Abdominoplasty is one of the most commonly performed aesthetic surgical procedures\(^1\) and has undergone considerable evolution over the past several decades, from a simple dermolipectomy as described by Kelly in 1910\(^2\) to Lockwood’s high lateral tension abdominoplasty\(^3\) and Le Louarn and Pascal’s high superior tension abdominoplasty.\(^4\) Importantly, the placement of incisions has changed, often reflecting the changing bikini or underwear styles in vogue. Concern for the possibility of prominent, visible scars has resulted in many plastic surgeons electing not to perform reverse abdominoplasties.\(^5\) We, however, feel that it is an invaluable technique in selected patients— in particular, those who have previously undergone conventional abdominoplasty or liposuction and are left with upper abdominal fullness.

The female body habitus follows a gynoid or hourglass shape, being narrow at the waist and wider at the hips (with a ratio of approximately 0.7).\(^6\) The most significant area of this fat accumulation on the abdomen is usually around and below the umbilicus, where excess skin over a diastasis of the rectus muscles is most apparent. This is a deformity that can usually be adequately addressed by conventional abdominoplasty. However, some patients also present with deformity in the upper trunk. At its worst, this deformity may present as the so-called “bra fat pads”—dependent ptotic fat and skin below the bra line resulting from abdominal zones of adherence. Figure 1 illustrates an example of a patient with bra fat pads, which are more pronounced when the patient is sitting—something about which these patients typically

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complain. These may be difficult to correct by conventional abdominoplasty. Furthermore, the deformity may manifest itself even after conventional lower abdominoplasty has been performed. To make matters worse for the patient, this upper abdominal deformity is often visible under clothing.

In short, the upper abdomen is a challenging area in body contouring. Attempts at correction through liposuction are often only successful if the deformity is mainly one of fat, but this does not address skin redundancy. Essentially, the problem posed is antigravity. Reverse abdominoplasty differs from traditional abdominoplasty by eradicating the excess fat and skin from the trunk. It can be performed as an isolated procedure or in combination with other procedures such as mastopexy or reduction mammoplasty, often in massive weight loss patients. Furthermore, the redundant upper abdominal tissue may be utilized to autoaugment the breasts in a mastopexy-augmentation procedure.

The reverse abdominoplasty has a defined role in select patients, as described. This article reviews our experience with this operation in a consecutive series of 14 patients, its indications, our results, and the conclusions we have drawn from a detailed analysis of our outcomes.

**PATIENTS AND METHODS**

The medical records of patients who had undergone reverse abdominoplasty by the two senior authors (GS and MR) were reviewed. Details of patient demographics, operative detail, and patient follow-up (as well as a range of other relevant information) were recorded. Patient satisfaction was assessed through an analog scale with a range of 1 to 5 (1 being poor and 5 being excellent).

We performed the reverse abdominoplasty for trunk contouring on 14 female patients over a five-year period. In this same time period, we performed over 400 conventional abdominoplasties, meaning that for every reverse abdominoplasty procedure, we were performing approximately 28 conventional abdominoplasties. The age range of our 14 patients was 35 to 66 years (mean, 56.6 years), and the patients had a mean body mass index of 23.9. Where recorded, the weight of tissue resected ranged from 170 to 570 g (mean, 326), and the width ranged from 4 to 10.5 cm (mean, 5.95 cm). Mean follow-up was 14.2 months (range, three to 56 months).

**Surgical Technique**

The reverse abdominoplasty can be performed by a single W- or curvilinear incision extending from left to right across the midline, or as two separate inframammary crescentic excisions. In our series, six patients underwent the procedure with two crescentic excisions, and the remaining eight patients were treated with a single excision and W-plasty. Follow-up ranged from three to 56 months. With both techniques, liposuction may be used as an adjunct. Furthermore, a mini lower abdominoplasty may also be added to tighten the skin across the full abdomen without altering the position of the umbilicus. A routine abdominoplasty may be subsequently performed if careful preservation of the blood supply has been maintained.

**Patient Marking**

Patients were marked preoperatively while standing. The new inframammary sulcus was marked, and reference marks were also made at the edges of the torso and in the midline. The level of this incision was carefully planned by initially marking the position of the patient’s bra. In this way, the scars were planned such that they would be hidden by a bra postoperatively. The skin excess was determined by pulling the skin up superiorly from the abdomen, after which the lower border of the skin excision was marked. The excision was then planned as either two separate inframammary crescents or as a continuous “W” or curvilinear excision, as described earlier (Figure 2). The two separate excisions are most often used to address patients who have distinct bra fat pads. A straight line may also be used in the midline; we found that, possibly due to the older age group of our cohort and their increased tissue laxity, this did not seem to predispose our patients to bridling of the scar postoperatively.

**Operative Technique**

The patient was placed in the supine position on the operating table, with the arms abducted on arm boards. The upper border of the planned skin excision was incised and...
inferiorly-based flaps were raised, with the dissection at the level of the rectus sheath. It was important to preserve the landmark of the inframammary crease when making the skin incision. (If the inframammary crease is violated, it can be recreated at the appropriate position by suturing the inferior flap margin to Scarpa’s fascia, the pectoralis fascia, or even the periosteum of the ribs following the skin excision.) Dissection then continued inferiorly, reaching as far as the umbilicus. The excess skin was then pulled superiorly and excised under moderate tension. Plication of the divericated recti and liposuction were then performed, if indicated. After meticulous hemostasis, the abdomen was closed with quilting mattress sutures between the abdominoplasty flap and the rectus sheath, to distribute tension evenly and avoid any tension on the scar itself. To create and define the inframammary sulcus, deep-tension sutures (1 PDS; Ethicon, Inc., Somerville, New Jersey) were then passed through Scarpa’s fascia of the abdominoplasty flap into the perichondrium of the ribs. The skin was then closed in two layers. If two separate crescentic excisions were performed, liposuction of the epigastrium was usually carried out to ensure an optimum contour. Two suction drains were placed in situ and the dressings were supplemented with an abdominal binder. The patient was instructed to wear abdominal support for a minimum of six weeks postoperatively.

**Adjunctive Surgical Procedures**

We have combined the above technique with a range of adjunctive surgical procedures (see Table 1). The adjunctive procedures usually address the breasts, in the form of mastopexy, breast reduction mammoplasty (BRM), or occasionally a breast augmentation mammoplasty (BAM), each compatible with an inframammary sulcus scar. An autologous breast augmentation or augmentation-mastopexy may be performed with the tissue from the abdomen that would normally be excised. In these situations, the tissue to be excised was instead deepithelialized and used to augment the breasts with or without a Wise-pattern mastopexy (Figure 3). The abdominoplasty flap was pulled superiorly and deep quilting sutures were placed to secure the flap in place. The flap was split in the midline and each half was advanced into a subglandular pocket dissected within each breast. Care was taken to avoid tension at the base of the flaps when the tissue was utilized for the breasts. The placement of two or three small dermal trapdoor flaps on each side in the area of the abdominoplasty flap that would lie at the inframammary crease was helpful in this regard. These were buried deeply through the main flap and sutured to the perichondrium, both to relieve tension and also to help to define the inframammary sulcus. It is important to place sutures vertically to minimize the disruption to the trapdoor flaps’ vascularity.

Other adjuncts include extension of the abdominal tissue into the axilla and lateral back to address further areas of skin laxity as needed, especially in massive weight loss patients. As stated earlier, liposuction further refines and sculpts the abdomen.

**RESULTS**

A summary of the patients, their operative details, and their follow-up measurements is presented in Table 1. Most patients had previously undergone body contouring or breast surgery. Seven patients had preexisting submammary scars. Importantly, eight patients in our series of 14 had undergone previous abdominoplasty. Three additional patients had undergone liposuction to their abdomen prior to their reverse abdominoplasty. Ten of our patients underwent liposuction at the time of their reverse abdominoplasty with us. Other procedures performed included a limited revision lower abdominoplasty (or miniabdominoplasty) and reduction or augmentation mammoplasty, including two patients (patients 9 and 12).
Table 1. Patient Demographics, Operative Procedures, and Follow-Up

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age</th>
<th>BMI</th>
<th>Indication</th>
<th>cm of Tissue Excised</th>
<th>Weight of Tissue Excised, g</th>
<th>Separate Excisions?</th>
<th>Additional Procedures Performed on Trunk</th>
<th>Preexisting Submammary Scars</th>
<th>Previous trunk Procedures</th>
<th>Complications</th>
<th>Postoperative Procedures</th>
<th>Follow-Up, mo</th>
<th>Patient Satisfaction</th>
<th>Future Trunk Procedures Performed</th>
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<tbody>
<tr>
<td>1</td>
<td>62</td>
<td>23.2</td>
<td>Upper abdominal skin and fat excess</td>
<td>NS</td>
<td>400</td>
<td>No</td>
<td>Rectus plication, 300 mL SAL</td>
<td>Yes</td>
<td>BRM, SAL, and abdominoplasty</td>
<td>Minor delayed wound healing</td>
<td>Scar revision</td>
<td>56</td>
<td>5</td>
<td>Flank liposcopy</td>
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<td>2</td>
<td>57</td>
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<td>Upper abdominal skin excess</td>
<td>6</td>
<td>570</td>
<td>No</td>
<td>400 mL SAL</td>
<td>No</td>
<td>Abdominoplasty</td>
<td>None</td>
<td>None</td>
<td>19</td>
<td>4</td>
<td>Buttock lift</td>
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<tr>
<td>3</td>
<td>66</td>
<td>21.9</td>
<td>Upper abdominal skin excess</td>
<td>6</td>
<td>NS</td>
<td>No</td>
<td>None</td>
<td>Yes</td>
<td>BRM and abdominoplasty</td>
<td>Dog ears</td>
<td>Scar revision</td>
<td>12</td>
<td>4</td>
<td>None</td>
</tr>
<tr>
<td>4</td>
<td>61</td>
<td>25.6</td>
<td>Upper abdominal skin excess</td>
<td>4</td>
<td>360</td>
<td>No</td>
<td>Redo lower abdominoplasty, 400 mL SAL</td>
<td>Yes</td>
<td>BRM and abdominoplasty</td>
<td>None</td>
<td>None</td>
<td>5</td>
<td>5</td>
<td>None</td>
</tr>
<tr>
<td>5</td>
<td>62</td>
<td>25.6</td>
<td>Upper abdominal skin and fat excess</td>
<td>6</td>
<td>350</td>
<td>No</td>
<td>None</td>
<td>No</td>
<td>Abdominoplasty</td>
<td>None</td>
<td>None</td>
<td>17</td>
<td>4</td>
<td>None</td>
</tr>
<tr>
<td>6</td>
<td>60</td>
<td>19.2</td>
<td>Upper abdominal skin and fat excess</td>
<td>10.5</td>
<td>200</td>
<td>No</td>
<td>600 mL SAL 6 cm, 95 g lower mini-abdominoplasty</td>
<td>Yes</td>
<td>BRM</td>
<td>None</td>
<td>None</td>
<td>12</td>
<td>5</td>
<td>Brachioplasty</td>
</tr>
<tr>
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<td>5</td>
<td>NS</td>
<td>Yes</td>
<td>900 mL SAL 4 cm, 95 g lower mini-abdominoplasty</td>
<td>Yes</td>
<td>BRM and abdominoplasty</td>
<td>None</td>
<td>None</td>
<td>12</td>
<td>4</td>
<td>None</td>
</tr>
<tr>
<td>8</td>
<td>46</td>
<td>23.7</td>
<td>Upper abdominal skin excess</td>
<td>5</td>
<td>NS</td>
<td>Yes</td>
<td>Mastopexy</td>
<td>Yes</td>
<td>SAL and BRM</td>
<td>Hypertrophic scars laterally</td>
<td>Scar revision</td>
<td>10</td>
<td>4</td>
<td>BAM</td>
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<tr>
<td>9</td>
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<td>26.3</td>
<td>Upper abdominal skin and fat excess</td>
<td>6 cm deepithelialized</td>
<td>NS</td>
<td>Yes</td>
<td>BAM 1500 mL SAL; right flap used to autoaugment right breast</td>
<td>No</td>
<td>SAL</td>
<td>Left breast implant seroma</td>
<td>Washout left breast cavity</td>
<td>13</td>
<td>3</td>
<td>Abdominal liposuction one year later, reposition implants</td>
</tr>
<tr>
<td>10</td>
<td>46</td>
<td>20.3</td>
<td>Upper abdominal skin and fat excess</td>
<td>4</td>
<td>NS</td>
<td>Yes</td>
<td>Capsulotomy and implant exchange, upper abdominal scar revision</td>
<td>Yes</td>
<td>BAM</td>
<td>None</td>
<td>None</td>
<td>13</td>
<td>4</td>
<td>None</td>
</tr>
<tr>
<td>11</td>
<td>60</td>
<td>25.6</td>
<td>Upper abdominal skin and fat excess</td>
<td>NS</td>
<td>170</td>
<td>No</td>
<td>BRM 800 mL SAL</td>
<td>No</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>3</td>
<td>5</td>
<td>None</td>
</tr>
<tr>
<td>12</td>
<td>49</td>
<td>22.6</td>
<td>Upper abdominal skin excess</td>
<td>8 cm deepithelialized</td>
<td>None</td>
<td>No</td>
<td>Bilateral autoaugmentation mastopexy</td>
<td>No</td>
<td>SAL, mastopexy</td>
<td>None</td>
<td>None</td>
<td>13</td>
<td>5</td>
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<tr>
<td>13</td>
<td>59</td>
<td>26.0</td>
<td>Upper abdominal skin excess</td>
<td>5</td>
<td>300</td>
<td>Yes</td>
<td>400 mL SAL, BRM, brachioplasty</td>
<td>No</td>
<td>Abdominoplasty</td>
<td>None</td>
<td>None</td>
<td>4</td>
<td>4</td>
<td>None</td>
</tr>
<tr>
<td>14</td>
<td>64</td>
<td>25.7</td>
<td>Upper abdominal fat excess</td>
<td>NS</td>
<td>250</td>
<td>Yes</td>
<td>1000 mL SAL</td>
<td>Yes</td>
<td>BRM and abdominoplasty</td>
<td>Hypertrophic scars</td>
<td>None</td>
<td>10</td>
<td>4</td>
<td>None</td>
</tr>
</tbody>
</table>

BMI, body mass index; BAM, bilateral augmentation mammoplasty; BRM, bilateral reduction mammoplasty; NS, not stated in patient chart.
who underwent autologous augmentation-mastopexy as described above.

All patients except one rated their results as 4 or 5 (out of 5) on direct questioning. The single patient who rated her result as only 3 out of 5 had undergone a moderately stormy postoperative course as a result of a seroma in the simultaneously performed breast augmentation. She required an implant explantation and cavity washout. After three months, she underwent reimplantation of her breast prosthesis. She then went on to have an adjustment of her prosthesis and refinement of her trunk contour through suction, following weight gain of 8 kg at one year postoperatively, with good outcome. Pre- and postoperative clinical comparisons are shown in Figures 4 to 6.

Complications and sequelae included one patient who underwent a simultaneous breast augmentation and developed a breast seroma necessitating explantation of the prosthesis (as described above), two patients who developed areas of hypertrophic scarring (both were treated with intralesional steroid injections and one underwent subsequent scar revision), and one patient who suffered from minor delayed wound healing. There were no postoperative wound infections.

No patient required revision of the newly created inframammary sulcus when reconstructed. Two patients underwent a secondary scar revision to correct dog-ears, one patient later underwent flank liposuction to correct lower lateral abdominal skin redundancy not adequately addressed by the original conventional abdominoplasty, one patient subsequently underwent a brachioplasty, a buttock lift was performed on another patient, and one patient underwent a breast augmentation.

**DISCUSSION**

Reverse abdominoplasty is a useful technique in select patients and should be considered in patients with lax upper abdomens relative to the lower inframammary abdomen, but we speculate that many surgeons have little experience with the technique and therefore do not always consider it when contemplating abdominal wall contouring. It is not indicated in the majority of patients, as most present with lower abdominal skin and fat excess and are therefore better suited to conventional abdominoplasty. In addition, many patients are not prepared to accept scars on the upper abdomen, despite the fact that they are usually well hidden below the breasts and the midline scar is concealed beneath the bra.

In our small series, most of the patients were very satisfied with their reverse abdominoplasty result, with a mean...
Figure 4. (A, C, E) A 62-year-old woman who had previously undergone a bilateral reduction mammaplasty and demonstrated the related inframammary sulcus scars. (B, D, F) Five months after reverse abdominoplasty combined with 300 mL suction-assisted lipoplasty. There was significant improvement in upper abdominal skin laxity and fat excess. The inframammary sulcus scars have also improved and were very subtle at last follow-up.
patient satisfaction score of 4.3. These results, of course, must be viewed in relation to the patient cohort itself. Over half of our patients had previously undergone conventional abdominoplasty, anywhere from two months to 20 years previously. The patient who had undergone a conventional abdominoplasty two months previously (patient 1) was offered a fleur-de-lis abdominoplasty initially but declined due to the resulting midline scar. Instead, she opted for a staged procedure (a conventional abdominoplasty followed by a subsequent reverse abdominoplasty) to address her upper as well as lower abdominal wall laxity. Due to the extensive undermining involved with both procedures, we chose not to perform them both simultaneously, although this has been described with limited undermining.8 In addition to previous conventional abdominoplasty, three more of our patients had also undergone abdominal suction.

A further important subgroup in our data included the eight patients who had previous surgery to their breasts, resulting in the presence of submammary scars. It is understandable why such a high number of these patients are represented in our cohort, as they are probably more willing to consider the addition of a further scar in the internammary space than those with no previous scars in the vicinity. Six additional patients underwent simultaneous procedures on their breasts, which would have left them with submammary scars even without the reverse abdominoplasty, suggesting that a patient who has either undergone a previous abdominoplasty that has not adequately addressed the upper abdomen or who has preexisting submammary scars (including those who desire surgery to their breasts) would be more willing to consider a reverse abdominoplasty as an option. From the surgeon’s point of view, however, we feel that this procedure should also be considered as a primary option in those whose body habitus lends itself to it (ie, those patients in whom the abdominal tissue excess primarily resides superior to the umbilicus).

Despite the operation being relatively undemanding technically, careful attention must be paid to recreating and securing the inframammary sulcus in order to avoid loss of definition and future lowering due to gravity. The placement of deep superficial fascial suspension sutures and quilting sutures can prevent this pitfall3,4; they are attached to the periosteum of the ribs and between the abdominoplasty flap and the rectus fascia, respectively.

Figure 5. (A, C) A 57-year-old patient who had previously undergone a conventional abdominoplasty. (B, D) Nineteen months after reverse abdominoplasty combined with 400 mL liposuction. The patient’s scars have improved, as did the general contour of her trunk following the procedure.
Figure 6. (A, C) The 49-year-old woman whose intraoperative photographs are shown in Figure 2. (B, D) Thirteen months after reverse abdominoplasty combined with an autologous breast augmentation with the redundant abdominal tissue. The patient was extremely satisfied with her postoperative result. Please note the improvement in skin quality after tightening, as well as the general improvement in abdominal wall definition.
Any dimples produced in the skin settle with time (up to two months, in our experience). Our incidence of problematic scarring was low (two out of 14), despite the intermammary scar lying in an area notorious for bad scarring. We surmise that this is due to the minimal amount of tension on this scar as a result of the quilting sutures.

Two of our patients underwent autologous breast augmentation with the tissue that would otherwise have been discarded. One had previously undergone a mastopexy (patient 12) and the other had undergone a BAM (patient 9). This second patient had a degree of breast asymmetry, which was corrected with the autologous tissue. A similar procedure has recently been elegantly presented by Zienowicz, who also proposed debulking of the xyphoid if prominent. In his use of the reverse abdominoplasty for autologous breast augmentation, however, Zienowicz uses a turnover (actually, a “turn-under”) dermal-fat flap to augment each breast. In that technique, the flaps are based superiorly at the base of each breast and are turned under the breast for the augmentation. In contrast, we have used the continuation of the deepithelialized abdominoplasty flap itself for the autologous breast augmentation. We use small dermal attachment flaps within the cephalically advanced, deepithelialized abdominoplasty flap to secure the abdominoplasty flap to the perichondrium. Placing sutures vertically rather than horizontally maximizes the vascularity of the trapdoor flaps. These distally based local flaps were also described by Zienowicz and serve the combined purposes of taking up the tension of the abdominoplasty flap and defining the inframammary sulcus, ensuring that there is no tenting or bow-stringing of the inframammary skin. It is also important to ensure that a good layer of dermis is maintained on the abdominoplasty following deepithelialization, so that the dermal trapdoor flaps can be sutured with the required tension.

The mean age of our patients was relatively high, at 56.6 years. In our experience, younger patients presenting with fat excess in the upper abdomen may be treated with liposuction alone, as it is supported by the inherent elasticity of the upper abdominal skin. In this older age group with relatively poor-quality skin elasticity, liposuction will not be sufficient and reverse abdominoplasty has a unique role to play. We do also feel, however, that liposuction has an important role in refining the contour of the trunk prior to surgical excision of the excess tissue (the bra fat pad). It may also be used to address any irregularities following skin closure.

There are limited reports of the reverse abdominoplasty in the literature, the first of which in the English literature was by Baroudi et al in 1979.8 These authors described a combination of reduction mammoplasty and reverse abdominoplasty by inverted T-scar technique, demonstrating that the desired effects of shaping the breast and improving upper trunk contour could be done simultaneously, utilizing the same incisions. Periumbilical perforators were preserved in the central abdomen, thereby protecting the important vascularity to the abdominal apron and enabling use of this technique when cholecystectomy and other abdominal scars might otherwise preclude conventional abdominoplasty. Hurwitz and Aghamohammadi9 described reverse abdominoplasty for body contouring in massive weight loss patients as part of upper body lift. They successfully combined breast reshaping (spiral flap) with upper body lift for breast reshaping after massive weight loss. Most recently, Halbesma and van der Lei10 published a series of seven cases of reverse abdominoplasty, with a wide range of patient satisfaction and aesthetic results. In their technique, they designed a “gull wing” upper incision and used minimal abdominal flap undermining. The procedure has also been reported in postburn reconstruction.11

CONCLUSIONS

The reverse abdominoplasty can achieve refinement of an abdomen as a primary procedure, but is especially useful when a conventional abdominoplasty has been performed previously. Its use in those with previous submammary scars, even as a primary procedure, should be considered in all cases of abdominal wall contouring. The use of the excess tissue to autoaugment the breasts is a particularly valuable tool to which reverse abdominoplasty lends itself well; liposuction is also an important adjunct with this technique. The procedure is technically only moderately demanding and results in few complications. The authors have performed this procedure with both a single scar crossing the midline and two separate crescentic scars with good outcomes and minimal complications with both techniques.

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