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Kidney transplantation after desensitization in hypersensitized recipients a single-center case series from an annual cohort of 50 transplants (2025)

Abstract

Background: Hypersensitization remains a major barrier to kidney transplantation due to elevated panel reactive antibodies (PRA), donor-specific antibodies (DSA), and high mean fluorescence intensity (MFI), all of which are associated with increased risks of antibody-mediated rejection and early graft dysfunction.[1–4]

Methods: This retrospective single-center case series includes hypersensitized kidney transplant recipients treated in 2025. Among 50 kidney transplants performed during the study year, six recipients (12%) fulfilled immunological criteria for hypersensitization and underwent tailored desensitization protocols. Sensitization profiles, desensitization strategies, and early post-transplant outcomes were analyzed descriptively.

Results: All recipients demonstrated positive peak PRA (Class I only: 50%; Class I and II: 50%). DSA burden varied, including one case with MFI >6000. Desensitization included double filtration plasmapheresis (DFPP), intravenous immunoglobulin (IVIG) in 83.3%, rituximab in 33.3%, and rATG induction in 66.7%. All CDC cross-matches were negative at transplantation. Delayed graft function occurred in 33.3%, acute rejection in 16.7%, and no early infectious complications were recorded. Renal function improved in all patients by postoperative day 7.

Conclusions: Individualized desensitization enabled successful kidney transplantation in hypersensitized recipients with acceptable early outcomes, supporting its role as a viable strategy when alternative allocation pathways are limited.[1,2,5]

Keywords: organ donation, transplantation ethics public attitudes, Libya, islamic bioethics

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Introduction

Kidney transplantation is the optimal renal replacement therapy for patients with end-stage renal disease; however, access remains limited for hypersensitized candidates due to broad anti-HLA reactivity and high DSA burden.[1,3] Sensitization commonly results from blood transfusion, pregnancy, or previous transplantation and is associated with increased rates of antibody-mediated rejection (ABMR), delayed graft function (DGF), and inferior graft survival,[4–6]

Contemporary consensus supports individualized desensitization strategies aimed at achieving a negative complement-dependent cytotoxicity (CDC) crossmatch before transplantation, most commonly using apheresis-based antibody removal combined with IVIG, with adjunctive therapies in selected cases.[1,2,7] Meta-analyses and cohort studies have demonstrated that desensitized hypersensitized recipients can achieve patient and graft survival comparable to non-sensitized recipients, albeit with higher rejection risk.[5,8]

Emerging therapies, including enzymatic IgG cleavage with imlifidase, have further expanded options for highly sensitized patients, although cost, availability, and long-term outcomes remain under evaluation.[9–11] Alongside clinical considerations, transplantation in hypersensitized recipients raises ethical issues related to equity, proportionality of risk, and informed consent, particularly in resource-limited settings.[21–25]

This study reports a single-center case series of hypersensitized kidney transplant recipients treated during 2025, explicitly contextualized within the center's annual transplant activity.

Methods

Study design and population

This retrospective case series was conducted at a single tertiary kidney transplant center. During 2025, 50 kidney transplants were performed. Six recipients (12%) were identified as hypersensitized and required pretransplant desensitization; these patients constitute the study cohort.

Definition of hypersensitization

Hypersensitization was defined by one or more of the following:

Elevated peak or current PRA (Class I and/or II)

Presence of donor-specific anti-HLA antibodies

High DSA MFI values, particularly >4000 [3,4]

Immunological assessment

All recipients underwent standardized immunological evaluation including:

Peak and current PRA testing

Luminex single-antigen bead assays for DSA detection and MFI quantification

CDC crossmatch testing, which was negative in all transplanted cases

Desensitization protocol

Desensitization strategies were individualized based on immunological risk assessment

Double filtration plasmapheresis (DFPP) was performed in selected high-risk recipients, particularly those with:

Elevated donor-specific antibodies (DSA)

High mean fluorescence intensity (MFI > 3000–5000)

High panel reactive antibody levels (PRA > 50%)

Positive crossmatch or unacceptable immunological profile

DFPP was utilized to reduce circulating alloantibody levels prior to transplantation. The number of sessions ranged from 2 to 8, administered daily or on alternate days depending on antibody response.

Intravenous immunoglobulin (IVIG) was administered following DFPP sessions to modulate immune response and prevent rebound antibody production.

Rituximab (600 mg/m²) was used selectively in patients with persistent high antibody levels or strong DSA positivity to achieve B-cell depletion

Rabbit anti-thymocyte globulin (rATG) was used as induction therapy in the majority of recipients to provide potent immunosuppression and reduce the risk of antibody- Mediated rejection[1,5,7,12]

The number of DFPP sessions ranged from 2 to 8, delivered daily or every other day.

Immunosuppression and follow-up

All patients received steroid-based induction and maintenance immunosuppression with a calcineurin inhibitor, mycophenolate mofetil, and prednisolone. Early outcomes assessed included graft function, DGF, acute rejection, infectious complications, and hospital length of stay.

Statistical analysis

Given the descriptive nature of the study and small sample size, data are presented as counts, percentages, and ranges without inferential statistical testing.

Desensitization strategies were individualized according to immunological risk stratification. DFPP was primarily utilized in recipients with moderate to high DSA burden (MFI ≥3000–4000), multiple DSAs, or combined Class I and II sensitization. Low-risk patients with lower DSA levels (MFI <3000) were managed with IVIG-based protocols without apheresis. High-risk recipients, defined by DSA MFI ≥5000–6000 or multiple antibodies, additionally received rituximab and rATG induction.

Results

Baseline characteristics

Recipients ranged in age from 22 to 51 years, with 66.7% female. All patients were receiving hemodialysis, and none had undergone previous kidney transplantation. Sensitizing events included blood transfusion (66.7%) and pregnancy (33.3%). All transplants were from living related donors.

Degree of sensitization

Peak PRA was positive in all recipients:

Class I only: 50%

Class I and II: 50%

DSA burden varied:

Selected cases with MFI >4000

One case with MFI >6000

Lower-level DSA in others

All patients had a negative CDC crossmatch at transplantation.

Desensitization strategies and outcomes

DFPP was performed in selected high-risk recipients (2–8 sessions per patient). IVIG was administered in 83.3% of cases, rituximab in 33.3%, and rATG induction in 66.7% of recipients.

When outcomes were analyzed according to desensitization protocols:

DFPP + IVIG group:

Demonstrated consistent reduction in antibody levels with progressive improvement in graft function

DFPP + IVIG + Rituximab group:

Used in highly sensitized patients; showed effective immunological control with no early graft loss

rATG induction group:

Associated with stable early graft function and reduced rejection rates

Early Post-Transplant Outcomes:

- Delayed graft function: 33.3%
- Acute rejection: 16.7%
- Early infection: 0%

All patients showed progressive improvement in serum creatinine by postoperative day 7

Length of hospital stay ranged from 6 to 14 days.

These findings demonstrate that tailored desensitization protocols can successfully enable transplantation in hypersensitized recipients with acceptable early outcomes.

Discussion

This case series demonstrates that kidney transplantation following individualized desensitization is feasible in hypersensitized recipients, even within a modest-volume transplant program. Our approach aligns with international consensus recommendations emphasizing antibody reduction, negative CDC crossmatch, and potent induction immunosuppression.[1,2,7]

The observed rates of DGF and acute rejection are consistent with reports from other desensitized cohorts.[5,8,12] The absence of early infectious complications is reassuring but should be interpreted

cautiously given the small sample size and limited follow-up.[6,13]

Emerging strategies, including immunoadsorption and imlifidase-based desensitization, may further improve access for highly sensitized candidates, though long-term comparative data are still evolving.[9–11,14–18] Ethical considerations related to equity, informed consent, and self-sufficiency remain central to decision-making in this population.[19–25]

Conclusion

In this single-center annual cohort, hypersensitized recipients accounted for 12% of kidney transplants. Tailored desensitization protocols incorporating DFPP, IVIG, rituximab, and rATG enabled transplantation with acceptable early outcomes. These findings support continued development of structured desensitization pathways to expand transplant access for sensitized patients**.**

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None.

Conflicts of interest

The authors declare that there is no conflicts of interest.

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