ABDOMINOPLASTY

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Abstract : *Surgery for improvement in the appearance of the abdomen (aesthetic abdominoplasty) is 100 years old. All the initial operations were done with the primary aim of herniorrhaphy, excising the fatty apron as a bonus. The majority of patients presenting today have neither a hernia nor the severity. They require more of aesthetic body contouring operations designed to give a better look in various states of dress or undress. The modern abdominoplasty techniques developed in the last 45 years consist of a low transverse incision, wide undermining up to the costal margins, correction of divarication of recti (with or without tightening of musculature in horizontal direction), excision of redundant skin and fat, and umbilical transposition. Many times a liposuction procedure is combined with abdominoplasty to provide better contouring. To achieve a successful outcome, appropriate patient selection and attention to minor details during surgery are of extreme importance.*

INTRODUCTION

'Abdominoplasty' is the cosmetic surgery of the abdomen and it denotes only the correction of contour deformities of the anterior abdominal wall. Aesthetic abdominoplasty is also variously referred to as abdominal wall contouring, abdominal liposculpture and dermolipectomy of the abdomen or simply as 'tummy tuck' by a layman. Reconstruction of the abdominal wall is not included under this topic.

HISTORY

It began at the turn of the 20th century, when the operations were primarily aimed at repairing the hernia along with resection of excessive abdominal fat by a wedge excision. Demars and Marx in France (1890)[1] did extensive abdominal wall fat resection. In 1905, Gaudet and Morestin[2] reported transverse closure of a large umbilical hernia along with resection of skin and fat. Desjardin (1911)[3] used a vertical incision to remove skin and fat. Kelly (1899,1910)[4,5] introduced the term 'abdominal lipectomy' to describe the transverse resection of a large pendulous abdominal wall. His incision extended across the mid abdomen into the flanks, excising a wedge of panniculus, repairing the hernia and closing without any undermining. Babcock (1916)[6] was the first to advocate wide undermining of the anterior abdominal wall carried out through a vertical ellipse–shaped incision. Thorek (1939)[7] described a technique, which he called 'plastic adipectomy' for fatty aprons. He excised the umbilicus along with fatty apron through a crescent shaped incision and at the end of the operation transplanted the same as a composite graft at the another appropriate site. He did not mention the success rate of graft 'take' but did suggest the alternative technique of circumcising the umbilicus, leaving it attached to anterior abdominal wall and then, bringing it out through an opening made in the skin.

All these initial operations were done with the primary aim of herniorrhaphy, excising the fatty apron as a bonus. However, the aesthetic advantages of these operations were quite obvious. They were definitely the forerunners of the techniques, which were later developed into the operations performed with the sole aim of cosmetic improvement. The majority of patients coming for 'abdominoplasty' today have neither any hernia nor the severity for which earlier surgeons performed them. Vernon (1957)[8] was the first to use a low transverse incision with undermining of abdominal flap and transposing the umbilicus. Pitanguy (1967)[9] reported 300 cases of dermolipectomies with low transverse incision. Regnault[10] described his 'W' technique in 1972. Psillakis (1978)[11] first performed the suture plication of external oblique muscle in transverse direction like a belt. The modern abdominoplasty techniques [12-16] were developed in the last 45 years or so and the principles have since remained the same, viz., a low transverse incision, wide undermining up to the costal margins, correction of divarication of recti and tightening of musculature in horizontal direction, excision of redundant skin and fat, and umbilical transposition as a flap. The primary aim of all the currently popular techniques is to leave a scar that can be hidden under the bikini.

The last 25 years have seen the development of a new modality, viz. liposuction, to address the problem of milder cases with localized excessive fat but without redundant skin. This has been dealt in detail in the article on liposuction elsewhere in this volume.

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CONTOURS OF THE ABDOMEN

The bony framework, the musculo-aponeurotic system of the anterior abdomen, the thickness of subcutaneous adipose tissue and the skin make the abdominal contours. The various depressions, including that of the umbilicus, reflect light i.e. a shadow is formed by the depression. The shadow of the median sulcus is flanked on either side by the shadows from the lateral margins of the rectus muscles. Superiorly the abdomen is bounded by inferior costal margins and inferiorly by the pelvic rim. Alteration in any of these tissues, that constitute the abdomen, changes the appearance by modifying the light reflexes and shadows.

The contours of the anterior abdomen vary greatly not only in different individuals and sexes but also in the same individual at different ages. This variation is caused by the varying amounts and site of subcutaneous fat deposition and the tone of underlying abdominal muscles. In general, very small children have a protuberant belly but in older children and young adults of both sexes, the abdomen is flat on side view in erect position. In pregnant females, the abdomen becomes more and more protuberant as the pregnancy advances. Pregnancy stretches the skin as well as the musculo aponeurotic structures beyond their biomechanical capacity leading to striae gravidarum and diastasis of recti. After the delivery, the tone of muscles returns back, but not completely, unless appropriate exercises are undertaken. In addition, there is fat deposition in infra-umbilical region. Repeated pregnancies increase the laxity of abdominal wall as a whole and the infra umbilical fat deposits leading to an appearance of a protuberant and pendulous abdomen. Even in males, with increasing age, there is a loss of tonicity of abdominal wall muscles, especially the rectus abdominis, and abdomen starts protruding. With more and more protrusion the abdomen becomes pendulous and in extreme cases covers the mons pubis and external genitalia forming a fatty apron.

A number of young and middle aged obese individuals of both sexes have now become 'health conscious' because of media and societal pressures. They strive to loose weight by all means. It is to be noted that while increase in weight of an individual occurs due to uniform deposition of fat all over the body, the loss in fat is not uniform during weight

reduction, thereby leading to localized collections of fat e.g., in the infraumbilical region. After weight reduction or surgery for morbid obesity the skin becomes loose and unaesthetic. *This conversion of pendulous abdomen into a shape that is normal for a young adult of an ideal weight is the essence of aesthetic abdominoplasty.*

SPECTRUM OF DEFORMITY AND TECHNIQUES

There is a huge spectrum of deformity and consequently the techniques to correct them. A number of factors like the degree of redundancy and flaccidity of the skin, scars on the skin including those of previous abdominal operations, laxity of musculo-aponeurotic system, anterior abdominal wall hernias[17], thickness of subcutaneous fat, overall weight of the patient (body mass index) etc. are taken into consideration. At one end of the spectrum, there may be a case with mild fat deposit without excess skin and with a normal musculo aponeurotic system. At the other end, there may be an individual with great excess of skin and fat with striae or scars and severe laxity of musculo-aponeurotic system (fig.1). While former clearly requires removal of fat alone (by liposuction), the latter needs a traditional dermolipectomy with tightening of the musculo-aponeurotic system. Because of the wide spectrum that exists, each case needs be evaluated individually and the treatment tailored accordingly.
The last 25 years have seen the introduction of liposuction[18, 19] as a body contouring modality. It has radically changed the approach to abdominoplasty. The classical abdominoplasty, in many cases does not satisfy the surgeon and the patient because of superior displacement of pubic skin, long scars, flattening of infraumbilical abdomen etc. Similarly, liposuction alone does not address the skin laxity and it depends on the skin retraction that is not under the surgeon's control. So a number of workers started combining the two procedures. The patients who have isolated mild problems are now offered mini-abdominoplasty. Mini-abdominoplasty utilizes a minimum length of abdominal incision to excise redundant infraumbilical skin and fat. Recently, the divarication of recti has been corrected using endoscopic instrumentation.[20]

PREOPERATIVE ASSESSMENT

A detailed history and physical examination is very important for a successful outcome. As most of the patients are females, a history of pregnancies and their effect on the patient's abdominal wall, type of delivery (caesarean or otherwise), any post-delivery measures to regain abdominal contours and extent of weight gain during pregnancy and after childbirth should be noted. History of excessive weight gain and / or loss should be recorded in both the sexes. A detailed history of medical illnesses and drug intake especially to reduce weight should be elicited. While smoking increases the chances of flap necrosis, aspirin may increase the chances of hematoma and seroma formation. The emotional status of the patient and immediate reason for his/her desire to undergo abdominoplasty should be assessed. It is of utmost importance to know if the patient has realistic expectations or fanciful goals. The patient must understand that this is not a weight-reducing surgery. Moreover, abdominal protuberance due to intra-abdominal fat accumulation cannot be corrected.
The physical examination should look for condition of the skin, presence of striae gravidarum or previous operative scars, hernias, diastasis of recti, tonicity of muscles and thickness of subcutaneous fat in various regions. The overall weight of the patient with respect to ideal weight is recorded. An ultrasonography of the abdomen must be done to exclude any co-incidental intra-abdominal pathology. Preoperative counseling to apprise the patients of realistic goal is very essential. Preoperative photographs should be taken in standing position from front and sides.

Fig.1 Front view of the abdomen in a 49 year old female showing extreme laxity of abdominal apron with striae and incisional hernia.

CONTRAINDICATIONS

The biggest contraindication to abdominoplasty is a patient who believes this operation a weight- reducing measure rather than a body contouring procedure. These patients form the biggest lot of unsatisfactory outcome. Similarly, any patient with unrealistic expectations with respect to morbidity or scarring is a poor candidate. A patient must be emotionally stable to undergo any aesthetic procedure.
Patients who have significant associated medical conditions leading to unacceptably high risks should not be offered this operation. A history of upper abdominal surgery through sub costal incisions that may compromise the vascularity of flaps, and patients who have planned future pregnancies are poor candidates for this surgery. A case of morbid obesity should first undergo an appropriate intra abdominal procedure for weight reduction and an abdominoplasty thereafter.

'TRADITIONAL ABDOMINOPLASTY'

Preoperatively, a low transverse incision is marked on the patient in standing position. A number of workers like Pitanguy[9], Regnault[10] etc. have described low transverse incisions that give excellent results if the operation is executed properly. They can also be modified to suit the individual requirements.
The skin incision is extended to the flanks from the suprapubic region and deepened to the anterior rectus sheath. The skin flap (panniculus) is raised superiorly using monopolar electrocautery with coagulation/ ligation of musculo aponeurotic perforators till the umbilicus is reached. It is preferable to allow a small amount of subcutaneous fat to remain on the muscle/fascia. The umbilicus is then circumscripted. The infraumbilical flap is then incised vertically in the midline. This helps in raising the supraumbilical flap under vision without much retraction. The panniculus is raised up to xiphisternum in midline and about 2-3 cm. above the costal margin on either side. Complete hemostasis is achieved using bipolar cautery.
The exposed musculo-aponeurotic layer needs correction in most of the cases especially those following multiple pregnancies. Diastasis of recti and incisional hernia are corrected at this stage. Plication of the rectus sheath is done from the xiphisternum to the symphysis pubis with horizontal mattress sutures of strong nylon or prolene (1 '0', 2 '0') (fig.2a-d). In patients where rectus sheath plication is insufficient a horizontal tightening is done by one of following techniques. Jackson and Downie (1978) [21] advocated a transverse plication using same heavy sutures at the level of umbilicus and sometimes midway between umbilicus and

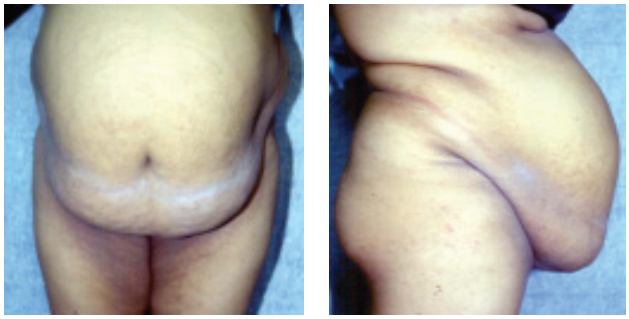

Fig.2 a & b Front and lateral views of the abdomen in a 47 year old female following multiple pregnancies. Note the huge excess of abdominal apron. She also had divarication of the recti muscles.

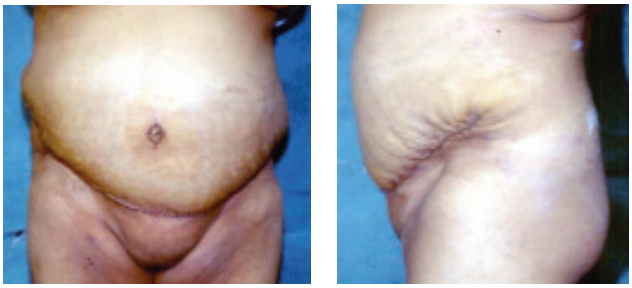

Fig.2 c & d Showing the front and lateral views at 10 days following a dermolipectomy, abdominoplasty and correction of rectus divarication. A liposuction of the flanks would have further enhanced her contours. (The procedure was done almost 15 years back when liposuction had not become popular).

pubic symphysis. External oblique musculofascial flaps can be dissected on either side and sutured in midline to further narrow the waistline (Psillakis, 1984) [22].

Many surgeons combine this standard abdominoplasty procedure with a liposuction. Skin flaps, which are intended to remain in place, are liposculptured to obtain better contouring (fig.3a-e).

The umbilicus is the only desirable scar in the human body whose absence causes great mental trauma. Hence, preservation of umbilicus and its relocation is of utmost importance. After the skin flaps are brought down the position for new umbilicus is located just above the centre of the abdomen[23-26]. The extent of skin flap excision is marked inferiorly. The umbilicus is brought out on the surface through a cruciate incision and all incisions are closed after placing closed suction drains.

POSTOPERATIVE CARE

Postoperatively, the patient is nursed in semi-Fowler's position with legs elevated to relieve tension on the abdominal wound. The patient may be catheterized electively. Gradually, over a period of few days, the patient is allowed to lie straight. Early ambulation increases the risk of hematoma / seroma formation. An adynamic ileus may persist longer in patients with associated ventral hernias where peritoneum was opened. Therefore, a semisolid diet is gradually introduced depending on bowel movement and patient tolerance. Analgesics are given in the postoperative period. A pressure garment or an abdominal binder is prescribed before resumption of full activity.

COMPLICATIONS

The complications[27, 28] may be the ones that are common to most of such surgical operations or they may be aesthetic, which are specific to this procedure and related to surgeon experience, making the result sub optimal or even poor.

The general complications are hematoma / seroma formation, lipolysis,

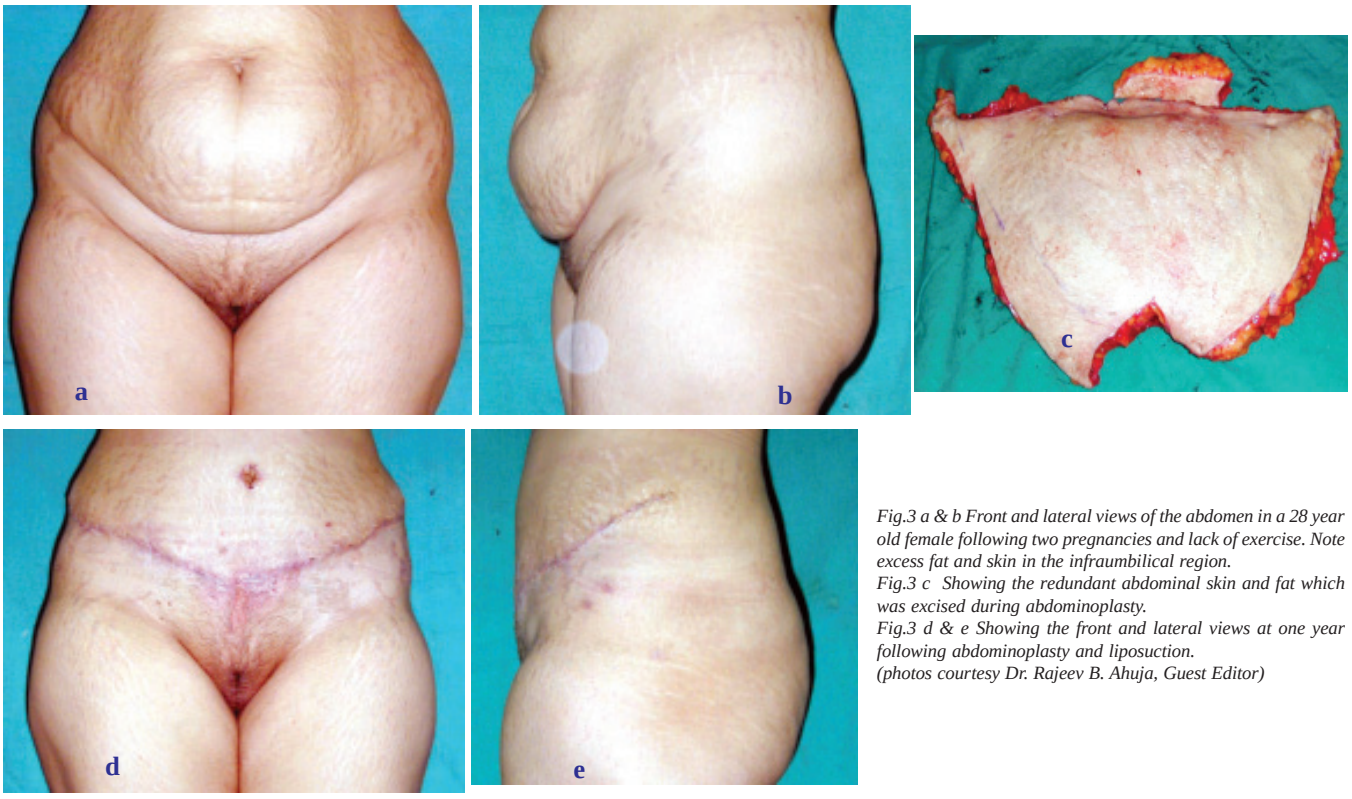

Fig.3 a & b Front and lateral views of the abdomen in a 28 year old female following two pregnancies and lack of exercise. Note excess fat and skin in the infraumbilical region.
Fig.3 c Showing the redundant abdominal skin and fat which was excised during abdominoplasty.
Fig.3 d & e Showing the front and lateral views at one year following abdominoplasty and liposuction.
(photos courtesy Dr. Rajeev B. Ahuja, Guest Editor)

infection, flap necrosis, poor scars etc. By far the commonest complication is hematoma or seroma formation. Wide bore negative suction drains must be kept in place for at least 5-6 days to allow the flaps to adhere to the bed and obliterate the dead space and raw area. Once formed, they need drainage / aspiration. If not attended to early they lead to flap necrosis because extensive undermining compromises the flap vascularity. Since this surgery is performed in obese individuals where thick panniculus flaps are raised, they are always prone to fat liquefaction. Hematoma, seroma, fat liquefaction and flap necrosis make the patient prone to infection. The use of non-absorbable sutures and meshes has a potential of making these infections chronic. Flap necrosis is one of the most dreaded complications in plastic surgery. Thus, meticulous attention to detail especially with respect to tissue trauma, plane of dissection, hemostasis, tension of wound closure etc. is mandatory in getting a good result. When flap necrosis does occur it needs to be managed proactively. The necrotic flap is excised after the line of demarcation has appeared. A small wound may be allowed to heal secondarily or a thin split thickness skin graft is applied once healthy granulations appear.

As in any aesthetic procedure, it is mandatory to counsel the patients preoperatively to have realistic expectations from surgery. By and large majority of patients are extremely satisfied from this procedure. It has to be ensured that dermolipectomy is adequate and symmetrical. Liposuction must be used to give better contouring. Any secondary surgery is only undertaken after about a year to allow the tissues to resolve. Excessive flap resection is another very dreaded complication because it can lead to wound dehiscence and also pull up the pubic region or labia (in females). Further, it can lead to widening of the scars, which are difficult to correct as all laxity of tissues has disappeared because of surgery. However, scars do become supple and less noticeable with time. Hypertrophic scars also settle in due course with oil massage, silicone gel sheets, intralesional triamcinolone injections and pressure garments. 'Dog ears' in the flanks need revision after 4-6 months. Much of the abdominal striae get excised with dermolipectomy but the ones that remain are extremely difficult or impossible to correct. Placement of the umbilicus and its shape needs great attention to prevent it from having an 'artificial' look, being asymmetrically placed or being too deep. There is also a risk of partial or complete necrosis of the umbilicus.

ABDOMINOPLASTY IN MALES

The number of men requesting abdominoplasty is much less than women, nevertheless, it remains a frequently performed aesthetic procedure in males. This is because of increasing incidence of obesity in society. In males also the shape of the abdomen reflects his fitness, health, and sexuality. Increasing body weight with loss of abdominal muscular tone due to lack of exercise are the prime reasons for altered abdominal contour.

Males present for abdominoplasty at an older age and higher weight. Their interest is often in a single region (abdomen) compared to women who generally want contouring of multiple regions like abdomen, thigh, arms etc. The male integument also varies a great deal from the females. It is less prone to overstretching and laxity, and therefore, excessive skin redundancy is generally observed in those who have undergone massive weight loss. With advancing age (from 25 years onward) the fat pattern changes in males. There is an 'internalization' of fat, with an increase in intra- abdominal fat and a corresponding decrease in subcutaneous fat, as well as infiltration to and between the muscles. This change has the greatest impact on the appearance of the abdomen and is an essential fact for patient appraisal. Overall, there is a decline in lean body mass and a redistribution of fat which is reflected in an increase in the body mass index. The waist-hip ratio and triceps-skin fold thickness (which correlates with visceral abdominal fat) are valid measurement indices of these changes. Differences between the genders exist in the muscular layer as well. Women often present with a lower abdominal rectus muscle diastasis, creating a visible umbilical to pubic 'bulge'. In contrast, men often have a rectus diastasis in the upper abdomen, which contributes along with intra-abdominal fat to a 'bear belly' appearance. Because males have fewer variations in their presentations as compared to females the necessity for a variety of surgical procedures is less in them. Typically, 'liposuction', a 'full abdominoplasty' or a 'dermolipectomy with liposuction' is sufficient, in contrast to the wider range of procedures performed on women. In spite of these differences the endpoints of surgery are identical in males and females.

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