Facelift Complications and the Risk of Venous Thromboembolism: A Single Center’s Experience

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Abstract
Background: The number of facelifts performed in the United States has steadily increased over the past decade. Moreover, the risk of venous thromboembolism in plastic surgery has been established in recent studies.

Objectives: The authors investigate the overall complication rate in a single-center series to identify risk factors and determine the risk of venous thromboembolism.

Methods: A retrospective chart review was performed for patients who underwent a facelift procedure at a private clinic in Atlanta, Georgia, between January 2004 and December 2010. A total of 630 patients were included. The data collected included patient demographics, comorbidities, body mass index, smoking history, operative time, and concurrent procedures. All postoperative complications were recorded.

Results: The mean age of the patients in this series was 58.4 ± 7.3 years. A small percentage of the patients were men (8.1%); 23.2% had hypertension; 4.9% were smokers; and 3.5% had a history of taking prophylactic aspirin. The mean operative time was 255.6 ± 81.6 minutes. Almost a quarter (23.6%) of the patients underwent concurrent procedures. There were 38 complications, including 29 hematomas, two deep vein thromboses (DVTs), two eye infections, two instances of partial skin loss, and one ectropion. Risk of complications was significantly higher in men, patients over 55, and those with a body mass index > 30 kg/m². The risk of hematoma was higher (P < .05) in men, patients over 55, those with a history of hypertension, and those taking aspirin. The risk of DVT increased when the procedure time was longer than five hours. Both patients who developed DVT had undergone a facelift in combination with another procedure. There was also an increase in the risk of complications when the facelift was combined with two or more procedures.

Conclusions: Identifying various risk factors for complications, especially DVT, can help to minimize those factors in the postoperative period and treat complications effectively when they occur. The data indicate that the number of concurrent procedures is a specific risk factor for development of DVT, so care should be taken when planning for multiple treatment sites. Combining facelift with other procedures also increases the risk of complications, especially DVT.

Level of Evidence: 4

Keywords
rhytidectomy, facelift, complication, venous thromboembolism

Accepted for publication September 2, 2011.

According to the American Society for Aesthetic Plastic Surgery’s National Data Bank statistics,¹ there was an increase of almost 9% in the total number of cosmetic surgical procedures between 2009 and 2010, with over 1.6 million procedures performed in 2010. Furthermore, the total number of cosmetic procedures has increased over 155% since 1997. Over that time, surgical procedures increased by 71%, while nonsurgical procedures increased by 228%. In 2010, 127,512 facelifts were performed in the United States (a 28.5% increase since 1997), making it the seventh-most-common cosmetic surgical procedure. The majority of facelifts were performed on women (91.9%), and American Society for Aesthetic Plastic Surgery (ASAPS) members performed an average of 12.3 facelifts in 2010.

Over the past few years, venous thromboembolism (VTE) has commanded our field’s attention. It is well established that VTE leads to substantial costs, morbidity,

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Fecha de recepción: 2 de septiembre de 2011.

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DOI: 10.1177/1090820X12442213
www.aestheticsurgeryjournal.com
and mortality. An estimated 2 million Americans develop this condition annually, and 200,000 patients die from VTE annually. According to the American Health Association, VTE contributes to more annual deaths than breast cancer, AIDS, and traffic accidents combined. Pulmonary embolus (PE) is the most common preventable cause of death in hospitalized patients. We should not take lightly the incremental cost of this condition on health care ($10,000 per deep vein thrombosis [DVT] and $20,000 per pulmonary embolus). Many plastic surgeons have become increasingly aware of the need for prevention of VTE, even though the reported incidence of VTE in our specialty is low. Recent studies have cited rates of VTE from 1% to 2%, which translates to an estimated 33,000 plastic surgery patients affected per year. It is also important to note that the incidence is most likely underestimated, with up to two-thirds of cases being asymptomatic.

In 2008, Keyes et al published data from the American Association for Accreditation of Ambulatory Surgery Facilities (AAAASF) examining mortality in outpatient surgical centers. The data were acquired through an Internet-based quality assurance and peer review reporting system. The authors found 23 deaths in 1,141,418 procedures performed in association-accredited facilities, making the mortality risk one in almost 50,000. Interestingly, four of those deaths were in patients undergoing facelifts and related procedures, which made facelift the second-most-common procedure associated with postoperative mortality following abdominoplasty. Over half of the 23 deaths were related to VTE.

In 2001, Reinisch linked VTE to facelifts. He surveyed 273 ASAPS surgeons who had performed 9,937 facelifts. The incidence of DVT was 0.35%, and the incidence of pulmonary embolus was 0.14%, with 0.01% of the total being fatal. According to the 2010 ASAPS data, this translates into an estimated 446 patients developing DVT and 179 patients developing pulmonary embolism after a facelift. Interestingly, a survey by Broughton et al showed that only 48.7% of surgeons performing facelifts administered any DVT prophylaxis on a continual basis.

In view of the statistics about facelift procedures and DVT risk, we examined the operative results in the facelift population at a private outpatient center to determine overall complication rate and risk factors and to identify specific risks of VTE.

METHODS

Patients

The records of all patients who underwent a facelift procedure in a four-surgeon private practice—specifically, an AAAASF–accredited outpatient facility in Atlanta, Georgia—between January 2004 and December 2010 were retrospectively reviewed for this study. A total of 630 patients were included. Demographic and clinical data included age, sex, body mass index (BMI), tobacco use, comorbidities, and medications. Comorbidities included hypertension, diabetes mellitus, and respiratory and other chronic conditions. Operative data included primary versus secondary facelift, any additional procedures performed (other than procedures related to the facelift), placement of drains, and operative time. All patients underwent a comprehensive preoperative process, including a full history and physical exam, age-appropriate laboratory work, and an EKG for preoperative clearance by the anesthesia department. All patients received general anesthesia administered by an anesthesiologist and DVT prophylaxis in the form of TED compression stockings and sequential compression devices. All patients were monitored overnight prior to discharge. All postoperative complications occurring within 30 days were also recorded. A complication was defined as an adverse postoperative event occurring as a direct consequence of the facelift or related procedure and requiring close observation or additional treatment.

Statistical Analysis

The patients’ characteristics were compared by two-tailed student, Fisher, or $\chi^2$ tests. A two-tailed student $t$-test set for a Type 1 error of 5% ($\alpha = 0.05$) was applied to determine significance for continuous variables. Logistic regression analysis was performed to identify the independent risk factors for postoperative complications. All analyses were performed with SPSS 17.0.

RESULTS

Patient Demographics

Table 1 shows the demographic characteristics of the 630 patients in this study (Table 1). The average patient age was 58.4 ± 7.2 years, and the majority of the patients (71.4%) presented at 55 years of age or older. Women made up a greater proportion of the patient population than men (91.9% vs 81.1%). Average BMI was 23.2 ± 3.9. The majority of patients (71.1%) had a BMI exceeding 25. Eighty-two patients (13.0%) presented with multiple comorbid conditions. The most common chronic medical condition was hypertension (23.1%), followed by thyroid disease (6.3%) and diabetes mellitus (19.9%). Thirty-one patients (4.9%) were active smokers, and 22 (3.5%) were taking aspirin on a regular basis, although patients were asked to stop taking aspirin seven days before surgery and stop smoking three weeks preoperatively, per facility protocol. Interestingly, 147 patients (23.3%) had been diagnosed with depression or had been receiving antidepressant medication.

Operative Data

The majority of patients underwent a facelift only (76.4%). Average operating time in the study was 4.2 ± 1.3 hours. Patients who underwent a facelift with additional procedures spent more time in the operating room (4.7 ± 1.4 hours) compared to those who had a facelift only (4.0 ± 1.2 hours, $P < .001$). Procedures exceeding five hours were recorded in 169 cases (26.8%), and in 25 cases (3.9%), they exceeded seven hours.
A total of 149 patients (23.6%) underwent facelift in combination with other cosmetic procedures (Table 2). Most patients who underwent facelift concurrently received only one additional unrelated procedure (21.4% of the total patient population), while a smaller number (2.2% of the patient population) had two or more combined procedures (Figure 1). The majority of the patients who underwent concurrent procedures were women (93.9%). The most common procedure was liposuction (5.5%), followed by rhinoplasty (3.8%) and abdominoplasty (2.3%). Thirteen women (2.0%) underwent simultaneous breast augmentation, and 0.6% had a breast reduction. Drains were placed in 291 cases (46.1%).

### Overall Complications and Risk Factors

The overall complication rate was 6%, or 38 complications (Figure 2). The most common postoperative complication was hematoma (4.6%). Chemosis, eye infection, and skin loss occurred at a rate of 0.3% each. Two patients developed DVT postoperatively (0.3%). Pulmonary emboli were not observed. One patient developed ectropion (0.15%). On univariate analysis, patients over 55 years of age were found to have a higher rate of postoperative complications compared to younger patients (7.3% vs 2.8%, \( P = .03 \)). Incidence of postoperative complications was significantly higher for patients who took aspirin preoperatively on a regular basis (27.2%) compared to those without a history of taking aspirin (5.2%, \( P > .001 \)), even though all patients stopped taking aspirin seven days prior to surgery. Men developed more complications than women (11.7% vs 5.5%), but the difference did not reach statistical significance (\( P = .07 \)). Among the patients with BMI > 25, sixteen (9.5%) experienced postoperative complications, which was significantly higher than the rate in patients with a lower BMI (4.7%, \( P < .026 \)). Operative time exceeding five hours was associated with a higher complication rate (5.8% vs 5.1%); however, this was not statistically significant (\( P = .154 \)) (Table 3). Aspirin use was a single independent risk factor on multivariate analysis.

Unpublished data from the same surgical center at an earlier point showed a trend of increased complication rates when facelifts were combined with other procedures. In our series, we also observed a similar trend, though it was less pronounced.
compared to previous studies. In our patient population, we noted two DVT occurrences, for an incidence rate of 0.3%. No cases of pulmonary embolism were observed. Both patients who developed DVT had undergone a facelift in combination with another procedure, and both cases lasted more than five hours (Table 5). The patients presented with leg swelling and calf pain. DVT diagnosis was made with an ultrasound and confirmed by computed tomography scan. Both patients were admitted and received anticoagulation therapy; they were then placed on warfarin for six months. Both experienced full resolution of their symptoms.

**Risk Factors for Hematoma**

The incidence of postoperative hematoma was significantly higher in men (11.7%) than in women (3.9%, P = .011). Patients taking aspirin preoperatively and those with hypertension showed a strong tendency toward a higher rate of hematoma (P = .002 and P = .017, respectively). Patients with a BMI > 25 were also at a significantly-higher risk of developing hematomas (P = .024). Older patients (> 55 years old) demonstrated an increased incidence of postoperative hematoma (Table 4), but this calculation did not reach statistical significance on univariate analysis (P = .07). The incidence of hematoma did not differ significantly between patients who underwent facelift alone and those who had additional concurrent procedures. When all risk factors were evaluated on multivariate analysis, only aspirin intake was found to be an independent predictive factor for formation of postoperative hematomas (P = .028).

**Venous Thromboembolism**

Of the 630 patients included in the study, we noted two DVT occurrences, for an incidence rate of 0.3%. No cases of pulmonary embolism were observed. Both patients who developed DVT had undergone a facelift in combination with another procedure, and both cases lasted more than five hours (Table 5). The patients presented with leg swelling and calf pain. DVT diagnosis was made with an ultrasound and confirmed by computed tomography scan. Both patients were admitted and received anticoagulation therapy; they were then placed on warfarin for six months. Both experienced full resolution of their symptoms.

**DISCUSSION**

Surgical facial rejuvenation remains one of the most common cosmetic procedures performed in the United States and throughout the world. In this study, our aim was to examine the facelift population in a single surgical center to determine complication rates and identify risk factors associated with these complications.

Our overall rate of complications showed similar results compared to previous studies. In our patient population, the risk of developing complications after a facelift significantly increased with age over 55 years, history of aspirin intake, and higher BMI. As expected, hematoma was the most common complication, at a rate of 4.6%. This rate is similar to previously-published studies, which describe an incidence of hematoma between 1.8% and 9%. Matarasso et al reported a postoperative bleeding rate of 4.4% in 12,325 patients. Jones and Grover also reported an overall incidence of hematoma at 4.4% in 910 patients.

We found that the risk of developing a hematoma after a facelift was significantly increased in men, overweight patients, patients with a history of aspirin intake, and patients with hypertension. Grover et al also found a significant relationship between hematoma formation and systolic blood pressure, gender, aspirin intake, and smoking. Facelifts in men had an increased risk of hematoma formation in our patient population (11.7%), which is similar to observations reported in other studies, where the reported incidence of hematoma following male facelifts ranges from 7.9% to 12.9%. It is our recommendation that male facelift patients be counseled about their possible higher risk of complications. Furthermore, special attention must be paid by the surgeon to the prevention of such complications.

The correlation between high BMI and an increase in complications is well established in many surgical specialties. Obesity (BMI > 30) has been found to increase risk of complications, including VTE. Goldhaber and Berkowitz reported that BMI > 29 increases risk for pulmonary embolus. In our study, BMI > 25 was a statistically-significant risk factor for developing any complication, specifically hematoma.

Baker et al have urged patients to stop aspirin and aspirin-containing compound intake two weeks prior to surgery and one week postoperatively. It is known that the effect of aspirin on platelets persists for the entire lifetime of the platelet, which is approximately 10 days. Our previous protocol was to ask patients to cease taking aspirin and aspirin-containing products seven days prior to surgery, although there was no data-based rationale for this. In our study, a history of aspirin intake was the only independent risk factor that was statistically significant for the development of a complication or hematoma, and our results caused us to reconsider the time point at which patients are asked to stop taking these medications. At present, we urge patients to cease aspirin intake at least two weeks preoperatively and preferably four weeks.

In our patient population, history of hypertension was a significant risk factor for hematoma formation. The incidence of hematoma in these patients increased to 8.2%, compared to patients without a history at 3.5%. All patients in the study who were diagnosed with hypertension were being actively treated by their primary care physician with blood pressure medications. Perioperatively, the patients were maintained on their medications. Aggressive blood pressure control in the recovery room was achieved with clonidine and alprazolam. Interestingly, in our study, hematomas still developed in spite of this aggressive control.
while in other studies, blood pressure control has been shown to decrease the risk of postoperative hematomas following facelifts. In 1976, Berner et al suggested that blood pressure was the most important factor in hematoma formation, and they demonstrated the use of chlorpromazine for management of rebound hypertension and prevention of uncontrolled blood pressure. Baker et al suggested preoperative clonidine administration for control of hypertension in facelift patients. Two other studies confirmed the role of preoperative clonidine in lowering the hematoma rate and postoperative antihypertensive drug requirements. Our patients only received antihypertensive medications preoperatively. However, a recent study by Rees et al showed that the preoperative and postoperative blood pressure did not affect the incidence of hematoma in rhytidectomies. In this study, we did not examine the correlation between intraoperative hypertension and the development of postoperative hematomas. Our results might indicate that aggressive preoperative control might also be needed to decrease the risk of hematoma formation.

Interestingly, 58% of patients who developed postoperative hematomas had drains placed intraoperatively. This correlates with two publications by Jones et al—one a prospective randomized controlled study in 2004—which revealed that drains do not prevent postoperative hematomas or other complications.

Abdominoplasty alone has a higher incidence of VTE than that of other plastic surgery procedures, in the range of 1.4% to 2%. Combining it with other procedures increases the incidence to around 6.6%. Grazer was one of the first to report a pulmonary embolus following abdominoplasty combined with an intra-abdominal procedure. Hester et al reported similarly-high rates of VTE complication when abdominoplasties were combined with other procedures. All surgical patients are at some risk for the development of DVT. This has been well documented in the general surgery and orthopedic literature. Incidence of postoperative DVT in general surgery patients ranges from 16% to 30%, with an incidence of significant pulmonary embolus at 1.6%. However, only a few

### Table 3. Risk Factors for Complications in All Patients

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Univariate Analysis</th>
<th>Multivariate Analysis</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>No. (%)</td>
<td>No. (%)</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
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<tr>
<td>Male</td>
<td>51 (8.1)</td>
<td>6 (11.7)</td>
</tr>
<tr>
<td>Female</td>
<td>579 (91.9)</td>
<td>32 (5.5)</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 55</td>
<td>450 (71.4)</td>
<td>33 (7.3)</td>
</tr>
<tr>
<td>&lt; 55</td>
<td>180 (28.6)</td>
<td>5 (2.8)</td>
</tr>
<tr>
<td><strong>Hypertension</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>146 (23.1)</td>
<td>13 (8.9)</td>
</tr>
<tr>
<td>No</td>
<td>484 (76.9)</td>
<td>25 (5.1)</td>
</tr>
<tr>
<td><strong>Aspirin</strong></td>
<td></td>
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<tr>
<td>Yes</td>
<td>22 (3.5)</td>
<td>6 (27.2)</td>
</tr>
<tr>
<td>No</td>
<td>608 (96.5)</td>
<td>32 (5.2)</td>
</tr>
<tr>
<td><strong>Body mass index</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 25</td>
<td>462 (73.3)</td>
<td>22 (4.7)</td>
</tr>
<tr>
<td>&lt; 25</td>
<td>168 (26.7)</td>
<td>16 (9.5)</td>
</tr>
<tr>
<td><strong>Operating room time</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 5 h</td>
<td>200 (31.7)</td>
<td>16 (8.0)</td>
</tr>
<tr>
<td>&lt; 5 h</td>
<td>430 (68.3)</td>
<td>22 (5.1)</td>
</tr>
<tr>
<td><strong>Facelift alone</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facelift + addl procedure</td>
<td>149 (23.7)</td>
<td>10 (6.7)</td>
</tr>
</tbody>
</table>
publications in the literature report the incidence rate of VTE among plastic surgery patients. The incidence rate of VTE in aesthetic surgery is 1.2% according to Grazer and Goldwyn, and 0.8% for pulmonary embolus among abdominoplasty patients. In our facelift patient population, the incidence of DVT was 0.3%. This compares to a study by Reinisch et al that showed a DVT incidence of 0.35% in 9937 facelift patients based on a survey of 273 surgeons. The authors also noted that thromboembolic complications were more likely to occur when a facelift was performed under general anesthesia versus local anesthesia with sedation. They observed that the use of intermittent compression devices was associated with fewer thromboembolic complications with facelifts performed under general anesthesia, which is consistent with the fact that anesthesia-related immobility is a significant risk factor for thromboembolism of the lower extremity and pelvis.

Prior to Reinisch, there were a few isolated case reports linking facelifts with VTE. In 1997, Rigg published a first account of two DVT incidents occurring after a facelift procedure.

In light of our findings and the previously-published literature, we can say that the risk of VTE in facelift patients is real and should inspire us to concentrate on preventive efforts. A survey by Broughton et al. showed that only 48.7% of surgeons performing facelifts, 43.7% of surgeons performing lipoplasty, and 60.8% of surgeons performing a combined procedure actively administer DVT prophylaxis on a continual basis. There have been several excellent publications outlining steps that could be taken to reduce risk of VTE.

In high-risk patients, the administration of pharmacologic prophylaxis must be weighed against the risk of postoperative hematoma. Surgeons in other disciplines have had success with risk assessment models to guide perioperative thromboprophylaxis. Specifically, Davison et al modified the Caprini risk stratification model and applied it to plastic surgery patients. This model stratifies plastic surgery patients into different risk groups based on certain factors, in a manner similar to the guidelines published by the American College of Chest Physicians. Preoperative application of this model could help identify the patient’s inherent risks and select the prophylaxis necessary to prevent a thromboembolic event. Plastic surgeons need more data to apply this model more accurately and effectively, which could be provided by the ongoing VTE prevention study funded by the Plastic Surgery Education Foundation.

The results of our study should urge plastic surgeons to incorporate a VTE prophylaxis regimen into their practices and be more vigilant for signs and symptoms of VTE.

**CONCLUSIONS**

In our patient population, the risk of developing complications after a facelift was increased in men, patients...
older than 55 years, overweight patients, patients with hypertension, and patients with a history taking prophylactic aspirin. Combining the facelift with other procedures also increased the risk of complications, especially DVT. The risk of VTE is real, even in presumed low-risk procedures such as facelifts. Plastic surgeons must be aware of these risk factors, prophylaxis guidelines must be followed, and our patients must be protected accordingly.

Acknowledgments
We would like to thank Dr. T. Roderick Hester, Dr. Mark Codner, and Dr. Farzad Nahai for providing case data for inclusion in this series.

Disclosures
The authors declared no potential conflicts of interest with respect to the research, authorship, and publication of this article.

Funding
The authors received no financial support for the research, authorship, and publication of this article.

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