Reduction of Lipoplasty Risks and Mortality: An ASAPS Survey

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Background: *Previously published articles presenting rates for lipoplasty morbidity and mortality have reported on procedures performed before mid 1998.*
Objective: *The present survey reports on morbidity and mortality for lipoplasty procedures performed by members of the American Society for Aesthetic Plastic Surgery (ASAPS) from September 1, 1998, through August 31, 2000. It assesses whether ASAPS-member surgeons have modified their lipoplasty practices in accordance with the 1998 recommendations of the Lipoplasty Task Force.*
Methods: *In September 2000, ASAPS sent out a 4-page questionnaire to 1432 Active Members, all of whom were board-certified plastic surgeons. The survey included questions about complications and fatal outcomes associated with lipoplasty procedures, performance of combination procedures, patient selection, changes in lipoplasty and anesthesia techniques, and surgical facility accreditation. Completed surveys were anonymous and were mailed by respondents directly to an independent research firm for collation. Further data analysis was conducted by an independent statistician.*
Results: *A total of 754 questionnaires were returned, for a response rate of 53%. ASAPS members reported on 94,159 lipoplasty procedures. In all, 66% of the procedures were lipoplasty only, 20% were lipoplasty without abdominoplasty but with one or more additional procedures, and 14% were lipoplasty with abdominoplasty, with or without any other procedures. The most frequently reported postoperative event was nausea/vomiting (1.02%, or 1 per 98 procedures). The most frequently reported major complication was skin slough (0.0903%, or 1 per 1107 procedures). In all, there were 245 major complications, for a rate of 0.2602%. Death associated with lipoplasty performed as an isolated procedure was rare; the mortality rate was 0.0021%, or 1 per 47,415 procedures. Stated positively, the estimated non-mortality probability is 99.98%. When lipoplasty was performed with other procedures, excluding abdominoplasty, the rate was 0.0137%, or 1 per 7314 procedures. When lipoplasty was combined with abdominoplasty, with or without other procedures, the rate was 0.0305%, or 1 per 3281 procedures—a rate 14 times greater than that for lipoplasty only. Nearly 33% of respondents said that they had modified their approach to lipoplasty and/or their approach to patient selection within the last 24 months in accordance with published recommendations of the Lipoplasty Task Force.*
Conclusions: *The ASAPS survey documents the current safety of lipoplasty when it is performed as an isolated procedure by properly trained surgical specialists adhering to recommended standards of clinical practice. Further studies are needed to examine the factors that increase the risk in combined procedures as well as the effectiveness of prophylactic measures in avoiding complications.*

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According to statistics compiled by the American Society for Aesthetic Plastic Surgery (ASAPS),[1] the number of cosmetic procedures nationwide increased 119% between 1997 and 1999; for lipoplasty, the most frequently performed cosmetic surgery, the number increased 62%. During the same period, concern about the safety of lipoplasty was a frequent topic in the news media.

Current data are needed to help establish the actual rates of complications and mortality associated with lipoplasty. The author, as Chair of the ASAPS Body Contouring Committee, was asked by the Society to oversee implementation of a survey to gather information on the safety of lipoplasty as performed by its members. Although the inherent limitations of self-reported data on surgical complications and deaths were recognized, it was felt that a significant response from ASAPS members would provide meaningful data.

Background

In 1989, Teimourian and Rogers[2] reported on a survey of complications from 112,756 body contouring procedures performed by 935 board-certified plastic surgeons from January 1984 to January 1988. These included 75,591 major lipoplasty procedures (distinguishing between "major" and "minor" lipoplasty was left to the subjectivity of the reporting surgeon). The authors concluded that major lipoplasty, with a mortality rate of 2.6 deaths per 100,000 procedures (0.0026%, or 1 per 38,462) was a safe operation. Comparative data on abdominoplasty, gathered as part of the same survey, showed a much higher mortality rate—41.4 deaths per 100,000 procedures (0.0414%, or 1 per 2,415). Combination procedures were not addressed by the survey.

In January 2000, Grazer and de Jong[3] suggested that the risk of death associated with lipoplasty had escalated to 1 per 5224 procedures (0.0191%). Their article was based on a random survey reporting on 496,245 lipoplasty procedures performed from 1994 to mid 1998. Although the survey was sent to 1200 board-certified plastic surgeons who were members of ASAPS, the respondents were asked not only about any fatalities from lipoplasty that they had personally encountered but also about any such incidents that they had heard about in their communities; therefore, the results did not reflect the specific practices of ASAPS members. The survey was criticized for a method that could easily result in duplicate reporting of deaths.[4]

In addition, by the time the survey results were published, it was widely believed that educational efforts undertaken by the Lipoplasty Task Force involving several plastic surgery societies—ASAPS, the American Society of Plastic Surgeons, and the Lipoplasty Society of North America—during the preceding 2 years had altered the way in which lipoplasty was being performed by board-certified plastic surgeons and significantly increased the level of patient safety. Corroborating this belief was a statement from the Medical Director of The Doctors' Company, the nation's largest malpractice insurer of board-certified plastic surgeons, that from October 1998 to the time of the ASAPS survey in September 2000 there were no claims of significant complications or death associated with any lipoplasty procedures performed by its more than 1000 insured board-certified surgeons.[5]

From 1998 to the present, ASAPS and other plastic surgery organizations have focused particular educational efforts on lipoplasty safety. In September 1998, after conducting its own survey, the Lipoplasty Task Force attempted to identify the most significant risk factors for lipoplasty. These were widely publicized to board-certified plastic surgeons, including all ASAPS members, through educational meetings, instructional courses, and publications. The Lipoplasty Task Force data and recommendations were highlighted by Rohrich and Beran[6] in 1999. In 2000, ASAPS conducted the Survey on Office Surgery and Lipoplasty to gather current data on ASAPS members' practices.

Materials and Methods

In September 2000, ASAPS sent out a 4-page questionnaire ("ASAPS Survey on Office Surgery and Lipoplasty") to 1432 Active Members; 1398 of these members were certified by the American Board of Plastic Surgery (ABPS) and practiced within the United States, and the other 34 had certification in plastic surgery from the Royal College of Physicians and Surgeons of Canada (considered the Canadian equivalent of ABPS certification). The median number of years in plastic surgery practice of the survey respondents was 20. A previous survey of the ASAPS membership had shown that 69% of the average member's practice is devoted to aesthetic (cosmetic) surgery.[7]

The primary goals of the survey were to:

- assess rates of morbidity and mortality associated with lipoplasty procedures performed by ASAPS members from September 1,1998, through August 31, 2000, and

Table 1. Accreditation of office-based surgical facilities by organization (multiple responses allowed)*

Organization	Percentage of respondents with accreditation
American Association for Accreditation of Ambulatory Surgery Facilities (AAAASF)	77.4
Accreditation Association for Ambulatory Health Care (AAAHC)	7.6
Joint Commission for Accreditation of Health Organizations (JCAHO)	4.7
Medicare	19.4
State-licensed	18.6

*Among 65% of ASAPS respondents operating in accredited office-based surgical facilities.

- determine whether ASAPS members have significantly changed any aspects of their approach to patient evaluation for lipoplasty or lipoplasty since September 1998, when physician education by plastic surgery organizations concerning lipoplasty risk factors was sharply accelerated.

The survey included questions to determine the percentage of ASAPS members who currently operated in surgical facilities that were (1) accredited by a national or state-recognized accrediting agency/organization, (2) state-licensed, and/or (3) Medicare-certified under Title XVIII. In addition, survey questions were developed to determine the percentage of ASAPS members, among those whose surgical facilities did not meet one or more of those criteria, who were planning to seek facility accreditation, licensure, or certification in the near future. This information was important in the light of the Joint Policy Statement on Accreditation of Non-Hospital Surgery Facilities,[8] approved by the ASAPS Board of Directors on February 19, 2000; the statement called for each ASAPS member to perform all plastic surgery procedures involving anesthesia (other than minor local anesthesia and/or minimal oral tranquilization) only in surgical facilities meeting at least one of the criteria. The policy statement included a 3-year phase-in period with a deadline of July 1, 2002.

An independent research firm in Columbus, Ohio, conducted the survey mailing using address labels for ASAPS Active Members that had been provided by the Society. Completed surveys, which were anonymous, were mailed directly to the firm by respondents. After the collation of data, a statistical analysis was conducted by an independent statistician affiliated with New York University.

Results

A total of 754 questionnaires were returned, for a response rate of 53%. The tabulated surveys showed that respondents performed a total of 439,132 cosmetic surgical procedures from September 1, 1998, through August 31, 2000; the average was 302 procedures per year per surgeon. These data are comparable to those obtained in other studies.[1,9] In all, 61.4% of the procedures were performed in office-based surgical facilities. Among ASAPS respondents operating in office-based facilities, 65.2% said that their facility was state-licensed, Medicare-certified under Title XVIII, or accredited by a national or state-recognized accrediting organization (Table 1). However, 95.1% of responding ASAPS members provided answers indicating that they either were already in compliance or planned to be in compliance with the Joint Policy Statement requiring surgical facility accreditation, licensure, or certification by July 2002.

Of those respondents who indicated that they would not seek facility accreditation, a significant number said that they performed only minor procedures in the office-based unit or that they planned to switch to another facility. As was to be expected, given that all respondents were board-certified in plastic surgery, virtually all (97.8%) indicated that they had hospital privileges for the procedures that they performed in an office-based setting.

Lipoplasty morbidity

ASAPS members reported specifically on a total of 94,159 lipoplasty procedures. In all, 66% of the total number of lipoplasty procedures were lipoplasty only; 20% were lipoplasty without abdominoplasty but with one or more other procedures; and 14% involved lipoplasty with abdominoplasty, with or without any other procedures. The most frequently reported postoperative event was nausea/vomiting (1.02%, or 1 per 98 procedures). The most frequently reported nonfatal major complication was skin slough (0.0903%, or 1 per 1107 procedures). In all, there were 245 major nonfatal complications in the 94,159 reported procedures. This number compares favorably with the 175 significant complications in 24,295 lipoplasty procedures reported by the Lipoplasty Task Force.[10] With regard to our sur-

Table 2. Nonfatal complications from lipoplasty and lipoplasty combination procedures

Complication	Percent	Rate (1 complication in every __ procedures)
Skin slough	0.0903	1 per 1107
Ultrasound-assisted lipoplasty skin burns	0.0712	1 per 1404
Deep vein thrombophlebitis	0.0329	1 per 3040
Pulmonary embolus	0.0266	1 per 3759
Excessive blood loss	0.0149	1 per 6711
Fluid overload	0.0138	1 per 7246
Fat emboli	0.0053	1 per 18.868
Cannula penetration of abdominal cavity	0.0021	1 per 47,619
Lidocaine toxicity	0.0021	1 per 47,619
Surgical shock	0.0011	1 per 90,909

vey, nonfatal complications and their frequencies are listed in Table 2.

Lipoplasty mortality

Death associated with lipoplasty performed as an isolated procedure was rare; the mortality rate was 0.0021%, or 1 per 47,415 procedures. Stated positively, the estimated non-mortality probability is 99.98%. When lipoplasty was performed with other procedures, excluding abdominoplasty, the mortality rate was 0.0137%, or 1 per 7314 procedures. When lipoplasty was combined with abdominoplasty, with or without other procedures, the mortality rate was 0.0305%, or 1 per 3281 procedures (Table 3). It is noteworthy that in our survey, the mortality rate for lipoplasty combined with abdominoplasty is comparable to, but lower than, the mortality rate for abdominoplasty alone (0.0414%, or 1 per 2415 procedures) that was reported in 1989 by Teimourian and Rogers.[2]

Discussion

Data from this survey suggest that significant progress has been made in improving patient safety in cosmetic surgery. First, the percentage of ASAPS members operating in office-based surgical facilities that are accredited, state-licensed, or Medicare-certified is substantial and increasing. Second, the survey findings suggest that lipoplasty research and educational efforts have begun to yield measurable results.

Table 3. Mortality rate for 94,159 lipoplasty procedures performed by ASAPS members: Sept 1, 1998, through Aug 31, 2000

Procedure	Percent	Rate (1 death in every __ procedures)
Lipoplasty alone	0.0021	1 per 47,415
Lipoplasty with other procedures, excluding abdominoplasty	0.0137	1 per 7314
Lipoplasty with abdominoplasty, with or without other procedures	0.0305	1 per 3281

Table 4. Changes to lipoplasty technique or patient evaluation, since September 1998, by 32.7% of ASAPS respondents who reported making modifications

Change in technique	Percentage of respondents changing technique or evaluation
Less likely to perform in combination	35.1
Stricter patient selection criteria	33.3
Generally remove less fat in one session	31.1
Limit length of surgery	31.1
Have modified anesthesia technique	20.4
Additional patient monitoring procedures	11.1
Other	25.8

The Lipoplasty Task Force, in 1998, reported on data from lipoplasty procedures performed by board-certified plastic surgeons (however, not exclusively by ASAPS members) and presented a mortality rate of 0.02%, or 1 death per 5000 lipoplasty surgeries.[10] As a result of these findings, the Lipoplasty Task Force emphasized to plastic surgeons that performing multiple unrelated procedures at the same time was among several factors that appeared to increase lipoplasty risks.

The data obtained from the current ASAPS survey underscore this risk more directly than those from any previous survey. At the same time, however, the mortality rate of 1

Table 5. Likelihood of denying surgery to a prospective lipoplasty patient

Risk factor	Percentage of respondents denying surgery
Serious medical problems	98.4
Unrealistic expectations	97.9
Inadequate skin tone/refuse skin tightening	78.4
Significantly above ideal body weight	68.3
History of alcohol or drug abuse	65.4
Heavy smoker	45.9
History of significant weight fluctuations	40.1

Table 6. Effect of excess body weight on denial of surgery

Percentage above ideal body weight	Percentage of respondents denying surgery
More than 15	12.9
More than 20	31.9
More than 25	55.2

per 47,415 procedures when lipoplasty is performed as an isolated procedure presents a strong case for lipoplasty safety. The survey confirms that when other procedures are performed with lipoplasty, the risks increase; the specific combination of lipoplasty and abdominoplasty presents the greatest risk.

Significantly from the standpoint of increased patient safety, nearly one third (32.7%) of ASAPS respondents said that they had modified their lipoplasty practice within the 24 months of the survey period (Table 4). Of those indicating that they had made changes, the most frequent modification was that they were less likely to perform lipoplasty in combination with certain other procedures. Almost as common, however, were using stricter patient selection criteria, limiting the length of surgery, and removing a smaller volume of fat.

Proper patient selection is always of utmost importance in the safety of cosmetic surgery. ASAPS members responding to the survey indicated that there were many situations in which they were likely to decide against performing lipoplasty on particular patients because of concerns about safety or for other reasons (Table 5).

Table 7. Volumes of supernatant fat removed per patient

Supernatant fat (cc)	Percentage of patients treated
Less than 500	8.7
500-1500	19.7
1501-2500	25.9
2501-3500	24.2
3501-5000	16.1
More than 5000	5.4

In 1998, the Lipoplasty Task Force cited poor patient health as a significant risk factor in lipoplasty.[6] Virtually all responding ASAPS surgeons (98.4%) said that they would be likely to deny lipoplasty surgery to an individual with a serious medical problem. Interestingly, however, almost as many (97.9%) said that they would be unlikely to perform surgery on a prospective patient who had unrealistic expectations. Other groups of patients on whom a majority of respondents said that they would probably be unwilling to perform lipoplasty included (1) patients with inadequate skin tone who were unwilling to undergo necessary skin tightening procedures (78.4%), (2) patients who were significantly above their ideal body weight (68.3%), and (3) patients with histories of alcohol or drug abuse (65.4% of respondents; Tables 5 and 6). Nearly half (45.9%) of the respondents said that they would be likely to deny lipoplasty surgery to a heavy smoker.

The Lipoplasty Task Force report suggested that excessive amounts of fluid and local anesthesia were other factors that can increase the surgical risk associated with lipoplasty.[6] The current ASAPS survey results show that 98% of respondents were using a wetting solution-to-aspirate volume of 2:1 or less.

The final risk factor cited by the Lipoplasty Task Force was excessive removal of fat.[6] In the 24 months of the study, most (54.3%) of the lipoplasty procedures reported involved removal of 2500 cc or less of supernatant fat. Only 5.4% of patients underwent so-called "large-volume" lipoplasty, in which more than 5000 cc of supernatant fat is removed (Table 7).

Conclusions

The ASAPS survey documents the current safety of lipoplasty when it is performed as an isolated procedure

by a properly trained surgical specialist adhering to recommended standards of clinical practice.

Surgeons and their patients must carefully consider both the benefits and the risks of combining lipoplasty with other procedures, realizing that the risk of complications increases substantially when multiple procedures are performed. Antiembolism measures should be implemented routinely. Compression devices to minimize the risk of deep vein thrombosis and embolus have recently been recommended for any procedure performed with the patient under general anesthesia and lasting longer than 1 hour.[6] Proper patient selection, good clinical judgment in anesthesia technique, and prudent postsurgical monitoring are also necessary to achieve maximum patient safety.

Safety measures include using properly equipped facilities with appropriate procedures in place for handling emergencies. In addition to mandatory accreditation of office-based surgical facilities, there should be mandatory reporting of all untoward events associated with cosmetic surgery. Such records, as well as the requirement of appropriate credentials for physicians in the office-based surgical environment, ultimately will help to improve standards of care and make surgery safer for all patients undergoing cosmetic procedures.

By July 2002, ASAPS members almost universally will be operating in accredited surgical facilities. As this survey demonstrates, a significant number of surgeons have changed their approach to lipoplasty as a result of the increased educational focus on risk reduction. The combination of these 2 factors suggests that among ASAPS members the safety record for lipoplasty will improve further over the next decade.

Outcome studies on the effects of combined procedures on surgical risk will also be important to the continuation of progress in meeting patient needs for safe and effective cosmetic surgery. The morbidity and mortality rates for specific procedure combinations need careful scrutiny. We need more information to determine whether it is the combination of certain procedures or other factors, such as extended operating time, that most significantly influence the rate of complications. Risk factors associated with abdominoplasty should be investigated. We also need additional data to help us determine whether antiphlebitis/antiembolism measures actually are effective in lowering the rate of complications and mortality for lipoplasty and other specific procedures or combinations of procedures.

Many surveys result in data that should provoke further study; this is one of them. An ongoing effort to improve results by carefully analyzing outcomes is vital if we are to serve our patients well. ■

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Commentary

by Mark L. Jewell, MD

Historically, lipoplasty has been considered a safe procedure. Data such as those presented in 1989 by Teimorian and Rogers[1] show that in the mid 1980s, lipoplasty had a rate of morbidity and mortality comparable to or lower than the rates for other major cosmetic surgical procedures. Although substantially flawed, the study by Grazer and de Jong[2] of lipoplasty procedures performed between 1994 and mid 1998, which showed a mortality rate of 0.0191%, or 1 per 5224 procedures, suggested that something had changed since the 1980s. In retrospect, it seems that during a relatively brief period in the evolution of lipoplasty technique, limitations necessary to achieve the highest level of safety were, in some instances, unknowingly or unwisely overlooked or ignored. Recent changes in the way that plastic surgeons approach lipoplasty surgery and patient selection are attributable, in large part, to the efforts of the professional plastic

surgery societies to identify lipoplasty risk factors and then to expand and improve lipoplasty education among board-certified plastic surgeons.

The ASAPS survey identifies variable levels of risk for lipoplasty, depending on whether it is performed alone or in combination with other procedures. At the same time, as Dr. Hughes points out, there are many more questions that need answers before we can make definitive statements about whether plastic surgeons should or should not perform certain procedures in combination with lipoplasty. However, we certainly have been put on notice that combined procedures carry an increased risk of patient mortality.

In particular, prudent patient selection is a necessity that we, as responsible aesthetic surgeons, cannot afford to ignore. The ASAPS survey shows that a large percentage of ASAPS-member surgeons have altered their patient selection criteria since 1998. Many surgeons also have made significant modifications to their lipoplasty technique.

Although the survey does not tell us whether prophylactic measures to minimize the incidence of deep vein thrombosis and/or pulmonary embolism (DVT/PE)—ie, pneumatic compression boots/sequential compression devices or low molecular weight heparin—impacted the outcomes of specific procedures, such measures are increasingly advisable (see page nnn). Teimourian and Adham[3] claimed to have avoided any occurrence of DVT/PE in more than 10,000 cases. They attributed this to the use of intravenous alcohol, intraoperative steroids, intermittent pneumatic compression of the legs, and early ambulation. Additional research is needed for a better understanding of why individuals undergoing abdominoplasty or combinations of lipoplasty and abdominoplasty have a greater risk of DVT/PE[1] and other complications.

DVT/PE can occur during cosmetic surgery as it does in other medical and surgical situations (trauma, intensive care unit patients, total joint surgery). The rates shown in the ASAPS survey of 1 DVT per 3040 procedures and 1 PE per 3759 procedures, including lipoplasty combination procedures, are lower than rates of venous thromboembolism (VTE) (1 per 500 procedures) for 30,000 gynecologic surgeries reported by Schorge et al.[4] In that study, 91% of patients diagnosed with VTE received some form of prophylaxis. One of the factors in a decreased rate of VTE (1 per 4000 procedures) in a subset of patients was surgical anesthesia fewer than 3 hours.

Recent reports demonstrate that a synthetic pentasaccharide containing the biologically active region of heparin is more effective than low–molecular-weight heparin for the prevention of DVT after total hip surgery.[5] This new anticoagulant works by selective inhibition of factor X_a through potentiation of the effects of antithrombin.

As physicians, we have been trained to view the occurrence of surgical complications in a scientific context that includes information on the relative frequency and severity of such events. In contrast, the public, the media, and even regulatory bodies often use single adverse events as a basis for attitudes and judgments that ultimately can impact medical practice in either positive or negative ways. This is particularly true of elective cosmetic surgery,[6] in part because of the inaccurate perception that cosmetic surgery is, or should be, "risk free."

The risk of adverse events is an inherent part of life, whether such events are associated with one's occupation, travels, lifestyle, avocations, or health care. How individuals choose to manage these risks depends on many factors. For the aesthetic surgeon, there can be no deviation from the highest standards for reducing patient risk. That is why ASAPS has taken a strong position regarding mandatory accreditation, state licensure, or Medicare certification of members' surgical facilities by July 2002.

For patients, adequate understanding of risk must precede all surgical decisions. Quantifying risk for patients remains a complex problem in informed consent, involving not only the quality of available data on risk but also the highly variable ways in which individuals understand and process information.[7] Nevertheless, statistics such as those derived from the ASAPS survey provide us with improved tools for educating patients about the risks of elective cosmetic surgery.

The latest ASAPS data confirm that lipoplasty is a safe procedure when it is performed by well-trained surgeons exercising good medical and surgical judgment. A comparison between the results of this survey examining lipoplasty procedures performed since September 1998, and the results of surveys of morbidity and mortality from lipoplasty procedures performed in the early and mid 1990s suggests that considerable progress has been made by ASAPS-member surgeons in diminishing patient risk. It also suggests the positive impact of physician education by ASAPS and other professional plastic surgery societies, which has increased awareness of the risk factors involved in lipoplasty and provided guidelines for increasing patient safety.

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