1389. Risk Factors and Clinical Outcomes of Tuberculosis Among Kidney Transplant Recipients in High Endemic Country: A Case–Control Study

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Background. Tuberculosis (TB) is considered as a challenging issue in solid-organ transplant recipients because of high morbidity and mortality. Active TB after transplant can occur from reactivation of latent infection or newly acquired from community. Understanding risk factors and clinical information of TB may provide an appropriate prevention and treatment strategies in this specific patient population; however, most of data were from non-endemic countries.

Methods. A single-center, matched case–control study was conducted in our institute. Cases were defined as newly diagnosed proven or probable active TB in patients who underwent kidney transplant between April 1992 and October 2018. For each case, 5 controls were matched by age and sex. Risk factor associated with TB was determined using univariate and multivariate conditional logistic regression.

Results. Between study period, kidney transplant was performed in 787 patients. None of the recipients was screened or treated for latent tuberculosis. Twenty-seven cases (3.4%) were diagnosed with active TB including 20 proven and 7 probable cases. The overall incidence of TB in our population was 315 cases per 100,000 patients per year. Allograft rejection was significantly associated with active TB (P < 0.001). The median onset of infection was 17 months (IQR, 4–59 months) after transplantation and 3.4 months (IQR, 2.7–16.3 months) after episode of allograft rejection. Majority of patients (96.3%) were cured after complete treatment; however, those with TB remained having significant unfavorable outcomes including higher all-cause mortality and graft loss.

Conclusion. Incidence of TB in kidney transplant recipients is higher than normal population. Increasing risk of active TB after allograft rejection is probably due to mycobacterial reactivation following high-dose immunosuppressant. Since TB is associated with poor post-transplant outcomes, screening, and treatment of latent infection may be beneficial even in endemic country.

Table 1: Univariate and multivariate analysis of clinical characteristics between KT recipients with TB and control

| Risk factor               | OR (95% CI) | P-value |
|---------------------------|-------------|---------|
| Induction                 |             |         |
| No                        | Ref         |         |
| Induction                 | 3.82 (1.09–15.55) | 0.04    |
| Medication                |             |         |
| Living                    | Ref         |         |
| Cederarich                | 2.26 (0.91–5.6) | 0.08    |
| Cyclosporin               | Ref         |         |
| No                        | Ref         |         |
| Allograft rejection       | Ref         |         |


d = Odds ratio, x2 = adjusted Odds ratio; P-value evaluated by conditional logistic regression. In multivariate model, induction, adjusted dose type, cyclosporin, we found only allograft rejection was associated with TB infected after KT, dOR = 4.46, P 0.002

Figure 1. Compare probability of TB disease after kidney transplantation between KT recipients with and without rejection

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1390. A Novel Application of the Interferon-Gamma Release Assay (IGRA) Among End-Stage Heart Failure Patients Awaiting Heart Transplantation

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Background. The optimal approach to assay the immune status in heart failure is challenging because of the inherent complexity of chronic inflammation. Interferon-gamma release assays (IGRAs) measure an aspect of cell-mediated immunity encompassing both the innate and adaptive immunity. In this study, we evaluated the utility of a commercial IGRA for predicting mortality and infectious complications among heart transplant candidates.

Methods. This prospective cohort study was conducted between August 1, 2014 and January 31, 2019 at a medical center in Taiwan. All heart transplant candidates received an IGRA (QuantiFERON® - TB Gold In-Tube, QFT-GIT) at baseline as part of the initiative to screen for latent tuberculosis. Impaired cell-mediated immunity was defined as the release of <1 IU/mL of interferon-γ (IFN-γ) in response to the common mycobacterial antigens.

Results. Between study period, heart transplant was performed in 787 patients. A total of 102 patients were enrolled; of whom, 23 (22.5%) had impaired cell-mediated immunity at baseline. During the study period with a median follow-up of 1.90 years (IQR 1.17–3.56), 23 (22.5%) patients died and 45 (44.1%) patients developed an infectious complication. Overall mortality was significantly greater among those with impaired cell-mediated immunity (39.1% (9/23) vs. 17.7% (14/79), P = 0.031). A trend toward higher rates of infection was observed among impaired cell-mediated immunity group (60.9% (14/23) vs. 39.2% (31/79), P = 0.066). The most common cause of death was infection (56.5%). No patient developed active tuberculosis during the study and the most common infection was bacteremia (35.6%). In the age-adjusted multivariate analysis, impaired cell-mediated immunity was an independent predictor of mortality (HR 2.87, CI 1.23–6.68, P = 0.014) and subsequent infectious event (HR 3.00, CI 1.56–5.76, P = 0.001).

Conclusion. An interferon-γ release assay utilizing the positive control tube of the QuantiFERON® - TB Gold In-Tube kit was predictive of overall mortality and infections among patients with advanced heart failure awaiting heart transplantation.

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1391. Latent Tuberculosis Screening Cascade in Liver Transplant Candidates: A Single, Transplant Center Experience

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Background. Screening for latent tuberculosis infection (LTBI) is an essential component of the pre-transplant evaluation and key in identifying patients at risk for TB reactivation post-transplantation. At our center, liver transplant candidates (LTC) are routinely referred to transplant infectious disease (TID) for pre-TID evaluation including LTBI screening. Our aim was to determine the effectiveness of our screening practices and identify barriers to LTBI treatment.

Methods. We conducted a medical chart review of actively wait-listed LTC as of February 18, 2019. Data points collected included: TB risk factors, TID referral and completion of evaluation, intention to screen for LTBI (defined as placing an order), screening completion (with documentation of a test result), screening method (IGRA or PPD), screening test result, radiographic findings, and treatment initiation and completion, if applicable. A positive screen was defined as a positive IGRA or PPD result while a negative screen was defined as a negative result or an indeterminate result with
lack of epidemiological risk factors and negative radiographic findings. The proportion of LTC who completed each step in the cascade of care for LTBI was determined.

**Results.** Of 102 LTC, 100 met inclusion criteria. Two were excluded due to past LTBI treatment. Of 100 LTC, 95 completed a pre-TID evaluation. For 94 (98.9%), there was intention to screen. Of those intended for screening, 91 (95.8%) successfully completed screening: 6 (6.6%) patients screened positive and 85 (93.4%) screened negative. All 6 LTC who tested positive were recommended for treatment. Five of 6 (83.3%) agreed to treatment, 3/6 (50.0%) started treatment, and all 3 completed treatment. Reasons for non-treatment included: defer until completion of HCV treatment or hepatologist approval or patient refusal. Treatment regimens included rifampin (n = 1) and isoniazid (n = 2).

**Conclusion.** The prevalence of LTBI in our LTC cohort was low. Nonetheless, TID played a role in the successful completion of LTBI screening and identifying those appropriate for treatment in this vulnerable patient population. Barriers to successful LTBI screening and treatment completion are contingent on effective care coordination and addressing competing co-morbidities.

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1392. Tuberculosis Disease in Recipients of Organ-Transplantation, California 2010–2017
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**Background.** Tuberculosis (TB) disease in persons who have received organ transplantation causes high morbidity, but the epidemiology and clinical features of this problem remain poorly described.

**Methods.** Using California TB registry data from 2010–2017, we describe clinical features of all TB cases occurring in patients who previously received solid-organ transplantation. We compared TB cases with and without transplant, and examined mortality controlling for age.

**Results.** During 8 years of observation, the California TB Registry recorded 116 cases of post-transplant TB. A majority of patients with post-transplant TB were >45 year old (84%), nonwhite (90%), and born outside of the United States (84%). Of 116 cases, 48 (41%) had pulmonary disease, while 68 (59%) had extra-pulmonary disease of both pulmonary and extra-pulmonary disease, compared with 69% and 31%, respectively, in non-transplant-associated TB (P < 0.01). Common sites of extrapulmonary disease in transplant patients included pleura (19%), cervical lymph nodes (12%), and bone (12%). Controlling for age, transplant cases were nearly twice as likely to die as non-transplant-associated TB cases (OR = 1.92, CI = 1.13, 3.25). Among 49 post-transplant TB cases with a positive TB skin test (TST) or interferon-gamma release assay (IGRA), 12 (24%) had the test performed > 6 months prior to TB diagnosis.

**Conclusion.** Our findings suggest that post-transplant TB disease is more likely to be extra-pulmonary and result in death than non-transplant-associated TB, and that opportunities may exist for preventing TB disease through screening and treatment for LTBI in this population.

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1393. Tuberculosis (TB) After Solid-organ Transplant (SOT) and Hematopoietic Stem Cell Transplant (HSCT)
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**Background.** Tuberculosis is an important opportunistic infection that affects transplant recipients; the risk of active infection increases significantly when compared with the general population. Most disease results from reactivation of latent infection, being extrapulmonary and disseminated disease the most common presentations. Most cases occur during the first year post-transplantation when immunosuppression is highest. We describe the clinical characteristics of patients diagnosed with TB after transplant.

**Methods.** Single-center, retrospective study of adult SOT and HSCT recipients in Mexico City, who developed active TB after transplant. We reviewed medical records, and collected demographic data, clinical characteristics, and outcomes.

**Results.** We identified 16 patients with post-transplant TB: 13 SOT, and 3 HSCT recipients. The majority of SOT recipients were women (53.8%); median age was 43 years, 9 were kidney and 4 liver transplant recipients. At TB diagnosis, 84.6% of patients were on 3 immunosuppressors. Latent TB was assessed before transplant in 5 patients (38.4%), of these 3 (60%) were tuberculin skin test+, and 2 received isoniazid. Extrapulmonary disease was most common (7, 53.8%). Predominant symptoms were fever (53.8%), chills (30.8%), and diaphoresis (38.5%); six were diagnosed during the 1st year (46.2%) post-transplant; the median of time to diagnosis was 24 months after transplant. The diagnosis was made by histopathology in most cases. Twelve patients received first-line anti-TB treatment. Overall mortality was 30.8%, directly attributable to TB in 2. In the HSCT group, 2 were women; median age was 22 years, 2 allogeneic and 1 autologous transplant. One patient had been treated for latent TB before transplantation. Two developed disseminated disease. Two patients presented within 6 months after the transplant, and the other within a year. Mortality was 100%, attributable to the infection in two patients.

**Conclusion.** In regions with intermediate to a high prevalence of TB, post-transplant TB could result from reactivation or post-transplant exposure. Most cases occur within the first year post-transplant; clinical symptoms are nonspecific, which lead to a delay in diagnosis. Morbidity and mortality remains high.

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1394. Clinicopathologic Features of Infectious and Noninfectious Tissue Granulomas in Transplant Patients
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**Background.** There is a paucity of literature about the implications of granulomatous disease in hematopoietic stem cell transplant (HSCT) and solid-organ transplant (SOT) patients. Given the broad range of infectious and noninfectious etiologies as well as the heightened risk for severe infection, it is important to characterize the clinicopathologic features of granulomas in this population and to develop a framework to guide further evaluation.

**Methods.** We performed chart reviews of 1,280 transplant recipients (791 SOT and 489 HSCT) at Yale-New Haven Hospital from 2009 to 2019 to identify patients with granulomas in pathologic specimens obtained peri-transplantation. Data on histopathology, microbiology, indication for biopsy, patient characteristics, and clinical presentation were recorded. Morbidity and mortality were noted at 1, 3, and 12 months after granuloma diagnosis.

**Results.** We identified 28 patients with granulomas (9 SOT, 19 HSCT); an incidence of 2.2%. None had explicit risk factors for MTB. Most granulomas (93%) were non-necrotizing. Common sources were lung (n = 9) and lymph node (n = 5). Most were found post-transplant (n = 19) and biopsies were prompted mostly by symptoms (n = 13) or incidental imaging findings (n = 9). Most granulomas were not associated with an infectious process (n = 20). Among infectious granulomas, bacterial soft-tissue infection (n = 2), bartonellosis (n = 2), and fungal infection (1 Cryptococcus and 1 Blastomyces) were most common. MTB PCR was negative in 4 specimens. Among granulomas discovered in SOT patients, 44% were infectious compared with 21% in HSCT recipients. Most infectious granulomas were found in symptomatic patients (75%). One granuloma-related adverse outcome occurred in a case of cryptococcal organizing pneumonia discovered pre-HSCT that worsened with tapering of immunosuppression post-HSCT.

**Conclusion.** Granulomas were uncommon in a large transplant population. Most were deemed noninfectious and their presence alone was not associated with adverse outcomes post-transplant or with increased immunosuppression. Granulomas were more likely to be infectious in SOT recipients and those with symptoms. Symptoms should guide the extent of microbiologic evaluation and reflexive MTB PCR testing is not warranted if risk factors are absent.