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Body Contouring

Preliminary Report

Endoscopic Intramuscular Fat Grafting for Precise and Safe Abdominal Contouring: Introducing the Supercharged Body Technique—Preliminary Report of a Novel Approach

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Abstract

Background: High-definition (HD) liposuction is widely favored by plastic surgeons and patients for its capacity to create athletic, sculpted body contours. However, traditional HD liposuction may not effectively enhance muscle volume, resulting in a less natural appearance during motion.

Objectives: To evaluate the benefits and efficacy of the Supercharged Body Contouring (S-BC) technique, which employs endoscopic intramuscular fat grafting to augment the rectus abdominis and external oblique muscles under direct endoscopic visualization.

Methods: From October 2019 and November 2024, 32 patients (30 male, 2 female) underwent abdominal deep plane liposuction with preservation of superficial fat, combined with the S-BC technique, a novel endoscopic intramuscular fat grafting method designed to enhance abdominal muscle definition.

Results: No significant complications, such as infections, pulmonary embolism, venous embolism, or fat embolism, were reported. A minor complication, mild seroma, occurred in 8 patients. Other minor issues included temporary bruising in 2 patients and slight asymmetry in one, which was addressed with a secondary fat injection at 3 months. At the 1-year follow-up, the median patient satisfaction score was 9.5 out of 10 (range: 7-10, 95% CI: 9-10). The fat injection technique for enhancing muscle appearance produced sustained results in all patients. Skin tightening evaluations showed 56.25% ($n = 18$) of patients rated as good, 40.6% ($n = 13$) as very good, and 3.12% ($n = 1$) as moderate.

Conclusions: The S-BC technique offers a safe and reproducible method for enhancing HD liposuction, achieving natural and dynamic abdominal contours. This case series suggests its applicability in aesthetic abdominal surgery, pending further validation in larger studies.

Level of Evidence: 4 (Therapeutic)

Liposuction is among the most popular cosmetic procedures worldwide. It was first described for aesthetic reasons by Fischer in 1976.[1] After gaining popularity in the 1980s, traditional liposuction methods underwent numerous refinements and technological updates.[2] Today, it ranks as the second most common cosmetic surgery, after breast augmentation.[3] Over time, new concepts and techniques have emerged. Mentz and colleagues first introduced the concept of "muscle carving" to enhance body contouring. Later, in 2007, Hoyos and Millard systematized and expanded this approach by incorporating ultrasound-assisted techniques to achieve improved tissue retraction, thus introducing the concept of high-definition (HD) liposculpture.[4,5] In individuals with a normal body mass index, HD-liposuction can create an athletic and toned appearance by removing fat and emphasizing key muscle groups.[6,7]

Today, intramuscular fat transfer for muscle volumization has become a preferred method for achieving more natural and long-lasting

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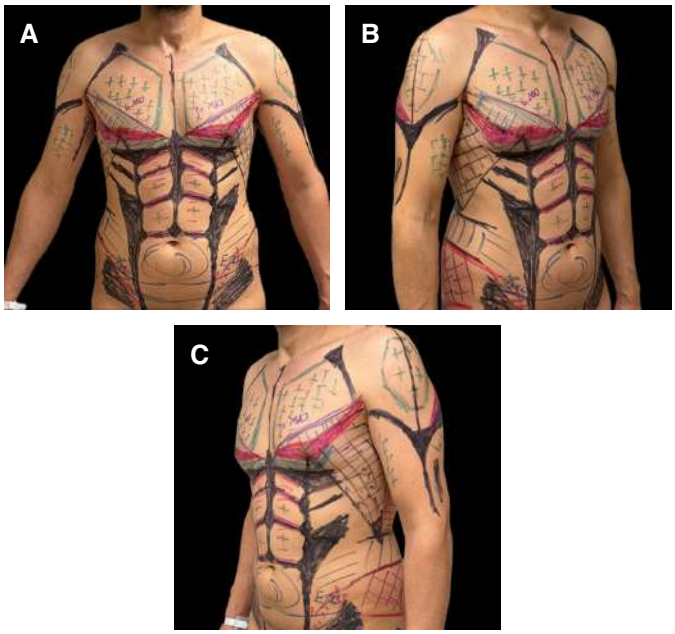

Figure 1. (A-C) Illustration of the surgical plan for S-BC technique, highlighting targeted areas and procedural approach. Patient is a 34-year-old male.

Figure 2. Intraoperative fat processing setup for VASER-assisted liposuction.

results.[8] This approach involves defatting the subcutaneous tissue layer to a thickness of 0.3-0.5 cm overlying the muscles and subsequently performing fat grafting directly into the muscle to create authentic definition.[9]

A significant advantage of adipose tissue is its rich content of mesenchymal stem cells, which surpasses even that of bone marrow in quantity.[10] These cells are crucial because they can transform into various tissues, such as bone, nerve, skin, and muscle, and they release growth factors that support tissue repair.[11] These properties make adipose-derived cells ideal candidates for regenerative medicine, particularly in skeletal muscle repair.[12]

High-definition–liposuction has become a popular procedure among plastic surgeons and patients due to its ability to achieve athletic and contoured body shapes. However, conventional HD liposuction may fall short in accurately enhancing muscle volume, resulting in a less natural appearance during movement.[13]

This study evaluates the benefits and efficacy of the Supercharged Body Contouring (S-BC) technique, which employs endoscopic intramuscular fat grafting to augment the rectus abdominis and external oblique muscles under direct endoscopic visualization. We assessed the safety, reproducibility, and aesthetic outcomes of this method in the context of high-definition liposuction.

METHODS

Between October 2019 and November 2024, a total of 32 patients (30 males, 2 females) underwent abdominal deep plane with preservation of superficial liposuction, combined with S-BC, a novel endoscopic intramuscular fat grafting technique used for abdominal muscle augmentation by a single surgeon.

The inclusion criteria comprised healthy individuals aged 18-60 years, with a body mass index (BMI) of 18.5-29.9 kg/m^2, mild to moderate skin laxity, and sufficient skin elasticity for optimal contouring and adequate fat reserves suitable for VASER-assisted liposuction. The exclusion criteria included a BMI of 30 kg/m^2 or higher, severe systemic diseases, coagulation disorders, prior major abdominal surgery, infections, pregnancy, history of smoking, positive HIV status, lipoatrophy disorders. This study was conducted in accordance with the Declaration of Helsinki, and informed consent was obtained from all patients included. All patients were preoperatively marked in a standing position. Preoperative markings on the patient's torso, as shown in Figure 1, were accurately applied to emphasize superficial anatomy for natural results. Different colors aided preoperative planning, with separate zones marked for debulking (deep liposuction), definition (superficial liposuction), and addition (fat grafting, including endoscopic fat grafting into the rectus abdominis and external oblique muscles).

Fat was harvested using VASER-assisted liposuction (100% energy, C-mode, 5-groove, 3.7 mm probe), emulsified, and collected via airtight vacuum systems with 4 mm cannulas. After decantation and filtration through 2.4 and 1.4 mm filters, the purified grafts were loaded into 10-50 cc syringes for injection (Figure 2).

Endoscopic access was achieved through preexisting inguinal and umbilical entry points without the need for additional incisions. CO_2 insufflation was utilized to expand the cavity between skin and abdominal muscles.[1-3] A 5-10 mm endoscope (0° and 30°) was used for visual guidance during intramuscular fat grafting. In some cases, additional dissection was performed using endoscopic scissors to improve visualization.[4-7]

Fat grafts were injected into the rectus abdominis and external oblique muscles using semi-sharp, guided cannulas designed by the author surgeon, avoiding overcorrection (Figure 3). The rectus abdominis muscle was divided craniocaudally into 4 rows using tendinous intersections and linea alba as landmarks: the first row is closest to the costal cartilages, the second and third rows lie above the umbilicus, and the fourth row extends below the umbilicus to the pubic symphysis, tailored to patient anatomy for consistent fat distribution.

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Figure 3. Custom-designed semi-sharp fat injection cannulas.

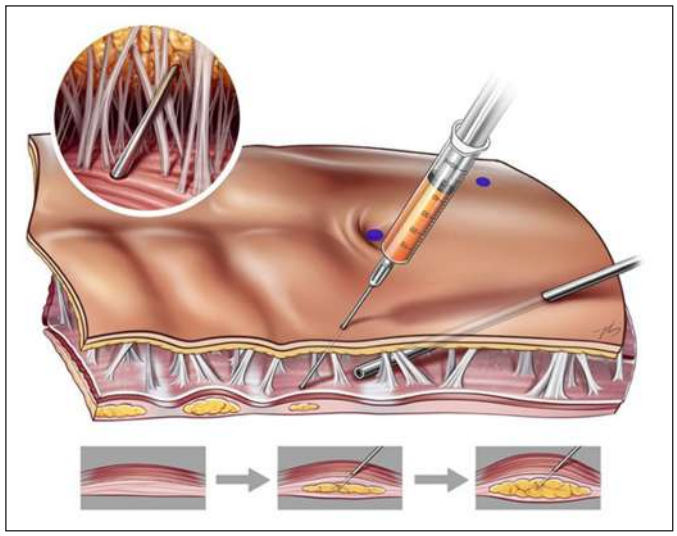
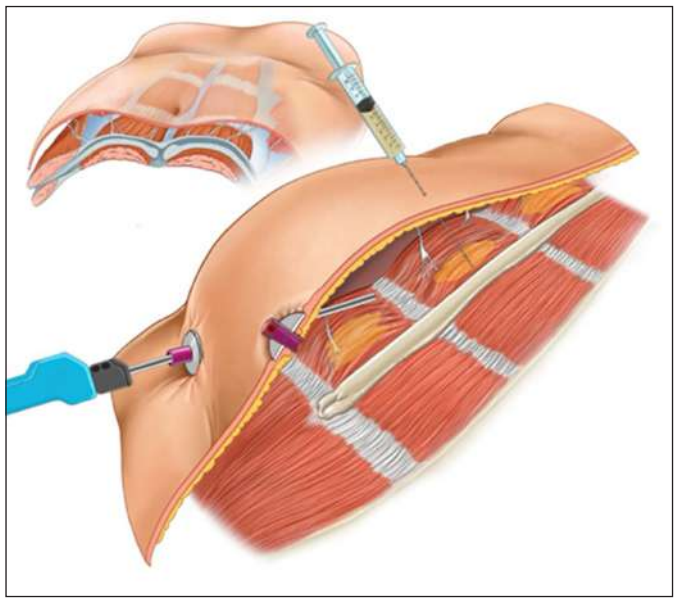


Figure 4. Endoscopic intramuscular fat grafting technique applied to the rectus abdominis muscle.



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The rectus abdominis received the following injection volumes: 10-20 mL (mean: 17 mL) for the first row, 20-50 mL (mean: 35 mL) for the second row, 30-50 mL (mean: 40 mL) for the third row, and 30-40 mL (mean: 36.7 mL) for the fourth row. The external oblique muscle received 40-60 mL (mean: 44.50 mL; Figure 4 and Videos 1 and 2, available online at https://doi.org/10.1093/asjof/ojaf160).

All patients were monitored for 24 hours postoperatively and discharged the following day. Oral antibiotics and analgesics were prescribed for 5 days. Compression garments were worn for 4-6 weeks, and physical activity was restricted for 3 weeks. Follow ups were

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conducted at 1 week, 1 month, 3 months, 6 months, and 1 year postoperatively. The median follow-up duration was 24.40 weeks with the range of 1-52 weeks. Patient satisfaction was assessed using a 10-point scale survey (1 = very dissatisfied, 10 = very satisfied) 1 year post-procedure, evaluating aesthetic outcomes and overall experience. During the follow-up period, no muscle stimulation or other noninvasive techniques were applied to ensure that outcomes were directly attributable to the S-BC technique.

RESULTS

Demographic characteristics of the patient group are summarized in Table 1. In the study, 32 patients (20 female, 12 male) had an age range of 26-53 years with a median of 36.5 years.

No major complications, such as infection, pulmonary embolism, venous embolism, or fat embolism, were observed. Mild seroma was noticed in 8 patients as a minor complication. Minor issues included transient bruising in 2 patients and mild asymmetry in one.

The median follow-up duration was 24.40 weeks with the range of 1-52 weeks. At the 1-year follow-up visits, the median patient satisfaction score was 9.50 out of 10 (range: 7-10, 95% CI: 9-10). Fat injection for muscle appearance achieved lasting results in 100% of patients. According to the skin tightening assessment, 56.25% ($n = 18$) of patients were rated as good, 40.6% ($n = 13$) as very good, and 3.12% ($n = 1$) as moderate.

Figure 5 shows the preoperative, 1-month, and 1-year postoperative abdominal appearance of a 40-year-old male patient with a BMI of 27.7 who underwent the S-BC technique. The surgery lasted 6 hours, and the patient experienced an uneventful recovery. Postoperative recovery allowed resuming daily activities within 2 weeks. At the 1-month and 1-year follow ups, photographic comparison demonstrated an improved abdominal contour. At the 1-month follow-up, significant improvements in abdominal and upper torso definition were observed. At the 1-year follow-up, a sustained muscular contour and a natural aesthetic appearance were achieved with the S-BC technique.

Figure 6 shows the preoperative, 1-month, and 1-year postoperative abdominal appearance of a 30-year-old male patient with a BMI of 26.4 who underwent the S-BC technique. The procedure lasted 5 hours, and the recovery period was again 2 weeks, with no complications reported. Visible improvements in abdominal and upper torso definition are observed, with enhanced contour of the rectus abdominis and oblique muscles. At the first month follow-up, this patient exhibited significantly improved muscular definition and natural contouring, both at rest and during movement. The patient reported high satisfaction with the results.

Table 1. Demographics of Patient Group

	Median	Range	95% CI
Age (years)	36.50	26-53	31-38
BMI	26.45	20.50-29.60	25.39-27.10
Infiltration amount (cc)	3000	2000-4680	2699-3100
Total aspirate (cc)	2050	950-3700	1700-2300
Emulsification duration (min)	27.50	21-42	24.99-31.00
Surgery duration (min)	71	57-83	69-75

DISCUSSION

Body contouring surgery continues to evolve in response to growing patient demand for athletic and natural-looking results. High-definition-liposuction has become a reliable and widely performed procedure for this purpose, particularly among patients with a normal BMI who seek muscular definition.[13] We aimed to develop a novel technique, the S-BC technique, a method of endoscopic intramuscular fat grafting that enhances muscle bulk and definition under direct visualization, to overcome complications associated with HD-liposuction while aiming to achieve sustained and aesthetically pleasing results.

High-definition-liposuction has become a growing trend among both plastic surgeons and patients. However, despite its popularity, this technique has certain limitations and disadvantages. High-definition-liposuction often fails to achieve true volumetric muscle enhancement, and in some cases, can produce results that appear artificial, overly sculpted, or unnatural, resulting in a body contour that appears artificial.[13] Figure 7 shows the artificial and bulky appearance caused by residual fat left over the muscles during the protection procedure in conventional HD liposuction. In contrast to Danilla et al,[13] our study observed no patients with unnatural contours, and all patients were satisfied with the resulting appearance.

As reported in the literature, intramuscular fat injections into the gluteus maximus are not recommended, and cases of fat embolism following injections in this area have led surgeons to approach other muscle groups with caution as well.[14] On the other hand, there are publications describing the safe application and viability of fat grafting to various muscle groups, such as those by Flores, Hoyos, and Kandulu.[15-17] Nevertheless, when it comes to the abdominal region, a practical, safe, and reproducible method for ensuring adequate fat delivery into the correct plane while avoiding the risk of intra-abdominal organ injury remains lacking. Due to off-label applications of HD Liposuction and complications from superficial liposuction, such as sensory loss, seroma, and skin discolouration, surgeons are seeking alternative approaches for the abdominal region. Considering that abdominal muscle thickness is typically 0.6-1.4 cm, as reported in the literature, risks such as visceral organ injury and challenges in determining cannula position and depth are common.[18] Our study combines deep-plane liposuction with

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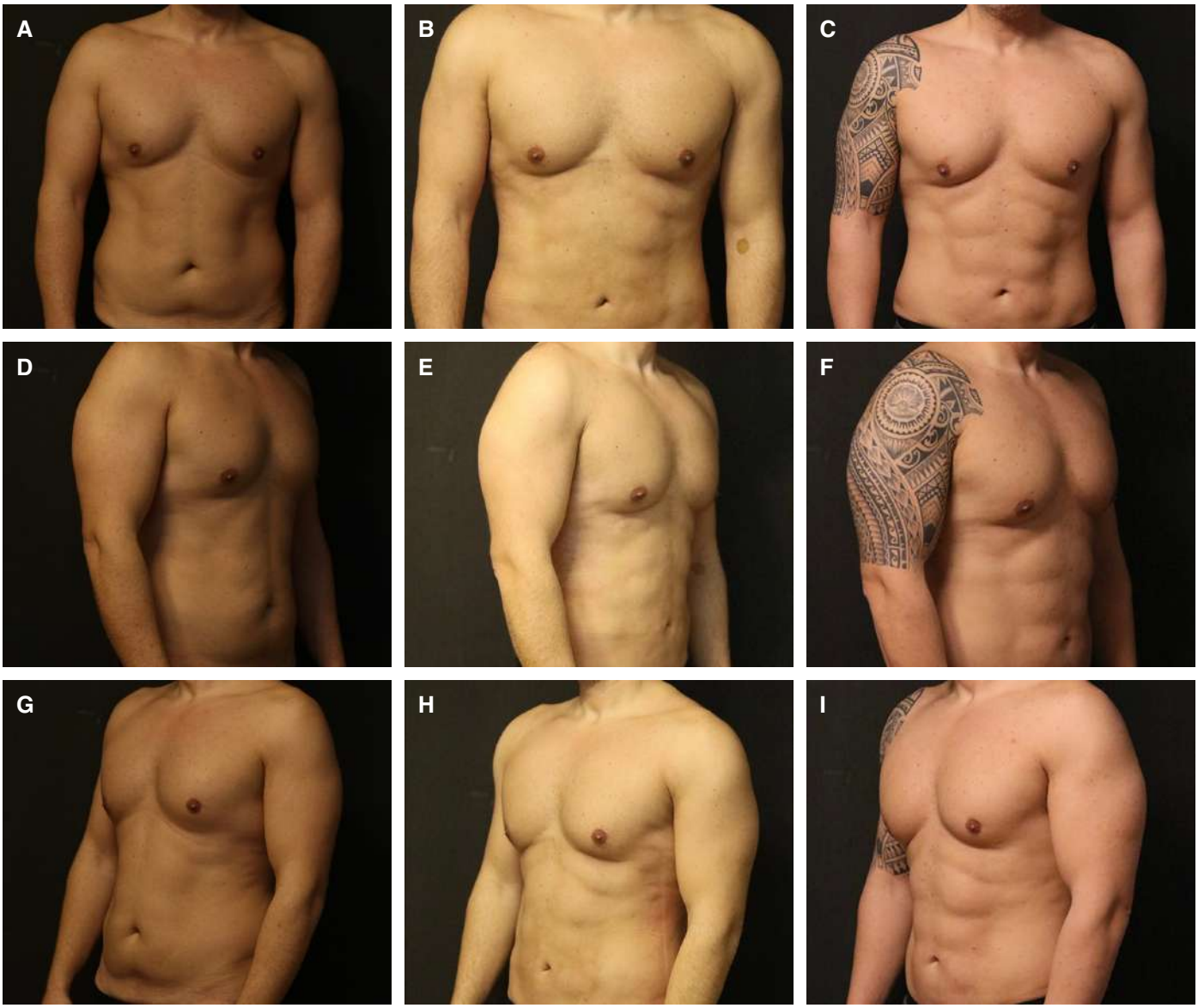

Figure 5. Key anatomical zones, planned muscle augmentation targets, and liposuction areas are delineated using standard high formale patient A, a 40-year-old patient. (A, D, G) Preoperative view of a 40-year-old male patient presenting with mild central obesity, moderate lower abdominal skin laxity with belt deformity, and insufficient muscle volume, resulting in the absence of an athletic abdominal contour. (B, E, H) Postoperative view at 1 month, showing improved abdominal and upper torso definition with enhanced rectus abdominis and oblique muscle contours. (C, F, I) Postoperative view at 1 year following deep-plane liposuction and endoscopic intramuscular fat transfer, demonstrating adequate muscle volumization with sustained definition and a natural aesthetic appearance.

preservation of the superficial dermal plexus and E-Graft, utilizing endoscopic fat transfer to provide a more precise and safer application with direct visualization. Our endoscopic fat transfer approach offers accurate fat placement with direct visualization, providing a shorter learning curve and a safer method for the abdominal region.

Prior studies, such as those by Danilla et al[19] and Viaro et al,[20] introduced rectus abdominis fat grafting techniques, including ultrasound-guided rectus fat transfer (UGRAFT), to improve results in non-abdominoplasty candidates. Viaro et al reported that advanced techniques like high-definition liposuction or dynamic resolution mini lipoabdominoplasty can deliver impressive outcomes in specific cases but fall short in patients with moderate to severe abdominal skin laxity or weight gain. They further stated that lipoabdominoplasty conducted under direct visualization results in a more natural abdominal contour. Escandon et al[21] reported in their meta-analysis that contour irregularities were the second most common complication. In contrast, our study observed no contour irregularities, as the procedure was performed under direct visualization. The S-BC technique, utilizing direct endoscopic visualization, facilitates controlled placement of fat into specific muscle layers, supporting consistent aesthetic outcomes in this cohort.

The S-BC technique employs endoscopic guidance for fat grafting, aiming to minimize the risk of intraperitoneal or vascular injury, particularly in delicate areas like the lower rectus. The method facilitates controlled fat placement to reduce the likelihood of overcorrection and asymmetry. It seeks to improve muscle definition during movement

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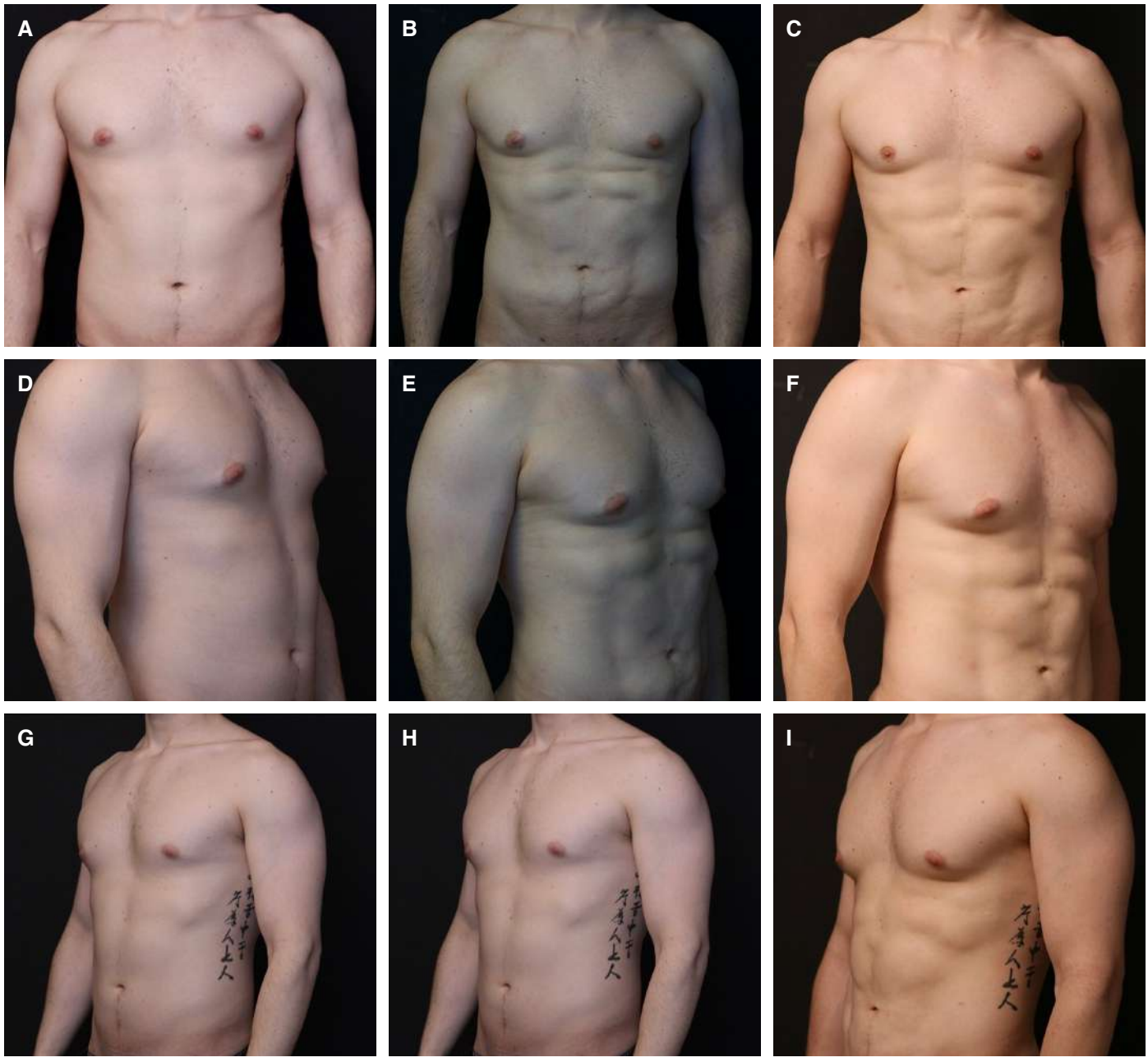

Figure 6. Key anatomical zones, planned muscle augmentation targets, and liposuction areas are delineated using standard high for male patient B, a 30-year-old patient. (A, D, G) Preoperative view of a 30-year-old male patient with adequate skin elasticity and overall fit appearance, but lacking sufficient muscle volume in the chest and abdominal regions. (B, E, H) Postoperative view of 30-year-old male patient at 1 month, showing improved abdominal and upper torso definition. (C, F, I) Postoperative view of a 30-year-old male patient at 1 year, demonstrating sustained muscular definition and natural aesthetic appearance. The round nodular structure located on the linea alba between the umbilicus and xiphoid represents a postoperative herniation and is unrelated to the fat grafting procedure.

through intramuscular volumization. Additionally, the endoscopic grafting step was typically completed in under 25 minutes with increasing surgical experience, suggesting feasibility for trained surgeons..

The main limitations of our study include its retrospective design, the use of a single-surgeon cohort, a small sample size of 32 patients, and the lack of a control group. Another limitation of this study is the absence of long-term follow-up beyond 1 year, which limits understanding of the durability of fat graft retention and aesthetic outcomes over extended periods. This study did not include a direct comparison with ultrasound-guided intramuscular fat injection techniques or pre- and postoperative volumetric imaging (eg, MRI), limiting the ability to objectively assess relative outcomes and changes in muscle volume. However, consistent clinical follow ups and standardized photography suggest stable fat graft retention up to 1 year postoperatively.[22] Clinical observations and photographic documentation indicate that patients treated with intramuscular grafts via the S-BC technique achieved consistent muscle definition and aesthetic abdominal contouring.

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Figure 7. The artificial and bulky appearance caused by residual fat left over the muscles. Patient is a 53-year-old male.

Importantly, no major complications such as fat embolism or infection were observed in our series. Minor issues (bruising, asymmetry) were limited and resolved without permanent sequelae. These findings further support the safety and reproducibility of this technique.

Furthermore, although the endoscopic approach presented in this study is anatomically and technically specific to the rectus abdominis muscle, the surgical principles underlying this technique may be adapted and cooperatively integrated with other methods for fat grafting into different muscle groups. This adaptation has the potential to enable safe and controlled 3-dimensional body definition in regions such as the deltoid, pectoralis major, biceps, and trapezius, where direct endoscopic access may not be feasible.

CONCLUSIONS

The S-BC technique integrates endoscopic intramuscular fat grafting into the HD-liposuction framework, aiming to achieve muscle volumization and natural definition during dynamic movement. This case series indicates that the technique is safe and reproducible, with consistent outcomes observed in the study cohort.

The use of endoscopic guidance enabled accurate fat placement, minimized risk, and enhanced aesthetic results, particularly in the rectus abdominis and external oblique muscle groups. While further studies with larger patient samples and objective imaging are needed, our results suggest that the S-BC technique may be a promising addition to the armamentarium of modern body contouring, especially in patients seeking more refined, muscular, and natural abdominal aesthetics.

Disclosures

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