


HIV Positivity per se Does Not Affect Tympanoplasty Outcomes

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Abstract

Background: The English language literature finds no clear protocols for otologic surgery for HIV+ patients.

Objective: To demonstrate that simple tympanoplasty and type III tympanoplasty in HIV+ patients with CD4 >400 cells/cc results in tympanic membrane closures and hearing improvements equivalent to the same procedures in controls.

Materials and Methods: This retrospective review documents the otologic conditions and operative results of 32 HIV+ patients and 32 controls. The controls were healthy and had no opportunistic infections or other medications.

Results: Genders, ages, sizes of tympanic membrane perforations, severity of air bone gaps, and type of operation were equivalent between the HIV+ and the control groups. Thirty of 32 patients in each group had closure of their perforations after 1 operation. Air bone gaps improved significantly for each group ($P = .001$): 22 dB (SD = 11 dB) in the HIV+ group and 26 dB (SD = 10 dB) in the control group. And there was no statistically significant difference in change in hearing between the 2 groups. There were no complications of infection, wound dehiscence, worsened sensorineural levels, dizziness, or facial weakness in either group.

Conclusion: HIV+ patients whose CD4 counts are above 400 cells/cc can undergo simple tympanoplasty or type III tympanoplasty with acceptable outcomes.

Keywords

HIV, tympanoplasty, developing country, CD4

Introduction

The burden of ear disease in Ethiopia has been shown to be worse among HIV+ patients. Compared to people whose HIV status is unknown but clinically negative, more HIV+ patients have tympanic membrane perforations, draining ears, and hearing loss.^{1,2} HIV positivity has been associated with more aural fullness, tinnitus, dizziness, and otalgia in the United States as well.³ Previous reports of otologic operations on HIV+ patients have been mixed. Tympanoplasties, stapedetomies, and mastoidectomies have reported some successes and some failures.⁴⁻⁷ However, preoperative thresholds for viral load or CD4 counts were not established or reported for these studies. Careful review of the English language literature finds no recent clear report of outcomes in HIV+ otologic procedures.

This article reports the standardized protocol that has been used since 2011 in 1 otologic center in Ethiopia, a low resource country. This article demonstrates equivalent post-operative outcomes in HIV+ patients whose CD4 counts are above 400 cells/cc and controls for simple tympanoplasties and type III tympanoplasties.

Materials and Methods

This study has received Institutional Review Board approval from the OtoRhino-ENT Specialty Clinic Ethics and Patient Protection Committee.

Study Site and Date

This study was a retrospective review of the medical records, supplemented by recall to clinic of patients who

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had failed to return postoperatively. The site was a tertiary otology clinic in Addis Ababa, Ethiopia, from July 2011 through August 2017.

Patients and HIV Status

During this time period, 1800 patients underwent tympanoplasty at this site. Thirty-two of these tympanoplasty patients were known HIV+, revealed through self-reported medical history and medications or HIV testing. However, preoperative HIV testing was mandated only for 5 patients who had a history of tuberculosis, herpes zoster, emaciation, or opportunistic infections such as oral thrush. Of these 5, only 2 tested HIV+. A CD4 count was obtained in HIV+ patients, and tympanoplasty was delayed until CD4 counts approached or exceeded 400 cells/cc. Control patients were 32 people who underwent tympanoplasties on the same day and any of the HIV+ patients. Age and sex and duration of symptoms were recorded for each patient.

Operative Setting and Technique

HIV and hepatitis pretesting of patients was not routine, therefore universal precautions were employed for all procedures: All instrument sterilization for all operations was performed against blood-borne pathogens. Also, consistent intraoperative precautions were employed for all patients to protect the staff from acquired infections. In addition, the known HIV+ patients were operated last on the operative days.

All operations were performed by 1 experienced otologic surgeon. All operations were performed under local anesthesia after preoperative oral diazepam with perioperative antibiotics. All patients received 7 days of postoperative antibiotics of amoxicillin/clavulanic acid, and for patients over 13 years old, norfloxacin was added.

All operations were transaural. Two types of tympanoplasties were recorded. For simple tympanoplasties, perichondrium or a double layer of perichondrium with cartilage island were used in the underlay or the over-under technique.⁸ For type III tympanoplasty, the malleus head or the incus body were repurposed and repositioned between the capitulum and the cartilage/perichondrial reconstruction of the tympanic membrane.

Audiometric and Aural Microscopy Evaluations

In the cases of multiple postoperative visits, the follow-up examination that was most distant from the operative date was selected as the examination date for postoperative physical and audiometric results. Patients who had failed their postoperative follow-up were recalled to the outpatient clinic.

Preoperative air bone gaps were calculated by averaging the air bone gaps at 0.5, 1, 2, and 4 kHz. Postoperative air

bone gaps were similarly calculated. The differences between the pre- and the postoperative averages for each patient were analyzed using the SPSS 20 statistical program.⁹ Perforation sizes pre- and postoperatively were recorded for each patient.

Results

Patients

The HIV+ rate for all the patients operated at the outpatient clinic during the timeframe in question was 32 of 1800 (1.8%), which is consistent with the calculated 2% HIV+ rate in Ethiopia as a whole.

For the HIV+ patients, there were 20 females and 12 males. For the controls, there were 21 females and 11 males. Average age for each group was 24 years old, with the standard deviation of 11.5 years for the HIV+ and 8.8 years for the controls. The average age for all patients was 24 years old (range, 7-53 years).

The CD4 count for the HIV+ ranged from 369 to 990 cells/cc (552 cells/cc average and 151 SD). (Only 1 patient had a CD4 count below 400 at the time of operation but had had no symptoms of the disease for years and was therefore operated on.)

Of the 32 HIV+ patients, 19 were taking antiviral medications preoperatively, and these were continued through the perioperative and postoperative period. Medications for patients operated before 2014 were Zidovudine and Lamivudine and Nevirapine combined. After 2014, the HIV+ patients were on Tenofovir and Lamivudine and Efavirenz combined.

Operations

The distribution of operations was equivalent between both groups of patients. Twenty-three patients in each group underwent tympanoplasty, and 9 patients in each group underwent type III tympanoplasty with malleus head or incus body interposed between the capitulum and the cartilage/perichondrial reconstruction of the tympanic membrane.

Severity of Disease and Postoperative Condition

The duration of symptoms from the tympanic membrane perforations for the HIV+ patients was 8 months, and for the controls, it was 10 months. However, 20 HIV+ and 23 control patients reported more than 10 years of chronic infections. None of the ears were wet at the time of operation.

Table 1 demonstrates the distribution of tympanic membrane perforations among HIV+ and control patients. The preoperative perforation sizes between the 2 groups were equivalent: 15 HIV+ and 14 controls had perforations more than 60% of the drumhead, 14 HIV+ and 17 controls had

perforations of 30% to 60% of the drumhead, and 3 HIV+ and 1 control had perforations less than 30%.

There were 2 failures to close the tympanic membrane perforation from each group for a total of 2 of 32 failures with reoperation in both the HIV+ and the controls groups. There was 1 reoperation in each group to release adhesions and 1 reoperation in an HIV+ patient to reposition an ossicle.

Figure 1 demonstrates a “box and whiskers” plot of the average air bone gap pre- and postoperatively for the HIV+ and control subjects. Preoperative air bone gaps for the HIV+ patients and the controls were equivalent: HIV+ patients showed on average 42 dB (range, 25-55 dB, SD = 8 dB), and controls showed on average 41 dB (range, 26-56 dB, SD = 7 dB).

Postoperative examination data were extracted from office visits at 4 to 64 months after operation (average 10 months, SD = 13 months). Date from the longest follow-up time was selected for analysis.

Table 1. Distribution of Preoperative Tympanic Membrane Perforation Sizes Between HIV+ Patients and Controls.

Perforation Size (%)	HIV+	Controls	Total
0-30	3	1	4
31-60	14	17	31
>60	15	14	29
Total	32	32	64

The postoperative air bone gaps and the improvements in air bone gaps for the HIV+ patients and controls were also equivalent: HIV+ patients showed air bone gaps on average 20 dB (range, 0-52 dB, SD = 12 dB) and the controls on average 15 dB (range, 0-48 dB, SD = 11 dB). The average improvements in air bone gaps were 22 dB (SD = 11 dB) in the HIV+ group and 26 dB (SD = 10 dB) in the control group. A *t* test found no significant statistical difference between the hearing improvements of the HIV+ and the controls within the 95th percentile confidence interval.

However, the improvements in air bone gaps was highly significant *within* each group ($P = .001$).

There were no postoperative complications such as wound infection, wound dehiscence, worsened sensorineural levels, dizziness, or facial nerve weakness.

Discussion

This study finds that the postoperative results for simple tympanoplasty and type III tympanoplasty are equivalent between HIV+ patients and patients whose HIV status is unknown (HIVU). This study found that when the CD4 counts of the HIV+ patients are above 400 cells/cc, preoperative and postoperative conditions of the tympanic membranes and the hearing were equivalent between the 2 groups. There were no significant complications in either

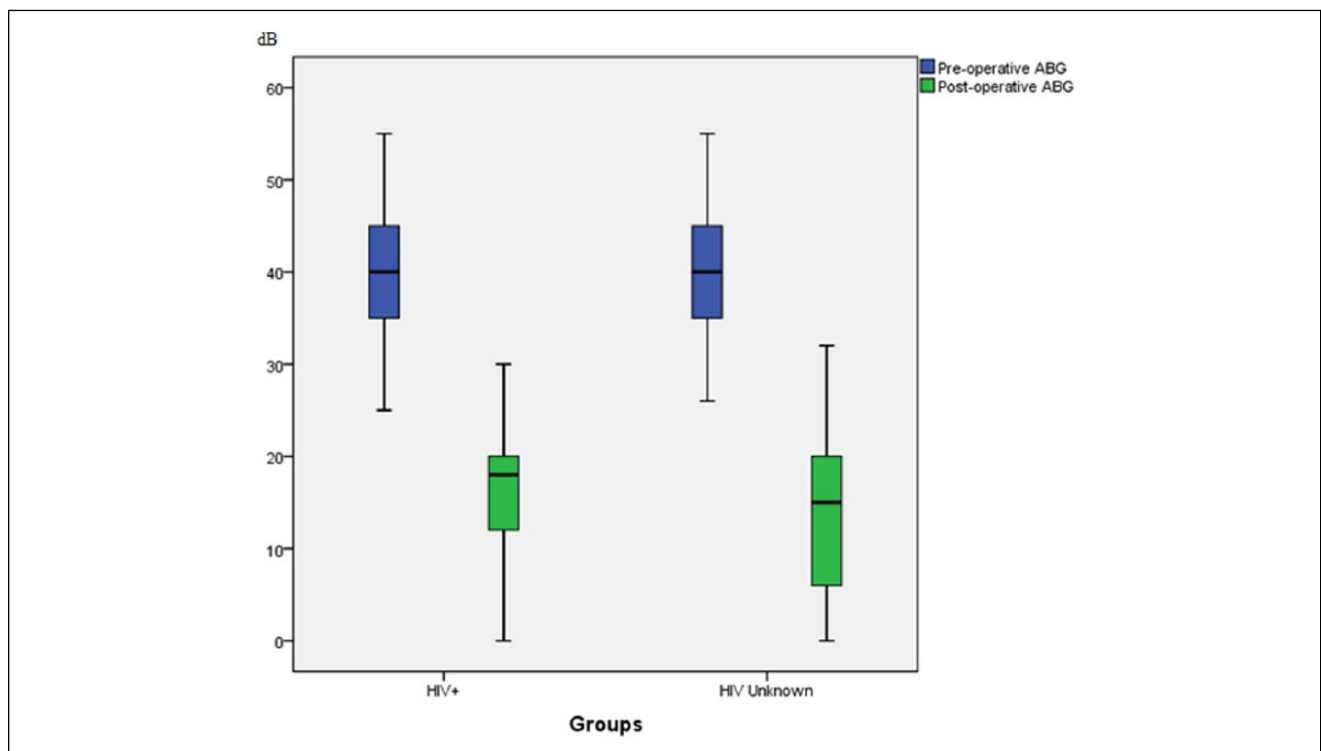


Figure 1. “Box and whiskers” plot of the average air bone gap pre- and postoperatively for the HIV+ and control subjects. Mean air bone gap, standard deviation, and range are illustrated.

group and no problems with wound healing in the HIV+ group.

The uncertainty about the status of the HIVU patients does indeed contaminate the results of this study, however. Because of limitations in laboratory testing in Ethiopia, the designation *HIVU* has been commonly used in reporting for patients suspected to be HIV-.^{1,2} Here too, although it is not certain, most likely the HIVU patients were HIV negative: Their histories were not suggestive of infection. The President's Emergency Plan for Aids Relief program (PEPFAR)¹⁰ in Ethiopia has made HIV medications available and reduced the stigma self-reporting HIV positivity. And the percentage of HIV+ tympanoplasty patients (1.8%) seen at this operative site closely matches the 2% rate in Ethiopia as a whole.

The uncertainty about HIV status is always a primary concern during otologic surgery, especially for protecting operating room personnel.¹¹ However, the costs of universal HIV testing have been prohibitive in Ethiopia, which is a low resource setting. Tests of viral load, another standard for evaluating disease progression,^{11,12} is even more expensive. Therefore, for this site, HIV testing was obtained only for those people who had histories suggestive of undiagnosed HIV, and CD4 counts were obtained for all HIV+ patients.

For safety, operating protocol and sterilization procedures were conducted to protect against acquired blood-borne infections. As an additional precaution, control/HIV+ pairs in this study were selected from operations performed on the same day—with the control early in the day and the HIV+ patient last. As an aside, although all operations were performed by the same surgeon, the order of the operations during the day did not seem to affect their outcome.

For this study, tympanoplasty or type III tympanoplasty for HIV+ patients were performed if the CD4 counts were above 400 cells/cc. This threshold for elective operations in HIV+ patients has been logically established: First, this standard is based on widespread reports of operative experiences in other fields¹³⁻¹⁵ that CD4 counts below 400 cells/cc were associated with worse postoperative healing. Second, in the world AIDS literature, CD4 counts of at least 400 cells/cc appears to be a marker of immunocompetency and resistance to infection.^{12,13} Finally, the 95th percentile range of CD4 counts for healthy HIV- Ethiopians is from 386 to 1598 cells/cc with the averages being 869 cells/cc¹⁶ or 775 cells/cc.¹⁷ Therefore, the CD4 counts of the HIV+ patients in this study (range, 369-990, average 552 cells/cc) fall well within this range.

This study has the flaws outlined previously. However, the simplicity of the operative procedures, numbers of subjects in the HIV+ and HIVU groups, paucity of complications, and outcomes all suggest that these otologic surgeries on HIV+ patients are equivalent to the same procedures on HIV- patients.


Declaration of Conflicting Interests

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