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ORIGINAL ARTICLE

Prevention of Acute Hematoma After Face-Lifts

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Abstract Acute hematoma remains one of the most frequently encountered complications after face-lift surgery. Several risk factors inherent to the patient and omission of certain intraoperative regimens are considered to cause hematoma. Significant risk factors include high blood pressure and male gender. Possible intraoperative regimens for the prevention of hematoma include tumescence infiltration without adrenaline, clotting of raw surfaces with fibrin glue, usage of drains, and application of compression bandages. However, little attention has been paid to postoperative measures. To examine whether different regimens in the postoperative phase can influence the incidence of hematoma, all face-lift patients who underwent surgery by a single surgeon in two different clinics ($n = 376$) with two different postoperative regimens were evaluated over the course of 3 years. In group 1 ($n = 308$), all postoperative medication was administered on request including medication for pain control, blood pressure stabilization, and prevention of nausea and vomiting as well as postoperative restlessness and agitation. In group 2 ($n = 68$), this medication was administered prophylactically at the end of the operation before extubation. The hematoma rate was 7% in group 1 and 0% in group 2. This study showed that the prophylactic use of medications (e.g., analgesics, antihypertonics, antiemetics, and sedatives) during the postoperative phase is superior to making drugs available to patients on request and can decrease the occurrence of acute hematoma in face-lift patients.

Keywords Acute hematoma · Face-lift · Postoperative phase · Prophylactic medication

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Hematoma remains one of the most frequently encountered acute complications after face-lift surgery [1–4]. A large expanding hematoma may endanger the vascularity of skin flaps (Fig. 1) and, at minimum, delay postoperative recovery due to edema, bruising, or seroma. The long-term course may even lead to regional hyperpigmentation and contour changes due to subcutaneous scarring. In the case of skin necrosis, hematoma may lead to a complicated healing process requiring secondary surgical interventions. The reported incidence of hematoma ranges from 2% [5] to 9% [6], but these numbers reflect only large and expanding hematomas requiring surgical evacuation.

The occurrence of hematoma is attributed to several causes. A review of 1,078 face-lifts [2] showed significant associations between hematoma formation and anterior platysmaplasty, high systolic blood pressure, male gender, aspirin or nonsteroidal antiinflammatory drugs intake, and smoking. Among these indicated risk factors, high systolic blood pressure and male gender have been confirmed repeatedly [7, 8]. Even patients with such evident risk factors are not routinely excluded from face-lift surgery. Thus, numerous strategies have been attempted in an effort

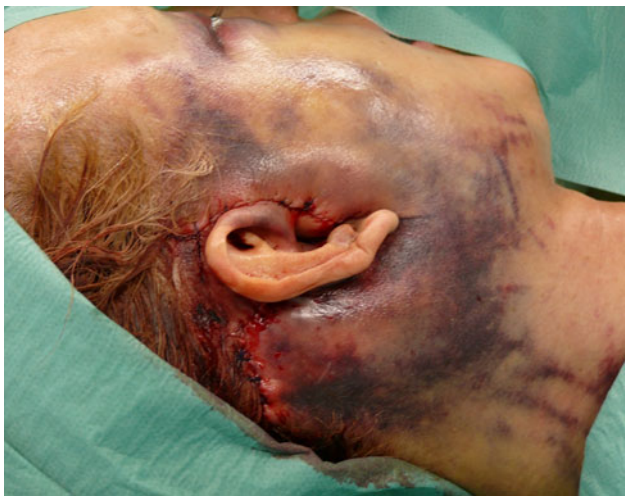

Fig. 1 A large, acute expanding hematoma on the right side in a woman with drastic edema and bruising 12 h after the operation (the patient was not from this study; published with permission of the surgeon)

to prevent hematoma. These strategies include tumescence infiltration without adrenaline, clotting of raw surfaces with fibrin glue, usage of drains, and application of compression bandages.

Surgeons may use particular strategies out of habit. Each approach has supporters and opponents. For example, many authors support the use of fibrin glue [9, 10]. Marchac and Sandor [6] reported a statistically significant decrease in the rate of major hematoma formation associated with the use of fibrin glue in a study of 200 patients. Jones et al. [11] found that the use of intrawound vacuum drains during the first 24 h after surgery significantly decreased the rate of seroma formation. The occurrence of hematoma also was reduced, but less dramatically and not significantly.

In contrast, Huang et al. [12] found that the routine use of continuous suction drains for patients undergoing rhytidoplasty probably is unnecessary. Similarly, Jones and Grover [1] found no significant difference in the rate of hematoma with the use of drains, fibrin, or dressings. However, a significant reduction was observed in the incidence of hematoma after withdrawal of adrenaline from the tumescence infiltration.

Although various controversial studies have investigated risk factors for the development of hematoma and various intraoperative measurements for the prevention of hematoma, little attention has been paid to postoperative measurements for hematoma prevention. However, the majority of acute hematomas develop within the first 24 h postoperatively, even if none of the addressed risk factors is present, and all suggested preventative intraoperative measures have been performed.

To examine whether different medical regimens in the postoperative phase can influence the incidence of hematoma, all face-lift patients who underwent surgery by a single surgeon in two different clinics were evaluated with regard to risk factors, preventative ancillary intraoperative measures, and medication during the first 24 h of the postoperative phase.

Patients and Methods

All 376 patients who underwent face-lifts from January 2005 until December 2008 were evaluated retrospectively. The study included all patients who underwent an open, classical cheek–neck lift with lateral removal of the superficial muscular aponeurotic system [3] combined with additional submental liposuction when indicated. It excluded patients with minilifts and frontal face-lifts as well as those with an open submental lipectomy or an anterior platysmaplasty. It also excluded patients who had taken aspirin or nonsteroidal antiinflammatory drugs during the past 7 days and all patients with an American Society of Anesthesiologists (ASA) score of 3 (severe systemic disease, not incapacitating). Data collection included patient age, gender, blood pressure, concomitant medical disease and medication, smoking habits, type of face-lift, and whether the face-lift was a primary or secondary procedure.

All the operations were performed by a single surgeon (G.M.B.). All patients received low-molecular-weight heparin prophylaxis because they had surgery under general anesthesia. The heparin prophylaxis started 12 h before the operation, then was continued every 24 h until complete mobilization. Anesthesia was induced using fentanyl combined with propofol and/or sevoflurane. Endotracheal intubation was performed with the patient under rocuronium, and anesthesia was maintained with propofol or sevoflurane using 100% oxygen. To prevent urinary retention, Foley catheters were used for women.

During the operation, systolic blood pressure was kept constant between 90 and 110 mmHg. Before the face-lift operation, we infiltrated the areas to be dissected with an adrenaline–saline solution (2 mg adrenaline in 500 ml of 0.9% saline solution, 50 ml on each side of the face). We routinely used the technique of "second look closure" [3]. This technique involves suturing the first side only after dissection of the other side, thus allowing a return to the first side for a "second look" and meticulous hemostasis before the final closure and after the adrenaline has worn off completely. On each side of the face, an 8-mm suction drain was inserted and left in place for 48 h. All patients were supplied with a head compression bandage for 24 h.

In group 1 ($n = 308$), all necessary postoperative medications were administered at the patient's request. The medications included those for pain control, blood pressure stabilization, prevention of nausea and vomiting, and prevention of postoperative restlessness and agitation. In group 2 ($n = 68$), this medication was administered prophylactically at the end of the operation and before extubation. The prophylactic treatment consisted of 1 g perfalgan (to control pain), 150 μg clonidine (to stabilize blood pressure and prevent agitation), and 4 mg ondansetron (to prevent nausea and vomiting). All patients were additionally observed and monitored carefully for the first 24 h.

The level of care was comparable in the two clinics. This included the number of nurses during the day and night watches, the machined monitoring, the number of face-lift patients per day (1 or a maximum of 2), and the number of plastic surgeons on duty. In cases of recurrent pain, perfalgan was administered repeatedly every 6 h. In cases of severe pain, morphine was added as an externally controlled intravenous analgesia. When the systolic blood pressure increased beyond 130 mmHg, additional clonidine was given intravenously. If the patient was known to experience hypertension, the usual antihypertensive medication also was added. In addition to monitoring blood pressure, we recorded qualitative observations of nausea and vomiting as well as restlessness and agitation.

The patients from groups 1 and 2 were arbitrarily assigned to one of the two clinics. Hematomas were subclassified into acute clinical and subclinical hematomas. Whereas the former necessitated surgical evacuation within the first 24 h, the latter were so small that they were left for spontaneous resorption. [13] Only acute clinical hematomas were collected for this study.

The results were analyzed using SPSS 13.0 (SPSS, Chicago, IL, USA). Continuous variables were summarized as mean ± standard deviation and compared between groups using the Mann–Whitney test. Nominal variables were presented as n (%), and differences were compared using Fisher's exact test. All p values of 0.05 or less were considered significant (two-tailed test).

Results

The 376 patients in this study included 356 women (95%) and 20 men (5%) ranging in age from 27 to 89 years (mean, 58 ± 9 years). In total, 49 patients (13%) had high blood pressure, 73 patients (19%) were smokers, and 56 patients (15%) had undergone a secondary face-lift.

The two groups separately (308 patients in group 1 and 68 patients in group 2) showed no significant differences in terms of age, gender distribution, or significant risk factors. However, group 1 had more smokers. Furthermore, more patients in group 1 experienced nausea and vomiting as well as postoperative restlessness and agitation. The data for both groups are listed in Table 1.

In group 1, 22 patients (7%) experienced acute clinical hematoma that necessitated surgical evacuation. In group 2, the clinical hematoma incidence was zero, making the difference in the hematoma rates between the two groups statistically significant ($p = 0.029$).

The mean age of the 22 hematoma patients in group 1 was exactly the same as that of the entire group. Further comparison with the entire group of patients showed that the hematoma group had more male patients (14%; $p = 0.07$) and more patients with a history of high blood pressure (23%; $p = 0.12$). In the hematoma group, 18% of the patients were smokers and 18% had received a secondary face-lift. One patient displayed two significant risk factors (male gender and high blood pressure). None of the 11 patients (50%) who experienced acute hematoma had significant risk factors.

Discussion

This study showed that the incidence of acute clinical hematoma for the 308 patients undergoing an open face-lift (group 1) was 7%. For the 68 patients in group 2, the incidence of hematoma was zero. Regarding significant risk factors for the development of hematoma in both groups, the number of patients with high blood pressure

Table 1 Characteristics of the 376 patients receiving face-lifts in two different clinics

	Group 1 ($n = 308$, 82%)	Group 2 ($n = 68$, 18%)	p
Age	59 ± 9 (38–89)	57 ± 10 (27–78)	NS
Sex (F/M)	292/16 (95%/5%)	64/4 (94%/6%)	NS
Secondary lift	48 (16%)	8 (12%)	NS
Blood pressure (high)	40 (13%)	9 (13%)	NS
Nicotine	67 (22%)	6 (9%)	0.02
Nausea & vomiting	11 (5%) VP*	1 (1.5%)	NS
Agitation & restlessness	56 (17%) VP*	7 (10%)	NS
Hematoma	22 (7%)	0	0.03

* *VP*, valid percent ($n = 213$); *NS*, nonsignificant

and male gender was comparable high in relation to other studies [2].

The intraoperative surgical and anesthetic regimen was comparable across the two groups, and all the patients in both groups underwent surgery by the same surgeon, which guaranteed an identical operating style. Additionally, the patients who had taken aspirin or nonsteroidal antiinflammatory drugs during the preceding 7 days were excluded from the operation. Nevertheless, all the patients received low-molecular-weight heparin for thrombosis prophylaxis. In a recent survey by Broughton et al. [14], only 49% of surgeons performing face-lifts used such a prophylaxis on a continual basis. Yet, the general guidelines in Europe and America [15, 16], which are increasingly accepted, state that operations with patients under general anesthesia lasting longer than 1 h already have a "moderate" risk for the development of thromboembolic complications (thromobembolic risk categories: low, moderate, high, highest [17]). For patients older than 40 years and those with additional predisposing and exposing risk factors (e.g., history of deep venous thrombosis, use of oral contraceptives, recent surgery requiring general anesthesia, obesity), the risk of thromboembolic complications increases to "high" or "highest." Thus, patients with a face-lift under general anesthesia have at least a "moderate risk," which means the guidelines dictate the application of low-molecular-weight heparin for prophylaxis.

Concomitantly to the administration of prophylactic heparin the question arises whether the rate of bleeding-related complications increases, and if so, whether the risk-to benefit ratio justified in face-lift operations. The reports on this item differ [15]. In one report [18] on "low-molecular-weight heparin and postoperative bleeding in rhytidectomy," the authors observed a bleeding rate of 16% in a low-molecular-weight heparin group of 37 patients. This high hematoma rate likely is related to the timing of the prophylaxis in this group, which was begun 2 h before surgery. Such a stringent timely regimen has been known to increase major bleeding [19] and is preserved for the highest-risk groups in surgery, such as elective hip surgery. In contrast, we started the prophylaxis 12 h before surgery (a milder regimen), which results in a hematoma rate of zero for group 2.

Other studies [20] also found no significant increase in the hematoma rate after the prophylactic administration of low-molecular-weight heparin. However, the timing of this administration also was different in that it was begun postoperatively.

Concerning the general postoperative phase, medication was administered at the patient's request in group 1 and prophylactically in group 2. Thus, the postoperative medical regimen was the only significantly differing variable in the two groups.

The postoperative regimen (the phase of postanesthesia recovery) comprises the control of pain, blood pressure, nausea and vomiting, and restlessness and agitation. The intensity of pain after face-lifts usually is moderate. Marin-Bertolin et al. [21] stated that after superficial operations on the head and neck, the majority of patients had moderate pain, with baseline pain scores lower than 4 on a visual analog scale ranging from 0 to 10, and only 5% to 15% of patients experienced severe pain.

Despite the expected moderate level of pain, effective postoperative pain treatment is of major importance. However, this issue is largely neglected, as observed by Popping et al. [22] in a recent survey of 19,000 postoperative patients. Thus, even moderate pain may initiate a dangerous vicious circle insofar as pain enhances blood pressure, perhaps initiating nausea and vomiting [23] and leading to restlessness and agitation. All these factors may ultimately contribute to the development of acute hematoma.

The medication recommended most frequently for the control of moderate pain is paracetamol or metamizol. Either of these two analgesics should be preferred over aspirin and nonsteroidal antiinflammatory analgesics because the adverse effects on the clotting function of thrombocytes is negligibly small [24]. Saray et al. [26] compared metamizol and diclofenac (a nonsteroidal anti-inflammatory analgesic) and noted a reduction in platelet number and prolongation of bleeding time for the majority of the patients receiving diclofenac. They concluded that metamizol also is superior to diclofenac for reducing postoperative pain after plastic surgery. The same applies to paracetamol [25], which is a safe and effective drug for the treatment of postoperative pain. Regardless which of these analgesics is chosen, the most effective manner of treatment is to administer them prophylactically rather than on demand. Saray et al. [26] even stated that modern medical practice dictates the generous use of analgesic agents as an adjunct or substitute to minimize deleterious postoperative effects and to facilitate an earlier return to work and daily activities. Our patients in group 2 reported that they woke up after the operation with virtually no pain.

Regarding blood pressure in the early postoperative period, every prophylactic measurement should be undertaken to prevent its elevation. This claim is unchallenged in the literature. In representative studies, postoperative blood pressure was found to be significantly associated with hematoma after face-lifts [2, 27, 28]. Berner et al. [28]described a "reactive hypertension" 3–5 h after rhytidectomy that was particularly evident in older patients, which represent the majority of face-lift clientele (average age of our patients, 58 years). This is an additional argument that adequate antihypertensive medication (and analgesia and sedation) must be applied to reduce the magnitude of "reactive hypertension."

A striking example showing that postoperative hematoma can be hindered by adequate prophylactic antihypertensive medication is provided by a study on neurosurgical patients by Vassilouthis et al. [29]. In their study, 526 consecutive patients underwent craniotomy under a strict anesthesiologic protocol based on deep analgesia that virtually eliminated any acute elevations of arterial pressure during craniotomy and immediately afterward. It was concluded that postoperative hematoma probably is an avoidable complication of intracranial surgery. This should also apply to face-lift surgery. Prophylaxis with clonidine in the group 2 patients seemed to help achieve this goal.

The prevention of nausea and vomiting is another major goal of postoperative care. The factors affecting nausea and vomiting are patient characteristics, surgical procedure, anesthetic technique, and postoperative care. Kovac [23] stated that the overall incidence of postoperative nausea and emesis is estimated to be 25% to 30%. Female patients have a 1.5- to 3-fold greater incidence of nausea and vomiting than males. However, the exact reason for this difference is unknown [30]. These rates were confirmed in a study (unpublished) we conducted with 151 patients (63% women and 37% men). In this study nausea was experienced by 34% of the men and 16% of the women, and vomiting, respectively, by 26% and 6%.

Because most of our patients undergoing face-lifts are women, we consider the prophylactic administration of antiemetic medications such as ondansetron justified, especially considering that the costs are paid by the patients themselves. Patients experience postoperative nausea and vomiting as two of the most distressing complications. Similarly, Watcha and White [31] stated that vomiting should not be considered an unavoidable part of the perioperative experience. The availability of an emesis basin for every patient during postanesthesia recovery is a reflection of the limited success obtained with the available therapeutic techniques. Kovac [23] reported that antiserotonin (i.e., ondansetron) is highly effective at preventing postoperative nausea and vomiting for 24 h postoperatively compared with traditional antiemetics (droperidol and metoclopramide). We observed the same trend in our group 2 patients.

Emergence agitation is a postoperative behavior that may be experienced by patients undergoing general anesthesia [32]. The treatment of choice involves sedatives such as clonidine and benzodiazepines. The evidence is convincing [33–36] that clonidine leads to evident sedation, anxiolysis, central anesthesia, and reduced pain sensitivity at peripheral nerve endings. Thus, it has antihypertensive properties as well as sedative and analgesic effects. Clonidine has therefore become our drug of choice during the postoperative phase. Yet, due to a potential for additive effects such as bradycardia and atrioventricular block, caution is warranted for patients receiving clonidine concomitantly with agents known to affect sinus node function or atrioventricular nodal conduction (e.g., calcium-channel blockers and beta-blockers). Yet, the administration of such medication presents no absolute contraindication because clonidine can be titrated according the pulse rate of the patient.

The identity of the clonidine effects most responsible for preventing hematoma remains obscure. This is one shortcoming of the current retrospective study. The same applies to some of the quantitatively collected data in this study. During the postoperative phase, blood pressure was recorded quantitatively, whereas the other factors were recorded qualitatively. Thus, the contribution of factors such as nausea and vomiting or agitation and restlessness to the occurrence of hematoma remains obscure.

Despite these shortcomings, this survey showed that the prophylactic administration of postoperative medications such as analgesics, antihypertonics, antiemetics, and sedatives is superior to administration of these drugs at the request of the patient. Prophylactic administration can decrease the occurrence of acute hematoma in face-lift patients, even in patients who routinely receive low-molecular-weight heparin for thrombosis prophylaxis. The associated higher costs for prophylactic postoperative medication will be balanced by the benefits to the patients, which include a pain-free and convenient postoperative recovery, with fewer days spent recuperating and reduced suffering due to chronic pain [24].

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