Outcomes of High Superior Tension Lipoabdominoplasty Versus Traditional Abdominoplasty

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ABSTRACT

Nowadays, abdominoplasty techniques undergo a continuous process of evolution. One of the most interesting techniques is high superior tension lipoabdominoplasty (HSTLA). HSTLA includes a lipoabdominoplasty with selective undermining (to preserve vascular perforators and lymphatics), high tension sutures in the peri umbilical area (to progressively move the abdominal flap caudally) and quilting sutures (to close the dead space). The objective of this study was to evaluate the outcome of HSTLA compared to traditional abdominoplasty (TA). This study included two groups: Group I: consisted of 19 patients subjected to high HSTLA and Group II: consisted of 26 patients subjected to TA. The outcomes of both groups are compared. As compared with TA, HSTIA technique significantly reduces the incidence of seroma formation and loss of sensation of the lower abdominal flap together with decrease in the incidence of partial wound dehiscence and skin edge necrosis. Also HSTIA significantly decreases the need for blood transfusion and shortens the hospital stay with more satisfactory results to patients and surgeons. HSTLAP is a better way to treat the abdominal region producing better aesthetic results with fewer complications with more satisfaction to patients and surgeons when compared to TA.

Key words: Abdominoplasty, liposuction, lipoabdominoplasty.

INTRODUCTION

Although Kelly was the first to describe functional abdominoplasty in 1899(1), Pitanguy had introduced aesthetic abdominoplasty in 1967. Since then, abdominoplasty techniques have undergone a continuous process of evolution(2). In spite of this evolution in the abdominoplasty techniques, there are many complications such as seromas, hematoma, skin suffering, and skin necrosis that are attributed to the wide undermining of the abdominal flap(3). Since the advent of lipoplasty introduced by Illouz in 1980(4), great progress in the surgical approach of the abdominal region has been made. One of the most important advances is the introduction of abdominal liposuction before pannus resection(5). The technique of selective upper flap undermining with preservation of blood vessels and nerves reduces the need for wide surgical undermining(6,7).

Avelar(7), in 1985, described a technique of liposuction associated with abdominoplasty for patients who have a prominent abdomen with supra- and infraumbilicus fat deposits and muscular laxity. In 2002(8), the same author described abdominoplasty without undermining and removal of fat through liposuction, with skin resected surgically in the lower abdomen. In 2000, Matarasso(9,10) described liposuction used with abdominoplasty as a way to preserve the blood supply of the abdominal flap. Mladick in 2001(11) described progressive tension sutures to prevent seroma formation.

One of the most interesting techniques, developed by Saldanha et al in 2001(12), is abdominoplasty without undermining of the abdominal flap associated with liposuction of the entire abdomen and flanks. The same author(13) in 2003 published a lipoabdominoplasty (Abdominoplasty associated with liposuction) with selective dissection but with a too-high suprapubic scar resulting from the lack of paraumbilical high-tension sutures. No progressive tension sutures were used to close the dead space.

In 2007 Le Louarn et al. described the high superior tension approach to abdominoplasty, maximum tension is transferred to the periumbilical area, an area in which vascularization is good, undermining is minimal, and perforator vessels are nearby(14).

Anatomically, the hypogastrium drains downward to the inguinal lymph nodes, and the epigastrium drains upward to the axillary nodes.
Thin lymphatic vessels connect these two systems at the umbilicus. Although a section of these thin vessels has no effect, a section of lymphatic trunks at the inguinal level, between Scarpa’s fascia and the muscle aponeurosis, may lead to accumulation of lymphatic fluid (15).

In 2010, Le Louarn et al. introduced high superior tension approach to lipoabdominoplasty (12,13,15). High-superior-tension lipoabdominoplasty (HSTLA) includes a lipoabdominoplasty with selective undermining (preservation of the inguinal and axillary lymphatic trunks and epigastric tunnel dissection) and high tension sutures to fix the abdominal flap to the muscle fascia to progressively move the abdominal flap caudally and quilting sutures to close the dead space. HSTLA places maximum tension on the periumbilical area, where vascularization is good, rather than on the suprapubic area, where vascularization is poor, as in standard abdominoplasty (15).

The objective of this study is to evaluate the outcome of high superior tension lipoabdominoplasty compared to traditional abdominoplasty.

 PATIENTS & METHODS

Between March 2008 and January 2011, 45 patients (36 females and 9 males) aged 26–47 years, were included in this study. All patients had supra- and infra umbilical fat deposits, skin excess in the infraumbilical segments and diastases of the rectus muscles. This study included two groups: Group I: consisted of 19 patients subjected to high superior tension lipoabdominoplasty (HSTLA) and Group II: consisted of 26 patients subjected to traditional abdominoplasty (TA).

Marking
For both groups, with the patient standing, the midline and a low abdominal curved line approximately 8 cm above the upper end of the vulvar cleft were delineated. The amount of skin to be resected was estimated and the inguinal groove extremities were identified. The supraumbilicus incision connecting both extremities was outlined. For group I: the areas to undergo liposuction were outlined in supra- and infraumbilical regions and in the flanks.

Anesthesia
Surgery was performed under epidural anesthesia in all cases. Foot venous pumps were applied to decrease the risk of deep venous thrombosis. Preoperative antibiotics were administered to all patients.

Surgical techniques
Group I: high superior tension
Lipoabdominoplasty (HSTLA):
A long 2-mm blunt-tipped infiltration needle was used for tumescent Infiltration with a saline solution containing epinephrine at 1:500,000 concentrations to avoid excessive bleeding. We do not believe that xylocaine is needed with the use of epidural anesthesia. Liposuction started in the epigastrium in both superficial and deep planes. In the superficial plane, to decrease the bulk and in deep plane, to undermine the upper flap selectively by tunneling with the liposuction cannula, preserving the upper flap blood supply by eliminating the need for further surgical undermining (Fig. 1A).

Below the umbilicus, lymphatic trunks are mainly below and lateral to the umbilicus deep to Scarpa’s fascia (15). So liposuction was done deep to Scarpa’s fascia to remove fat bulk without harm to lymphatic and vascular networks. A gentle 4-mm cannula was used, which transforms the fat layer into a thin fibrous spider web in which the normal physiology was left intact. No need for superficial liposuction below the umbilicus because this layer will be removed when the lower abdominal flap is excised. Although liposuction throughout the anterior abdomen, facilitated a smooth transition between the upper and lower flaps once the pannus was removed, the only region to be avoided in liposuction was the lateral superior flanks in order to avoid damaging the neurovascular bundles that give arterial, venous, and neural support to the abdominal flap.

After liposuction, skin incision followed the previously determined markings at the low abdominal curved line and a vertical incision from the umbilicus to the pubis was added to facilitate dissection. The umbilical scar was isolated and dissection of the deep tissues was performed with a no. 22 blade avoiding electrocautery dissection to maintain tissue integrity and reduce the incidence of seroma.

Below the umbilicus, the plane of dissection was just beneath the level of Scarpa’s fascia
leaving a thin fatty layer with its connective tissue and lymphatic vessels especially laterally (Fig. 1B). If necessary there was a complementary liposuction performed in this area to remove the fat excess. Above the umbilicus, a retractor was used to create a narrow preaponeurotic tunnel in the midline, proceeding 1.5 cm lateral to the medial border of the rectus abdominus muscle up to the xiphoid appendix, allowing adequate fascia plication, and preserving perforators (Fig. 1C).

The operating table was flexed 30º and the flap was pulled down to estimate the amount of skin to be resected, then the redundant skin and fat were excised. Aponeurotic plication was performed from the epigastrum to the pubis using interrupted 0 Prolene suture reinforced with continuous running 0 Prolene (Fig. 1D). The maximum effect of plication was achieved between the lowest costal margin and the iliac crest (i.e., at waist level) to produce an aesthetically pleasing abdominal shape. Two suction drains were exteriorized.

Two high-tension sutures were placed in the supraumbilical tunnel in the midline to help the epigastric skin to move downward and to quilt the epigastric dead space (Fig. 1E). The site of the new umbilicus was determined and cut on the skin 2 cm higher than the projection of the umbilicus stalk. This gap between the new umbilical site and the umbilical stalk allowed the high superior tension. Two Vicryl 2-0 stitches were placed to fix the umbilicus stalk deep into the muscle aponeurotic plane positioned at 6 and 12 o’clock (Fig. 1E).

Below the umbilicus, three staged traction sutures were performed on the midline to fix the abdominal flap to the muscle fascia to progressively move the lower edge of the flap caudally and to avoid pubis elevation (Fig. 1G). Three traction sutures were put in each iliac fossa. So high tension was applied above the umbilicus, medium tension below the umbilicus, and no tension on the lowest part of the abdominal flap (Fig. 1F). Five quilting sutures (meaning no vertical traction) were performed beneath the abdominal scar. Quilting sutures were performed by Vicryl 3-0 to fix the scarp fascia of the abdominal flap to the inferior scarp fascia border together with the muscle aponeurotic tissue. The goal was to obliterate the dead space and to prevent flap sliding. Intradermic sutures were made with Vicryl 4–0, and 3–0 Prolene subcuticular stitches were performed (Fig. 1H). Support garments were fitted before the patients were transferred to recovery in a semi sitting position. The patients can and should move her legs beginning early after the surgery and the patients were allowed to ambulate immediately at the night of surgery with the hips flexed. Suction drains were removed before they were discharged when the output is less than 50 ml of serous fluid per day.

Group II: Traditional Abdominoplasty (TA):

The same marking and epidural anesthesia were utilized. But no liposuction, no tension sutures or quilting sutures were performed. Traditional abdominoplasty was performed by utilizing the same incision as mentioned in group I and then undermining proceeded superiority to the sternal margin. Aponeurotic plication was performed as before. The umbilicus was transposed and excess skin was removed. The wound was closed and two suction drains were exteriorized. Vicryl 3–0 stitches were applied to fix the scarp fascia of the abdominal flap to the inferior scarp fascia border. Intradermic sutures were made with Vicryl 4–0, and 3–0 Prolene subcuticular stitches were performed. Support garments were fitted before the patients were transferred to recovery in semi sitting position. The patients were allowed to ambulate immediately at the night of surgery with the hips flexed. Suction drains were removed before they were discharged when the output is less than 50 ml of serous fluid per day.

Statistical analysis:

Statistical analysis was performed using the 15.0 version of SPSS statistical software for windows. Unpaired student t test used in the comparison between 2 groups in age, BMI, Pannus weight, Hospital stay, and Follow-up period. Pearson Correlation was used to assess the association between incidence of complication with age, BMI and pannus weight. Chi square and fisher exact tests were used to compare between 2 groups in incidence of complications and patient satisfaction (16). P values less than 0.05 were considered significant.
liposuction was performed in the superficial and deep planes above the umbilicus but in the deep plane below and lateral to the umbilicus.

Dissection in the iliac fossa was performed just beneath the Scarpa’s fascia to preserve lymphatic trunks.

Selective limited undermining in the epigastrum. Note the intact perforators.

Aponeurotic plication with preservation of perforators.

Two high-tension sutures were placed in the supraumbilical tunnel in the midline. Another two stitches were performed to fix the umbilicus stack deep into the muscle aponeurotic at 6 and 12 o’clock.

Three traction sutures were placed in each iliac fossa.

Below the umbilicus, three staged traction sutures were performed on the midline.

Intraoperative lateral view of the abdomen at the end of HSTLA.

Lipoaspirate and the resected pannus.

Fig. (1)
RESULTS

This study included two groups. Group I: consisted of 19 patients subjected to high superior tension lipoabdominoplasty (HSTLA) and Group II: consisted of 26 patients subjected to traditional abdominoplasty (TA).

Statistical analysis showed no significant differences noticed between group I and group II as regard age of the patients, BMI or preoperative HB% (Table 1).

There was a significant decrease in the mean value of the needed units of blood transfusion and the hospital stay in group I when compared with that of group II. However, no significant difference between both groups as regard the pannus weight (table 2).

As regard local complications, Group I showed decrease in the incidence of seroma, partial dehiscence, skin edge necrosis and loss of sensation in lower abdominal skin in comparison to group II. however, it was only statistically significant as regard seroma and loss of sensation (table 3). One patient in group I developed seroma compared to 8 patients in group II. These 9 patients in both groups had BMI above 30 kg/m² and the weight of the excised pannus were between 4.110 and 7.935 Kg. The seromas were developed 2 to 3 weeks postoperatively and were solved with repeated syringe aspiration in all cases. One patient in each group developed minor wound infection that responded to antibiotics. Minor partial wound dehiscence had occurred in one patient in group I, compared to three patients in group II. Dehiscences were treated conservatively by repeated dressing. Non of the patients in group I developed skin necrosis while one patient in group II developed skin edge necrosis and sloughing in the midline of the lower abdomen that necessitated repeated dressing, debridement and later skin graft. This patient had BMI 39 kg/m² and the weight of the excised pannus was 7.935 Kg. None of the patients in both groups developed any general complication.

In both of groups, there were significant positive correlation between incidence of complication and each of pannus weight, BMI and age. In addition, the units of blood transfusion needed was also significantly associated with both of BMI and pannus weight (table 4).

The results in group I was significantly more satisfactory for the patient than group II. Only One patient in group I was disappointed due to residual excess fat and asymmetry in the upper abdomen. Whereas three patients, were disappointed in group II due to the development of complications in the form of skin edge necrosis, seroma with repeated aspirations and loss of sensation in the lower abdominal skin. Only one patient in group I needed secondary procedure in the form of later liposuction in comparison to two patients in group II in the form of skin graft in one patient and liposuction in the other patient (table 5).

From the aesthetic point of view, the surgeons (the authors') satisfaction was also compared between both groups as regarding natural shape and contour of the abdominal wall, absence of permanent epigastric bulging and uniform thickness between the abdominal flap and the pubis. Statistical analysis showed that group I was significantly more satisfactory to surgeons than group II (Table 6).

<p>| Table 1: Comparison between the results of two groups as regard age, BMI and preoperative HB %. |
|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|</p>
<table>
<thead>
<tr>
<th>Group I (HSTLA)</th>
<th>Group II (TA)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age Range 26-41</td>
<td>26-47</td>
<td></td>
</tr>
<tr>
<td>Mean ± SD 32.84 ± 5.20</td>
<td>34.46 ± 7.37</td>
<td>0.418</td>
</tr>
<tr>
<td>BMI Range 27.2-41.5</td>
<td>26.2-42.1</td>
<td></td>
</tr>
<tr>
<td>Mean ± SD 33.39 ± 5.02</td>
<td>33.85 ± 4.92</td>
<td>0.760</td>
</tr>
<tr>
<td>Pre-operative Range 10.2-14.7</td>
<td>10.2-14.6</td>
<td></td>
</tr>
<tr>
<td>HB% Mean ± SD 11.81 ± 1.40</td>
<td>11.58 ± 1.72</td>
<td>0.636</td>
</tr>
</tbody>
</table>
Table 2: Comparison between the results of two groups as regard pannus weight, blood transfusion, hospital stay and follow-up period.

<table>
<thead>
<tr>
<th></th>
<th>Group I (HSTLA)</th>
<th>Group II (TA)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pannus weight (Kg)</td>
<td>Range</td>
<td>1.45- 7.235</td>
<td>1.837-7.820</td>
</tr>
<tr>
<td></td>
<td>Mean ± SD</td>
<td>4.239 ±1.97</td>
<td>3.991 ± 1.79</td>
</tr>
<tr>
<td>Blood transfusion (unit)</td>
<td>Range</td>
<td>0-1</td>
<td>0-2</td>
</tr>
<tr>
<td></td>
<td>Mean ± SD</td>
<td>0.21 ± 0.42</td>
<td>0.65 ± 0.68</td>
</tr>
<tr>
<td>Hospital stay (day)</td>
<td>Range</td>
<td>1-4</td>
<td>1-5</td>
</tr>
<tr>
<td></td>
<td>Mean ± SD</td>
<td>2.05 ± 1.78</td>
<td>2.88 ± 1.34</td>
</tr>
<tr>
<td>Follow-up period (month)</td>
<td>Range</td>
<td>6-20</td>
<td>6-30</td>
</tr>
<tr>
<td></td>
<td>Mean ± SD</td>
<td>11.10 ± 4.47</td>
<td>17.35 ± 7.96</td>
</tr>
</tbody>
</table>

Table 3: Comparison between the results of two groups as regard complications.

<table>
<thead>
<tr>
<th>Complications</th>
<th>Group I HSTLA</th>
<th>Group II (TA)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>seroma</td>
<td>1/19 (5.26 %)</td>
<td>8/26 (30.77 %)</td>
<td>0.03</td>
</tr>
<tr>
<td>wound infection</td>
<td>1/19 (5.26%)</td>
<td>1/26 (3.85%)</td>
<td>0.672</td>
</tr>
<tr>
<td>partial dehiscences</td>
<td>1/19 (5.26%)</td>
<td>3/26 (11.54%)</td>
<td>0.432</td>
</tr>
<tr>
<td>skin edge necrosis</td>
<td>0/19 (0%)</td>
<td>1/26 (3.85%)</td>
<td>0.578</td>
</tr>
<tr>
<td>Loss of sensation in lower abdominal skin</td>
<td>0/19 (0%)</td>
<td>5/26 (19.23%)</td>
<td>0.043*</td>
</tr>
</tbody>
</table>

Table 4: Association of complication and units of blood transfusion with pannus weight, BMI and age in both groups.

<table>
<thead>
<tr>
<th>Pearson correlation</th>
<th>Group I (HSTLA)</th>
<th>Group II (TA)</th>
<th>r</th>
<th>P</th>
<th>r</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complication/ Pannus wt</td>
<td>+ 0.713**</td>
<td>0.001</td>
<td>+ 0.883**</td>
<td>0.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complication/ BMI</td>
<td>+ 0.682**</td>
<td>0.001</td>
<td>+ 0.723***</td>
<td>0.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complication/ age</td>
<td>+ 0.678**</td>
<td>0.001</td>
<td>+ 0.759**</td>
<td>0.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blood transfusion/BMI</td>
<td>+ 0.703**</td>
<td>0.001</td>
<td>+ 0.664**</td>
<td>0.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blood transfusion/Pannus Wt</td>
<td>+ 0.693**</td>
<td>0.001</td>
<td>+ 0.873**</td>
<td>0.000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5: Comparison between the results of two groups as regard patient satisfaction.

<table>
<thead>
<tr>
<th>Patient satisfaction</th>
<th>Group I (HSTLA)</th>
<th>Group II (TA)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very satisfied</td>
<td>12/19 (63.16%)</td>
<td>4/26 (15.38%)</td>
<td>0.001**</td>
</tr>
<tr>
<td>Satisfied</td>
<td>6/19 (31.58%)</td>
<td>19/26 (73.08%)</td>
<td>0.067</td>
</tr>
<tr>
<td>Disappointed</td>
<td>1/19 (5.26%)</td>
<td>3/26 (11.54%)</td>
<td>0.286</td>
</tr>
<tr>
<td>Secondary procedures</td>
<td>1/19 (5.26%)</td>
<td>2/26 (7.69%)</td>
<td>0.618</td>
</tr>
</tbody>
</table>

Table 6: Comparison between the results of two groups as regard surgeons satisfaction.

<table>
<thead>
<tr>
<th>Patient satisfaction</th>
<th>Group I (HSTLA)</th>
<th>Group II (TA)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>satisfied</td>
<td>16/19 (84.21%)</td>
<td>11/26 (42.30%)</td>
<td>0.006*</td>
</tr>
<tr>
<td>Not satisfied</td>
<td>3/19 (15.78%)</td>
<td>15/26 (57.69%)</td>
<td>0.005**</td>
</tr>
</tbody>
</table>
Fig. (2): A,C  Preoperative views of a 34-year-old male patient who had supra and infra umbilical excess fat and skin together with muscle laxity. HSTLA was performed. B,D postoperative views 13 months postoperative showing low suprapubic scar. The abdominal contour is improved.

Fig. (3): A,C  Preoperative views of a 31-year-old female patient who had psoriasis in the abdominal skin. She had excess fat and skin in the supra and infraumbilical regions together with muscle laxity. HSTLA was performed. B,D postoperative views 7 months postoperative. The abdominal shape and contour are improved.
Fig. (4): A,C  Preoperative views of a 42-year-old female patient who had three children. She had excess fat and skin in the supra and infraumbilical regions together with muscle laxity. HSTLA was performed. B,D postoperative views 6 months postoperative. The abdominal shape and contour are improved.

Fig. (5): A,C  Preoperative views of a 38-year-old female patient who lost 36 kg from gastric banding. HSTLA was performed. B,D postoperative views 6 months postoperative with more youthful appearance of the abdomen.
DISCUSSION

In spite of the progress in the abdominoplasty techniques, a significant complication rate is still associated with abdominoplasty including flap necrosis, seroma, hematoma, infections, wound dehiscence, and delayed healing. Because this procedure involves wide undermining, denervation occurs, and the skin flap loses vascularity. The flap, with its decreased blood flow and innervation, then is stretched maximally and sutured under tension, which results in possible ischemia and lack of sensation in the lower abdominal skin. Moreover, even with adequate drainage, there is still a high incidence of postoperative seroma. Selective undermining (preservation of the lymphatic vessels, vascular perforators and nerves) and high tension sutures to fix the abdominal flap to the muscle fascia to progressively move the abdominal flap caudally and quilting (means no tension) sutures to close the dead space. HSTLA places maximum tension on the peri umbilical area, where vascularization is good, rather than on the suprapubic area, where vascularization is poor, as in standard abdominoplasty. Illouz, Matarasso, Lockwood and Saldanha et al., reinforced this previous findings, noting that an effective, discontinuous undermining is achieved by liposuction of the upper flap. This method avoids the need for surgical undermining, thus preserving the...
lymphatic vessels, perforators and nerves to the flap and to the area that defines the wound edge. Pollock(18) described that tension sutures obliterate the dead space and take the tension away from the distal skin flap, lead to less scarring, and prevent wound breakdown.

In the current study, statistical analysis documented a significant decrease in need for blood transfusion in group I subjected to HSTLA when compared with that of group II subjected to TA. A significant positive correlation was found between the increase in the weight of the excised pannus and increase in BMI to the need for blood transfusion. Our findings are comparable with Illouz(5) and other authors(16) who documented a decrease in the amount of blood loss when liposuction was used with abdominoplasty. This may be attributed to infiltration of a solution containing adrenaline. As a result, the operative field is bloodless, and perforators are visible for coagulation(5,16).

According to our statistical analysis, the hospital stay was significantly shorter in group I than in group II. Our findings are in accordance with Khan(19) who noted that lipoabdominoplasty with tension sutures greatly reduces postoperative recovery time and makes patients relatively more comfortable for early mobilization.

As regards local complications in this study, there was a significant positive correlation between the increase of age, BMI and weight of the excised pannus to the development of complications in both groups. Our findings are comparable with Antonio et al who described abdominoplasty with total abdominal liposuction for patients with massive weight loss.

Many authors agree that seroma formation is a common complication after abdominoplasty, with an incidence that varies from 1% (20) to 38%.(21,22) Although the rate of seroma in our study was significantly lower in group I (5.26%) than in group II (30.77%), our results are inferior to that of Rangaswamy. Rangaswamy in 2008(17) reported no seromas in his experience performing mostly obese patients using the key points of the HSTLA technique. In contrast, Saldanha et al(13) described a lipoabdominoplasty with selective dissection but with two cases of seroma and too-high suprapubic scar. No paraumbilical high-tension sutures or quilting sutures were used by Saldanha. Khan et al(23) documented in his comparative study that progressive tension sutures play an important role in reducing seroma formation. Other studies postulated that increased BMI is likely to increase seroma formation regardless of whether liposuction was performed simultaneously or not(24).

In our experience, the lower rate of seroma in group I is due to that HSTLA technique with selective undermining that preserves the lymphatics in addition to the tension and quilting sutures that close the dead space and reduce seroma formation which is comparable with belief of other authors(25,26).

None of our patients developed hematoma, this is in contrast to Rangaswamy(17) who reported two hematomas after lipoabdominoplasty for more than 120 patients. Minor partial wound dehiscence had occurred in one patient (5.26%) in group I, compared to three patients (11.54%) in group II(19). In other studies(18,23), wound break down occurred in 6% of patients with progressive tension sutures, as compared to 4.1% in the group without tension sutures.

None of the patients in group I developed skin necrosis while one patient in group II (3.85%) developed skin edge necrosis in the midline of the lower abdomen. Our experience proposed that HSTLA achieves discontinuous undermining of the abdominal flap and maintains vascular perforators, creating a more mobile flap that can be easily closed, with less tension. However in a review of 161 patients who underwent lipoabdominoplasty (n = 93) or traditional abdominoplasty (n = 68), Samra et al.(25) found no statistically significant difference in perfusion-related complications between the two groups, although lipoabdominoplasty involves potential trauma to the vascularity of the elevated abdominal flap.

None of the patients in group I complained of loss of sensation in lower abdominal skin compared to five (19.23%) patients in group II with statistically significant difference between both groups. Because of limited undermining in HSTA, most of the nerves in the abdominal flap are preserved. Therefore, sensation in the abdominal wall is not lost as it often with traditional abdominoplasty. Our result is comparable with that of Castus et al in 2009(26) and Le Louarn et al in 2010(15).
As regards patient satisfaction in our study, the results in group I was significantly more satisfactory for the patient than group II (P = 0.001). Our results reinforce that of Heller et al in 2008 who compared lipoabdominoplasty and conventional Abdominoplasty with dissatisfaction rate (3 percent) and revision rate (3 percent) in Lipoabdominoplasty. Limitations of this analysis includes lack of more extensive evaluation of patient satisfaction using established questionnaires.

In our study, aesthetic concern was in mind. From the aesthetic point of view, the surgeons (the authors') satisfaction was also compared as regarding natural shape and contour of the abdominal wall, absence of permanent epigastric bulging and uniform thickness between the abdominal flap and the pubis. group I was significantly more satisfactory to surgeons than group II in surgeons' opinions. Limitations of this analysis includes lack of standard classifications for such aesthetic comparison.

CONCLUSION

As compared with TA, HSTIA technique significantly reduces the incidence of seroma formation and loss of sensation of the lower abdominal flap together with decrease the incidence of partial wound dehiscence and skin edge necrosis. Also HSTIA significantly decreases the need for blood transfusion and shortens the hospital stay with more satisfactory results to patients and surgeons.

We believe that HSTLAP is a better way to treat the abdominal region producing better aesthetic results with fewer complications with more satisfaction to patients and surgeons.

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