9. Types of rejection

9.1. Antibody-mediated


- This review discusses current diagnostic, pathologic, phenotypes, prevention strategies and novel treatment options for AMR


- This review discusses HLA and non-HLA antibodies as well as non-complement dependent mechanisms of antibody toxicity


- This retrospective study studied the impact of C1q-binding antibodies in combination with DSA and their impact on post-transplant renal allograft outcomes.

- This serum-based study details the potential role of non-HLA antibodies (MICA) and their impact on allograft survival.


- This review discusses the nature of anti-vimentin antibodies, their potential mechanisms of allograft damage and their impact on allograft survival.


- This retrospective study addresses the outcomes of renal allografts undergoing early or late AMR while addressing some potential causes for late vs early AMR.


- This systematic review addresses potential uses for eculizumab in renal transplantation (prevention, treatment, aHUS, etc)

- This review assesses and grades the available evidence for the treatment of acute AMR in kidney transplant recipients.


- This review highlights the roles of IVIg in highly sensitized patients, alone or in combination with rituximab and for the treatment of AMR


- This review discusses the mechanism of action as well as potential indications of rituximab in renal transplantation


- This prospective trial demonstrates the potential role of eculizumab therapy in prevention AMR in sensitized renal transplant recipients


• Comprehensive review of AMR diagnosis and treatment. Includes a nice literature summary by treatment agent.


• Literature review of bortezomib in the treatment of antibody mediated rejection. Discusses mechanisms of action, basic science research, and current clinical trials


• In this phase III, multicenter, double-blind, placebo-controlled trial, we randomly assigned patients with biopsy proven AMR to receive rituximab (375 mg/m2) or placebo at day 5. All patients received PE, IVIg, and CS.

Outcome of patients with transplant glomerulopathy (TG) is poor. Using B-cell targeting molecules represent a rational strategy to treat TG during chronic antibody-mediated rejection.


- Single-center series, presenting 23 consecutive patients treated for late AMR.


- Review article regarding the updated 2013 Banff pathology on AMR and future diagnostic directions.

9.2. Chronic


- This review details autoimmune, alloimmune and non-immune mechanisms of cardiac allograft rejection and coronaropathy

• This review discusses the role of DSA in chronic types of AMR, including indolent AMR, C4d negative AMR and late pathophysiologic effects of DSA.


• This review describes the clinical spectrum of lung allograft dysfunction and the bronchiolitis obliterans syndrome, their pathogenesis and auto/immune risk factors as well as non-immune factors.


• This review lays the bases of allo- and autoimmune responses in the context of chronic rejection for heart, lung, liver and kidney allografts.


• This review details immune and non-immune reasons for chronic liver allograft failure including disease recurrence and de novo autoimmune hepatitis.

- This review details multiple mechanisms of cellular and humoral kidney allograft rejection and integrates those in the context of chronic rejection.


- This review discusses the pathophysiologic processes underlying chronic renal allograft dysfunction from immune perspective but also recipient and donor characteristics. Prevention and treatment are also discussed.


- This review discusses chronic antibody-mediated rejection and its progression to transplant glomerulopathy focusing on pathophysiology and potential therapy.


- This review discusses transplant glomerulopathy secondary to chronic anti-body mediated rejection and reviews both prevention strategies and treatment.

9.3. Hyper-acute

• Xenotransplantation was initially limited by hyperacute rejection. However, as genetic manipulation has largely allowed many of those issues to be resolved, the focus has shifted to overcoming the other barriers to xenotransplantation.


• One of the first descriptions of donor-specific antibodies causing hyper-acute rejection in kidney transplantation.


• Simultaneous liver-kidney transplant may protect the kidney allograft from hyper-acute rejection. However, patients with class II donor-specific antibodies should be closely monitored for both acute and chronic rejection of both organs.


• An immature immune system is more permissive of ABO-incompatible allografts. Hyperacute rejection may be avoided in infants who receive ABOi heart transplants.


• Review of hyperacute rejection of ABO-incompatible kidney allografts and current views on pre-transplant management to improve post-transplant outcomes

9.4. T-cell mediated

- Review and discussion of the role IL-17 and T-helper 17 cells play in allograft rejection.


- Review of the role regulatory T cells play in protecting a renal allograft from rejection or in predicting the clinical outcome of rejection.


- Review of the mechanisms of T-cell mediated allograft rejection and the treatment/management of ACR with different immunosuppressive agents. Also includes a history and discussion of developing T-cell mediated allograft tolerance.


- Discussion of the use of antithymocyte globulin and alemtuzumab to control T-cell mediated renal allograft rejection.

- Extensive review of the literature to describe the utility and potential clinical benefit of gene expression (both proteomic and genomic transcripts) in diagnosis of multiple forms of kidney transplantation pathology.


- This pivotal trial showed that rATG was superior to ATGAM in treating acute cellular rejection in renal transplantation.