Journal of Clinical and Nursing Research, 2026, Volume 10, Issue 5
http://ojs.bbwpublisher.com/index.php/JCNR
Online ISSN: 2208-3693
Print ISSN: 2208-3685

Preliminary Clinical Observations on the Treatment of 20 Cases of Severe Immune-Mediated Diseases Using the Combined Immune-Inflammation Adsorption System (CIAS)

Wei Zhang, Xiaohui Yan*

Shaanxi Provincial People's Hospital, Xi'an 710068, Shaanxi, China

Author to whom correspondence should be addressed.

Abstract: *Objective*: To investigate the short-term efficacy and safety of the Combined Immune-Inflammation Adsorption System (CIAS) in the treatment of severe immune-mediated diseases. *Methods*: A retrospective analysis was conducted on the clinical data of 20 patients with severe immune-mediated diseases treated at our hospital using CIAS, which involved a series connection of the Kangbail® Protein A Immunoadsorption Column and the Kangseitong® Hemoperfusion Device. Changes in key laboratory indicators and clinical symptoms before and after treatment were compared. Results: A total of 68 treatment sessions were completed across the 20 patients. The mean reduction in IgG levels after a single treatment was (46.2 ± 11.3)% ($p < 0.01$). In patients with lupus nephritis, anti-ds-DNA antibody titers decreased by (68.4 ± 15.2)%, and 24-hour urine protein levels decreased from (4.8 ± 2.1) g/day to (1.2 ± 0.7) g/day ($p < 0.01$); Antibody levels in patients with anti-glomerular basement membrane disease decreased significantly, with 3 cases (75%) becoming independent of dialysis; in the group of highly sensitized patients prior to kidney transplantation, the positive rate of reactive antibodies (PRA) decreased from (76.5 ± 18.3)% to (21.4 ± 12.6)% ($p < 0.01$), and all patients successfully underwent transplantation. Post-treatment, both IL-6 and TNF-α levels decreased by more than 50% ($p < 0.05$). The overall clinical remission rate was 85% (17/20), including 6/7 cases of lupus nephritis, 3/4 cases of anti-GBM disease, 3/4 cases of ANCA-associated vasculitis, and 5/5 cases of highly sensitized pre-transplant patients. The incidence of treatment-related adverse reactions was 14.7% (10/68 sessions), primarily consisting of mild hypotension, bleeding at the puncture site, and mild allergic reactions. All symptoms resolved after symptomatic treatment, and no serious complications occurred. *Conclusion*: CIAS demonstrates definite short-term efficacy in severe immune-mediated diseases, with good safety and manageable adverse reactions, and can serve as a rescue treatment option for patients who have not responded well to conventional drug therapy.

Keywords: Immuno-inflammation adsorption system; Protein A immunoadsorption; Severe immune-mediated diseases; Hemodialysis; Lupus nephritis; Desensitization for kidney transplantation

Online publication: May 31, 2026

1. Introduction

Ethical Approval: This study is a retrospective case analysis and has been reviewed and approved by the Ethics Committee of Shaanxi Provincial People's Hospital (Approval No.: 2024R168). As the treatment constitutes routine clinical practice and the data were analyzed anonymously, informed consent from patients was waived.

Severe lupus nephritis, anti-glomerular basement membrane disease, ANCA-associated vasculitis, and other severe immune-mediated diseases are common critical conditions in nephrology. Patients often present with severe immune dysregulation and intense inflammatory responses. Conventional treatment with corticosteroids and immunosuppressants not only takes time to take effect but is also frequently interrupted due to severe side effects, resulting in persistently high clinical mortality rates [1,2]. Hemodialysis is an emerging technology in modern clinical practice, commonly referred to as renal replacement therapy (RRT). It directly removes circulating immune complexes, pathogenic autoantibodies, and inflammatory mediators from the circulation and has become a crucial adjunctive treatment for critically ill patients in our department [3].

The Combined Immune-Inflammation Adsorption System (CIAS) is a novel combined blood purification technology that has emerged in recent years. By using a Protein A immunoadsorption column in series with a broad-spectrum adsorption perfusor, it simultaneously achieves the dual therapeutic goals of specific autoantibody removal and non-specific inflammatory mediator adsorption [4,5]. Building on previous clinical experience, this article presents a retrospective analysis of 20 cases of severe autoimmune diseases treated with CIAS in the Department of Nephrology at Shaanxi Provincial People's Hospital from January 2024 to December 2025. The aim is to preliminarily evaluate the short-term efficacy and safety of this technology and provide real-world evidence to support future prospective controlled studies.

2. Materials and methods

2.1. General characteristics

The study included 20 patients with severe autoimmune diseases who underwent CIAS treatment at the Hemodialysis Center of the Department of Nephrology, Shaanxi Provincial People's Hospital, from January 2024 to December 2025. Among them, 8 were male and 12 were female; Ages ranged from 18 to 65 years, with a mean age of (38.6 ± 12.5) years. Disease types included 7 cases of severe/critical lupus nephritis, 4 cases of anti-glomerular basement membrane (GBM) disease, 5 cases of high sensitization prior to kidney transplantation (PRA ≥ 50%), and 4 cases of ANCA-associated vasculitis with renal involvement.

2.1.1. Inclusion criteria

(1) Met the established diagnostic criteria for lupus nephritis, anti-GBM disease, ANCA-associated vasculitis, and other relevant conditions [6,7];

(2) Serological evidence of high-titer autoantibodies or the presence of significant systemic inflammatory response;

(3) Inadequate response to standard treatment with adequate doses of corticosteroids and immunosuppressants, or inability to tolerate medication due to severe adverse reactions.

2.1.2. Exclusion criteria

(1) Patients with concurrent severe active infections, such as sepsis, severe pneumonia, or active

tuberculosis;

(2) Patients with concurrent malignant tumors, end-stage liver disease, multi-organ failure (SOFA score ≥ 12), or a projected survival of < 3 months;

(3) Patients who have received rituximab, bortezomib, plasma exchange, or other immunoadsorption therapies within 30 days prior to treatment.

2.2. Methods

All CIAS treatments were performed by a dedicated medical team at the Hemodialysis Center. The treatment system utilized a series combination of the Kangbail® Protein A Immunoadsorption Column and the Kangseitong® disposable hemoperfusion device, both manufactured by Zhuhai Lizhu. Extracorporeal circulation was established using a CRRT machine or a blood cell separator, and line priming was strictly performed in accordance with the department's standardized procedures.

Anticoagulation regimens:

(1) Unfractionated heparin

Initial dose of 2000–3000 U administered by intravenous push, followed by a maintenance dose of 5–10 U/(kg·h) via continuous infusion. ACT is monitored every 30 minutes to maintain a level of 1.5–2.5 times the baseline.

(2) Low-molecular-weight heparin

For patients at high risk of bleeding, use 0.4 mL of nadroparin to prime the tubing, with an additional 0.2 mL administered every 2 hours during treatment, or adjust dynamically based on thromboelastography.

(3) Parameter settings

Blood flow rate 100–150 mL/min; single treatment duration 120–180 min. Treatment frequency is individualized based on clinical condition and immune markers, typically once daily or every other day, with 3–5 sessions constituting one course of treatment.

2.3. Observation parameters

(1) Laboratory parameters

Measurement of immunoglobulin G (IgG) before and after treatment; autoantibodies: antinuclear antibodies (ANA), anti-ds-DNA, anti-glomerular basement membrane antibodies (anti-GBM), anti-neutrophil cytoplasmic antibodies (ANCA); plasma renin activity (PRA);Renal function: (serum creatinine (Scr), blood urea nitrogen (BUN); 24-hour urine protein quantification; inflammatory markers: interleukin-6 (IL-6), tumor necrosis factor-α (TNF-α).

(2) Clinical efficacy indicators

Determine the clinical remission rate according to standardized criteria; record renal function recovery and discontinuation of dialysis.

(3) Safety indicators

Record adverse reactions such as hypotension, allergic reactions, and puncture site bleeding, along with management outcomes. Incidence rate = Number of adverse reaction events / Total number of treatment sessions (68) × 100%.

2.4. Definition of clinical remission

(1) Lupus nephritis

A decrease in urinary protein of ≥ 50% and stable or improved serum creatinine (decrease of ≥ 20% from baseline or return to normal).

(2) Anti-GBM disease/ANCA vasculitis

Discontinuation of dialysis (no dialysis required for 4 consecutive weeks and eGFR ≥ 15 mL/min/1.73 m^2) or a decrease in serum creatinine (Scr) of ≥ 50%.

(3) Pre-transplant in highly sensitized patients

PRA reduced to < 50% and successful kidney transplantation.

(4) Other

Significant improvement in symptoms, with a ≥ 30% reduction in corticosteroid dosage.

2.5. Statistical methods

Data were analyzed using SPSS 22.0 software. Continuous variables are expressed as mean ± standard deviation ($\overline{x} \pm s$). Paired *t*-tests were used for intra-group comparisons; categorical variables are expressed as percentages (%). A *p*-value < 0.05 was considered statistically significant.

3. Results

3.1. Comparison of changes in laboratory parameters before and after treatment

A total of 68 CIAS treatments were administered to 20 patients, and all patients completed the treatment course as planned. Laboratory test results showed that, compared with pre-treatment levels, IgG levels in the 20 patients decreased significantly, with a reduction ranging from 32% to 65% and an average decrease of (46.2 ± 11.3)% ($p < 0.01$); IL-6 decreased from (42.3 ± 15.6) pg/mL to (18.5 ± 7.2) pg/mL, representing a reduction of (56.3 ± 14.2)% ($p < 0.05$);TNF-α decreased from (38.7 ± 12.4) pg/mL to (16.2 ± 6.1) pg/mL, representing a reduction of (58.1 ± 13.6)% ($p < 0.05$); in 7 patients with lupus nephritis, anti-ds-DNA titers decreased by (68.4 ± 15.2)% ($p < 0.01$), 24-hour urine protein decreased from (4.8 ± 2.1) g/day to (1.2 ± 0.7) g/day ($p < 0.01$), and serum creatinine (Scr) decreased from (156.4 ± 72.3) μmol/L to (98.6 ± 41.2) μmol/L ($p < 0.05$); In 4 patients with anti-GBM disease, antibody levels decreased by an average of (73.6 ± 14.2)%, with 2 patients becoming seronegative; in 4 patients with ANCA-associated vasculitis, ANCA titers decreased by an average of (58.3 ± 20.5)% ($p < 0.01$), with 2 patients becoming seronegative; Among the 5 patients with high sensitization (PRA ≥ 50%) prior to kidney transplantation, the mean PRA decreased by (55.1 ± 15.7)% ($p < 0.01$). See **Table 1** for details.

Table 1. Comparison of changes in laboratory parameters before and after treatment ($\overline{x} \pm s$)

Disease type	Laboratory parameters	Pre-treatment	Post-treatment	Decrease (%)	*t*-value	*p*-value
Total cohort (n = 20)	IgG (g/L)	18.6 ± 5.2	10.0 ± 3.1	46.2 ± 11.3	7.39	< 0.01
	IL-6 (pg/mL)	42.3 ± 15.6	18.5 ± 7.2	56.3 ± 14.2	6.63	< 0.05
	TNF-α (pg/mL)	38.7 ± 12.4	16.2 ± 6.1	58.1 ± 13.6	7.96	< 0.05

Lupus nephritis (n = 7)	Anti-ds-DNA (IU/mL)	124.5 ± 38.6	39.3 ± 15.4	68.4 ± 15.2	6.14	< 0.01
	24-hour urine protein quantification (g/day)	4.8 ± 2.1	1.2 ± 0.7	75.0 ± 12.5	4.87	< 0.01
	Scr (μmol/L)	156.4 ± 72.3	98.6 ± 41.2	36.9 ± 18.4	2.03	< 0.05
Anti-GBM disease (n = 4)	Anti-GBM antibodies (RU/mL)	156.8 ± 42.5	41.2 ± 15.3	73.6 ± 14.2	5.74	< 0.01
High sensitization before kidney transplantation (PRA ≥ 50%) (n = 5)	PRA (%)	76.5 ± 18.3	21.4 ± 12.6	55.1 ± 15.7	5.98	< 0.01
ANCA vasculitis (n = 4)	ANCA titer (U/mL)	112.5 ± 38.6	46.8 ± 16.4	58.3 ± 20.5	3.37	< 0.01

3.2. Evaluation of clinical efficacy after four weeks of treatment

Overall clinical remission rate: 85% (17/20). After four weeks of treatment, 17 of the 20 patients regained renal function and were weaned off dialysis, resulting in a remission rate of 85%. Among them, 6 of the 7 patients with lupus nephritis achieved significant remission, yielding a remission rate of 85.7%; Among the 4 patients with anti-GBM disease, 3 achieved remission, resulting in a remission rate of 75%; among the 4 patients with ANCA vasculitis, 3 achieved remission, resulting in a remission rate of 75%; all 5 patients with high sensitization prior to kidney transplantation successfully underwent the procedure, resulting in a remission rate of 100%.

3.3. Evaluation of treatment safety

A total of 10 adverse events occurred in 7 patients, with an incidence rate of 14.7% (10/68). These included 5 cases of mild hypotension (7.35%), 3 cases of bleeding at the puncture site (4.41%), and 2 cases of mild allergic reactions (2.94%). After targeted clinical management, symptoms improved significantly, and no serious safety incidents occurred (see **Table 2**).

Table 2. Results of treatment safety evaluation

Type of adverse reaction	Occurrences	Incidence (%)	Clinical manifestations	Management	Outcome
Mild hypotension	5	7.35	Dizziness, mild drop in blood pressure (90–100/60–70 mmHg)	Rapid fluid resuscitation, reduction of cardiac output	Resolved within 10 minutes, no recurrence
Bleeding at the puncture site	3	4.41	Minor bleeding at the puncture site, subcutaneous bruising	Apply local pressure for 10–15 minutes	Bleeding stops; bruising gradually resolves
Mild allergic reaction	2	2.94	Skin itching, scattered rash	Administered antihistamines for symptomatic treatment	Symptoms resolved within 30 minutes; no worsening

4. Discussion

The core pathophysiological mechanisms of severe autoimmune diseases include the excessive release of pathogenic IgG-class autoantibodies and inflammatory mediators. Although traditional plasma exchange can remove pathogenic substances, it has limitations such as limited plasma resources, the risk of allergic reactions, and loss of coagulation factors [8]. The CIAS model adopted in this study utilizes protein A to specifically adsorb IgG with high affinity, while simultaneously adsorbing medium- and large-molecule

inflammatory mediators via a perfusion device, thereby achieving dual-target clearance of "antibodies and inflammation."

Results showed that a single CIAS session reduced IgG levels by 46.2%, an effect comparable to that reported in the literature for simple immunoadsorption, while avoiding the blood-borne risks associated with plasma exchange. Clinical studies have confirmed that CIAS can rapidly control renal inflammation in lupus nephritis and significantly reduce proteinuria and creatinine levels; for patients with rapidly progressive kidney injury, it can rapidly clear pathogenic antibodies, creating an opportunity to preserve renal function and reduce dependence on dialysis [9,10]; for highly sensitized patients awaiting kidney transplantation, it can effectively reduce PRA and improve transplant success rates. The overall remission rate in this group was 85%, indicating that CIAS has clear short-term therapeutic value.

This study also found that the combined immuno-inflammatory adsorption system (CIAS) treatment for severe immune-mediated diseases has a low incidence of adverse reactions, primarily consisting of mild, transient reactions, with no serious adverse events, making its clinical application safe and controllable. From a health economics perspective, CIAS does not require allogeneic plasma, thereby reducing the risk of bloodborne infections and allergies; although the cost of consumables is relatively high, it can shorten hospital stays, reduce the dosage of immunosuppressants, and improve transplant success rates. However, as this study was a single-center, retrospective observational study with a limited sample size and no parallel control group, selection bias exists. Furthermore, the study only assessed short-term efficacy and safety, lacking long-term follow-up data; cost data were not systematically collected, and no quantitative ICER analysis was conducted. Treatment frequency, duration, and anticoagulation regimens were adjusted on an individualized basis, and no unified standardized protocol was established. Treatment frequency, duration, and anticoagulation regimens were adjusted on an individual basis, and a unified standardized protocol was not established. Consequently, the impact on long-term renal function, recurrence rates, and survival rates cannot be assessed. Therefore, the study conclusions have certain limitations. Future studies will further expand the sample size and conduct multicenter, prospective randomized controlled trials to provide further validation.

5. Conclusion

In summary, this single-center retrospective study demonstrated that the Combined Immune-Inflammation Adsorption System (CIAS) exerts reliable short-term therapeutic effects on multiple types of severe immune-mediated renal diseases. By specifically removing pathogenic autoantibodies and nonspecifically eliminating circulating inflammatory mediators, CIAS effectively reduced systemic inflammatory levels, alleviated renal tissue damage, decreased proteinuria, and improved renal function in patients with lupus nephritis, anti-GBM disease, ANCA-associated vasculitis, and pre-transplant hypersensitization. Moreover, CIAS treatment presented a low incidence of mild and reversible adverse reactions, confirming favorable clinical safety and controllable treatment risks. Compared with traditional plasma exchange and single immunoadsorption, CIAS avoids allogeneic plasma transfusion and related blood transfusion complications, providing a superior alternative rescue strategy for patients with poor response to conventional hormone and immunosuppressant regimens. Nevertheless, restricted by the small sample size, single-center design, retrospective nature and lack of unified standardized treatment protocols and long-term follow-up data, the long-term clinical

efficacy and economic benefits of CIAS remain to be further verified. Large-sample, multicenter, prospective controlled studies are urgently required to optimize the treatment scheme and promote the standardized clinical application of CIAS.

Disclosure statement

The authors declare no conflict of interest.

References

[1] Ding Y, Yang Z, Zhang L, et al., 2026, Clinical Analysis of the Combined Use of Immunosuppressants and Glucocorticoids in the Treatment of Severe Pneumonia Complicating Pediatric Immune-Mediated Kidney Diseases. Journal of Rare and Rare Diseases, 33(03): 138–141.

[2] Alnaimat F, AbuHelal A, Elmusa R, et al., 2026, Immune Rehabilitation After Renal Transplantation in Autoimmune Diseases: Balancing Immunosuppression and Risk of Complications. Autoimmunity Reviews, 25(4): 104031.

[3] Zhang L, Guo Y, Huang H, et al., 2025, The Role of Continuous Blood Purification Techniques in the Treatment of Patients with Acute Kidney Injury Due to Sepsis. China Medical Device Information, 31(17): 144–146.

[4] Chen M, Wu G, Niu H, et al., 2025, A Study on the Role and Mechanism of Hemoperfusion for Inflammatory Adsorption in the Treatment of Sepsis-Induced Cardiomyopathy. Journal of Lingnan Emergency Medicine, 30(06): 636–639.

[5] Zheng N, An Z, Liu H, et al., 2019, Effects of Uridqing Granules Combined with Combined Artificial Kidney on Lipid Metabolism, Inflammatory Response, and Cellular Immune Function in Patients with Diabetic Nephropathy Undergoing Maintenance Hemodialysis. Journal of Modern Integrated Traditional and Western Medicine, 28(20): 2208–2211.

[6] Cheng J, 2025, Establishment of an Evaluation System for the Efficacy of Integrated Traditional Chinese and Western Medicine in Lupus Nephritis, thesis, Yunnan University of Traditional Chinese Medicine.

[7] Zhao Y, Gao Y, Zhu R, et al., 2025, A Case of Anti-GBM Disease Complicated by IgA Nephropathy. Zhejiang Clinical Medicine, 27(12): 1873–1875.

[8] Kaur M, Chittipolu S, Marathi R, et al., 2026, A Rare Diagnostic Crossroad: ANCA Vasculitis with C3 Glomerulopathy. The American Journal of the Medical Sciences, 371(Suppl 1): S94–S95.

[9] Chen Q, Yan Z, Liu L, et al., 2026, Analysis of the Efficacy of Rituximab Combined with Mycophenolate Mofetil in the Treatment of Lupus Nephritis. Chinese Journal of Modern Drug Application, 20(09): 82–85.

[10] Zeng Y, Hou C, Wu W, et al., 2025, Analysis of the Efficacy of Immunoadsorption in the Treatment of Pediatric Neuroimmunological Diseases. Chinese Journal of Neuroimmunology and Neurology, 32(04): 307–312.