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Fleur-de-lis Abdominoplasty after Bariatric Surgery - Our Experience

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ABSTRACT

As a result of the obesity pandemic, more and more individuals are seeking bariatric surgery for weight loss and resolution of conditions related to obesity. As the numbers have risen, the number of post bariatric massive weight loss patients presenting to the plastic surgeon for body contouring to address excess skin laxity is increasing. In this article, we are sharing our experience with fleur de lis abdominoplasty and inclusion of regenerative therapy to decrease the anticipated complications (seroma, hematoma, infection, and necrosis) of Fleur-de-lis abdominoplasty and to improve the wound healing. To our knowledge, this is the first study to include regenerative therapy with fleur de lis abdominoplasy.

KEYWORDS

Abdominoplasty; Fleur-de-lis; Bariatric surgery; Regenerative; Body contouring; Obesity

INTRODUCTION

According to recent statistics, 650 million persons worldwide are fat and nearly 1.9 billion are overweight. Obesity-related deaths have been estimated to reach 2.8 million in number. The risk of obesity and its negative effects (such as diabetes, ischemic heart disease, etc.) is significant in developing nations because of the intake of energy-dense food (i.e., poor eating habits), sedentary lifestyles, a lack of health care services, and budgetary constraints. More than 135 million people in India suffer from obesity. The prevalence of obesity varies by age, gender, location (geographic and socioeconomic), etc. in India. The prevalence rate of obesity and central obesity varies from 11.8% to 31.3% and 16.9% to 36.3%, respectively, according to the 2015 ICMR-INDIAB research. One of the main risk factors for cardiovascular disease (CVDs) in India is abdominal obesity. Numerous studies have revealed that women were much more likely than men to be obese. One of the biggest medical and financial expenses for the government is obesity [1].

A growing number of people are turning to bariatric surgery to lose weight and treat obesity-related diseases as a result of the obesity pandemic. The number of patients seeking body contouring to treat extra skin laxity following bariatric significant weight reduction has been rising as the numbers have gone up [2]. Massive weight loss is described as loss of 50% or more of extra weight, which causes the abdomen skin to become slack and occasionally severely redundant. Rashes, soreness, physical restriction, back strain, and cosmetic deformities can all result from this. In 1985, Lee Dellon described the fleur de lis abdominoplasty as a progression of the

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Regnault modified-W Castanares procedure. The fleur-de-lis abdominoplasty underwent a drastic extension, according to George Ramsey-Stewart, in 1993. In an effort to improve the waistline to hip contour, Moya and Sharma described an additional fleur-de-lis abdominoplasty modification in 2007. This alteration included an extended high lateral incision [3]. Due to the huge incisions and significant dead space, fleur de lis abdominoplasty procedures are risky and might result in problems including seroma and hemorrhage. Both classic panniculectomy series (36%–43%) and those reporting fleur-delis abdominoplasties (12%-62%) have a wide range of published complication rates. Due to concerns of increasing complication rates in non-cosmetic after weight loss surgery, many surgeons avoid the fleur-de-lis (or "inverted-T") abdominoplasties, despite the advantage of resecting tissue in both the vertical and horizontal directions [4]. In this article, we are sharing our experience with fleur de lis abdominoplasty and inclusion of regenerative therapy to decrease the anticipated complications (seroma, hematoma, infection, necrosis) of Fleur-de-lis abdominoplasty and to improve the wound healing. To our knowledge, this is the first study to include regenerative therapy with fleur de lis abdominoplasy.

MATERIALS AND METHODS

23-years old male healing from Calicut, Kerala, driver by occupation presented to Plastic surgery OPD with post bariatric surgery- deformity of abdomen, lower back, chest, both arms, both thighs 2 years duration.

The patient was obese since childhood. His mother was diabetic at the time of pregnancy which was uncontrolled. She underwent a caesarean section at 9 months due to macrosomia. The patient was 6 kg at the time of delivery. He progressively gained weight as age increased. He was 120 kg when he was in 10th standard then he had surgery to left knee joint while playing badminton for which he was bed ridden for 7 months following which his weight further increased. He was 175 kg at 20 years of age. No other co-morbidities (no diabetic, hypertension, cardiovascular disease, obstructive sleep apnoea, GERD). Psychological status of the patient - normal. No history of any disorder or syndromes in the family.

He came to our centre in 2019 for weight loss surgery. He underwent Laparoscopic Sleeve Gastrectomy at JIPMER in 2019. Following surgery his weight progressively decreased and at present he is 83 kg. His weight is stable for the past 6 months. He was a smoker which he stopped 1 year back (Figure 1).

Figure 1: Skin excess in the lower abdomen and back, chest, both arm and both thighs.

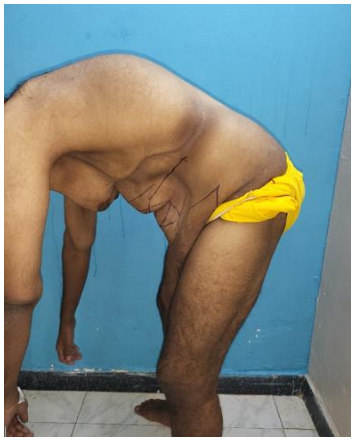

Figure 2: Diver's test - lower abdominal fullness with significant laxity.

On examination (head to toe) - Scar in the abdomen (lap port), bilateral lower limb varicose vein.

Height = 180 cm (1.8 m).

Weight = 83 kg (now).

BMI (now) - 25.6.

BMI (lowest) - 25.6.

BMI (highest) - 54 kg/m^2.

Local Examination.

Skin excess in the lower abdomen and back, chest, both arm and both thighs (Figure 1).

Musculofascial laxity assessment.

Diver's test - Lower abdominal fullness with significant laxity (Figure 2).

Pinch Test - significant laxity.

Midline rectus diastasis - absent.

No ventral or umbilical hernia - absent cough impulse.

Measurement of skin folds:

1. Vernier caliper.
2. Fat Measure caliper.

1. Abdominal fold measurement using vernier caliper (Figure 3).

Figure 3: Abdominal fold measurement using vernier caliper.

Fat measuring caliper (Figure 4)

Figure 4: Fat measuring caliper.

Patients want to under a staged body contouring procedure. He opted abdominoplasty in the first stage. Laboratory evaluation, including complete blood count, Serum electrolytes, liver function test, albumin, calcium, ferritin, folate, iron, and vitamins (A, B1, B6, B12, and D 25- hydroxy), blood sugar levels, HbA1c, Lipid profile, TSH, Free T4, intact PTH, testosterone, coagulation profile, were performed. The studies did not reveal any abnormalities. Serum Leptin level was analysed and was within normal limit. Radiological evaluation including chest X ray, ECHO, USG abdomen, CECT abdomen and thorax were performed. The studies did not reveal any abnormalities (no divarication of recti or abdominal wall hernia). DEXA scan to analyze the body composition was performed and the study did not reveal any abnormalities. Karyotyping was performed to rule out chromosomal abnormalities like Prader Willi Syndrome, Bardet Biedle Syndrome. The study did not reveal any abnormalities.

After getting clearance from cardiology, endocrinology, surgical gastroenterology, psychiatry, pre anesthetic check-up and consent, the patient was planned and posted for Fleur-de-lis abdominoplasty.

Fleur-de-lis Abdominoplasty - Our Surgical Steps

1. Markings were performed preoperatively with the patient standing (to assess tissue redundancies suitable for excision) (Figure 5).

Figure 5: Preoperative marking in standing position.

2. Patient positioned supine in the operating table and DVT prophylaxis compression devices placed on lower extremities.
3. General Anaesthesia was induced. The patient's abdomen was prepped and draped in a sterile manner.
4. Tumescent infiltration at the incision lines and periumbilical site.
5. A low transverse incision was made in the suprapubic region upto the anterior superior iliac spine on either side (marked preoperatively).
6. Using Colorado microdissection needle tip cautery dissection was done deep to scarpa's fascia. Allies clamp used to raise the tissue to open up the plane. The dissection was carried cephalic (Figure 6).

Figure 6: Colorado microdissection needle tip cautery.

7. The perforating vessels were clamped, divided, and ligated and/or hemoclipped. The dissection continued cephalad elevating upto the umbilicus.

Figure 7: Detaching the belly button.

8. Detaching the belly button with 11 blades and scissors. Put a stay suture in the detached umbilicus for identification (Figure 7).
9. The abdominal skin below the umbilicus was split in the midline from the umbilicus to the pubis.
10. In our case there is no divarication of recti/ abdominal wall hernia clinically or radiologically. So, no midline plication was performed.
11. Patient was flexed into beach chair position (this manoeuvre allows the surgeon to assess how much tissue can be safely removed allowing for closure of incision under appropriate tension).
12. A stay suture was placed between upper abdominal wall skin and Mons pubis skin to assess adequate tension.

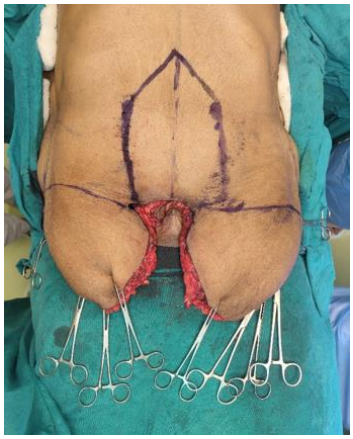

Figure 8: Marking for the vertical excision.

Figure 9: Vertical excision done.

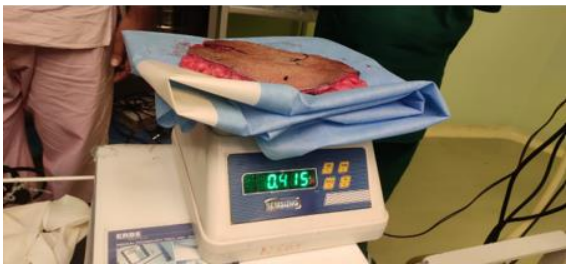

Figure 10: Weighing of vertical excision.

13. Mark the vertical skin excision using ink after assessing the laxity (Figure 8) Vertical excision done (Figure 9) and weight measured (Figure 10).
14. Midline vertical approximation is done (trial) to plan the lower skin removal from both sides.
15. Marking of the lower skin (both side) for removal is done (by pulling the skin lower and towards the midline before marking). Lower skin and subcutaneous tissue are removed from both sides and weight measured. (Figure 11).

Figure 11: Weighing of right and left excision.

16. A total of 1.55kg was removed. Regenerative therapy- Low level laser therapy (LLLT) (Figure 12), autologous platelet rich plasma (APRP) (Figure 13), and autologous bone marrow aspirate therapy (ABMA) (Figure 14) was done.

Figure 12: Low level laser therapy.

Figure 13: Autologous platelet rich plasma.

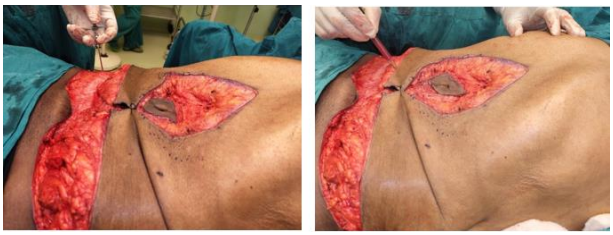

Figure 14: Autologous bone marrow aspirate therapy.

17. Umbilicus was repositioned in the anatomical position and midline vertical approximation is done in layers after applying tissue glue (Figure 15).

Figure 15: Tissue glue (fibrin sealant) application.

18. After haemostasis, two lateral drains were placed.

Figure 16: Fleur de lis abdominoplasty on table result.

19. Transverse incision closed in layers after applying tissue glue and skin staplers applied (Figure 16).
20. Dressing applied and closed incision negative pressure wound therapy (CiNPWT) applied (Figure 17). Patient position maintained.

Figure 17: Closed incision negative pressure wound therapy.

Post-Operative Management

On completion of the procedure, the patient is maintained in a flexed position and transferred from the operative table to the stretcher. The stretcher is adjusted to maintain flexion at the hips. An abdominal binder is placed. DVT prophylaxis continued with low molecular weight heparin. Drain output is monitored and the drains are removed when the output is less than 30 mL over a 72-hours period. When the drains are removed, the patient can transition into a compression garment for a total period of 4 weeks to 6 weeks. Aggressive physical activity is also minimized during the recovery period of 4 weeks to 6 weeks.

RESULTS

In our study of fleur de lis abdominoplasty and regenerative therapy after bariatric surgery, post-operative day 28, surgical site appears healthy with no complications of seroma, hematoma, necrosis, infection. (Figure 18) The deformity of the abdomen got corrected with good cosmetic results and patient satisfaction. Future plan-liposuction for contouring, mastopexy, and brachioplasty, thighplasty, lower body lift.

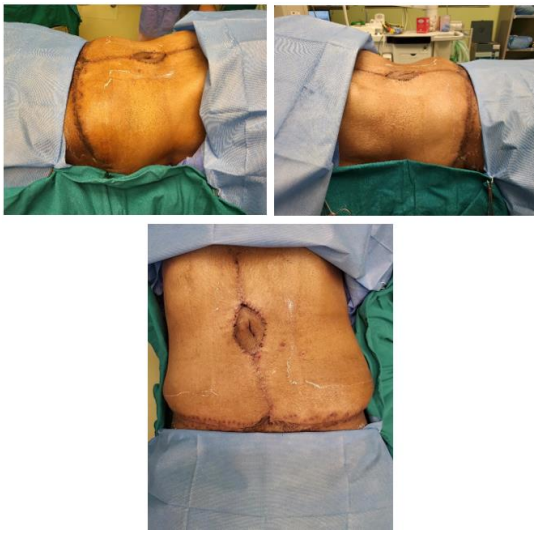

Figure 18: Fleur de lis abdominoplasty - post operative day 28.

DISCUSSION

Fleur de lis Abdominoplasty

After significant weight loss, an ever-increasing number of patients choose to have body contouring surgery to manage issues like intertrigo, restriction of motion, pain, and cosmetic deformities. One of these surgeries that is carried out most frequently is an abdominoplasty [5]. However, epigastric contour defects are frequently not properly corrected by traditional abdominoplasty methods. Fleur-de-lis abdominoplasty-first described in 1985 [6] - has become a suitable procedure for such cases. Its advantage is the capacity to eliminate extra tissue in both the vertical and horizontal directions as well as to highlight the waistline, even though a little bit more undermining is required. According to the literature, single analyses of fleur-de-lis abdominoplasty had a substantially lower reported incidence of problems than comparative studies comparing fleur-de-lis and traditional procedures of abdominoplasty. Fleur-de-lis abdominoplasty can be safely performed with overall complication rates comparable to those of conventional abdominoplasty techniques, despite the fact that obese and post-bariatric patients have a significantly higher risk of developing complications compared to non-obese and non-post-bariatric patients [7-9]. Hemostasis, seroma, and wound dehiscence are the most often reported consequences,

along with infection, particularly at the T-point. Their incidence levels in earlier investigations ranged from 0% to 7% (hematoma) and 0% to 12% (seroma). Minor seroma rates were found at rates ranging from 5.2% to 36%. During fleur-de-lis abdominoplasty, the use of drains and progressive tension sutures might help to prevent seroma formation [10].

The ability to remove extra tissue in both the vertical and horizontal orientations allow for more tissue to be removed, which is one advantage of fleur-de-lis abdominoplasty over conventional panniculectomy. There is hardly any skin necrosis because just minimal undermining is required. Traditional panniculectomy may leave the surgeon with upper abdominal fullness or lateral dog ears, which would require a circumferential body lift to rectify. Due to budgetary limitations, many patients frequently cannot do this. There are several restrictions with the fleur-de-lis abdominoplasty. In addition to leaving longer scars, it can also sometimes leave a dog-ear in the superior epigastric area, however this usually disappears over time [4]. Duff et al. found that the majority of the 68 patients in their study who received fleur-de-lis abdominoplasty experienced successful abdominal reshaping [11]. Twelve of these patients needed revision surgery due to cosmetically unacceptable results, leaving just one patient who was not satisfied. Due to the removal of tissue from the abdomen and surrounding areas, the modified vertical abdominoplasty approach has increased patient satisfaction. Because bariatric surgery already carries a high risk of complications, surgeons frequently hesitate to do fleur-de-lis abdominoplasty after this procedure. Additionally, by removing extra skin in both the vertical and horizontal planes, the fleur-de-lis incision enables the creation of a functional and possibly aesthetic result.

Low Level Laser Therapy

Any laser with a power density of less than 500 mW/cm^2 is considered low-level. A source of LLLT was a red Gallium Arsenide (GaAs) diode laser with a wavelength of 650 nm, a frequency of 10 kHz, and an output power of 100 mW. The laser is a continuous beam with a 4 J/cm^2 energy density. With 60 cm between the laser source and the wound, the machine delivers laser in scanning mode (non-contact delivery). A type of phototherapy that makes use of electromagnetic radiation is LLLT. In order to restore cell homeostasis, LLLT creates photochemical and photophysical effects rather than producing heat. In essence, light energy is applied topically in a safe and controlled manner, where it is safely absorbed by photo-absorbers (chromophores) and converted to chemical energy. The benefits of LLLT include accelerating tissue repair, increasing granulation tissue production, aiding in wound contraction, reducing inflammation and regulation, and easing pain [12]. According to the literature, low-energy photoemissions at a wavelength between 600 nm and 900 nm speed up wound healing and cell proliferation. Its action is believed to: Stimulate cytochromes and flavin in the respiratory chain, which increases adenosine triphosphate (ATP) synthesis and speeds up mitosis, increasing the number of fibroblasts; stimulate collagen and elastin production, which improves re-epithelialization; stimulate capillary dilatation and neovascularization to increase tissue oxygenation; stimulate mediator substances like histamine and serotonin [13].

Autologous Platelet Rich Plasma

A component of the plasma fraction of autologous blood with a platelet concentration above the background is known as autologous platelet rich plasma (APRP). The cost-effective and secure means of acquiring high quantities of these growth factors is APRP, which has a high concentration of alpha granules. Growth factors including PDGF, vascular endothelial growth factor, TGF, and EGF, which encourage angiogenesis, cell proliferation, maturation, and matrix formation, are known to be present in the alpha granules of platelets. Due to APRP's abundance of growth factors, it has been studied

in the context of regenerative medicine to improve wound healing [14].

Autologous Bone Marrow Aspirate Therapy

Each stage of the healing process for wounds has been demonstrated to be enhanced by MSCs (bone marrow). The involvement of mesenchymal stem cells (MSCs), which are produced from bone marrow, in the healing of cutaneous wounds was examined. According to the theory, in response to cytokine signalling, MSCs mobilize from the bone marrow niche and go to ischemic tissue through the peripheral circulation. When they get to the damage site, they start to differentiate into distinct epidermal and dermal cells. Neovascularization, or the development of new blood vessels, is a crucial step in the healing of wounds because it allows the damaged tissue to get oxygen and nutrients while also removing waste. In vitro experiments have demonstrated that MSCs are capable of differentiating into vessel-forming endothelial cells suggesting that they may contribute to postnatal vasculogenesis during the wound healing process [15].

Colorado Microdissection Needle (CMDN), Fibrin Sealant, Closed Incision Negative Pressure Wound Therapy

The Colorado Microdissection Needle (CMDN) used was N110 A (2.3622 mm sleeve diameter). Generator unit was set at between 10W to 15W for both cutting and coagulation & 390 kHz sinusoid waveform. N 103 A and N 110 A Colorado micro dissection needle were used alternatively. The incision depth included dermis, epidermis, and fascia. Advantages of Colorado include reduction in cutting time, less blood loss, less postoperative pain, less wound complications, less scar and better cosmetic results [16].

Fibrin sealants (tissue glue) have shown to lower rates of seroma postoperatively by obliterating the dead space [17].

Studies have shown that closed incision negative pressure wound therapy (CiNPWT) reduces tension across the surgical incision, improving local blood flow and hence minimizing dead space and wound fluid collection [18].

In our case of post bariatric abdominal deformity, fleur de lis abdominoplasty helped to remove excess tissue in both the vertical and horizontal directions and inclusion of advanced technology (Colorado Microdissection Needle, Tissue Glue) helped to minimize the blood loss, reduce the operative time, minimized the dead space and regenerative therapy with low level laser therapy, autologous platelet rich plasma, autologous bone marrow aspirate, closed incision negative pressure wound therapy helped to enhance the wound healing with no complications of seroma, hematoma, necrosis, infection. The deformity of the abdomen got corrected with good cosmetic results and patient satisfaction.

CONCLUSION

Fleur-de-lis abdominoplasty has become a suitable procedure for post bariatric abdominal deformity. Its benefit is the ability to remove excess tissue in both the vertical and horizontal direction as well as to accentuate the waistline. The anticipated complication of seroma, hematoma, necrosis, infection, longer scarring can be mitigated with careful patient selection, comprehensive approach, regenerative therapy and inclusion of advanced technology like the one presented in this article allows for safe and effective treatment of these patients. This is the first study to include regenerative therapy with fleur de lis abdominoplasty. As this is a single case study, further large scale randomized control study is required to comment on its efficacy.

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