



## Body Contouring

# Improvement in Brazilian Butt Lift (BBL) Safety With the Current Recommendations from ASERF, ASAPS, and ISAPS

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### Abstract

**Background:** In 2017, the ASERF Gluteal Fat Grafting Task Force reported gluteal fat grafting to be a high-risk procedure and recommended specific surgical techniques to decrease the risk of pulmonary fat embolism (PFE).

**Objectives:** The aim of this study was to determine whether ASAPS and ISAPS members were aware of the 2017 recommendations, what their current surgical techniques were, whether they had changed their techniques based on the 2017 recommendations, and whether the incidence of PFEs had changed since the recommendations were published.

**Methods:** An anonymous web-based survey was conducted among members of ASAPS and ISAPS. It included the questions from the 2017 survey, as well as questions about awareness of the Task Force recommendations and subsequent change in surgical techniques.

**Results:** In the 2 years following the publication of the recommendations, the incidence of any PFE was 1 in 2492 compared with 1 in 1030 reported in 2017 ( $P = 0.02$ ). Trends indicated a decreased mortality rate from 1 in 3448 in 2017 to 1 in 14,952 in 2019. Ninety-four percent of respondents were aware of the recommendations. Only 0.8% of surgeons in the current survey reported injecting in deep muscle, compared with 13.1% in 2017 ( $P < 0.01$ ). Compared with 4.1% in 2017, 29.8% of respondents in our survey reported that they only injected with cannulas  $\geq 4.1$  mm ( $P < 0.01$ ). Only 4% of respondents reported angling the cannula down in the current survey, compared with 27.2% in 2017 ( $P < 0.01$ ).

**Conclusions:** It appears that members were aware of the 2017 recommendations. There was a significant decrease in recent PFE and trends showed a change to safer techniques and an improvement in safety of the procedure.

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In 2015, the Aesthetic Surgery Education and Research Foundation (ASERF) formed a Gluteal Fat Grafting Task Force to study the mortality and complication rate of gluteal fat transfer (also known as Brazilian butt lift, BBL). The formation of the Task Force was ignited by a cluster of deaths in Los Angeles County. At that time, there was a small body of literature suggesting that BBL, especially below the muscular plane, could result in direct fat embolism to the heart and lungs.<sup>1-3</sup>

The purpose of the Task Force was to determine the relative safety of the procedure. Based on data from the American Association for the Accreditation of Ambulatory Surgical Facilities (AAAASF), the American Society for

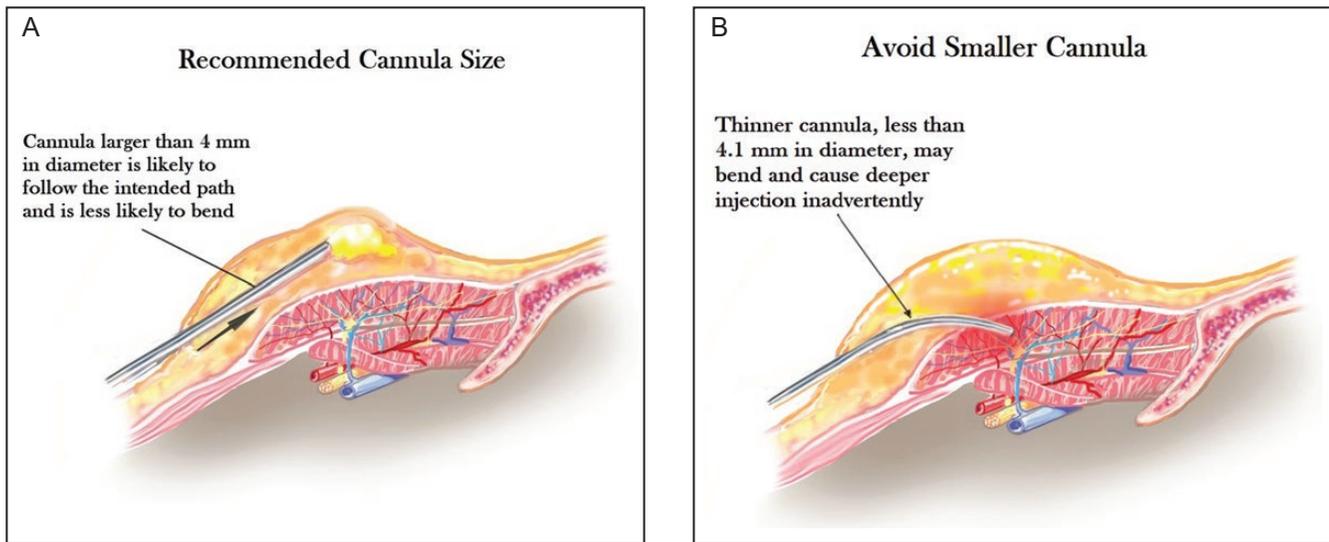
Aesthetic Plastic Surgery (ASAPS), and a member survey, it was determined that the mortality rate for BBL ranged from 1 in 2250 to 1 in 6214.<sup>4</sup> This was much higher than the mortality rate of abdominoplasty 1 in 13,193, considered the

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**Figure 1.** (A) It is recommended to use cannulas  $\geq 4$  mm in diameter. (B) Smaller cannulas may bend and result in inadvertent injection in muscular or submuscular planes which may cause vascular injury and fat embolism.

riskiest aesthetic procedure. Aesthetic procedures had an overall mortality rate of 1 in 55,000.<sup>5,6</sup>

In total, 692 members of ASAPS and the International Society of Aesthetic Plastic Surgery (ISAPS) responded to the 2016 survey. The survey played a key role in identifying not only morbidity and mortality numbers, but also aspects of the procedure that might improve patient safety. These findings were statistically significant and included:

- 1) Subcutaneous fat grafting only
- 2) Avoiding muscular injections
- 3) The use of thicker cannulas  $>4$  mm (Figure 1)
- 4) Avoidance of downward injection (Figure 2)

These data were published in the *Aesthetic Surgery Journal* in 2017.<sup>4</sup>

The major societies (ASERF, ASAPS, ISAPS, and the American Society of Plastic Surgeons [ASPS]) subsequently began a systematic education campaign to inform their members of the inherent risks of performing BBL surgery and what techniques or equipment could be used to minimize these risks. The campaign included frequent emails, white paper publications, and courses at the annual meetings. Special emphasis was placed on avoiding deep muscular fat transfer.<sup>7,8</sup>

In addition, an interorganizational Task Force was formed to study fat grafting to the buttocks. The Task Force included members of ASAPS, ISAPS, ASPS, and the International Federation for Adipose Therapeutics and Science (IFATS). Further anatomic studies were designed to test the validity of some of the recommendations of the initial studies. At this moment, it appears that many of the original recommendations of the Task Force were valid, especially keeping the injection plane in the fat (ie, above

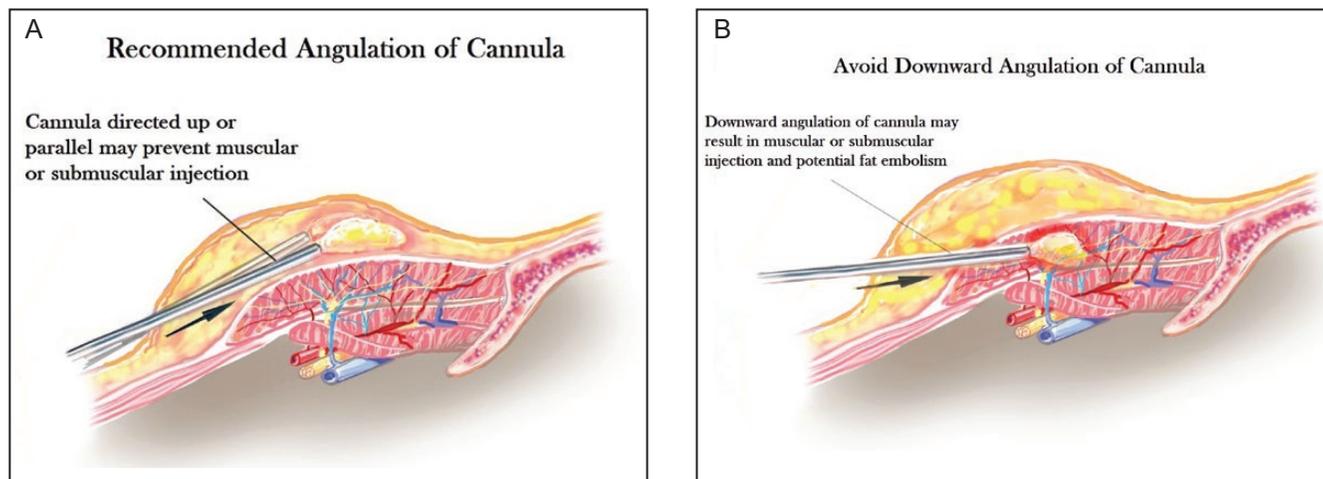
the muscle). This has also been confirmed by independent studies.<sup>9-11</sup>

The purpose of the survey was to determine whether members were aware of the safety recommendations from the fat grafting Task Force in 2017, their current surgical approach, and whether they had modified their approach after the recommendations. In addition, the survey asked members about fatal and nonfatal pulmonary fat embolism (PFE) in the past 24 months, the time since safety recommendations were established.

## METHODS

In 2017, the ASERF Gluteal Fat Grafting Task Force, comprised of surgeons, pathologists, and statisticians, published results of their survey of ASAPS and ISAPS member plastic surgeons about the incidence of fatal and nonfatal PFEs from BBL. The online survey comprised 15 questions regarding the number of procedures performed, the number of fatal and nonfatal PFEs occurring over a surgeon's career and over the past 1 year, the type and size of cannula used, the angulation and depth of injection, the approach and access used for fat grafting, and geographic location.

The survey instrument (SurveyMonkey Inc, San Mateo, CA) for our study comprised 29 closed-ended questions (Appendix). We included questions from the 2017 survey so that data could be combined and directly compared. Fourteen more questions, designed by the first author, were added pertaining to the members' awareness of the 2017 Task Force recommendations and if they had changed their techniques as a result of the recommendations. Members were also queried about the number



**Figure 2.** (A) It is recommended to angle the cannula upwards or parallel to ensure subcutaneous injection. (B) Downward injection may result in muscular or submuscular injections with potential for vascular injury and fat embolism.

of fatal and nonfatal PFEs in their career and in the last 2 years since the 2017 article and recommendations.

In May 2019, the link to the online survey was sent by email to all 5048 active members of ASAPS and ISAPS. An email reminder was sent in June 2019. The member rosters of the 2 organizations were compared so that a surgeon with membership of both organizations was only sent 1 survey and duplication was avoided. As with the 2017 survey, all responses were anonymous and it was not possible to know if an individual surgeon filled out the survey or filled it out more than once.

Continuous variables such as number of procedures and volume of fat grafting were examined for normal distribution and reported as mean or median as appropriate. Incidence rates of fatal, nonfatal, and any PFEs are reported with 95% confidence intervals (CIs). Because there were fewer than 10 fatal PFEs in each of the 2017 and 2019 surveys, 95% CIs for the difference in incidences could not be generated. Therefore, we compared the incidence of all PFEs (fatal and nonfatal) in the past 24 months from the 2019 survey with the incidence of all PFEs in the past 12 months from the 2017 survey.

All questions used for comparative analysis were closed-ended, multiple-choice questions. The answer choices were exhaustive, although participants could choose multiple answers to the same question. For example, when asked whether the angle of fat injection was up, parallel, or down, a participant could choose any number of these answers. Each of the answer options represented a unique variable in the dataset. These multiple response variables to each multiple-choice question were combined to generate a single response variable with mutually exclusive categories. These were further recoded to identify high-risk or low-risk categories as determined

in the 2017 survey. The 2017 and 2019 survey data were combined so we could compare the fat grafting technique before (2017) and after (2019) the Task Force recommendations were published. Continuous variables were compared by 2-tailed *t* test, whereas categorical variables were compared by Pearson chi-square test. Unless otherwise noted, a probability of type I error of <5% ( $P < 0.05$ ) was used to determine statistical significance. Survey data were extracted with Microsoft Excel (Microsoft, Redmond, WA) and analyses were performed with IBM SPSS Statistics 23.0 software (IBM Corporation, Armonk, NY).

## RESULTS

Of the 5048 ASAPS and ISAPS members invited to participate, 572 completed the survey (a response rate of 11.3%, compared with 14.3% in 2017). One record with 1000 reported PFEs over the past 2 years was excluded due to likely erroneous data entry. Forty percent of the surgeons were from the United States or Canada. Compared with the 2017 survey, there were more surgeons from Mexico/Central America and fewer from South America (Table 1).

Significantly fewer surgeons reported performing gluteal fat grafting than in 2017 (79.7% vs 88.4%,  $P < 0.01$ ). Among those not performing gluteal fat grafting, surgical risk was cited by 33% as the reason for not performing the procedure. The overall number of gluteal fat grafting procedures performed over the career and during the past 24 months was 203,629 and 29,904, respectively. The median number of gluteal fat grafting procedures over each surgeon's career, 30, was the same in 2019 and 2017. Table 2 shows the level of surgeon experience based on the number of cases performed; the distribution was not significantly different from 2017 ( $P = 0.16$ ).

**Table 1.** Geographic Location

Region	Percentage of respondents (2019)	Percentage of respondents (2017)
USA/Canada	40	38
Mexico/Central America	21	11
South America	14	24
Europe	14	15
Middle East/North Africa	6	5
Asia Pacific/Indian Subcontinent/Australia	3	4
Sub-Saharan Africa	1	1
Other	1	3

**Table 2.** Surgeons Stratified by Number of Gluteal Fat Grafting Procedures Performed Over Career

Number of procedures over career	Percentage of respondents (2019)	Percentage of respondents (2017)
1–50	53	53
51–100	10	10
101–300	15	17
301–500	6	7
500–1000	6	5
>1000	10	8

The survey queried occurrences of fatal and nonfatal PFEs over the career and over the past 24 months. Similar to the 2017 data, 3% and 7% of surgeons in the 2019 survey reported experiencing fatal and nonfatal PFEs, respectively, over the course of their careers. The 24-month interval was chosen because it encompasses the time since the Task Force recommendations were published in March 2017 and lends itself as a key variable for comparison with incidence rates prior to publication of the recommendations. Two fatal PFEs were reported in the last 24 months, resulting in an incidence rate of 1 in 14,952. Ten nonfatal PFEs were reported during the same period, an incidence rate of 1 in 2990. Due to the very small number of recent fatal PFEs in the 2019 and 2017 surveys we could not perform a meaningful statistical comparison. We therefore compared the incidence of any recent PFE (fatal and nonfatal) in the 2 surveys. There was a significant decrease in the incidence of any recent PFE in 2019 compared with 2017 (1 in 2492 vs 1 in 1030,  $P = 0.02$ ; [Table 3](#)).

Five hundred thirty-four (93.5%) respondents were aware of the Task Force recommendations. The core

**Table 3.** Comparison of PFEs Reports in 2019 and 2017 Surveys

	2019 survey (n = 571)	2017 survey (n = 692)
Surgeons with fatal PFEs over career	3%	3%
Surgeons with nonfatal PFEs over career	7%	7%
Recent fatal PFE incidence	1:14,952	1:3448
Recent nonfatal PFE incidence	1:2990	1:1449
Recent any PFE incidence*	1:2492	1:1030

Recent PFE incidence is defined as annual incidence of PFEs over past 12 months for the 2017 survey and over the past 24 months for the 2019 survey. \*Statistically significant at  $P = 0.02$

recommendations from the Task Force were to avoid injection into the deep muscle, use  $\geq 4.1$ -mm-diameter single-hole cannulas, and avoid downward angulation of the cannula. The survey queried the current technique as well as whether the surgeon has changed their technique after the Task Force recommendations. Of the respondents who previously injected fat in mid to superficial or deep muscle, 85.5% reported switching to injecting in the subcutaneous fat only. Only 0.8% surgeons in the current survey reported injecting in deep muscle, compared with 13.1% in 2017 ( $P < 0.01$ ; [Table 4](#)). With regards to cannula size, 30.5% respondents reported switching from  $< 4.1$ -mm cannulas to  $\geq 4.1$ -mm cannulas since the recommendations were published. Compared with 4.1% in 2017, 29.8% respondents in our survey reported only using cannulas  $\geq 4.1$  mm ( $P < 0.01$ ; [Table 4](#)). Change in the type of cannula used was reported by 8.4% respondents, with more surgeons using single-hole cannulas and fewer using sharp cannulas ( $P = 0.01$ ; [Table 4](#)). Among the surgeons who angled the cannula downward prior to the Task Force recommendations, 93.3% reported changing the angle of injection to a parallel or upward trajectory. Only 4% respondents reported angling the cannula down in the current survey, compared with 27.2% in 2017 ( $P < 0.01$ ; [Table 4](#)). Surgeons also reported change in access technique, with 30.3% reporting changing to injecting from medial to lateral through an intergluteal approach, 7.2% reporting change in patient's position for the procedure, and 7.5% reporting changing syringe size or method of fat injection ([Table 4](#)).

## DISCUSSION

The 2017 survey brought attention to the morbidity and mortality due to PFEs from BBLs. The resulting Task Force guidelines were widely publicized and disseminated to

**Table 4.** Comparison of Gluteal Fat Grafting Technique from 2019 and 2017 Surveys

	Number (%) in 2019	Number (%) in 2017	P value
Deepest plane injected			<0.01
Subcutaneous fat only	448 (85.7%)	252 (39.8%)	
Superficial-mid muscle	71 (13.6%)	298 (47.1%)	
Deep muscle	4 (0.8%)	83 (13.1%)	
Smallest cannula size used			<0.01
≤3 mm	148 (28.7%)	355 (56.2%)	
3.1-4 mm	214 (41.5%)	251 (39.7%)	
>4 mm	154 (29.8%)	26 (4.1%)	
Deepest cannula angle			<0.01
Up	215 (42.7%)	73 (12.0%)	
Parallel	269 (53.3%)	371 (60.8%)	
Down	20 (4.0%)	166 (27.2%)	
Type of cannula			<0.01
Single hole	236 (45.6%)	254 (40.1%)	
Multiple hole	201 (38.7%)	240 (37.9%)	
Blunt single and/or multiple hole	76 (14.7%)	115 (18.2%)	
Sharp	5 (1.0%)	24 (3.8%)	
Fat grafting access technique			<0.01
Medial to lateral	138 (27.5%)	93 (15.2%)	
Superior to inferior	90 (17.9%)	93 (15.2%)	
Lateral to medial	45 (9.0%)	77 (12.6%)	
Inferior to superior	17(3.4%)	33 (5.4%)	
Multiple techniques	212 (42.2%)	317 (51.7%)	
Fat grafting position			<0.01
Prone	283 (56.5%)	411 (66.7%)	
Prone-jackknife	99 (19.8%)	45 (7.3%)	
Lateral	44 (8.8%)	69 (11.2%)	
Multiple or other	75 (15.0%)	91 (14.8%)	
Smallest syringe size used			<0.01
≤10 mL	68 (13.5%)	163 (26.5%)	
20 mL	99 (19.6%)	108 (17.6%)	
60 mL	263 (52.1%)	318 (51.7%)	
Power or forced injection apparatus	75 (14.9%)	26 (4.2%)	

plastic surgeons across the globe. The current survey, performed 2 years after publication of the guidelines, gave us the unique opportunity to study any modification in techniques based on the guidelines, as well as any change in morbidity and mortality from PFEs. This survey had an 11.3% response rate, compared with 14.3% in 2017. Although low, the response rate is generally comparable to the participation obtained in such surveys. Variables such as the number of lifetime cases, geographic distribution, and volume of fat injection are similar in the 2 surveys, which may indicate that both are sampling the same group and likely represent random sampling to allow direct comparison. However, it is not possible to determine surgeons' motivation to participate or not participate in the survey, which may introduce sampling error. This survey shares the same concerns about the internal validity of the data as the previous one, such as recall bias, social desirability bias, terminology of the questionnaire, concerns about privacy, and inability to perform an audit. Surgeons may not accurately recall the number of BBL cases they have done or the number of PFEs they have encountered.<sup>4,12,13</sup> Generally, recall is worse for remote events than recent events. Therefore, we compared only the incidence of recent PFEs (12 months in the 2017 survey and 24 months in the 2019 survey) rather than career statistics. Social desirability bias may manifest as surgeons incorrectly reporting the surgical technique or the number of cases and PFEs. Because the responses to the survey were completely anonymous, it was not possible to verify the data. Additionally, the terms used in the questionnaire, such as the plane of fat injection, are arbitrary due to the nonvisualized nature of the procedure, and thus the response is subjective. However, since the 2017 paper extensively elaborated these terms, it may be reasonable to assume that they were well understood at the time of the second survey.

It appears the educational campaigns and research findings have been successfully disseminated to ASAPS and ISAPS members, with 93.5% of respondents being aware of the recommendations. In addition, the 2017 Task Force identified several factors that were statistically correlated with the safety of the procedure. These factors included subcutaneous fat injection only, the use of  $\geq 4.1$ -mm cannulas, and avoidance of downward injection. This survey showed that there was a positive movement in the trends towards these recommendations.

At this time, 86% of the current respondents exclusively inject in the subcutaneous plane. However, since the Task Force recommendations were published, 86% of those who previously injected in the muscle switched to the subcutaneous plane. In addition, 30% of respondents are using a cannula  $\geq 4.1$  mm to inject; 31% of respondents who used cannulas  $< 4.1$  mm cannulas have switched to larger cannulas. Only 4% of current respondents angle their tip

downwards. Since the task force recommendations, 93% of respondents have switched from angling their cannula tips downwards to angling them parallel or upwards.

Although this survey contains inherent limitations as described above, some positive trends were revealed. This survey suggests that fat grafting to the buttocks has become safer with the identification and adoption of safer techniques, primarily subcutaneous grafting. The 2017 survey showed a mortality rate due to recent PFEs of 1 in 3448, whereas the 2019 survey showed a mortality rate of 1 in 14,952. The latter survey indicates that the mortality for this procedure has reached an acceptable level, similar to that of abdominoplasty (1 in 13,193 mortality).<sup>6</sup> Interestingly, a recent survey of Brazilian plastic surgeons showed a mortality rate of 1 in 20,117 despite the fact that only 56% of the respondents were only exclusively grafting in the subcutaneous plane.<sup>14</sup> Overall, it appears that fat grafting to the buttock is an acceptably safe procedure if certain guidelines are followed, most importantly, grafting only in the subcutaneous plane.

Although the mortality and embolism rates have significantly improved since the publication of the original ASERF Task Force recommendations in 2017, there is still room for improvement. We found that 14% of respondents are still injecting in the muscle, 70% are still utilizing cannulas  $< 4$  mm, 85% are still using syringes, and 4% are still angling down during fat transfer.

It is anticipated that improvements will be obtained as recommendations continue to be disseminated to the members through direct communication and during annual meetings. In addition, ASERF and ASAPS will continue to participate and encourage studies trying to elucidate the best practices for the procedure.

Although the improvements in patient safety in this follow-up survey are impressive, they do have precedence. After liposuction was introduced in the United States in the 1980s, there was a similar concern for patient safety.<sup>15,16</sup> A task force was created to study liposuction and recommendations were given. After the adoption of the recommendations, liposuction became a safer procedure.<sup>17-19</sup>

Despite the improvements in safety for this procedure in the past 24 months, ASERF and ASAPS acknowledge that many more answers need to be obtained in defining the safest instrumentation, techniques, and anatomic considerations. Much success has been obtained in a short period of time, but continued persistence will further improve the safety of the procedure.

At this point, the study of BBL outcomes is limited by survey data. The goal is to develop an ASERF database using the Aesthetic Neural Network, which currently has 300 ASAPS members and continues to expand. By developing a metadata analysis system, ASERF could produce reliable and verifiable data on the safety of the BBL.

## CONCLUSIONS

The positive aspects of the survey highlight how research and education correlate with improved patient safety. It also highlights that gluteal fat transfer is currently safer in the hands of ASAPS, ASERF, and ISAPS members who are aware of and have adopted the latest patient safety recommendations. The current survey indicates that this procedure has reached a level of acceptable safety. ASERF encourages the establishment of rigorous evidence-based research to enlighten the safety techniques and instrumentation that can make this procedure safer.<sup>20-22</sup>

## Supplementary Material

This article contains supplementary material located online at [www.aestheticsurgeryjournal.com](http://www.aestheticsurgeryjournal.com).

## Disclosures

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