Wound Infection Rates in Elective Plastic Surgery for HIV-Positive Patients

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Background: Human immunodeficiency virus (HIV)-positive patients suffer from a unique set of aesthetic challenges, frequently requiring plastic and reconstructive surgical intervention. This study was designed to evaluate the overall wound infection rates for elective surgery in this patient population, focusing specifically on differences between transdermal (both open and minimally invasive) and transoral procedures.

Methods: Charts were reviewed for all patients with an *International Classification of Diseases, Ninth Edition* code of V08 (asymptomatic HIV infection, CD4 count >200 cells/μl) who underwent surgery by the senior author (S.P.D.) at this tertiary care hospital between January 1, 2000, and October 1, 2007 (39 patients, 98 procedures). Indication for surgery, type of procedure performed, wound infection rates, length of follow-up, status of HIV infection, and HIV treatment status were all documented. Data were collected according to internal review board protocol. Infection rates were compared between study groups and with the existing surgical literature.

Results: Statistical analysis revealed no significant difference in wound infection rate between open and minimally invasive procedures when a transdermal approach is used (10 percent and 0 percent, respectively; $p > 0.05$). However, there was a significantly increased infection rate in transoral surgery when compared with these two groups (71 percent; $p < 0.001$).

Conclusions: These findings indicate that there is a greatly increased risk of wound infections for HIV-positive patients undergoing transoral surgery when compared with transdermal surgery and historical norms. (*Plast. Reconstr. Surg.* 123: 106, 2009.)

The introduction of highly active antiretroviral therapy in the treatment of human immunodeficiency virus (HIV) has resulted in a significant decrease in the mortality and morbidity associated with the disease.[1] However, highly active antiretroviral therapy itself has complications, one of the most profound being its association with lipodystrophy (peripheral lipoatrophy, central lipohypertrophy, and lipomata). The overall prevalence of lipodystrophy in HIV-infected patients is 53 percent, with the face being one of the most frequently affected sites.[2] In addition, approximately 5 percent of HIV-positive patients suffer diffuse lymphoproliferative changes, most notably in the head and neck. Within the parotid gland, the intraglandular relationship of the lymph nodes leads to the development of lymphoepithelial collections. In the cervical region, bulky lymphadenopathy may occur. These changes can be physically, psychologically, and socially distressing to the individual. Especially distressing is the fear that these undesired body changes will involuntarily disclose their HIV status.[3]

Currently, few effective treatments are available for HIV-associated lipodystrophy. Alterations in antiretroviral therapy, most notably switching from a protease inhibitor to another drug, have shown limited to moderate success.[4–6] As a result, many patients affected by HIV-associated lipodystrophy are turning to elective plastic surgery.[7] However, as with any surgery, there are associated risks. Several articles have addressed the possibility of an increased rate of wound infection in HIV patients. The majority of these studies suggest no

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statistically significant difference in would infection rates.[8–11] However, there are data to suggest an increased risk of infection in HIV-positive patients undergoing transoral surgery, likely secondary to the inherently contaminated surgical field.[12,13] This latter notion was the primary impetus for our retrospective review. The purpose of this study was to help stratify the risk of wound infection for HIV-positive patients undergoing procedures in each of three categories: (1) open transdermal, (2) minimally invasive transdermal, and (3) open transmucosal.

PATIENTS AND METHODS

The records of all HIV-infected patients who underwent surgery by the senior author (S.P.D.) at Georgetown University Hospital between January 1, 2000, and October 1, 2007, were reviewed. Charts were identified by a computer search for patients with an *International Classification of Diseases, Ninth Edition* code of V08 (asymptomatic HIV infection). The following data were collected and recorded: age, sex, indication for surgery, type of procedure performed, postoperative infection, and HIV treatment status. Data were collected according to internal review board protocol. Procedures were classified as either transdermal or transoral. Transdermal procedures were further classified into open and minimally invasive categories. Nonelective procedures were excluded.

Operations were counted as operative events, regardless of the number of individual procedures performed in each surgical setting. For example, a patient undergoing bilateral upper and lower blepharoplasties was counted as a single open transdermal operative event. For a patient undergoing transdermal excision of the parotid gland and transoral suspension of the submandibular gland, the operative event was included in the analysis for both groups (Figs. 1 through 4).

Demographics were calculated on a per-event basis, as many patients underwent multiple operative interventions over time. Therefore, a 32-year-old man who underwent a series of three liposuction and fat injection procedures would have his age, sex, and CD4 count included three times in calculating the demographic means for the minimally invasive subgroup. Operations on the same patient were performed at least 3 months apart, after adequate healing time. Surgery was not carried out on any patient with clinical evidence of wound infection. Surgery was not performed on patients with CD4 counts less than 400 cells/μl or a viral load greater than 10,000 copies/ml. Although each operative event was analyzed separately, it is important to acknowledge the possible relationship between outcomes of operations at

Fig. 1. Photographs of a 47-year-old man presenting 4 days after parotidectomy and submandibular suspension with severe erythema, induration, purulent intraoral drainage, and tenderness at the wound site.

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Fig. 2. Computed tomographic scan obtained at the time of the initial postoperative visit.

different time points on the same patient. CD4 counts were calculated as means and standard deviations. Postoperative cellulitis and abscess formation were recorded if they occurred within 30 days of surgery. Infection rates were compared between study groups and with the existing surgical literature. A Fisher's exact test was used to calculate statistical significance between the three treatment groups.

RESULTS

Forty-one asymptomatic HIV-infected patients were identified for the study. Two were excluded because the procedures they underwent were nonelective (one pharyngocutaneous fistula and one drainage of abscess). This left 39 patients for the study, who underwent a total of 98 procedures. The demographics and clinical characteristics of the study population are outlined in Table 1. Patients undergoing transmucosal procedures had a higher average CD4 count (812 ± 128 cells/μl) than those undergoing minimally invasive (728 ± 82 cells/μl) or open transdermal procedures (620 ± 55 cells/μl). The mean follow-up duration for the study population was 12.0 months. Table 2 lists the type and total number of each procedure performed. A total of 98 procedures were performed on the study population. Forty-one were minimally invasive procedures, 50 were transdermal procedures, and seven were transmucosal procedures. Indications for surgery included facial wasting/lipodystrophy ($n = 59$), lymphoproliferation ($n = 16$), and facial aging/other cosmetic concerns ($n = 23$). All patients received a single dose of 1 or 2 g of preoperative intravenous cefazolin. Four-hundred milligrams of intravenous ciprofloxacin was substituted in penicillin-allergic patients.

Transmucosal surgical procedures were associated with a 71.4 percent (five of seven) infection

Fig. 3. Photographs obtained 18 days after intraoral incision and drainage and completion of a 2-week course of clindamycin (300 mg administered orally four times per day).

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Fig. 4. Wounds were ultimately well healed 6 months after the original operation.

Table 1. Demographics/Clinical Variables for 98 Procedures

	Transdermal	Transmucosal	Minimally Invasive	Overall
Male (%)	86	100	78	84
Female (%)	14	0	22	16
Mean age (yr)	46	44	45	46 (range, 26–60)
CD4 count (cells/μl)	620	812	728	674

Table 2. Procedures Performed

Procedure	No. Performed (No. of Wound Infections)
Transdermal	50 (5)
Flap/tissue rearrangement	12 (1)
Excision of buffalo hump	3 (1)
Open facial graft	2
Parotidectomy	14 (2)
Rhinoplasty	1
Blepharoplasty	2
Face lift	1
Excision of skin lesion	7 (1)
Breast reduction/mammaplasty	4
Abdominoplasty/panniculectomy	3
Calf implant	1
Transmucosal	7 (5)
Transoral malar implant	2 (2)
Transoral free fat graft	2 (1)
Mid face lift with Endotine* placement	1
Suspension submandibular gland	1 (1)
Genioglossus advancement with mandibulotomy	1 (1)
Minimally invasive	41 (0)
Liposuction/facial fat grafting	41
Total no. of procedures	98 (10)

*Coapt Systems, Palo Alto, Calif.

rate, compared with an infection rate of 10.0 percent (five of 50) for transdermal surgical procedures and an infection rate of 0.0 percent (zero of 41) for minimally invasive surgical procedures. One-way analysis of variance with post hoc Tukey's honestly significant difference yields $p < 0.01$ for the difference found between the transmucosal surgery group and the other two groups.

DISCUSSION

Since the advent of HIV antiretroviral therapy, the morbidity and mortality rates associated with HIV infection have decreased dramatically.[14] Unfortunately, these benefits are associated with substantial morphologic body changes from fat redistribution into the cervicodorsal fat pad, facial wasting, and gynecomastia. Because compliance with highly active antiretroviral therapy is well known to benefit survival, it is becoming increasingly important for clinicians to be aware of these issues so that they may provide patients with optimal treatment.

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Suction-assisted lipectomy has proven very useful for areas of abnormal fat deposition. For areas of fat wasting, there are various options: (1) surgical injection or open implantation of autogenous fat into areas of wasting, (2) injection or implantation of synthetic materials, and (3) alternative tissue grafting with gynecomastia specimen or cystic salivary tissue.[7]

With respect to the morphologic changes associated with diffuse lymphoproliferation, treatment may include cystic fluid aspirations, low-dose radiation, or open surgical resection. As noted, enlarged parotid tissue may be removed and redistributed into areas of facial wasting when occurring in concert with highly active antiretroviral therapy–associated lipodystrophy.

Minimally Invasive Procedures

In 1999, Wolfort et al. first described the use of tumescent liposuction to treat hypertrophied fatty deposits in three HIV-positive men receiving highly active antiretroviral therapy.[15] They reported that liposuction in these regions revealed many fibrous septae, which caused significant difficulty in passing the cannula, but that most regions were still accessible. Ponce de Leon et al. and Chastain et al. subsequently reported similar success in suction-assisted lipectomy to treat buffalo hump deformity.[16,17] The procedures were well-tolerated and patients were satisfied with the results. Although several authors have reported excellent postoperative results, the long-term outcome of liposuction in areas of abnormal fat deposition has only recently been examined. In a study of 15 patients, Gervasoni et al. reported buffalo hump recurrence in one of 15 patients (6.7 percent) at 19 months.[18]

Antibiotic prophylaxis in minimally invasive surgery in HIV-positive patients has been explored by several authors. Wolfort et al. recommended postponement of surgery (1) during increased viral activity, (2) when preoperative laboratory results reveal an inversion of the normal 2:1 CD4-to-CD8 ratio, or (3) when patients report increased fatigue or weight loss. In their study, antibiotic prophylaxis was achieved by administering cefazolin preoperatively followed by cephalexin orally twice daily.[15] Gervasoni et al. reported using intravenous amoxicillin plus clavulanic acid prophylaxis with no local infection in their cohort of 15 patients.[18] In our cohort of 41 minimally invasive procedures, a single dose of 1 or 2 g of preoperative intravenous cefazolin (400 mg of intravenous ciprofloxacin for penicillin-allergic patients) was used for prophylaxis in all patients. There were no local wound infections.

Open Transdermal Procedures

Of the 50 open transdermal procedures performed in this cohort of patients, parotidectomy was the most common ($n = 14$). The senior author uses a procedure in which the cystic parotid gland is harvested by facial nerve-sparing superficial parotidectomy technique and then transposed or used as a free graft to fill highly active antiretroviral therapy–associated facial wasting defects. The removal of salivary tissue for cosmetic and reconstructive surgery is not unprecedented.[19–21] Marten described submandibular gland resection in rejuvenation of the aging face, despite the risk to hypoglossal and lingual nerves.[20] It can be argued that deep plane or superficial musculoaponeurotic system rhytidectomy techniques that risk the facial nerve originally faced similar criticism. However, these techniques are currently accepted as standard practice.[19] It is our belief that with delicate dissection and preservation of surrounding structures, this multipurpose procedure is an ideal way to maximize the donor site in reconstructive surgery.

Another concern with the removal and reimplantation of salivary tissue is the potential for sialocele formation, salivary fistula, or wound breakdown from salivary exposure. In our experience, this has not occurred. Parasympathetic denervation occurs with transection of parotid and/or submandibular tissue, thereby eliminating production of salivary fluid.

The current literature indicates there is no significant increased risk of postoperative infections when comparing HIV-positive and HIV-negative patients with respect to general surgical procedures. The largest of these studies, by Horberg et al., was a case-controlled retrospective review of 5000 HIV-positive patients.[10] The rate of infection was ascertained at 4.4 percent in both groups. This is within the statistical range for our cohort of 50 open transdermal procedures, where there was an infection rate of 10 percent.

Open Transoral Procedures

The transoral sublabial approach is routinely used for hidden access to the midface and melolabial folds. The incision is invisible to others, is immediately adjacent to the target area, and involves minimal risk to neurovascular structures, namely, the maxillary branch of the trigeminal nerve.

Although some dental studies have found no significant increased risk of infection in HIV-positive patients undergoing tooth extraction,[10,11] the literature is not universal on this subject.[12] A study by Rose et al. comparing open reduction of mandibular frac-

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tures in HIV-positive versus HIV-negative patients did find a significantly increased risk of infection in HIV-positive patients compared with HIV-negative patients (45 percent versus 13.9 percent).[13] This is consistent with the results in our cohort of seven HIV-positive patients undergoing transoral surgery, where five patients suffered postoperative infection (71 percent). Two of two patients undergoing transoral placement of malar implants developed postoperative infections. Although several articles have documented the infectious sequelae of malar augmentation with alloplastic implants, the majority of these have been late complications (>30 days after surgery).[22–24] The early nature of postoperative wound infection in this subgroup suggests that transoral surgery is especially risky in the HIV-positive population. If transoral procedures are to be performed in this population, antibiotic prophylaxis should include anaerobic coverage. Clindamycin or a penicillin/metronidazole combination are viable options.

CONCLUSIONS

Our review of surgical infection rates in HIV-positive patients reveals the following: (1) percutaneous (minimally invasive) procedures such as liposuction and fat grafting carry essentially no risk of infection; (2) incisional surgery through skin has no greater risk of infection than historical norms; and (3) transoral mucosal incisional surgery has a significantly elevated risk of wound infection in HIV-positive patients. Further study with a larger sample size is needed to confirm these results. From these data, it is our recommendation that transoral surgery be avoided when possible in HIV-positive patients undergoing elective plastic surgery procedures. By identifying this potential risk, we hope to aid in more effectively treating this patient population.

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