unnecessary,[1, 3] but this method requires additional training, increases intraoperative time and does not achieve seroma rates as low as the ones obtained with Scarpa sparing and drains.[3, 13, 24]

The fact is that closed suction drains are still widely used and should be considered whenever dead space is created.[16, 17] However, few studies have addressed parameters that may affect drain efficiency. There are no studies comparing the intensity of drain vacuum in abdominal procedures. Due to lack of studies, the optimal parameters for closed-suction drain use are not well known and its use and care, by surgeons, nurses, and caregivers, may be inconsistent.

To the best of our knowledge, there are no studies on the number of drains and on what might be the best approach to use in abdominoplasty. Our study aims to clarify this matter with a prospective comparative study to determine if applying two or three closed-suction drains, after an abdominoplasty with Scarpa fascia preservation, has any effect on several outcomes.

PATIENTS AND METHODS

This was a prospective comparative study, at a single institution, conducted in Porto, Portugal, at Hospital of Santa Casa da Misericórdia de Lousada, from September 2016 to March 2019. Approval was granted by the Ethical Committee of this institution and Informed Consent was given by all involved patients.

Seventy-three consecutive patients who sought treatment with the involved surgeons were selected. Eligibility criteria were: female patients who presented

abdominal deformity, marked by excess abdominal skin and adipose tissue with muscle laxity, and met the criteria for a full abdominoplasty with umbilical transposition (Psillakis types III and IV and Matarasso types III and IV).[25, 26] Exclusion criteria were: significantly elevated operative health risks, bariatric patients without weight stabilization for at least 6 months, patients who anticipate future pregnancy, and patients with a body mass index over 30 kg/m^{2,} except those with previous bariatric surgery. Active smokers were instructed to stop smoking or to reduce smoking to 3 cigarettes per day 6 weeks before surgery, being considered as active smokers.

Two fully trained surgeons were involved in the study. Patients were allocated to each surgeon according to patient choice, but both surgeons worked together during all surgeries, differing on who was the main surgeon. Surgeon A performed an abdominoplasty with Scarpa fascia preservation and using two suction drains postoperatively (Group A), while Surgeon B performed the exact same surgical procedure with the sole difference of using three suction drains (Group B). The anatomical areas where drains were placed in each group are shown in Figure 1.

Data were extracted from patients' clinical charts, which included general demographics and clinical characteristics, intraoperative details, postoperative regimen, complications, and follow-up.

Surgical Methods

All patients routinely received preoperative enoxaparin (40mg/day subcutaneously during the hospital stay starting at least 2hours before surgery) and broad-spectrum intravenous antibiotics. The surgical procedure began with preparing and draping the patient under general anaesthesia. All patients were submitted to a full

abdominoplasty with umbilical transposition, rectus abdominis plication and preservation of the Scarpa fascia and the deep fat compartment in the infraumbilical area (the abdominal flap was dissected by electrocautery in two different planes: pre-Scarpa fascia in the lower abdomen and pre-muscular in the epigastric region and infraumbilical midline). Both the preoperative markings and the surgical technique of this procedure are well described elsewhere.[6, 20, 22]

The diathermocoagulation device used was ERBE VIO 300 S (Erbe Elektromedizin GmbH; Tuebingen, Germany), set to program 6, effect 4, with coagulation and cut regulated to 60, spray mode deactivated. The settings were always the same for both surgeons and for all the procedures.

Liposuction was limited to the flanks and no additional procedures were performed in the same operative time. No quilting sutures were used.

Two closed-suction drains were used in group A, placed in the right and left iliac fossae and in group B an additional third closed-suction drain was placed extending to the epigastric area (Figure 1). Drains used were VyDrain 600ml, with an initial vacuum pressure of 900 mbar (Vygon; Ecouen, France), together with a Redon drainage tube of 50 cm, 15 cm of which are double perforated (Braun; Melsungen, Germany).

The procedure did not differ in any other aspects between both groups. Compression garments were routinely used and applied in the operating room and the patients were motivated to ambulate on the first postoperative day. Drains were routinely removed when the patient was ambulatory and the single drain output was equal or less than 50 ml, collected over 24 hours, but were never removed during the first 24 hours. At least for the following 6 weeks, compression garments were used and strenuous activity was avoided.

Outcomes

The outcomes measured and analysed in this study included time to drain removal, total and daily volume of drain output, duration of hospital stay, emergency department visit, readmission to the hospital, secondary surgical procedure, and incidence of postoperative complications. The complications were defined as local or systemic. Systemic complications were defined as thromboembolic events, namely deep vein thrombosis or pulmonary thromboembolism. Local complications were defined as seroma, hematoma/bleeding, wound infection, wound dehiscence, and cutaneous necrosis. Seroma and hematoma were defined as a subcutaneous abdominal wall fluid collection evident on physical examination after drain removal that was successfully aspirated at least once (non-hematic clear fluid or hematic fluid, respectively); physical examination was considered suggestive of fluid collection when there was one of the following signs: erythema of the skin or scar, a visible distension, or a palpable tumefaction on the operated area with wave sign. If this was the case, a percutaneous puncture with a 21-gauge needle and a 20ml syringe was performed, for diagnosis and eventually for aspiration. Patients with liquid collections were examined within a week.

Drain output volume was registered daily, at the same time of day, by a nurse and all the patients were observed by one of the two surgeons daily until discharge. Patients were observed by one of the two surgeons at 1, 2, 3 and 4 weeks, and 2 and 3 months after surgery.

Statistical Analysis

Data were analysed using IBM SPSS version 21 software package (SPSS Inc.; Chicago, IL, USA). Normally distributed continuous variables were tested for normal

distribution and homogeneity of variance (Shapiro-Wilk and Levene tests respectively) and are presented as mean ± standard deviation. Non-parametric continuous and ordinal variable is described as mean ± standard deviation (median). Nominal categorical variables are described as percentages. T-Student and Mann-Whitney U tests were used to analyse continuous variables. χ^2 test was applied to analyse categorical variables. The probability level of 0.05 was used for rejection of the null hypothesis.

RESULTS

A total of 73 abdominoplasties with Scarpa fascia preservation were performed. In 33 patients, 2 closed-suction drains were used (group A) and in 40 patients, 3 closed-suction drains (group B).

The patients' general characteristics are summarized in Table 1 and did not differ significantly between groups. In group A, 7 patients had comorbidities, namely arterial hypertension, hypothyroidism (2 patients), venous insufficiency (2 patients), asthma, chronic obstructive pulmonary disease, and Crohn's disease; 22 patients had previous abdominal surgeries (c-section: 12 patients of which 7, 3 and 2 patients had one, two or three procedures; tubal ligation: 7 patients; total hysterectomy: 2 patients; appendectomy: 2 patients; hernia repair: 3 patients; and laparoscopic cholecystectomy: 2 patients); and 1 patient had previous bariatric surgery, having performed a laparoscopic sleeve gastrectomy. In group B, there were 4 patients with comorbidities, namely arterial hypertension (2 patients), Diabetes Mellitus type 1, and hypothyroidism; 18 patients had previous abdominal surgery (c-section: 13 patients, of which 5, 7 and 1 had one, two or three procedures; tubal ligation: 2 patients; total hysterectomy: 2

patients; oophorectomy: 1 patient; and hernia repair: 1 patient); and 2 patients had previous bariatric surgery (a laparoscopic Roux-en-Y gastric bypass and a laparoscopic adjustable gastric banding). In both groups, all the smokers reduced their consumption to 3 or less cigarettes per day 6 weeks prior to surgery.

Outcomes are summarized in Table 2 and Table 3. Figure 2 represents the daily evolution of drain output. Both, total and daily drain outputs, were lower in group B than in group A, although without significant statistical difference ($p>0.05$). Time until drain removal and duration of hospital stay are identical for every patient, since there was no other reason to prolong the hospitalization, being the patients discharged at the time of drain removal. None of the analysed outcomes had statistically significant differences between groups, even though group B tended to have a lower incidence of complications, namely seroma, hematoma, infection, wound dehiscence and DVT/PE. Group B had a higher incidence of necrosis and reoperation, but still without significant statistical difference.

In group A, complications were located as follows: among the 5 patients who developed seroma, 3 were located in the medial hypogastrium, 1 in the epigastrium and 1 in the umbilical region; hematomas were suprapubic (1 patient) or adjacent to the left drain perforation (1 patient); 1 patient had an infection in the umbilical region; wound dehiscence occurred mainly in the umbilical suture (5 patients), with 1 case in the inferior horizontal suture; cutaneous necrosis occurred in the umbilicus (1 patient); and 1 patient had an episode of deep venous thrombosis in the left leg.

In group B, complications were located as follows: 2 patients developed seroma in the epigastrium, 1 patient in the hypogastrium and 1 patient in the suprapubic region; 1 patient had a hematoma of the flank; no infections were identified; of the 4 patients

who developed wound dehiscence, 3 were located in the inferior horizontal suture, and 1 in the umbilical suture; cutaneous necrosis occurred in the umbilicus (2 patients); no vascular complications were reported.

It is important to highlight that all the fluid collections were of low volume (some as low as 15 ml of aspirated fluid) and resolved uneventfully with percutaneous aspirations in the office except for one case. This refers to a patient in group B who was reoperated during hospitalization, due to a hematoma of the flank, detected postoperatively, before hospital discharge. Neither of the groups registered emergency department visits or readmissions to the hospital. There were no deaths.

DISCUSSION

This prospective comparative study provides evidence that using 2 or 3 drains after abdominoplasty with Scarpa fascia preservation has no clinical important or statistically significant effects on the main outcomes (total and daily drain output, time to drain removal) or complications (local or systemic).

Closed-suction drains are still viewed as an important part of reconstructive and cosmetic surgery whenever dead space is created[16, 17] and have been one of the most accepted and used means of prevention of wound complications in abdominoplasty.[13] Being seroma the most common complication of abdominoplasty, the authors consider the use of drains, along with other precautions taken simultaneously, an advantage to reduce complications. As we have already pointed out, there are not many studies, either clinical or *in vitro,* analysing factors that may be relevant to improve suction drain efficiency. A systematic review on seroma prevention when potential spaces are

surgically created, as it is the case after a full abdominoplasty, has demonstrated that drains reduce seroma formation.[16] The criteria used for drain removal is important for maximizing its efficiency. The utilization of a volume-dependent criteria for drain removal rather than a time-dependent criteria is more effective for seroma prevention[16] considering a volume from 30 to 50 ml per 24 hours. Concerning intensity of drain vacuum, there are no studies published in the abdomen, but three randomized controlled trials involving 304 patients submitted to breast surgery, using two vacuum levels, high and low, did not show a significant effect of vacuum level in the analysed outcomes.[27-29] Similar results were found in the present study, as group B operative field was exposed to a 50% higher total vacuum level than that of group A and no significant differences on the main outcomes or complications were observed. However, high-vacuum drainage (i.e. increased pressure differentials) has been proven to optimize fluid flow rate in an *in vitro* study.[17] Despite the fact that there is no statistically significant differences between groups regarding total or daily drain output and seroma and hematoma incidences, there is a tendency for lower volumes and the fluid collections considered together (hematoma plus seroma) are 50% lower when three drains are used. A larger study population may clarify this issue.

One issue that is not addressed in most papers is the amount of fluid collected in the reservoir and the possible effect on drain efficiency. Other important issues which need to be clarified in clinical settings are: drain size and tubing length. A recent *in vitro* study analysed these variables and concluded that drain performance increases with perforated drains, increased intracavitary tubing length, decreased extracavitary tubing length and increased tubing diameter, being proportional to the negative pressure generated by the evacuator.[17] The evacuator fill will have 50% less negative pressure as

it reaches 25% of its capacity.[17] This may differ according to the evacuator volume.[17] Nevertheless, it is something that should be taken into account by the surgeon using suction drains after an abdominoplasty. Clinical studies with patients submitted to a full abdominoplasty are needed to further clarify these important issues, preferably prospective, comparative and controlled.

This study was done with patients submitted to a full abdominoplasty with Scarpa fascia preservation, using bovie dissection with the same settings, and a criterion for drain removal of 50 ml per 24 hours per drain. When compared to a previously published randomized controlled trial by the same surgeons,[22] who used dissection with an avulsion technique described by Vasconez[30] and a drain removal criteria of 30 ml per 24 hours per drain, we can verify an important evolution and advantage, since lower drain volumes (total an daily) and consequentially earlier drain removal were achieved. Indeed, time to drain removal was reduced from 3 to 2 days, representing an important enhancement of patient recovery and comfort. Nevertheless, the seroma rate increased from 2.5%, in the aforementioned study,[22] to 10 to 15 % in the present study, for group A and B, respectively. This may be a consequence of the fact that drains were removed with a volume criterion of 50 ml per 24 hours. On the other hand, these were low volume seromas with no impact on the final result, in agreement with previous findings stating that seromas below 80 ml are not clinically problematic.[13] Further studies, ongoing at our department, evaluating the effects of the dissection method and volumetric criteria for drain removal (30 *versus* 50 ml) on seroma rate incidence will allow for a better interpretation of these results.

This is the first prospective comparative clinical study on the number of drains in abdominoplasty with Scarpa fascia preservation. The clinical profile of the patients

included in this study is representative of the usual candidate for a full abdominoplasty - female, forty, with previous abdomen surgery, mainly c-section. Moreover, all surgeries were approached with the same surgical technique, using the same electrocoagulation device with the same settings, and with no concomitant procedures in the same operative time, by both surgeons working together during all surgeries, only differing on who was the main surgeon, performing a surgical technique and postoperative treatment protocol identical in all aspects, expect the number of drains used.

CONCLUSIONS

Based on a comparative prospective study, our results suggest that using three closed-suction drains postabdominoplasty with Scarpa fascia preservation has no advantages in total and daily drain output, time to drain removal or complications (local or systemic) when compared with the usual two drains approach. Further clinical studies are essential to clarify other determinants of suction drain efficiency.

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TABLES AND FIGURES

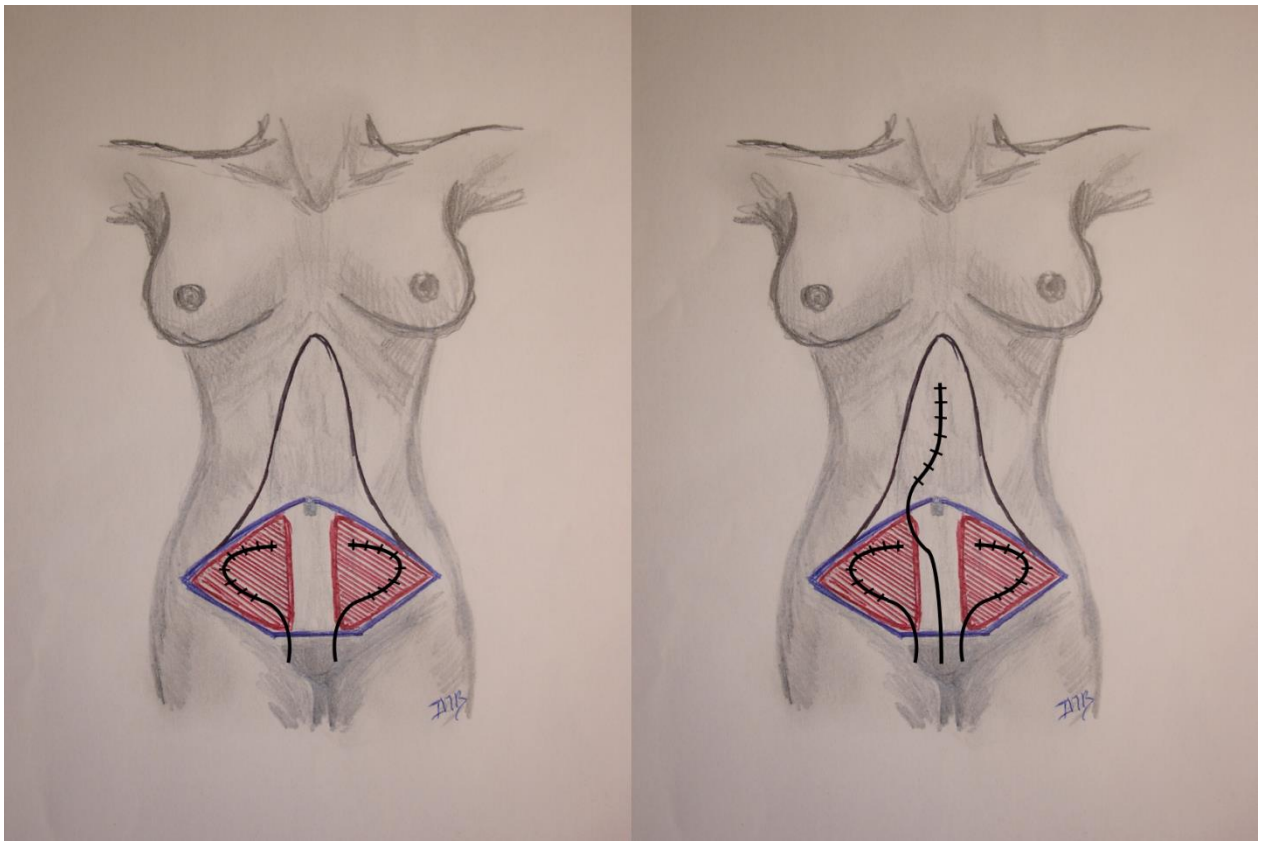

Figure 1. Representation of the closed-suction drains placement in group A (*left*) and group B (*right*). The *blue line* represents the skin resection. The *black line* limits the area to be undermined. The *red areas* show the region where dissection is performed on the plane of Scarpa fascia. The *curved lines* indicate the location of the closed-suction drains, with the traced portion representing the perforated part. (*Left*) In group A, two drains are placed, each in one iliac fossae, exiting in the lower hypogastrium, below the horizontal suture. (*Right*) In group B, a third drain is placed in the epigastric area, exiting alongside the other two.

Table 1. General characteristics of both Groups (n=73) *

	Group A (n=33)	Group B (n=40)	p - value
Age, years			
Mean ± SD	40.97± 8.76	41.20 ± 8.10	0.908
Range	25 – 61	22 – 57	
Body mass index, kg/m^2			
Mean ± SD	25.40 ± 2.24	25.49 ± 3.32	0.896
Range	21.1 – 31.6	19.9 – 32.9	
Smoker			
Total number (%)	4 (12.1%)	5 (12.5%)	0.623
Comorbidities			
Total number (%)	7 (21.2%)	4 (10.0%)	0.158
Previous abdominal surgery			
Total number (%)	22 (66.7%)	18 (45.0%)	0.053
Previous bariatric surgery			
Total number (%)	1 (3.0%)	2 (5.0%)	0.573
Weight specimen, g			
Mean ± SD	853.03± 343.10	839.54 ± 420.03	0.741
Range	270.0 – 1630.0	140.0 – 1730.0	

*Group A: 2 drains (n=33), Group B: 3 drains (n=40).

Values presented as means ± standard deviation (SD) for data normally distributed and as percentages for nominal categorical variables. All the variables, except age, body mass index, and weight specimen, were compared between groups using the χ^2 test (Not significant; $p>0.05$). The other variables were compared using the Student´s t-test (Not significant; $p>0.05$).

Table 2. Drain output of both Groups (n=73) *

	Group A (n=33)	Group B (n=40)	p - value
Time until drain removal, day			
Mean ± SD	2.30 ± 0.68 (2.0)	2.12 ± 0.40 (2.0)	0.138
Range	2.0 – 5.0	2.0 – 4.0	
Total drain output, ml			
Mean ± SD	204.09 ± 114.23	169.50 ± 101.07	0.315
Range	50.0 – 560.0	40.0 – 660.0	
Drain output day 1, ml			
Mean ± SD	129.39 ± 67.52	121.38 ± 74.34	0.634
Range	25.0 – 290.0	0.0 – 410.0	
Drain output day 2, ml			
Mean ± SD	54.70 ± 37.54	44.12± 30.99	0.192
Range	0.0 – 135.0	0.0 – 150.0	
Drain output day 3, ml			
Mean ± SD	14.39 ± 36.74	3.25 ± 12.28	0.076
Range	0.0 – 160.0	0.0 – 70.0	
Drain output day 4, ml			
Mean ± SD	3.64 ± 14.54	0.75 ± 4.74	0.241
Range	0.0 – 60.0	0.0 – 30.0	
Drain output day 5, ml			
Mean ± SD	1.82 ± 10.44	0.0 ± 0.0	0.274
Range	0.0 – 60.0	0.0 – 0.0	

*Group A: 2 drains (n=33), Group B: 3 drains (n=40).

Values presented as means ± standard deviation (SD) for data normally distributed and means ± standard deviation (median) for data not normally distributed (Time until drain removal). All the variables were compared between groups using the χ^2 test. Time until drain removal was analysed by the non-parametric test, Mann-Whitney U (Not significant; p>0.05).

Table 3. Outcomes of both Groups (n=73) *

	Group A (n=33)	Group B (n=40)	p - value
Seroma			
Total number (%)	5 (15.1%)	4 (10.0%)	0.377
Hematoma/bleeding			
Total number (%)	2 (6.1%)	1 (2.5%)	0.427
Infection			
Total number (%)	1 (3.0%)	0 (0.0%)	0.452
Wound dehiscence			
Total number (%)	6 (18.2%)	4 (10.0%)	0.251
Necrosis			
Total number (%)	1 (3.0%)	2 (5.0%)	0.573
DVT/PE			
Total number (%)	1 (3.0%)	0 (0.0%)	0.452
Emergency department visit			
Total number (%)	0 (0.0%)	0 (0.0%)	----
Readmission			
Total number (%)	0 (0.0%)	0 (0.0%)	----
Reoperation			
Total number (%)	0 (0.0%)	1 (2.5%)	0.548

DVT, deep venous thrombosis; PE, pulmonary embolism. Wound dehiscence refers to healing problems/suture rupture, without necrosis.

*Group A: 2 drains (n=33), Group B: 3 drains (n=40).

Values presented as percentages. All the variables were compared between groups using the χ^2 test (Not significant; $p>0.05$).

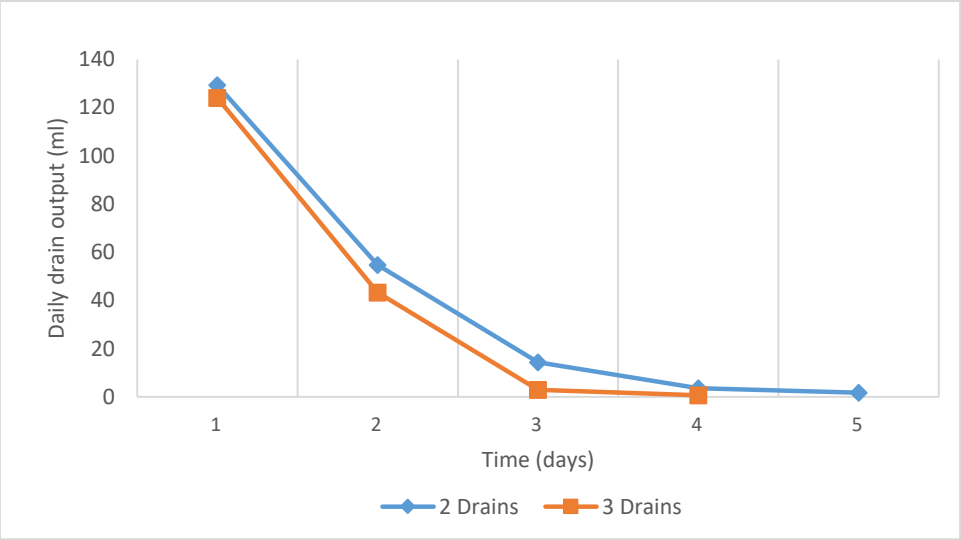

Figure 2. Average daily drain output (mean ± SD) from group A (2 drains, n = 33) and group B (3 drains, n = 40) (Not significant; $p>0.05$).

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3. Kellman RM, Marentette LJ. Atlas of Craniomaxillofacial Fixation. Philadelphia: Lippincott Williams & Wilkins; 1999

Software

4. Epi Info [computer program]. Version 6. Atlanta: Centers for Disease Control and Prevention; 1994

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5. Friedman SA. Preeclampsia: a review of the role of prostaglandins. *Obstet Gynecol* [serial online]. January 1988;71:22-37. Available from: BRS Information Technologies, McLean, VA. Accessed December 15, 1990

Database

6. CANCERNET-PDQ [database online]. Bethesda, MD: National Cancer Institute; 1996. Updated March 29, 1996

World Wide Web

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