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Clinical Outcome of Abdominoplasty Cases—A Five-Year Retrospective Study

Omar Alameri, Medhat Emil*, Dalal Al Mansoori, Anoud Al Qaydi, Aysha Al Naqbi, Ibrahim Al Marzooqi, Dalia Medhat Habib, Shamsa Alameri

Department of Plastic and Reconstructive Surgery, Zayed Military Hospital, Abu Dhabi, United Arab of Emirates
Email: *medhatemil1@hotmail.com

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Abstract

Aim: The aim of this study is to analyze the outcome of cases who underwent abdominoplasty surgery in our facility for the last five years. Patients and Methods: This is a retrospective study analyzing the outcome of patients who underwent abdominoplasty from the beginning of January 2015 till the end of December 2019 in Zayed Military Hospital, Abu Dhabi, United Arab of Emirates. Postoperative complications were recorded. The effects of risk factors including age, sex, smoking, body mass index, associated comorbidity, previous bariatric surgery and combined procedures were evaluated. Results: 213 patients were included in this five-year study. Majority of the patients were females 161 cases (75.6%) while males presented 52 cases (24.4%). The mean age was 38.3 years. The mean BMI was 27 Kg/m^2. 127 patients had previous bariatric surgery (59.6%) while 86 patients had not (40.4%). There were no major systemic complications in the cases as deep venous thrombosis, pulmonary embolism or paralytic ileus. There was no mortality in the study cases. Out of the 213 cases included in the study, 23 patients developed haematoma (10.8%), 8 patients developed seroma formation (3.8%), 3 patients had wound infection (1.4%) and one patient had tissue necrosis (0.5%). The complication rate was higher in males 36.4% compared to females 9.9% ($p < 0.001$). The patients who were 40 years old and above had less complications rate than those who were below 40 years 9.6% and 21% respectively ($p < 0.005$). The patients with BMI of 28 Kg/m^2 or less had less complications 14.3% compared to those above that level 21.2% although it was not a significant difference ($p = 0.231$). 55.7% of the smokers had complications while the incidence among non smokers was 8.5% ($p < 0.005$). Those who underwent previous bariatric surgery had more complications 19.7% compared to those who had not undergone this surgery 11.6% but it was not statistically significant ($p = 0.372$). Those who had liposuction, plication of the recti muscles or both in combination with the abdominoplasty procedure had 8% complica-

tion rate compared to those who had not these combined procedures done 23.9% ($p < 0.005$). Associated comorbidity did not have statistical significance in the complication rate. Conclusion: Although abdominoplasty is a safe operative procedure, still it has its complications which are mostly haematoma, seroma, wound infection and tissue necrosis. The risk of developing these complications is higher among smokers and male patients. Although complication rate is higher among patients who have elevated BMI above 28 Kg/m^2 and in those who underwent previous bariatric surgery, this was not statistically significant. Doing abdominoplasty for cases above the age of 40 years can be a safe procedure. Judicious liposuction and plication of the recti muscles do not carry higher risk of complications as well as associated comorbidity as long as it is well controlled along the perioperative period.

Keywords

Abdominoplasty, Outcome, Complications, Risk Factors

1. Introduction

Abdominoplasty is a commonly performed surgical procedure to reshape the body contour by reduction of redundant fat and skin tissue to improve quality of life and functional status of patients. [1] Like any other surgical procedure, it has a range of complications which vary from one center to another. These complications can be divided into systemic complications such as deep venous thrombosis, pulmonary embolism, paralytic ileus or even death and local complications as haematoma, seroma, wound infection and tissue necrosis. [2] Reviewing the literature shows that there are certain factors which can increase the risk of occurrence of these complications as age, male sex, smoking, elevated body mass index, comorbidity, history of previous bariatric surgery and combining other procedure to the abdominoplasty surgery as liposuction and plication of the recti muscles. In this study we will analyze our results in view of the postoperative complications and the effect of these risk factors on their incidence.

2. Patients and Methods

This is a 5 years retrospective study performed on patients who underwent abdominoplasty in Zayed Military Hospital, Abu Dhabi, United Arab of Emirates from the beginning of January 2015 till the end of December 2019. The data of the patients were analyzed retrospectively from the patients' files and through the computer system and kept in Excel sheet. The patients who underwent full abdominoplasty procedure in the classical way during the selected period were included in the study. Those who underwent dermatolipectomy or Fleur-de-Lis technique were excluded. The patients who had preexisting medical issues as haematological diseases were also excluded from the study.

The retrospective analysis included demographic data of patients, such as age, sex and body mass index (BMI). The increased risk factors for the patients were assessed according to increase of age, gender, smoking, history of bariatric surgery and combining other procedures to abdominoplasty as liposuction and plication of the recti muscles.

The minimum follow up period was determined to be 30 days postoperatively for the assessment of development of postoperative complications.

The complications were divided into systemic and local complications. Systemic complications included deep venous thrombosis (DVT), pulmonary embolism, paralytic ileus and death. The local complications were either major complications which required surgical intervention e.g. haematoma evacuation, wound debridement and secondary repair or minor complications which were managed as outpatient cases as aspiration of seroma or haematoma and treating infection or discharge.

2.1. Statistical Analysis

The data collected from January 2015 to December 2019 was compiled into Microsoft Excel using a customized matrix. This allowed for the participant's details to be entered and stored in a simple manner for comparison. Initially, descriptive and frequency statistics were performed to understand the population. Then, a series of statistic tests were conducted using SSPS to determine if an association between complications and the relevant risk factors were evident. Fischer's exact test was used for independent variables. Finally, the alpha was set at $\alpha = 0.05$.

2.2. Operative Technique

The surgical marking is done in the standing, sitting and supine positions. The marking starts in the lying position from a midline point 7 cm cephalic to the vulvar commissure in females or the root of the penis in males and extends laterally in a concave line on each side as much as required for removal of the sagging skin. This point is easily assessed in the sitting position. Confirmation of the proper measurements is assured in the standing position. The patient is taken to the operation theatre and the operation is done under general anaesthesia for all the cases. The skin is incised with a scalpel and the wound is deepened using the monopolar diathermy till the fascia superficialis and the anterior rectus sheath preserving the overlying thin lymphatic tissue layer. The superficial inferior epigastric vessels are cauterized or even ligated. The dissection is continued in a cephalic direction to the umbilicus. The umbilical stalk is preserved. Dissection is continued circumferentially around the umbilicus from the elevated abdominal flap. From this level, the dissection is continued in about 10 cm width in the midline region in the cephalic direction till the xiphisternum.

Liposuction of the flank region is done if required. If there is muscular diastasis, repair of the recti muscles is done in 2 layers using non absorbable sutures.

The lower part of the skin flap is excised. Haemostasis is ensured. The umbilicus is extruded through the advanced overlying skin and sutured with half horizontal mattress non absorbable sutures to its new location about 9 - 11 cm from the incision line. The Scarpa's fascia is repaired with 2/0 inverted absorbable sutures. The skin is sutured in two layers using 3/0 absorbable inverted interrupted dermal sutures and continuous subcuticular absorbable sutures. The wound is drained using two negative pressure drains; one kept at the epigastric region and the other one at the lower part of the wound. Dressing is applied with overlying compressive garment. (Figure 1)

2.3. Postoperative Care

The patient is kept postoperatively in the bed in the modified Fowler's position. Mobilization is started on the first postoperative day. Subcutaneous low molecular weight heparin 40 mg is started 6 hours postoperatively and continued once daily for 7 days. Antithrombotic pneumatic compression stockings are started in the operation theatre and continued till the patient is discharged. The drains are kept on negative pressure and removed when the drainage is less than 20 ml of fluid in 24 hours for each drain. The patient is usually discharged by the fifth postoperative day. The umbilical sutures are removed after 2 weeks. The patient continues to wear the abdominal pressure garment after the abdominoplasty surgery for a period of one month. If plication of the recti muscles is done during the abdominoplasty procedure, the duration of the pressure garment is extended to 3 months postoperatively.

3. Results

During the 5 years period from the beginning of January 2015 till the end of December 2019, 230 patients underwent abdominoplasty surgery.

Seventeen patients were excluded from the study. Thirteen of them did not undergo the classic form of abdominoplasty (11 patients had miniabdominoplasty and 2 had Fleur-de-Lis abdominoplasty). In addition, four patients were excluded; one had repeated abdominoplasty procedure, one had scar revision, one had haematological disorder that can mislead as haematoma complication and the last one had missing data in the records. (Table 1 shows the exclusion criteria from the study).

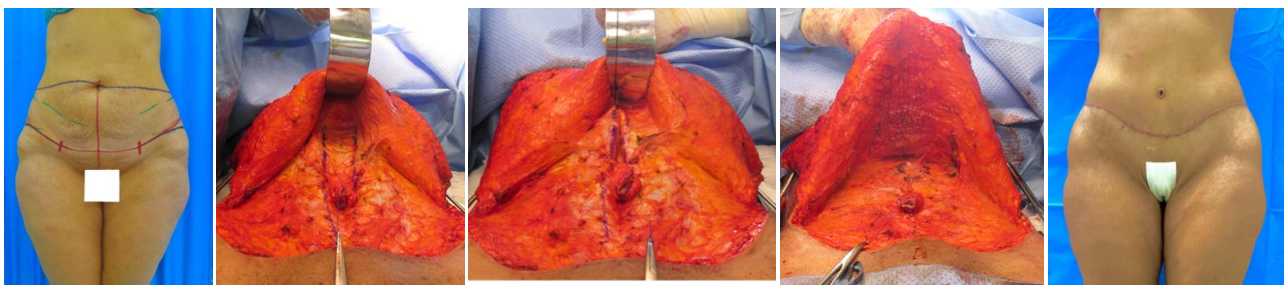

Figure 1. Abdominoplasty with plication of the recti muscles.

Table 1. Exclusion criteria from the study.

Cause of Exclusion	Number (Out of Total 17)
Miniabdominoplasty	11
Fleur-de-Lis	2
Redo Abdominoplasty	1
Scar revision post abdominoplasty	1
Haematological disorder	1
Missing data	1

This resulted in only 213 patients included in the study; 52 patients were males (24.4%) and 161 were females (75.6%).

The mean age of the patients included in the study was 38.3 (18 - 60 years). Those who were 40 years old or above were 84 patients (39.4%) and those who were below 40 years were 129 patients (60.6% of the total number of patients).

The mean BMI was 27 kg/m^2 (21 - 41.2 Kg/m^2). It was decided during the last 3 years of the study to limit abdominoplasty surgery to patients whom BMI is 28 Kg/m^2 or less. The patients who had BMI above 28 Kg/m^2 constituted 66 patients in the study (31%). Those who had BMI of 28 Kg/m^2 or less were 147 patients (69%).

The mean hospital stay was 6.6 days (4 - 19 days). The patient who stayed for 19 days developed postoperative haematoma with complications. (Table 2)

127 patients included in the study had undergone bariatric surgery before (59.6%) while 86 patients underwent abdominoplasty with no history of previous bariatric surgery (40.4%).

Out of the 213 patients included in the study, 100 patients had liposuction, plication of the recti muscles or both in combination with the abdominoplasty procedure.

36 patients included in the study were smokers while 177 patients were non smokers.

31 of the patients included in the study were found having pre-existing diseases. Nine patients were diabetic, eight were hypertensive patients while two other patients were having history of being both hypertensive and diabetic. Five patients were having history of treatment from asthma, two were getting iron supplementation for chronic anaemia, four had history of getting psycahtric medications and one patient was having treatment for rheumatoid arthritis. All the patients included in the study had their medical conditions well controlled before embarking on the abdominoplasty operation.

No patients in the study got major systemic complications as Deep Venous Thrombosis, pulmonary embolism or paralytic ileus. There was no mortality in the study cases.

35 patients developed local complications (16.4% of the cases). Complications were classified as major or minor according to the need to take the patient back

Table 2. Demographic data of the patients.

Demographic Data	Mean Value	Range	Total No. of Patients	Percentage %
Age				
>40	38.3 years	18 - 60	84	39.4%
<40			129	60.6%
BMI				
>28	27 Kg/m^2	21 - 41.2	66	31%
<28			147	69%
Male			52	24.4%
Female			161	75.6%
Post Bariatric			127	59.6%
Traditional Cosmetic			86	40.4%

to the operation theater or to be managed conservatively at bed side respectively. The commonest complication was haematoma formation (23 patients; 10.8%); 11 of them had to be evacuated surgically (5.2%) and 12 were managed conservatively by repeated aspirations in the OPD (5.6%).

8 patients developed seroma formation (3.8%); all were managed by repeated aspiration in the OPD except one case which had to be operated on by debridement, curettage of the seroma sac wall and quilting sutures application to close the space.

Three patients had wound infection (1.4%); one of them had to be taken to the operation theatre for drainage and two were managed bed side with antibiotics and dressings. One patient had tissue necrosis (0.5%) which required debridement and Vaccuum Assisted Closure of the wound. (**Table 3** and **Figure 2**)

Analysis was done for the risk factors which can increase postoperative complications, as male sex, increased age, elevated BMI, smoking, postbariatric surgery, combining liposuction and/or plication of the recti muscles with abdominoplasty and pre-existing co-morbidity.

Among the 52 male patients included in the study, 15 had haematoma formation (28.8%), one had seroma (1.9%), two had wound infection (3.8%) and one had tissue necrosis (1.9%) with total complications of 36.4%. On the other hand among the 161 female patients included in the study, 8 patients developed haematoma formation (5%), 7 had seroma collection (4.3%), one had wound infection (0.6%) and no patient had tissue necrosis (0%) with total complications of 9.9% (**Figure 3**). There was a statistically significant difference in scores for Male and Hematoma ($p < 0.001$). There was no significant statistical difference of Seroma occurrence between males and females ($p = 0.898$). The number of wound infections and tissue necrosis cases were low to be statistically compared.

84 patients were 40 years old and above while 129 patients in the study were younger than 40 years. Three patients above 40 years had haematoma (3.6%), four had seroma (4.8%), one had wound infection (1.2%) and no one had tissue

Table 3. Complications and their percentage to each other and to the total number of the patients.

Complication	No. of Cases			Percentage of Complications (35 Patients)	Percentage to Total No. of Cases (213 Cases)
	Major	Minor	Total		
Haematoma	11	12	23	65.71%	10.8%
Seroma	1	7	8	22.86%	3.8%
Wound Infection	1	2	3	8.57%	1.4%
Tissue Necrosis	1	0	1	2.86%	0.5%

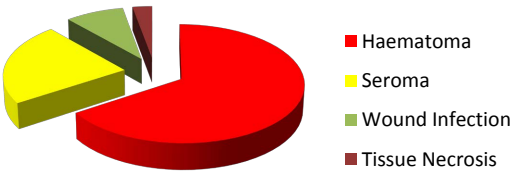

Figure 2. Percentage of complications to each other.

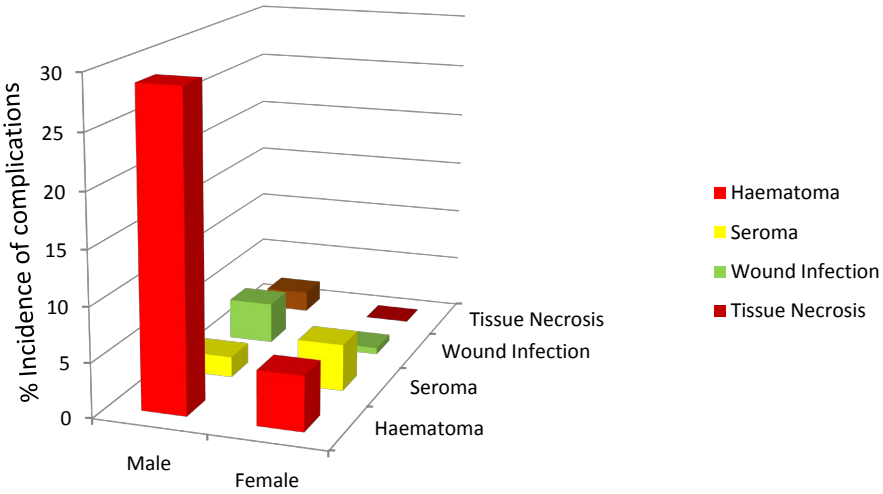

Figure 3. Relation between gender and incidence of complications.

necrosis (0%) with total complications of 9.6%. In the younger age < 40 years, 20 patients out of the 129 patients had haematoma (15.5%), 4 had seroma (3.1%), 2 had wound infection (1.6%) and one had tissue necrosis (0.8%) with total complications of 21%. (**Figure 4**) Statistic significance was found for patients under 40 and Hematoma ($p < 0.005$) suggesting patients under 40 have more risk in developing hematoma. While in comparing seroma cases with the two group ages, no statistical significance was found ($p = 0.715$). As for wound infection and tissue necrosis, the number of cases was low to be compared.

The patients who had BMI of 28 Kg/m^2 or less were 147 cases. Thirteen of them developed haematoma formation (8.8%), 7 developed seroma (4.8%), one case had wound infection (0.7%) and there was no tissue necrosis in this category with total complications of 14.3%. Sixty six patients had BMI above 28 Kg/m^2,

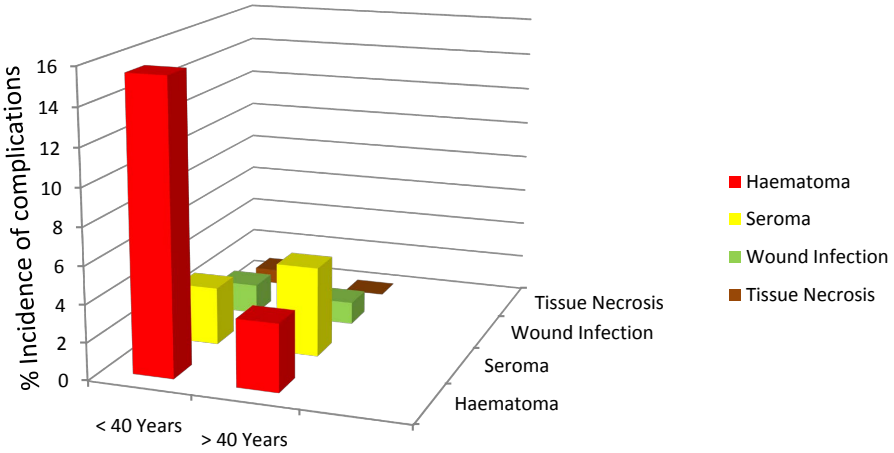

Figure 4. Incidence of complications according to age.

ten of them had haematoma formation (15.2%), one had sermoa formation (1.5%), two had wound infection (3%) and one had tissue necrosis (1.5%) with total complications of 21.2% (**Figure 5**). The two study groups did not have statistically significance in Hematoma development ($p = 0.231$). Similarly with Seroma development, no statistically significance difference was found ($p = 0.440$).

Among the 213 patients included in the study, 36 were smokers. Fifteen of the smoker patients had haematoma formation (41.7%), two had seroma formation (5.6%), two had wound infection (5.6%) and one had tissue necrosis (2.8%) with total complications of 55.7%. One hundred and seventy seven patients in the study were non smokers. Eight of them had haematoma (4.5%), Six had seroma formation (3.4%), one had wound infection (0.6%) and no one had tissue necrosis (0%) with total complications of 8.5%. (**Figure 6**) For Hematoma formation, there was a statistically significance in the smokers group ($p < 0.001$) suggesting smoking as a significant risk to developing hematoma. While in Seroma formation, no statistical significant difference was found between the two groups ($p = 0.621$)

In the study 127 patients underwent bariatric surgery prior to the abdominoplasty operation. Sixteen of these patients had haematoma formation (12.6%), five had seroma formation (3.9%), three had wound infection (2.4%) and one had tissue necrosis (0.8%) with total complications of 19.7%. Those who did not undergo bariatric surgery before the abdominoplasty operation were 86 patients. Seven of them had haematoma formation (8.1%), three had seroma formation (3.5%) and no one had wound infection or tissue necrosis (0%) with total complications of 11.6%. (**Figure 7**) No Statistic significance was found for all complications in comparison with the two study groups; hematoma development ($p = 0.372$), seroma formation ($p = 0.586$) and wound infection ($p = 0.274$)

Out of the 213 patients included in the study, 100 patients had liposuction, plication of the recti muscles or both in combination with the abdominoplasty procedure. Three of these patients developed haematoma formation (3%), four had seroma formation (4%), one had wound infection (1%) and no one had tissue

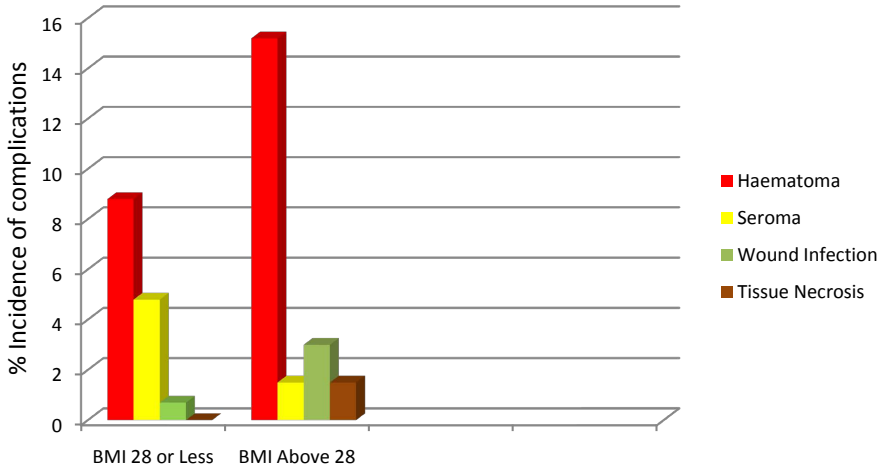

Figure 5. Relation between the Body Mass Index (BMI) and the complication rate.

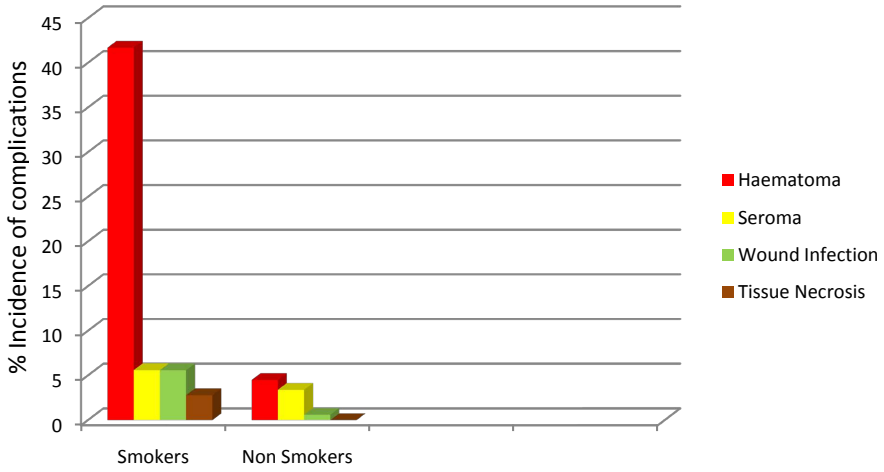

Figure 6. Effect of smoking on the incidence of complications.

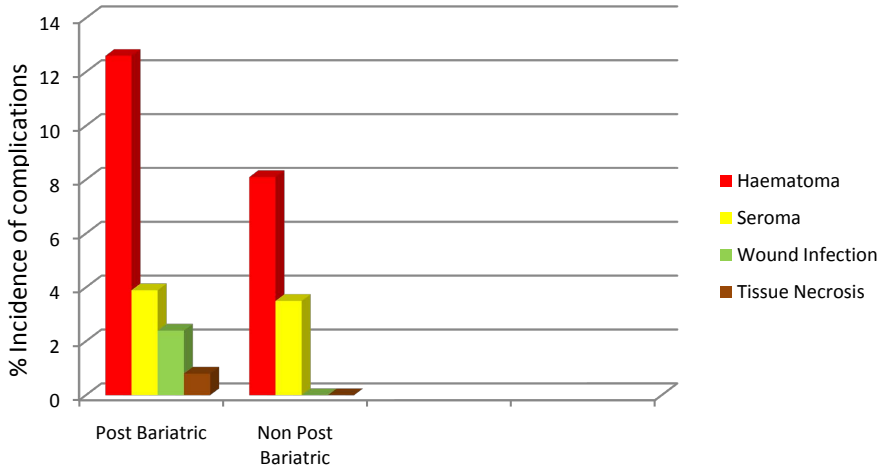

Figure 7. Relation between post bariatric surgery and the incidence of complications.

necrosis (0%) with total complications of 8%. The 113 patients who underwent abdominoplasty surgery without plication of the recti muscles or liposuction had

haematoma formation in 20 patients of them (17.7%), four of them had seroma formation (3.5%), two had wound infection (1.8%) and one patient had tissue necrosis (0.9%) with total complications of 23.9%. (Figure 8) The patients who underwent abdominoplasty surgery alone had a statistically significant score in developing hematoma ($p < 0.001$) while statistical tests showed no significant differences between the two groups in seroma formation ($p = 0.570$)

Thirty one patients had associated co-morbidity. Only one of the eleven diabetic patients had wound infection which was drained. Two patients with history of asthma had haematoma formation which was clinically irrelevant.

4. Discussion

Abdominoplasty is one of the most popular cosmetic procedures performed in plastic surgery. As with any surgical procedure, it is associated with complications which are assessed by many studies in the first 30 days following the abdominoplasty surgery. [3] [4] The complications can be classified as systemic complications like deep venous thrombosis, pulmonary embolism, paralytic ileus or even death and local complications as haematoma, seroma, wound infection and tissue necrosis. These local complications can be major requiring surgical intervention or minor which can be managed conservatively at the bed side. In our study we did not encounter systemic complications but we had 35 patients who sustained local complications which represented 16.4% of the patients included in the study. These complications were mostly haematoma 10.8%, seroma 3.8%, wound infection 1.4% and tissue necrosis 0.5%. There is a lot of variation of the complication rate and the incidence of each one between different centers. While some studies reported low incidence of complications of 4% with the majority haematoma followed by wound infection, [5] others reported high incidence of 32.6% which were mostly seroma formation followed by other complications. [6]

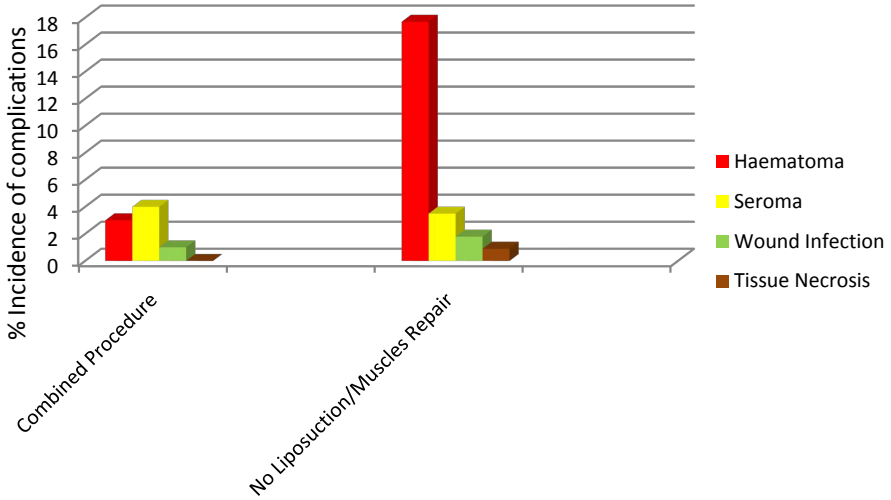

Figure 8. Complication rates of abdominoplasty either combined with liposuction and/or plication of the recti muscles or not.

There is a relation between possible risk factors and the occurrence of wound complications. These risk factors can be age, sex, body mass index, smoking, history of undergoing bariatric surgery, history of associated comorbidities and combining other procedures as liposuction or plication of the recti muscles with the abdominoplasty surgery. [7]

Chong *et al.* found on their retrospective study on 481 patients that males are at an increased risk of post abdominoplasty complications mostly hematoma and seroma formation compared to females. [8] Our study also showed that haematoma, wound infection and tissue necrosis were more in males than females. The exact cause of that is not known but there is a possibility that genetic factor can have a role. Additional possibility is that the number of smokers among men is higher than that among women.

Smoking is known to be associated with an increased risk of postoperative complications. This fact was confirmed by Grønkjær, M. *et al.*, on their meta-analysis of 107 studies [9] and was also stated before by Sørensen, L. T. on his review and meta-analysis of 140 cohort studies including 479,150 patients. [10] More than half of the smokers in our study (55.7%) developed complications of haematoma, seroma, wound infection and tissue necrosis while the complication rate among the non smokers was only 8.5%.

Christodoulos *et al.*; in their study showed that the incidence of complications in aesthetic surgery increases with the advancing age. [11] This was also stated by Dutot *et al.*; on their retrospective review of 1128 Cases who underwent abdominoplasty and found that an age of 40 years and older was associated with a higher rate of immediate complications and an elevated risk of seroma formation in particular. [12] Other studies which compared the complication rate in young and elder age groups who underwent abdominoplasty surgery did not find significant difference in either major or minor complications between the two groups. [13] Our study on the contrary showed that the complications were more in those who were younger than 40 years when compared to those who were 40 years of age and above. This could be explained by the fact that smoking is commoner among the younger age group and also most of the male patients in our study (72%) of them were below 40 years of age with higher incidence of complications among these both categories.

In contrary to the studies which related the increased incidence of complications in the elderly people to increase of comorbidities among them, [14] we did not find in our study a significant increase in the complication rate among the patients who were 40 years of age and above and had associated comorbidities. This could be due to proper patient selection, preoperative evaluation and control of the comorbidity conditions and continuation of monitoring and follow up of the patients intra and post operatively.

Many studies showed that Abdominoplasty in overweight and obese patients is associated with an elevated complication rate. [15] Hammond *et al.* performed abdominoplasty on patient with an average BMI of 32 kg/m^2 and had major and minor complications in 47.8% of the cases. [16] In the first 2 years of our study

we were performing abdominoplasty in patients with BMI above 28 Kg/m^2 and we had complication rate of 21.2% in these patients. We decided in the last 3 years of the study to restrict the abdominoplasty procedure to those who have BMI of 28 Kg/m^2 or less and the incidence of complications reduced to 14.3% in this category.

Grignaffini *et al.*, found that the risk of complications in postbariatric abdominoplasty is higher compared to cosmetic abdominoplasty. [17] Our study also showed 19.7% complication rate among those who had bariatric surgery before undergoing abdominoplasty compared to 11.6% among those who had not undergone that procedure before but the difference was statistically insignificant. Haematoma was the commonest complication noted. The possible causes for that can be due to deficiency of vitamin K with other malabsorption deficiencies in post bariatric cases which can predispose to more bleeding. [18] Baptista *et al.*; found that ex-obese patients have a higher number of small and large blood vessels, when compared to control patients and they related that to the excessive bleeding observed during their plastic surgery procedures. [19] Other studies related the increased incidence of haematoma in postbariatric abdominoplasty cases to the longer operative time and to the larger size of the surgical specimen removed in comparison to that in cosmetic abdominoplasty. [20]

Neaman *et al.*; found on their retrospective study of 1008 patients that concomitant liposuction of the flanks and abdomen with the addition of aggressive undermining leads to higher seroma rates. They related that to the increased resorptive demands placed on the abdominal lymphatics in the setting of greater dead space and larger fluid shifts as a result of liposuction. [6] We do not do aggressive undermining in our abdominoplasty cases especially if liposuction is done at the same time. We did not have significant difference in seroma formation between those who had abdominoplasty only and those who had abdominoplasty combined with liposuction or plication of the recti muscles. There was a significant difference in the formation of haematoma which was commoner in those who had abdominoplasty alone. Heller *et al.*; who performed similar technique of abdominoplasty combined with extensive liposuction and limited paramedian supraumbilical dissection had fewer complications and less dissatisfaction than in those who had traditional abdominoplasty. They attributed this to a reduced tension midline closure in the suprapubic region, less lateral undermining in the upper abdomen, and greater preservation of intercostal artery blood flow to the flap. [21] Swanson on his review of 360 cases found that combined procedure of liposuction and abdominoplasty is similar in discomfort level to abdominoplasty alone and produces the highest level of patient satisfaction. [22]

Further studies and meta-analysis research may be needed for evaluation of more factors and possible complications with their outcome.

5. Conclusion

The commonest complications of abdominoplasty surgery are haematoma, se-

roma, wound infection and tissue necrosis. Proper identification of the risk factors that can predispose to these complications should be considered in order to obtain the best outcome.

Compliance with Ethical Standards

This study was approved by Abu Dhabi Region Ethics and research Committed, Zayed Military Hospital Abu Dhabi.

Disclosure

The authors have no commercial associations that might be a conflict of interest in relation to this article.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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