

Combination of Pre-Exposure and Postexposure Prophylaxes Used for an Occupational Exposure to HIV: A Case Report

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Short report

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Abstract

Background: Pre-exposure prophylaxis (PrEP), the usage of antiretroviral medications in HIV-uninfected individuals to prevent acquisition of HIV, has been identified to be sufficient and safe for HIV prevention.

Case presentation: A surgeon was prescribed Tenofovir disoproxil fumarate (TDF) and emtricitabine (FTC) as pre-exposure prophylaxis before he performed a surgery for HIV positive patient. After occupational exposure, he was prescribed TDF/FTC and Raltegravir as postexposure prophylaxis. Serology confirmed no HIV infection at follow-ups.

Conclusion: This brief report presents a case who received PrEP and PEP in an occupational exposure to indicate the feasibility of the use of PrEP in occupational exposure.

Background

Health care workers (HCWs) are at high risk of occupational exposure to many infections, such as human immunodeficiency virus (HIV). The World Health Organization (WHO) estimated about 3 million occupational exposures in health care settings each year, 90% of which occurred in developing countries. HCWs working in the departments such as operating, delivery, emergency rooms and laboratories suffer from a higher risk of exposure¹. It has been estimated that more than 250,000 HCWs were exposed to HIV each year and about 1,000 HIV infections were likely to happen².

The advent of antiretroviral therapy (ART) has greatly improved the management and prevention of HIV infection³. Postexposure prophylaxis (PEP) has been proved to be a safe and effective treatment strategy aimed at preventing infection in those with recent HIV exposures. Approximately, 81% of the transmission of HIV risk can be reduced using PEP⁴. Based on the WHO guidelines, all the HCWs are required to use PEP after HIV occupational exposures⁴.

Pre-exposure prophylaxis (PrEP), the usage of antiretroviral medications in HIV-uninfected individuals to prevent acquisition of HIV, has been identified to be sufficient and safe for HIV prevention through case-control, observational and randomized clinical trial data⁵. In 2014, WHO recommended PrEP as a critical part of comprehensive HIV prevention. In 2015, the use of PrEP was further expanded from men who have sex with men (MSM) to all HIV high-risk populations⁶. However, the use of PrEP in HIV occupational exposure has not been reported.

Herein, we described the first reported use of combination of PrEP and PEP in a surgeon who was occupationally exposed to HIV during operation.

Case Presentation

Surgeon X, male, 31 years old, had planned to perform the open reduction and internal fixation of calcaneal fracture for a HIV serological positive patient. The patient, a 45-year-old male worker, was taken

to hospital after being injured on a construction site and diagnosed as a calcaneal fracture at 21 days before he came to Surgeon X for surgery. Preoperative laboratory findings suggested that the patient had an HIV viral load of 27,524 copies/ml and CD4 positive T lymphocyte count was 344/dl. He stated that he had not ever received any antiviral treatment previously. Considering patient's old and complex fracture, the reduction procedures would be very difficult and the operation might take a long time with a requirement of numerous kirschner pin immobilization. Surgeon X assessed that there was a high probability of occupational exposure during the operation and a high risk of infection with HIV after occupational exposure. Based on his understanding of on-demand advancement of PrEP strategy in HIV prevention⁷, Surgeon X went to our department requesting the PrEP. He had last tested with negativity for HIV 2 weeks earlier, and had no other risk events in the preceding 3 months. He had received the Tenofovir disoproxil fumarate (TDF) and emtricitabine (FTC) treatment for post-exposure prophylaxis in the past (out of use at that moment) with no side effects. Therefore, it was unlikely that there would be any discomfort during the surgery. Surgeon X took a loading dose of 600 mg of TDF and 400 mg of FTC with food 2 hours before surgery. In case of discomfort or other unexpected circumstances during the operation, he invited another Surgeon of the same seniority as him as an extra assistant. The operation lasted 2.5 hours and he did not feel any discomfort during the operation. Unfortunately, towards the end of the operation, the temporary kirschner needle pricked his thumb. PEP then must be started. After first aid, counseling and risk assessment, consent-based laboratory testing showed a baseline HIV antibody/antigen negative. Surgeon X was prescribed a course of TDF/ FTC and Raltegravir (RAL) for 28 days as PEP according to local guidelines⁸. Considering the the generated PrEP, he took only 400 mg of RAL and 12 h later another 400 mg of RAL at the first day. 24 h after PrEP, Surgeon X began taking a dose of 300 mg of TDF and 200 mg of FTC once a day in combination with 400 mg of RAL twice a day as a PEP regimen. Serological tests showed that HIV infection had not occurred at 1-month and 3-month follow-up.

Discussion And Conclusions

In 2015, WHO updated the previous recommendations on PrEP and recommended PrEP to the individuals at substantial risk of acquiring HIV rather than limiting the recommendation to specific populations. Substantial risk of HIV infection is provisionally defined as HIV incidence greater than 3 per 100 person-years in the absence of PrEP⁶. Moreover, this new recommendation also pointed out that individual risk varied with individual behaviors. Among some individuals, they actually stay at substantial risk who should be attracted to PrEP services in locations although the overall incidence of HIV infection is low. The thresholds for offering PrEP may vary depending on a variety of considerations, including available resources, the relative costs, feasibility and demand for PrEP. According to previous reports, Surgeon X's risk attributed to percutaneous injuries involving HIV was approximately 0.3% (95% CI, 0.2–0.5%)⁹. We estimated that Surgeon X's risk of HIV infection after occupational exposure could be higher than 0.3%, because the patient did not receive any antiviral treatment prior to surgery with a high viral load and greater chance of deep puncture during surgery¹⁰. As Surgeon X had a strong desire for PrEP, we prescribed TDF/ FTC for him as PrEP. The standard use of TDF/FTC as PrEP is 1 tablet (300 mg of TDF

and 200 mg of FTC) per day, but studies on MSM showed that PrEP on demand (2 tablets taken 2–24 h before sex, and another pill taken 24 h and 48 h after the first dose) could also effectively prevent HIV infection. The risk of infection can be reduced by 86.0% compared with the placebo group⁷. Therefore, we advised Surgeon X to take 2 tablets on-demand 2 h before surgery. Here we describe for the first time the use of PrEP before occupational exposure. After the occurrence of occupational exposure, given the possibility of blocking failure of PrEP, which was reported by other researches¹¹, PEP was still conducted timely. And the combination of PEP and PrEP ultimately ensured that Surgeon X was not infected with HIV after his occupational exposure. In the current case report, Surgeon X realized that he had suffered from occupational exposure during the surgery. and then the PEP was conducted after his immediate report. Thus, we can't predict whether Surgeon X can prevent HIV infection with PrEP alone after occupational exposure to HIV.

In clinical and laboratory settings, it is common for HCWs to be unaware of occupational exposure to HIV. In this situation, PEP is always not conducted and HIV infection has been reported as a result¹². Because the HIV vaccine development still has a long way to go, further evaluation is needed to determine whether PrEP can effectively block HIV transmission in this high-risk group.

Abbreviations

PrEP: Pre-exposure prophylaxis

PEP: postexposure prophylaxes

HIV: human immunodeficiency virus

TDF: Tenofovir disoproxil fumarate

FTC: Emtricitabine

RAL: Raltegravir

HCWs: Health care workers

WHO: World Health Organization

ART: antiretroviral therapy

Declarations

Ethics approval and consent to participate:

This retrospective study was approved by the ethics committee of Beijing Ditan Hospital, Capital Medical University. All procedures performed in studies involving human participants were in accordance with the

ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Consent for publication:

Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

Availability of data and materials:

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests:

The authors declare that they have no competing interests.

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Authors' contributions:

RZ and RD contributed equally to this work. Case follow-up by clinical and scientific point of view: RZ, RD and QZ. Data collection and analysis: RZ. Writing: RD, RZ and QZ. All authors have read and approved the final manuscript.

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References

1. WHO. Aide-Memoire for a strategy to protect health workers from infection with bloodborne viruses. https://www.who.int/occupational_health/activities/1am_hcw.pdf.
2. Pruss-Ustun A, Rapiti E, Hutin Y. Estimation of the global burden of disease attributable to contaminated sharps injuries among health-care workers. *American journal of industrial medicine*. Dec 2005;48(6):482-490.
3. Taramasso L, Magnasco L, Bruzzone B, et al. How relevant is the HIV low level viremia and how is its management changing in the era of modern ART? A large cohort analysis. *Journal of clinical virology : the official publication of the Pan American Society for Clinical Virology*. Feb 2020;123:104255.

4. WHO Guidelines Approved by the Guidelines Review Committee. *Guidelines on Post-Exposure Prophylaxis for HIV and the Use of Co-Trimoxazole Prophylaxis for HIV-Related Infections Among Adults, Adolescents and Children: Recommendations for a Public Health Approach: December 2014 supplement to the 2013 consolidated guidelines on the use of antiretroviral drugs for treating and preventing HIV infection*. Geneva: World Health Organization
Copyright (c) World Health Organization 2014.; 2014.
5. Desai M, Field N, Grant R, McCormack S. Recent advances in pre-exposure prophylaxis for HIV. *BMJ (Clinical research ed.)*. Dec 11 2017;359:j5011.
6. WHO Guidelines Approved by the Guidelines Review Committee. *Guideline on When to Start Antiretroviral Therapy and on Pre-Exposure Prophylaxis for HIV*. Geneva: World Health Organization
Copyright (c) World Health Organization 2015.; 2015.
7. Molina JM, Capitant C, Spire B, et al. On-Demand Preexposure Prophylaxis in Men at High Risk for HIV-1 Infection. *The New England journal of medicine*. Dec 3 2015;373(23):2237-2246.
8. [Chinese guidelines for diagnosis and treatment of HIV/AIDS (2018)]. *Zhonghua nei ke za zhi*. Dec 1 2018;57(12):867-884.
9. Gerberding JL. Clinical practice. Occupational exposure to HIV in health care settings. *The New England journal of medicine*. Feb 27 2003;348(9):826-833.
10. Cardo DM, Culver DH, Ciesielski CA, et al. A case-control study of HIV seroconversion in health care workers after percutaneous exposure. Centers for Disease Control and Prevention Needlestick Surveillance Group. *The New England journal of medicine*. Nov 20 1997;337(21):1485-1490.
11. Cohen SE, Sachdev D, Lee SA, et al. Acquisition of tenofovir-susceptible, emtricitabine-resistant HIV despite high adherence to daily pre-exposure prophylaxis: a case report. *The lancet. HIV*. Nov 29 2018.
12. Soria A, Alteri C, Scarlatti G, et al. Occupational HIV Infection in a Research Laboratory With Unknown Mode of Transmission: A Case Report. *Clinical infectious diseases : an official publication of the Infectious Diseases Society of America*. Mar 15 2017;64(6):810-813.