

A Retrospective Review Comparing Renuvion Helium Plasma Radiofrequency with BodyTite Bipolar Radiofrequency after Liposuction or Body Contouring

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Background: Driven by demand for nonexcisional alternatives to address lax skin following liposuction, various energy-based technologies have become available. Helium plasma radiofrequency (RF) and bipolar RF have gained prominence. These technologies have distinctly different methods of action and indications, potentially influencing procedural safety and duration.

Methods: Conducted to collect and evaluate real-world procedure and safety data, this retrospective, single-center, contiguous series study included patients who underwent either helium plasma RF or bipolar RF following a liposuction or body contouring procedure.

Results: The helium plasma RF group (N = 229) averaged 4.9 concurrent procedures, whereas the bipolar RF group (N = 236) averaged 4.4 concurrent procedures. The total treatment time, including concurrent procedures, was 182 minutes for the helium plasma RF group and 196 minutes for the bipolar RF group. The findings from the subanalysis group (n = 9) indicated that the treatment time for the helium plasma RF side of the body was 50% shorter than the bipolar RF side. A statistically significant difference in adverse events by group was observed. There were 45 events in 34 patients for helium plasma RF and 93 events in 62 patients for bipolar RF. Notably, fewer occurrences of burns, hematoma, hypertrophic scar, and seroma were reported for helium plasma RF compared with bipolar RF.

Conclusions: The analysis reveals a notable difference in the occurrence of adverse events, with statistically significantly fewer incidents observed for helium plasma RF compared with bipolar RF. Data suggests that helium plasma RF exhibits shorter durations in the operating room compared with bipolar RF, suggesting increased procedural efficiency. (*Plast Reconstr Surg Glob Open* 2024; 12:e6024; doi: 10.1097/GOX.0000000000006024; Published online 6 August 2024.)

INTRODUCTION

Liposuction can improve body contouring through the removal of excess, unwanted fat; however, age and/or the removal of significant fat volume often surpasses the body's

natural ability to contract the overlying skin/soft tissue, leaving many patients with undesirable laxity in the skin. Even with the introduction of energy during liposuction with laser-assisted liposuction (LAL) or ultrasound-assisted liposuction (UAL), many patients are left with undesirable skin laxity.¹⁻⁴ Excisional procedures may be used to address excess skin laxity. Alternatively, many patients now are electing minimally or noninvasive procedures involving trans-epidermal delivery of energy. LAL and ultrasound-assisted liposuction (UAL) devices have combined the removal of subcutaneous fat with soft tissue heating to reduce the skin laxity that often results from fat volume removal.^{5,6} These devices are placed in the same subcutaneous tissue plane as a standard suction-assisted liposuction (SAL) or power-assisted liposuction (PAL) cannula and are used to deliver thermal energy to coagulate the subcutaneous tissue, including the underside of the dermis, the fascia, and

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the septal connective tissue. The coagulation of the subcutaneous tissue results in collagen/tissue contraction that reduces skin laxity.⁵

Driven by demand for nonexcisional alternatives to address lax skin following liposuction, various energy-based technologies have become available. Among these, helium plasma radiofrequency (RF; Renuvion, Apyx Medical, Clearwater, Fla.) and bipolar RF (BodyTite, InMode, Irvine, Calif.) have gained prominence. These technologies have distinctly different methods of action and indications, potentially influencing procedural safety and duration.

The helium plasma RF device precisely controls the delivery of heat to the tissue with minimal thermal spread.^{7,8} This application provides rapid heating to 85°C with near-instantaneous tissue cooling; at 85°C, collagen contracts 60% in 0.044 seconds with helium plasma RF.⁷ Studies show that during subdermal use of helium plasma RF energy, temperature at the surface of the skin does not rise by more than 4°C; therefore, external temperature-monitoring of the skin is not required.⁷ The helium plasma RF device is designed and cleared by the Food & Drug Administration for the coagulation of subcutaneous soft tissues following liposuction for aesthetic body contouring and to improve the appearance of lax (loose) skin in the neck and submental region.⁹

The bipolar RF device provides subdermal tissue coagulation by bulk heating to 65°C–70°C by RF electrodes having direct contact with the tissue; at 65°C, collagen contracts 40% in approximately 2.5 minutes, whereas at 75°C, collagen contracts 40% in approximately 0.42 seconds.¹⁰ Due to the method of action of bulk heating, external temperature-monitoring of the skin is required to manage the surface temperature of the skin to prevent adverse events (AEs) such as burns.¹⁰ The bipolar RF device is indicated and cleared by the Food & Drug Administration for use in dermatological and general surgical procedures for electro-coagulation and hemostasis.¹¹

In this extensive retrospective study, the medical records of patients receiving treatment with the specified minimally invasive energy devices subsequent to liposuction or body contouring were systematically reviewed. The real-world evidence elucidates the safety profile and procedural details associated with the utilization of each device following liposuction or body contouring procedures.

METHODS

Study Design

This retrospective clinical study aimed to gather a consecutive series of retrospective procedure and safety data from patients who underwent treatment with either helium plasma RF or bipolar RF following liposuction or body contouring procedures.

All patients treated with helium plasma RF or bipolar RF following liposuction by the two primary co-investigators, Dr. Kluska and Dr. Deal, between 2018 and 2022 at the site were included in the analysis. Additionally, a subgroup of nine patients who were treated with a split-body treatment in 10 body areas were analyzed. In the

Takeaways

Question: Is there a difference in safety (adverse events) between helium plasma radiofrequency (RF) and bipolar RF?

Findings: There were 45 events in 34 patients for helium plasma RF, and 93 events in 62 patients for bipolar RF. Fewer burns, hematomas, hypertrophic scars, and seromas were reported for helium plasma RF than bipolar RF.

Meaning: Our article compares the safety and efficiency of two popular techniques used in liposuction and body contouring procedures, revealing statistically significantly fewer adverse events with helium plasma RF.

split-body treatment approach, helium plasma RF was applied to one side of the body, whereas bipolar RF was applied to the contralateral side following liposuction or body contouring.

The study received approval from the Sterling institutional review board in Atlanta, Georgia. Subjects were not contacted for this retrospective data review, a waiver of consent was granted by the institutional review board. All procedures adhered to the ethical standards outlined by the institutional research committee and were in compliance with the principles of the 1964 Declaration of Helsinki and its subsequent amendments or equivalent ethical standards. Data available for analysis were collected and compiled during the chart review process.

Outcome Measures

The outcome measures in this study encompassed the examination of AEs documented during and after the procedure, categorized by group, as well as the analysis of AEs documented by body area during and after the procedure, also stratified by group. Additionally, the study included an analysis of procedure data categorized by group, an assessment of patient satisfaction (when data were available), and an evaluation of changes in body area measurements before and after the procedure (when data were available).

RESULTS

This study analyzed real-world data extracted from 457 patient charts. Follow-up was noted during the chart review as number of days from the liposuction and RF technology procedure to the last contact date noted in the patient chart. The average time of follow-up was 312 ± 415 days, range 1–1570. Eight patients underwent treatments with both helium plasma RF and bipolar RF in distinct body regions; consequently, they were accounted for in the analyses of both groups. Similar-sized groups were determined, with 229 patients evaluated in the helium plasma RF group and 236 patients evaluated in bipolar RF group. The demographic characteristics of both groups exhibited similarity in terms of age, sex, body mass index, and tobacco usage, as illustrated in [Table 1](#).

Within the helium plasma RF group (N = 229), procedures were evenly distributed between Dr. Kluska and Dr. Deal, but Dr. Deal primarily performed the bipolar RF

Table 1. Demographic Characteristics

	Renuvion (N = 229)	InMode RF (N = 236)
Age (y)		
N	229	235
Mean ± SD	42.4 ± 10.6	44.9 ± 11.3
Median	41.9	44.3
Min, max	(19.5, 73.2)	(18.9, 76.2)
Sex		
Female	88.6% (203/229)	92.8% (219/236)
Male	10.9% (25/229)	7.2% (17/236)
BMI (kg/m²)		
N	228	228
Mean ± SD	27.0 ± 4.1	26.9 ± 4.4
Median	26.8	26.3
Min, max	(18.9, 40.8)	(17.8, 41.7)
Tobacco use		
None	92.1% (211/229)	89.0% (210/236)
Current user	1.7% (4/229)	3.4% (8/236)
Prior use	6.1% (14/229)	7.2% (17/236)
Not available	0.0% (0/229)	0.4% (1/236)

procedures (N = 236). During surgery, the helium plasma RF group averaged 4.9 concurrent procedures, such as abdominoplasty, breast augmentation, mastopexy, buttocks augmentation, whereas the bipolar RF group averaged 4.4 concurrent procedures. The total treatment time, including concurrent procedures, was 182 minutes for the helium plasma RF group and 196 minutes for the bipolar RF group. The findings from the subgroup analysis (n = 9) indicated that the device-specific treatment duration for the helium plasma RF side of the body with a total of 145

minutes was 47% shorter compared with the side treated with bipolar RF with a total of 309 minutes, suggesting increased procedural efficiency, as depicted in Figure 1.

Details of the liposuction or body contouring procedures are presented in Table 2. SAL emerged as the most commonly utilized method for both groups. In 50 patients, both UAL and SAL were used; in one patient both SAL and LAL were used, resulting in allocations surpassing 100%. Patients underwent liposuction followed by treatment with either helium plasma RF or bipolar RF across various body regions, as summarized in Table 3. Eight patients received both devices in different body regions and thus are accounted for in both columns. Furthermore, some patients received treatments with both devices in multiple locations, leading to percentages exceeding 100% in each column. Additionally, in certain cases, RF microneedling (Morpheus, InMode, Irvine, Calif.) was incorporated into the procedure within the same treatment area as helium plasma RF and/or bipolar RF; notably, a greater number of helium plasma RF patients (n = 31) received the adjunct of RF microneedling compared with bipolar RF patients (n = 12). Detailed analyses of the helium plasma RF procedures revealed an average power setting of 80% (range 60–85), helium flow rate of 2 LPM (range 1.5–4.0), an average of six passes (range 2–9), and an average energy application of 4.5 kJ (range 2.9–8.4). Similarly, analyses of the bipolar RF procedures indicated an average external temperature setting of 38°C (range 35.0–55.0), internal temperature setting of 70°C (range 50.0–70.0), an average treatment duration of 1980 seconds (range 120–5520), and an average energy application of 17.6 kJ (range 0.3–227.0).

AEs documented in patient charts were categorized by body area. A total of 134 patients experienced AEs, with

Treatment Time

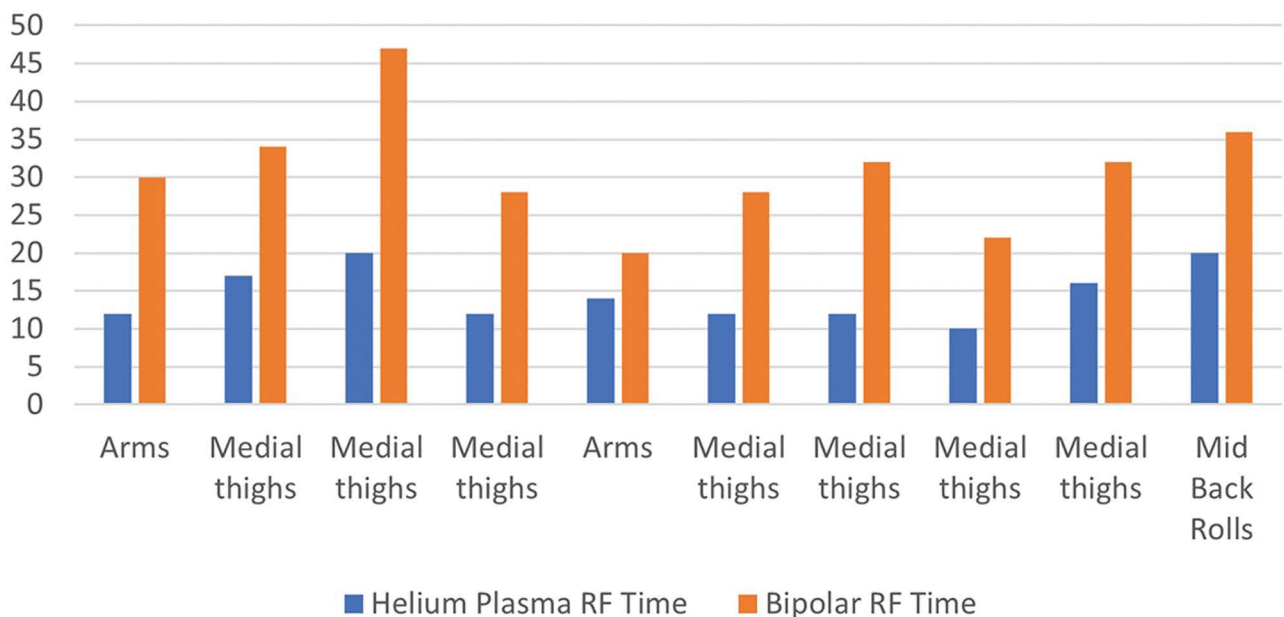


Fig. 1. Treatment time (minutes).

Table 2. Liposuction Procedure

Procedure Detail	Renuvion (N = 229)	InMode (N = 236)	Total (N = 457)
UAL	17.5% (40/229)	5.1% (12/236)	11.4% (52/457)
SAL	99.6% (228/229)	99.2% (234/236)	99.3% (454/457)
PAL	0.0% (0/229)	0.0% (0/236)	0.0% (0/457)
LAL	0.0% (0/229)	0.8% (2/236)	0.4% (2/457)

Table 3. Body Areas Treated

	Renuvion (N = 229)	InMode (N = 236)
Abdomen/pubis	31.4% (72/229)	33.1% (78/236)
Arms	27.1% (62/229)	25.4% (60/236)
Back	12.2% (28/229)	13.6% (32/236)
Breast/axilla	10.9% (25/229)	15.3% (36/236)
Buttocks	0.0% (0/229)	5.9% (14/236)
Face	3.9% (9/229)	7.2% (17/236)
Hips/flanks	7.4% (17/229)	3.8% (9/236)
Leg	29.3% (67/229)	39.4% (93/236)
Neck	30.6% (70/229)	11.4% (27/236)
Other	0.0% (0/229)	0.0% (0/236)

Table 4. Overall Distribution of AEs by Body Area

Body Area	Renuvion (N = 229 Patients)	InMode (N = 236 Patients)
Abdomen	35.6% (16/45)	37.6% (35/93)
Arms	6.7% (3/45)	15.1% (14/93)
Back	2.2% (1/45)	8.6% (8/93)
Buttock	4.4% (2/45)	5.4% (5/93)
Breast	6.7% (3/45)	5.4% (5/93)
Face	4.4% (2/45)	8.6% (8/93)
Leg	0.0% (0/45)	0.0% (0/93)
Neck	24.4% (11/45)	8.6% (8/93)
Other: anemia	6.7% (3/45)	6.5% (6/93)

the highest incidence reported in the abdomen (38.1%), as detailed in Table 4. Additionally, AEs were delineated and analyzed based on treatment group, as presented in Table 5. There were 45 AEs noted in the helium plasma RF group, including bruise (n = 3), burn (n = 2), contact dermatitis (n = 1), edema (n = 2), epidermolysis (n = 2), hypertrophic scar (n = 1), hypesthesia/numbness (4), infection (n = 4), anemia (n = 2), pain (n = 1), pruritis/itching (n = 1), seroma (n = 15), skin abscess (n = 1), skin rash (n = 2), subcutaneous nodule (n = 1), tissue necrosis (n = 1), and wound complication (n = 1). There were 93 AEs noted in the bipolar RF group, including allergic reaction (n = 1), bruise (n = 8), burn (n = 11), delayed healing (n = 1), edema (n = 6), erythema (n = 1), hematoma (n = 5), hypertrophic scar (n = 6), hypesthesia/numbness (n = 8), infection (n = 1), motor nerve weakness (n = 2), anemia (n = 3), pain (n = 2), seroma (n = 25), skin abscess (n = 1), skin hyperpigmentation (n = 1), skin scar (n = 1), subcutaneous induration (n = 6), subcutaneous nodule (n = 2), and wound complication (n = 1). Considering all AEs, the helium plasma RF group exhibited fewer statistically significant AEs (P value is <0.0001 using either chi square and Fisher exact test),

with fewer patients affected (45 events in 34 patients) compared with the bipolar RF group (93 events in 62 patients). Particularly noteworthy are the significantly fewer occurrences of burns, hematoma, hypertrophic scar, and seroma in the helium plasma RF group compared with the bipolar RF group. Table 5 encompasses all AEs, regardless of location or their relation to procedure. Furthermore, AEs were scrutinized and categorized as procedure-related if they occurred in the same body part where the procedure was performed, as delineated in Table 6. AEs affecting the entire treatment area were considered procedure-related. Regarding the procedure-related AEs, the helium plasma RF group demonstrated a statistically significant decrease ($P < 0.0001$ using either chi square and Fisher exact test) in reported procedure-related AEs, with fewer patients affected (28 events in 24 patients) compared with the bipolar RF group (69 events in 48 patients). There were significantly fewer instances of burns, hematoma, hypertrophic scar, and seroma in the helium plasma RF group compared with the bipolar RF group for procedure-related AEs.

A subgroup analysis was performed on nine patients who underwent split-body treatment across 10 body areas, including the inner thigh, midback, or arms. Among anatomical regions treated with helium plasma RF, body area measurements decreased 3.2% at 3 months (n = 7) and 6.5% at 6 months (n = 8). Areas treated with bipolar RF exhibited a decrease in body area measurements of 2.3% at 3 months (n = 7) and 4.2% at 6 months (n = 8). Satisfaction with the cosmetic appearance of treated areas was comparable between the split-body sides during the initial 24 hours posttreatment but showed continued improvement over the following 6 months in areas treated with helium plasma RF, as depicted in Figure 2. Overall subject satisfaction was notably higher for areas treated with helium plasma RF at 3- and 6-months posttreatment, as illustrated in Figure 3.

DISCUSSION

Strategies for managing skin laxity following liposuction include various energy-based technologies, notably helium plasma RF and bipolar RF. These serve as minimally invasive alternatives to excisional procedures. However, given the distinctly different methods of action and indications, these technologies exhibit differences in both procedural duration and safety.

The findings of the present study offer valuable insights into the safety and procedural aspects of these minimally invasive interventions in real-world clinical settings. Our results demonstrate a statistically significant reduction in AEs associated with helium plasma RF compared with bipolar

Table 5. Overall AE Summary, by Treatment Received (All AEs)

Adverse Event Printname	Renuvion (N = 229)		InMode RF (N = 236)	
	N Events	% (n) Patients	N Events	% (n) Patients
Allergic reaction	0	0% (0)	1	0.4% (1)
Bruise	3	0.9% (2)	8	2.5% (6)
Burn	2	0.9% (2)	11	4.2% (10)
Contact dermatitis	1	0.4% (1)	0	0% (0)
Delayed healing	0	0% (0)	1	0.4% (1)
Edema	2	0.9% (2)	6	2.1% (5)
Epidermolysis	2	0.9% (2)	0	0% (0)
Erythema	0	0% (0)	1	0.4% (1)
Hematoma	0	0% (0)	5	2.1% (5)
Hypertrophic scar	1	0.4% (1)	6	2.5% (6)
Hypesthesia/numbness	4	1.7% (4)	8	3.4% (8)
Infection	4	1.7% (4)	1	0.4% (1)
Motor nerve weakness	0	0% (0)	2	0.8% (2)
Other: anemia	2	0.9% (2)	3	1.3% (3)
Pain	1	0.4% (1)	2	0.8% (2)
Pruritis/itching	1	0.4% (1)	0	0% (0)
Seroma	16	7.0% (16)	26	10.2% (24)
Skin abscess	1	0.4% (1)	1	0.4% (1)
Skin hyperpigmentation	0	0% (0)	1	0.4% (1)
Skin rash	2	0.9% (2)	0	0% (0)
Skin scar	0	0% (0)	1	0.4% (1)
Subcutaneous induration	0	0% (0)	6	2.5% (6)
Subcutaneous nodule	1	0.4% (1)	2	0.8% (2)
Tissue necrosis	1	0.4% (1)	0	0% (0)
Wound complication	1	0.4% (1)	1	0.4% (1)
Total	45	14.8% (34)	93	26.3% (62)

Note: The bolded line items are the events of greatest concern for this type of treatment, specifically highlighting the differences in the number of AEs between the technologies.

Table 6. Procedure-Related AE Summary, by Treatment Received

Adverse Event Printname	Renuvion (N = 229)		InMode (N = 236)	
	N Events	% (n) Patients	N Events	% (n) Patients
Allergic reaction	0	0% (0)	1	0.4% (1)
Bruise	1	0.4% (1)	6	2.1% (5)
Burn	1	0.4% (1)	11	4.2% (10)
Edema	2	0.9% (2)	6	2.1% (5)
Epidermolysis	2	0.9% (2)	0	0% (0)
Hematoma	0	0% (0)	4	1.7% (4)
Hypertrophic scar	1	0.4% (1)	4	1.7% (4)
Hypesthesia/numbness	3	1.3% (3)	8	3.4% (8)
Motor nerve weakness	0	0% (0)	1	0.4% (1)
Other: anemia	2	0.9% (2)	3	1.3% (3)
Pain	1	0.4% (1)	2	0.8% (2)
Seroma	11	4.8% (11)	15	6.4% (15)
Skin hyperpigmentation	0	0% (0)	1	0.4% (1)
Skin rash	2	0.9% (2)	0	0% (0)
Subcutaneous induration	0	0% (0)	6	2.5% (6)
Subcutaneous nodule	1	0.4% (1)	1	0.4% (1)
Tissue necrosis	1	0.4% (1)	0	0% (0)
Total	28	10.5% (24)	69	20.3% (48)

Note: The bolded line items are the events of greatest concern for this type of treatment specifically highlighting the differences in the number of AEs between the technologies.

RF following liposuction, suggesting that helium plasma RF may offer a safer alternative to bipolar RF following liposuction or body contouring procedures. Furthermore, our data indicate that the helium plasma RF procedure is associated

with shorter procedural times compared with bipolar RF following liposuction. This suggests that helium plasma RF may provide increased procedural efficiency, potentially leading to shorter operating room durations.

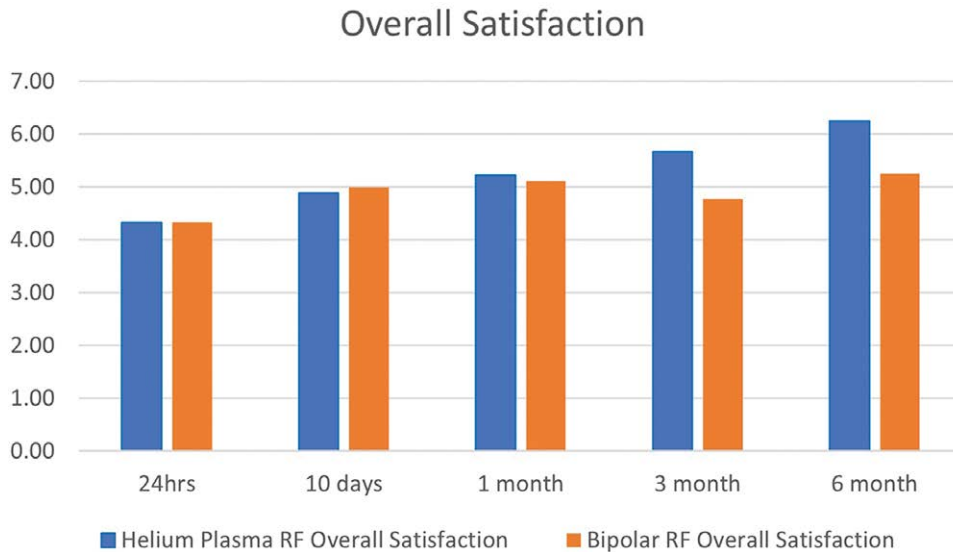


Fig. 2. Overall satisfaction.

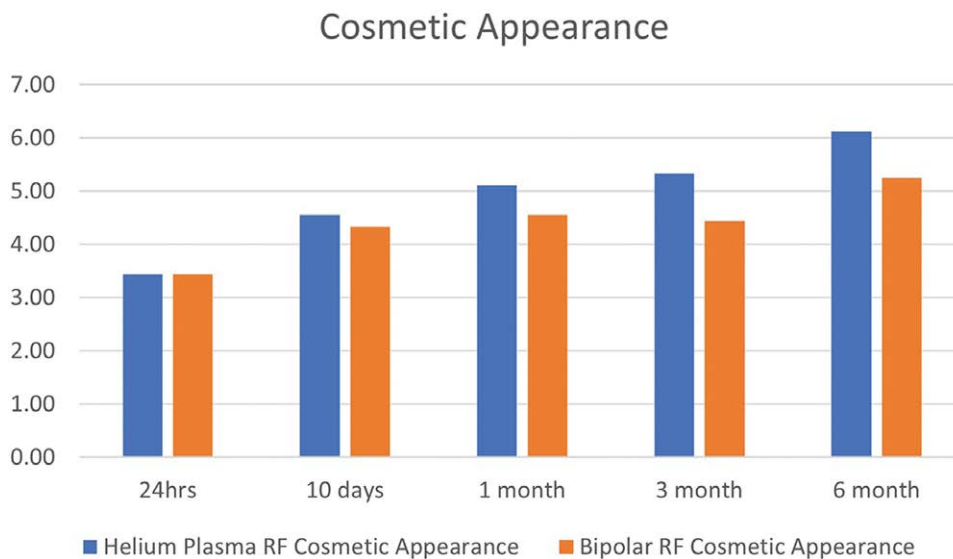


Fig. 3. Cosmetic appearance.

In the subgroup analysis, the data indicates support for helium plasma RF, demonstrating superior improvements in cosmetic appearance and tissue contraction in key anatomical regions. Moreover, overall patient satisfaction with helium plasma RF was higher, showing a 20% increase after 6-months compared with bipolar RF. With treatment times consistently 47% faster than bipolar RF, helium plasma RF allows for significantly less operative time, translating to lower operative costs. These findings reinforce the data observed in the primary dataset.

Interestingly, the data indicate improved cosmetic results and increased patient satisfaction with less energy administered by the helium plasma treated side compared with the bipolar treated side. The average energy application was 4.5 kJ with helium plasma RF and 17.6 kJ with bipolar RF, representing 75% less energy delivered to the treatment

area. This suggests that the helium plasma RF device delivers energy to the tissue more efficiently. Although the bipolar RF device necessitates the delivery of significantly more energy than the helium plasma RF device, the data from the subgroup analysis indicate that the additional energy does not translate into improved results. On the contrary, body area decreased more, and patient satisfaction was higher on the helium plasma RF treated side of the split-body comparison. The increased amount of energy required by the bipolar RF device is likely a contributing factor to both the increased operating time and the increase in AEs observed in this study. More energy delivery through the bulk heating method of the bipolar RF device requires more treatment time, leading to prolonged durations in the operating room. Additionally, greater energy delivery to the tissue through bulk heating correlates with a higher risk of AEs.

The results of our study conform with the work of Neinstein and Funderburk,¹² who compared the method of actions, safety mechanisms, and procedural recommendations of helium plasma RF and bipolar RF platforms for treatments across the body. They estimate that bipolar RF procedures typically require approximately 30–45 minutes per treatment area, whereas helium plasma RF procedures typically take about 5–12 minutes per treatment area.

Similarly, our findings align with the research conducted by Ibrahim,¹³ who investigated arm contouring using three groups: bipolar RF following UAL, helium plasma RF following UAL, and UAL alone. The incidence of AEs reported for burns was 2:1; for seroma, 3:1; for subcutaneous induration, 3:0; and for nerve injury, 2:0 for bipolar RF compared with helium plasma RF.

Additionally, our study results are consistent with the research conducted by Hoyos et al,¹⁴ who reported AE incidence in abdominoplasty procedures using helium plasma RF and bipolar RF. AE incidents were 6:4 for bipolar RF compared with helium plasma RF. Apart from the AE incidents, Hoyos et al. noted a preference for using helium plasma RF over bipolar RF due to its shorter exposure time, which correlates to the reduced procedure time reported in our data.

The study's findings underscore the importance of carefully selecting the appropriate energy-based technology for managing skin laxity following liposuction or body contouring procedures. The removal of significant fat volume through liposuction often surpasses the body's natural ability to contract the subcutaneous soft tissue and leaves many patients with undesirable outcomes. Physicians must choose between either performing more invasive, excisional procedures or using devices other than helium plasma RF that have not conducted clinical studies or been determined to be safe and effective for this application. The more invasive, excisional procedures carry with them more risks and comorbidities than the minimally invasive use of the helium plasma RF such as increased blood loss, longer healing times, increased risk of infection, and much larger scars, although the amount of skin removed can have more significant results than can be accomplished by energy-based technologies. For the patient, excisional surgery increases postoperative care and self-care, and patient recuperation time is increased significantly. Helium plasma RF emerges as a promising option over bipolar RF due to its superior safety profile, shorter procedural times, and higher patient satisfaction rates compared with bipolar RF. Surgeons may consider incorporating helium plasma RF into their practice to enhance patient outcomes, experiences, and cost-effectiveness, given the faster procedure time.

Limitations of the study include its retrospective design, lack of controlled conditions, viability in available data within patient charts, divergence in concurrent procedures among and within impacting overall procedure duration, a single surgeon performing most of the bipolar RF procedures compared with two surgeons performing the helium plasma RF procedures, and limited efficacy data due to the small sample size of the subanalysis group. Potential bias was mitigated by the comparable data accessibility and demographic likeness among subjects in both

treatment groups. Further, the contiguous series design facilitated the comprehensive evaluation of all pertinent and accessible data. Given the substantial sample size, the real-world evidence supported by these data holds significant relevance for the aesthetic medical community engaged in aesthetic body contouring procedures.

CONCLUSIONS

A comprehensive retrospective analysis of 457 patient charts compared the use of helium plasma RF to bipolar RF following liposuction or body contouring procedures. The totality of these real-world data indicates a statistically significant reduction in AEs associated with the application of helium plasma RF following liposuction or body contouring compared with bipolar RF. Particularly noteworthy are the reduced occurrences of burns, hematoma, hypertrophic scar, and seroma associated with the helium plasma RF procedure. Furthermore, the data suggest that the helium plasma RF procedure exhibits shorter durations in the operating room compared with bipolar RF, suggesting increased procedural efficiency.

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DISCLOSURES

Dr. Kluska and Dr. Deal are consultants for Apyx Medical and receive hourly compensation for consulting activities. Dr. Deal previously was a paid presenter and trainer for InMode. The other authors have no financial interest to declare in relation to the content of this article.

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