10. HIV and solid organ transplant

10.1 Kidney/pancreas transplant

- Single-center, retrospective cohort study comparing long-term outcomes of HIV-positive patients who underwent kidney transplant and/or liver transplant patients with matched HIV-negative patients
- At 15 years posttransplant, HIV negative recipients had significantly higher patient survival, but graft survival was not significantly different. Diagnosis of HIV was not a statistically significant predictor of patient survival (HR, 1.36; 95% CI, 0.83-2.24; p=0.22)
- Acute rejection was associated with reduced graft survival in HIV positive patients

- Retrospective review describing ART regimens, reasons for ART switching, and association between rejection and protease inhibitor (PI)-based and non PI-based regimen in 53 HIV+ to HIV+ kidney transplant recipients in South Africa
- An association was found between rejection and PI-based regimen (incident rate ratio 2.77; 95% CI 1.03-7.48; p=0.044)

- Comparison of access to kidney transplantation between HIV+ and HIV- patients
- Patients living with HIV had longer times to referral, evaluation, and waitlisting after starting dialysis compared to HIV- patients

- Comparison of protease inhibitor (PI)-based and non PI-based regimen on kidney transplant graft outcomes

- Review article of HIV and transplantation that discusses outcomes in HIV D-/R+ transplantation and HIV D+/R+ deceased/living donor kidney transplantation.

- Prospective multicenter study comparing HIV D+/R+ to HIV D-/R+ patients; Study did notice a trend towards higher rejection rates in the D+/R+ study group

- Retrospective study comparing graft rejection in HIV positive kidney transplant recipients who received maraviroc therapy compared to maraviroc-free antiretroviral regimens; No difference of graft rejection was seen between groups


- Case report of a HIV positive kidney transplant recipient who achieved controlled BKV viremia by switching CNI to sirolimus, discontinuing the steroid, and receiving a short course of leflunomide


- Letter to editor outlining case where donor HIV strains are detected in HIV positive recipient post transplant.


- Retrospective study to characterize comorbidities, viral control and management, viral resistance, and KT evaluation appointment rates in a cohort of KT evaluation-eligible HIV-positive patients.


- First known case report of an ABO-incompatible kidney transplant between HIV+ donor to HIV+ recipient.


- 122 HIV-positive kidney transplant recipients at Hahnemann University Hospital received PCP prophylaxis for 6 months; After a median follow-up of 2.88 years, PCP did not occur in any of the recipients.


- Case series evaluating tacrolimus trough levels in 4 HIV kidney transplant recipients on PI or cobi-based regimens who were converted from capsule formulation to liquid formulation tacrolimus.


- Summary of HIV-recipient positive kidney transplant outcomes and management strategies from 19 cohort studies

• Case report of HIV positive kidney recipient with stronglyoides hyperinfection, not detected on serology; treated with ivermectin therapy


• Retrospective analysis using SRTR data to evaluate utilization and outcomes of ESW in HIV positive kidney recipients; ESW use was more common with zero HLA mismatch, living donors, and lymphodepleting induction; Acute rejection was more common in the ESW group at 1 year.


• Retrospective review of short-term allograft and HIV-related outcomes following belatacept conversion in 10 HIV positive kidney recipients


• Single center 16-year retrospective review of kidney transplantation in 255 HIV-positive individuals assessing associations of antiretroviral therapy with long-term survival, cellular and antibody-mediated rejection rates, and the causes of allograft failure.


• A French national registry study evaluating access to the waiting list and kidney transplantation in 255 HIV-positive individuals noting delayed and reduced frequency in transplantation (HR 0.75, 95% CI, 0.52-1.10).


• Case report of the antiviral effects of sirolimus in an HIV-positive kidney transplant recipient who experienced low-level HIV-1 replication reporting stable graft function with monotherapy immunosuppression.


• Prospective, multicenter single-arm trial in 61 adult patients living with HIV who undergo kidney transplantation aiming to evaluate 6-month clinical acute rejection rates in patients treated with raltegravir, effective HIV therapy and time to transplantation.


• Meta-analysis and systematic review of 27 cohort studies and 1670 case series published between July 2003 and May 2018


• Retrospective study characterizing donor selection of 43 kidneys from 25 HIV-positive deceased donors have been transplanted into patients who are HIV positive in Cape Town, South Africa.

- Overview of the transplantation needs in the HIV population focusing on kidney and liver transplants discussing rejection rates, hepatitis C coinfection, and new donor pool opportunities with HIV(+) donor to HIV(+) recipient donation.


- Case series of nine HIV infected SOT patients (8 kidneys, 1 heart); 6/9 patients contracted disease within 5 years of transplant attributed to sexual acquisition; in 7/9 patients, virologic response and CD4 recovery were achieved within 3 months after starting antiretroviral therapy.


- United States nationwide analysis evaluating the effectiveness of kidney transplantation in 605 HIV-positive recipients by reporting clinical and health care utilization outcomes including infection rates, in-hospital mortality rates, and hospital charges.

### 10.2 Liver/intestine transplant


- Case report of the first know LDLT from a donor with history of both HIV and HCV infection. The recipient was a 60 year old male with HIV and ESLD caused by HCV/HBV/HDV co-infection. Patient has been appropriately treated for HCV and achieved SVR, and has well-controlled HIV, HBV, and HDV on a regimen of bictegravir/tenofovir alafenamide/emtricitabine. His donor was his wife, who tested positive for HIV and HCV. She also previously achieved SVR, and her HIV was well controlled. The transplant was successful, with maraviroc added to the recipient's regimen post-transplant.


- Cross-sectional study and retrospective cohort study using the US National Inpatient Sample (NIS) and the United Network for Organ Sharing (UNOS) registry data. 201,348 patients from the NIS were included, and the analysis found that one, two, or three or more organ failures were associated with higher pre-liver transplant (LT) mortality in HIV-infected patients compared to HIV-negative patients with the corresponding number of organ failures.
- UNOS data found that in HIV-infected patients the presence of two or more organ failures was associated with higher 1 year mortality in HIV-infected patients compared to HIV-negative patients, but in patients with no organ failure or only one organ failure, HIV status did not impact 1 year mortality post-LT.


- Review of current landscape of LT for persons living with HIV highlighting the impact of direct-acting antiviral HCV therapies on the epidemiology of liver disease and posttransplant outcomes in HIV-HCV co-infected recipients, improvements in posttransplant management of liver recipients with HIV, and expanding opportunities for persons with HIV as organ donors and recipients with the use of HIV positive livers for transplantation.
Liver transplant outcomes have improved in persons with HIV-hepatitis C co-infection persons with HIV. Preliminary results of HIV-to-HIV liver transplantation show acceptable results although rates of post-transplant infections and malignancies are areas of concern.

- Prospective, multicenter pilot study comparing HIV D+/R+ to HIV D-/R+ liver transplantation
- There were no differences in 1 year graft survival, rejection, or HIV breakthrough but HIV D+/R+ patients had more opportunistic infections, infectious hospitalizations, and cancer

- Retrospective evaluation of 299 liver transplant patients including 31 HIV positive recipients
- Increased but delayed HCC recurrence was found in HIV positive patients compared to HIV negative patients suggesting that surveillance protocols may need to be adjusted in this population

- Retrospective review of 62,195 liver transplant recipients between 2008 and 2019 who were identified from United Network for Organ Sharing and Organ Procurement and Transplantation Network data. Analysis showed that there was an increase in utilization of HIV infected recipients over time, with an average annual percentage increase of 9.2%. Graft and patient survival increased over the study period as well.
- A sub analysis of HCV-infected liver transplant recipients from 2014-2018 showed no significant difference in patient or graft survival between HIV infected and uninfected recipients. Non-viral liver disease was identified as the leading cause of liver transplant in the United States in HIV-infected patients.

- Prospective trial examining the impact of everolimus on HIV persistence and immune responses; Outcomes did not show a significant effect on cell-associated HIV-1 DNA and RNA levels with the use of everolimus in the entire cohort, however, there were significantly lower RNA levels up to 6 months post intervention in patients who had everolimus time-averaged trough levels >5 ng/mL within the first two months of therapy

- Comparison of HIV positive liver transplant recipients between 2008-2015 in Europe and the United States to HIV negative recipients; Improvement of patient and graft survival in HIV-infected liver transplant recipients was observed over time.

- Evaluation of changes in T cell phenotype and polyfunctionality in patients with or without HIV infection receiving liver transplant
- Review of 10 liver transplant recipients who received dolutegravir based HIV therapy post transplantation

- Characterization of T cells and NK cells subsets in HIV positive liver transplant recipients and HIV negative liver transplant recipients

- Retrospective study to identify risk factors associated with early relaparotomies and its impact on overall survival in HIV infected liver transplant recipients.

- Review of literature for HCV and HIV positive liver transplant recipients

- Case series of 3 liver transplant recipients who were transitioned to integrase non-strand transfer inhibitor containing regimens post-transplant to avoid drug interactions with previous regimen and immunosuppression

- Case report of a 49-year old HIV-positive male patient who underwent liver transplantation with subsequent development of PRES assessing accurate risk stratification and management.

- Case report of a living donor liver from an HIV-positive mother to her HIV-negative child in South Africa showing recipient seroconversion 43 days posttransplant and undetectable antibody titers at one year.

- Case report demonstrating acute liver rejection in an HIV-positive recipient due to a failure to recognize the loss of protease inhibitor interaction with maintenance immunosuppressive regimen.

10.3 Heart/Lung Transplant

Case report of the world’s first HIV D+/R+ heart transplant, performed as a heart/kidney transplant. Recipient was a middle-aged female with FSGS and a 3-decade history of HIV, well controlled on rilpivirine and dolutegravir. The patient was originally listed for a kidney transplant alone, after which LVEF declined to 20% and a heart transplant was deemed necessary. The patient was treated with basiliximab, tacrolimus, mycophenolate, and steroids. At 90 days post-transplant, patient was doing well with eGFR 90 mL/min/BSA and no evidence of cardiac or renal allograft dysfunction.


- Focuses on the role of cardiac transplantation for people who live with HIV (PLWH), with special emphasis on the global context.
- While there are significantly fewer heart transplants among PLWH, small case studies have shown that, as with the kidney/liver populations, the 5-year survival between PLWH and HIV-negative patients undergoing heart transplantation was similar. In addition to similar challenges around ideal immunosuppressive regimens, increased risk of rejection and challenges in equitable transplantation workup, PLWH heart recipients also struggle with a scarcity of available transplantation centres equipped for cardiac transplantation for this vulnerable patient population.


- Narrative review of studies published through September 2020 on cardiac transplantation in patients with HIV; Short-term survival is comparable to the general population and HIV status remains stable with post-organ transplantation immunosuppression; Immunosuppression doses are not recommended to be reduced over long-term follow-up due to higher rates of cellular rejection in HIV positive patients.


- Case report of LVAD and heart transplant in patient living with HIV and review of current field


- Case report of first lung transplant in patient living with HIV in Brazil.


- Using data from UNOS dataset, outcomes between HIV positive and negative heart transplants were compared; Rate of acute rejection was significantly higher in the HIV-positive group and there was no difference in short and moderate term survival between HIV positive and HIV negative recipients.


- Case report of a HIV positive heart transplant recipient with giant cell myocarditis

- Case report discussing drug interactions present in heart transplant recipient living with HIV over 11 years of follow-up


- Multicenter retrospective study of 29 HIV infected thoracic transplant recipients from 2000-2016; At 1 year, a rejection rate of 62% was observed for heart transplant recipients


- Retrospective study comparing outcomes of 35 heart transplantations between HIV-positive and HIV-negative recipients using SRTR transplant registry data reporting no difference in patient survival, overall graft survival and death-censored graft survival in HIV-positive and HIV-negative heart transplant recipients.


- Case report of a double lung transplant in a 50-year old HIV-positive patient with alpha-1 antitrypsin deficiency with a history of mycobacterium kansasi prior to transplant reporting stable graft function at 15-months posttransplant without initiation of mycobacterium therapy.


- Case report of a 48 year-old HIV-positive male patient who underwent heart transplantation from an HIV-negative donor complicated by disseminated intravascular coagulation.


- Case report of a 48-year old HIV-positive male who underwent successful bilateral lung transplantation in Canada discussing posttransplant HIV management, rejection & infection outcomes, and functional status at one year.


- Retrospective cohort study in HIV-positive patients receiving a lung transplantation.

10.4 Concurrent HBV/HCV


- Retrospective cohort at four centers - matched recipients of HCV-viremic kidneys to highly similar recipients of HCV-aviremic kidneys on established risk factors for BKPyV. The primary outcome was BKPyV viremia ≥1000 copies/ml or biopsy-proven BKPyV nephropathy; a secondary outcome was BKPyV viremia ≥10 000 copies/ml or nephropathy.

- The median days to peak BKPyV viremia level was 119 (IQR 87-182). HCV-viremic KT was not associated with increased risk of the primary BKPyV outcome (HR 1.26, p = .22), but was
significantly associated with the secondary outcome of BKPyV ≥10 000 copies/ml (HR 1.69, p = .03)

- Double-center retrospective study with a prospective follow-up enrolled 35 KTRs with HCV treated with DAAs for 12 weeks. We compared three parameters: estimated glomerular filtration rate (eGFR), 24-h proteinuria, and CNI trough levels at three time points: baseline, end of treatment (EOT), and 12 months later.
- Kidney allograft function remained stable when comparing baseline and 12-month post-treatment values of eGFR (60.7 versus 57.8 ml/min; p = 0.28) and 24-h proteinuria (0.3 versus 0.2 g/24 h; p = 0.15), while tacrolimus (Tac) trough levels underwent a statistically significant decline (6.9 versus 5.4 ng/ml; p = 0.004).

- Retrospective review of anti-HCV NAT positive and negative organs into negative recipients transplanted over 27 months. Primary outcome was the success rate of eradication of HCV post-transplant. Secondary outcomes were rate of transmission of HCV, treatment adverse events, and graft failure
- 33 anti-HCV positive organs were transplanted into negative recipients. 22 (66.7%) were NAT positive. The median time to initiating therapy was 41.5 days. SVR12 was 100% in patients who finished therapy. There were no adverse events with therapy and no graft failure.

- Passage of the HOPE Act and the advent of direct-acting antiviral (DAA) therapies have allowed for expansion of the donor organ pool to include donors with human immunodeficiency virus (HIV) and hepatitis C virus (HCV), thus providing new opportunities for waitlist candidates. This article provides updates on recent studies in solid organ transplantation (SOT) utilizing donors with HIV and HCV.
- With recent findings of good outcomes in both HIV D+/R+ and HCV D+/R- SOT, we feel the evidence supports both practices as standard clinical care options to mitigate organ shortage and reduce waitlist mortality.

- Retrospective cohort study of liver transplant recipients in Japan between 1997 and 2019 with concomitant HIV and HCV infection. A total of 17 patients met inclusion criteria; 12 receiving allografts from living donors and 5 from deceased donors. All participants were diagnosed with hemophilia. The greatest impact seen on outcomes was achievement of SVR.

- Retrospective analysis of adults with HIV monoinfection and HIV/HCV coinfection who received liver transplant (LT) comparing mortality in patients with HIV who received LT before versus after
the approval of integrase strand transfer inhibitors (INSTIs) and in patients with HIV/HCV coinfection who received LT before versus after approval of direct acting antivirals (DAAs). LT recipients with HIV monoinfection did not experience significant improvement in survival between the pre- and post-INSTI eras. Recipients with HIV/HCV coinfection in the DAA era had a 47% reduction in 1-year mortality as compared to the pre-DAA era.


- Case report of kidney transplant recipient co-infected with HCV (genotype 2a)/HBV/HIV

- Case series of 6 HIV/HCV co-infected kidney transplant recipients from 2001-2018

- Case report of HIV positive liver transplant recipient (with CD4 52 and VL ND at the time of transplant) who had recurrence of HCV on POD 34

- Multicenter, prospective and retrospective study evaluating sofosbuvir therapy in 42 pre and 26 post liver transplant recipients. 93% of patients achieved SVR and post liver transplant survival was 87.9% at 5 years.

- Review overview of transplantation in patients living with HIV, with focus on the management of combination antiretroviral therapy in this population including patients with HCV and HIV.

- Monte Carlo microsimulation model of HCV infection and kidney transplantation amount coinfected kidney-only transplant candidates to estimate the cost-effectiveness of pre- vs post-transplant therapy.

- Monte Carlo simulation performed to assess the risk of HIV, HBV and HCV transmission through organ transplantation with parameters including risk of disease acquisition for increased risk groups, number of virions that multiply to establish infection, virus doubling time, and limit of detection by NAT.

10.5 General/Other

- Review of 209 studies from Jan 2010 to Feb 2020 describing pharmacotherapeutic interventions in people living with HIV considered for or undergoing SOT. The majority of interventions surrounded induction and maintenance immunosuppression, immunizations, and ART adjustments.

- Phase 1 study evaluating the pharmacokinetics, safety, and tolerability of the co-administration of sirolimus or everolimus with ritonavir-containing 3D regimen of the direct-acting antiviral agents ombitasvir, ritonavir-boosted paritaprevir, and dasabuvir in healthy subjects.


- Prospective study of donors with HIV-positive and HIV false-positive test results that found that the use of HIV-positive donors increased annually, and major HIV drug resistance mutations were detected in 42% of patients, but only 4% compromise integrase stand transfer inhibitors.


- Interviews of kidney and liver transplant recipients enrolled in clinical trials evaluating HIV D+/R+ transplantation that identified that patients had overall positive experiences. Ethical concerns, such as targeted education for HIV-positive candidates, remain to be addressed.


- Case series of the characteristics and management of 8 HIV-infected kidney transplant recipients with COVID-19.


- Retrospective review of kidney transplant recipients admitted with COVID-19, which found that concomitant HIV infection was associated with increased mortality (87.5% vs 36.1%, p<0.01).


- Evaluation of treatment and outcomes of COVID-19 in 11 transplant recipients infected with HIV.


- Case series of 121 incident ALCI cases in HIV (n=86) and transplant (n=35) populations. ALCI risk was elevated in both HIV (SIR 5.43; CI 4.27-6.81) and transplant (SIR 5.96; 4.03-8.49) populations. Risk of ALCI was highest in the first year and after 10 years out from transplant in the solid organ transplant population. Only 12.5% HIV and SOT cases tested positive for Epstein Barr virus, suggesting that ALCI risk may not related to EBV infection.


- Revised version of the 2013 PHS guideline for assessing transplant donors and monitoring recipients for HIV, HBV, and HCV.
  - Guidelines outlining considerations for the transplantation of HIV-positive donors and recipients in Southern Africa.

  - Updates in organ transplant in the setting of HIV, including donors with false HIV + tests and increased cardiothoracic transplants.

  - Case series of two patients diagnosed with COVID-19 in London who were also HIV positive kidney transplant recipients

  - Part of the HOPE pilot study; Included 14 kidney transplant recipients and 8 liver transplant recipients from 3 hospitals in the United States who had donor-derived HIV superinfection

  - Description of transmission of HIV, HBV, and HCV from organ donors in Australia finding 3/149 had viral transmission (1 HCV, 2 HBV) from donors, all of which were recognized by donation services.

  - Updated guidelines from the Infectious Diseases Community of Practice of the American Society of Transplantation review the management of transplantation in HIV-infected individuals

  - Retrospective multicenter study from French databases in 7 HIV positive solid organ transplanted patients reporting on the prevalence of Kaposi sarcoma.

  - Updated section of the ID AST Guidelines on screening of donor and candidate prior to solid organ transplant to assess risk based on viral history, immunizations and exposures

• Guideline describing criteria to categorize donors at increased risk (increased risk donors [IRDs]) for transmitting these viruses to recipients; It also recommends universal donor testing for HBV, HCV, and HIV.


• Review analyzing the pharmacokinetic profile of these newer antiepileptic agents to assess their potential for drug interactions with antiretrovirals and immunosuppressants.


• The American Society for Transplantation Infectious Diseases Community of Practice guidance on strategies for living safely after SOT which includes potential exposure to others with viral or bacterial illness, potential exposure to food and water sources, participation in recreational activities, resuming sexual activity, living with pets, and opportunities for travel, especially internationally.


• Multi-center semi-structure interview-based study in 15 HOPE independent recipient advocates with the aim to understand the experiences of the first advocates serving in this role.


• Review article on evolution of HIV and solid organ transplant over 30 years with emphasis on recent developments in HIV-infected to HIV-uninfected individuals and their implications.


• HGG in HIV+ solid organ transplant recipients may contribute to infectious complications and other clinical endpoints.


• Multicenter survey study assessing center-level barriers to implementation of the HOPE Act including knowledge, attitudes and planned protocols.


• Retrospective, observational study evaluating 47 HIV+ liver transplant recipients in Italy. This study validated the frailty index in this patient population.