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Plasma Exchange is a Therapeutic Procedure used in the Management of Rapidly Progressive Glomerulonephritis (RPGN): A Case Report

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Abstract

Rapidly Progressive Glomerulonephritis (RPGN) is a clinical syndrome characterized by a rapid decline in kidney function and the presence of crescents on kidney biopsy, requiring immediate treatment to prevent disease progression. A 34-year-old man was admitted to the hospital with generalized body swelling that began in the eyelids one week prior. He had a history of fever before admission, which subsided upon hospitalization. Additional complaints included shortness of breath, cough, and runny nose. Past medical history included hypertension and hiperuresemia. In recent days, he experienced oliguria. Physical examination revealed pitting edema in the lower extremities. Laboratory tests showed anemia, hypoalbuminemia, and rapid decline in kidney function. Urinalysis revealed protein +3, leukocytes sediment 80.1/µL, erythrocytes sediment 468/µL, and Esbach 0.5 g/L. Complement C3 53 mg/dL, C4 13.8 mg/dL, ANA, and anti-dsDNA were negative, with no available data for anti-GBM, ANCA and kidney biopsy Segmental Mesangial Hypercellular Glomerulus and focal segmental sclerosis. Chest X-ray showed cardiomegaly, bronchopneumonia, and left pleural effusion. Abdominal ultrasound revealed bilateral parenchymal renal disease. The patient was treated with high dose steroids, antibiotics, antihypertensives, symptomatic medications, two sessions of hemodialysis, and four sessions of plasma exchange (PLEX). The combination therapy of high dose steroids and followed by hemodialysis and plasma exchange, resulted in significant reduction of edema and improvement in kidney function, demonstrating the effectiveness of an aggressive immunomodulatory regimen. In pauci-immune or idiopathic RPGN, the combination of high-dose steroids and plasma exchange along with dialysis provides a rapid clinical response, increases the chance of remission, and preserves kidney function.

Introduction

Rapidly Progressive Glomerulonephritis (RPGN) is one of the most severe and progressive forms of glomerulonephritis, characterized by a rapid decline in renal function within days to

weeks. Histopathologically, RPGN is marked by the formation of crescents in the glomeruli due to proliferation of parietal epithelial cells and infiltration of inflammatory cells in response to glomerular capillary injury (Mohamed et al., 2024; Meena et al., 2026; Kurts et al., 2025). Clinically, RPGN may present with hematuria, proteinuria, hypertension, and a rapid deterioration of renal function, which can progress to end-stage renal disease if not treated promptly (Graňák et al., 2025; Sahu et al., 2025; Berrocal et al., 2026). The prevalence is relatively significant among cases of severe glomerulonephritis. In developed countries, RPGN is estimated to account for approximately 10–15% of glomerulonephritis cases requiring kidney biopsy (Aghsaee Fard & Zahedian, 2024; Palma et al., 2025; Covic et al., 2025). In Indonesia, prevalence data remain limited due to the lack of a national registry; however, local studies indicate that RPGN occurs at a relatively high rate among patients with acute nephritis and rapid loss of renal function (Jauhal et al., 2026; Hull et al., 2026; Floege et al., 2025). The reported one-year mortality rate ranges from 20–30%, depending on the underlying etiology, delay in diagnosis, and response to therapy (Grillo et al., 2025; Gettings et al., 2025; Kamalo et al., 2026). Moreover, approximately 30–50% of patients may progress to end-stage chronic kidney disease and require long-term renal replacement therapy such as hemodialysis or kidney transplantation (Cortazar et al., 2023; Turra et al., 2026; Zisman-Ilani et al., 2026). Identifying the specific type of RPGN is crucial, as it directly influences therapeutic decisions and prognosis. Given its high progression rate and the risk of irreversible renal failure, RPGN is considered a nephrological emergency requiring early detection, accurate diagnosis, and intensive management to reduce both short- and long-term mortality and morbidity (Aghsaee Fard & Zahedian, 2024; Rovin et al., 2021; Jakubowska et al., 2026).

Methods

Case Illustration

A 34 year old man was admitted to the hospital with generalized body swelling, which began in the eyelids one week prior and progressively worsened to involve the entire body. He reported having a fever for one week, which improved after taking medication. Upon hospital admission, he was afebrile. Additional complaints included shortness of breath, cough, and nasal congestion. The patient reported cloudy yellow urine. His medical history was significant for hypertension and gout.

On physical examination, blood pressure was 180/90 mmHg, with other vital signs within normal limits. Conjunctivae were pale, and pitting edema was noted in both lower extremities. Examination of the head, chest, and abdomen was otherwise unremarkable. Laboratory results showed hemoglobin 7.2 g/dL, leukocyte count 11.1 × 10^3/µL, and platelet count 131 × 10^3/µL. Renal function tests revealed a blood urea nitrogen of 171 mg/dL and serum creatinine of 7.6 mg/dL, which increased rapidly over two days to 262 mg/dL and 10.3 mg/dL, respectively. Serum albumin was 2.1 g/dL, calcium 2.0 mmol/L, and other electrolytes were within normal range. Urinalysis demonstrated proteinuria (+3), leukocytes sediment 80.1/µL, erythrocytes sediment 468 1/µL, and Esbach 0.5 g/L. Antistreptolysin O was negative; Complement C3 53 mg/dL, C4 13.8 mg/dL, ANA 0.58 IU/mL, and anti-dsDNA 0.5 IU/mL were all within normal limits. Chest X-ray revealed cardiomegaly, bronchopneumonia, and left sided pleural effusion. Abdominal ultrasound demonstrated bilateral parenchymal renal disease. Kidney biopsy confirmed crescent formation in the glomeruli, Segmental Mesangial Hypercellular Glomerulus and focal segmental sclerosis, ANCA-Related RPGN.

The patient was diagnosed with acute glomerulonephritis, pauci immune type, with RPGN. Treatment included high dose intravenous methylprednisolone 500 mg every 12 hours for three days, followed by tapering to oral administration at 20 mg every 12 hours. Intravenous ampicillin sulbactam 1.5 g every eight hours was given for bronchopneumonia. Antihypertensive therapy consisted of amlodipine 10 mg once daily and imidapril 10 mg once

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daily. Additional medications included sodium bicarbonate 500 mg every eight hours, folic acid 1 mg once daily, and packed red cell transfusion. Hemodialysis was performed twice, and Plasma exchange (PLEX) was carried out four times. After 30 days of hospitalization, renal function improved significantly, with blood urea nitrogen decreasing to 60 mg/dL and serum creatinine to 1.0 mg/dL, accompanied by marked clinical improvement.

Result and Discussion

This 34 year old male presented with diffuse edema, hypertension, anemia, proteinuria, microscopic hematuria, and a rapid decline in renal function from an initial blood urea nitrogen of 171 mg/dL and serum creatinine of 7.6 mg/dL to 262 mg/dL and 10.3 mg/dL, respectively, within two days which is highly consistent with RPGN. Aggressive therapy comprising high dose steroids, PLEX, and dialysis represents the standard approach to prevent progressive glomerular injury (Rovin et al., 2021)(Odler et al., 2025).

RPGN is a clinical syndrome characterized by a rapid decline in renal function usually defined as a >50% reduction in glomerular filtration rate (eGFR) within ≤3 months and histologically by the presence of crescents in glomeruli on kidney biopsy; This condition constitutes a nephrological emergency, requiring prompt intervention to prevent progression to chronic kidney failure (Arimura et al., 2016).

In this case, ANA 0.58 IU/mL and anti-dsDNA 0.5 IU/mL were both negative, making lupus nephritis unlikely, while no anti GBM or ANCA data were available. Based on these findings, the most probable diagnosis was pauci immune or idiopathic RPGN (Han et al., 2023)(Gluhovschi et al., 2023).

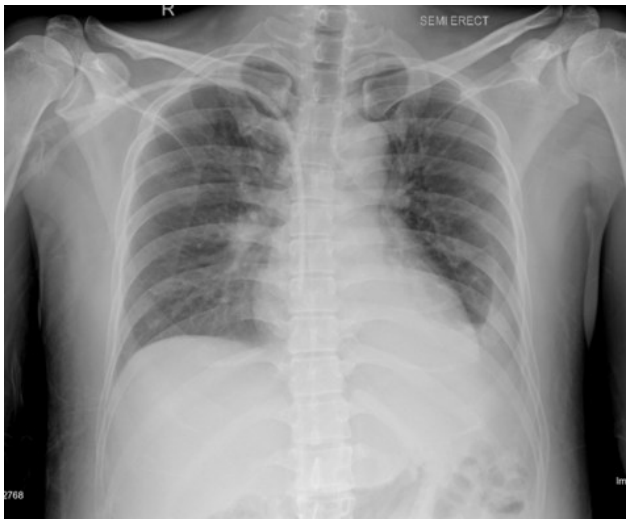

Figure 1. Chest X-ray revealed cardiomegaly, bronchopneumonia, and left sided pleural effusion

Generalized body edema pitting in the lower extremities was attributable to severe proteinuria and hypoalbuminemia serum albumin 2.1 g/dL. Urinalysis revealed proteinuria +3, leukocytes sediment 80.1/µL, erythrocytes sediment 468/µL, and Esbach 0.5 g/L, while abdominal ultrasound demonstrated bilateral parenchymal renal disease findings consistent with glomerulonephritis. Hypertension likely contributed to further glomerular damage. The patient had a history of hypertension and hiperuresemia, with previous use of antihypertensive agents amlodipine and imidapril that did not adequately control blood pressure. Chest radiography showed bronchopneumonia and pleural effusion, for which intravenous ampicillin sulbactam 1.5 g every eight hours was administered. Kidney biopsy confirmed crescent formation in the glomeruli, Segmental Mesangial Hypercellular Glomerulus and focal segmental sclerosis, ANCA-Related RPGN.

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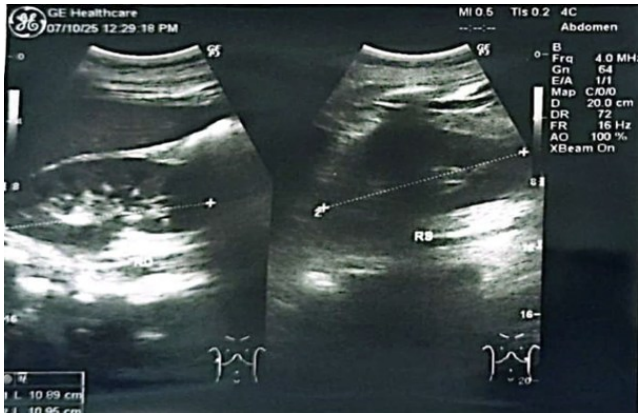

Figure 2. Abdominal ultrasound demonstrated bilateral parenchymal renal disease

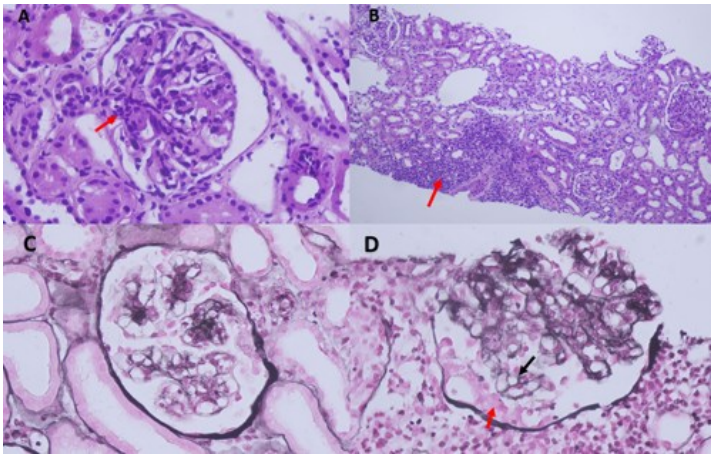

Figure 3. A. Focal hypercellularity glomerulus, neutrophyl infiltration, B. Interstitial inflammation, no interstitial fibrosis, C. Segmental sclerosis glomeruli, no interstitial fibrosis, D. Cellular crescent, opened glomerular capillary lumina

Administration of high dose steroids, such as intravenous methylprednisolone 500 mg every 12 hours for three days, rapidly suppresses inflammatory immune responses (Aghsaee Fard & Zahedian, 2024; Leon-Astudillo et al., 2026; Nelson et al., 2026). PLEX performed four times in this case, facilitates the removal of pathogenic antibodies or immune complexes and is recommended in anti GBM disease as well as in RPGN with high ANCA titers (Zepeda et al., 2023; Godbole et al., 2026; Moorani et al., 2022). Two sessions of hemodialysis were carried out to address uremic toxin accumulation and maintain fluid balance (Cortazar et al., 2023; Han et al., 2023; Guo & O'Donnell, 2026). Supportive therapy included furosemide for edema, ampicillin sulbactam for pulmonary infection, antihypertensives, folic acid supplementation, and packed red cell transfusion for anemia (Wenhong et al., 2025; Rashed, 2022; Zhou, 2024).

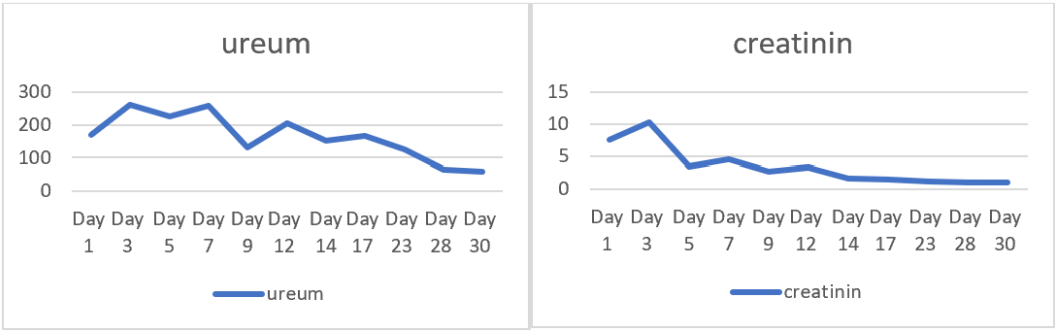

Figure 4. Kidney Function during Hospitalization

A rapid clinical response was observed within thirty days, with a marked reduction in edema and normalization kidney function. On the third day of hospitalization, hemodialysis was

initiated and subsequently followed by PLEX, resulting in clinical improvement. On the seventh day, a second hemodialysis session was performed in conjunction with PLEX. By the ninth day, a significant improvement in renal parameters was observed, with serum urea decreasing to 132 mg/dL and creatinine to 2.8 mg/dL. PLEX was continued with two additional sessions until day 30 of treatment, at which point renal function demonstrated marked recovery, with urea reduced to 60 mg/dL and creatinine to 1.0 mg/dL, demonstrating the effectiveness of the therapeutic regimen (Odler et al., 2025; Berti et al., 2019; Oberiukhtin et al., 2026). A favorable prognosis in such cases is supported by factors such as young age, early response therapy, and the absence of irreversible fibrosis on kidney biopsy. Studies have shown that combined therapy with steroids, hemodialysis, and PLEX achieves clinical remission in 60–70% of patients with anti GBM RPGN (Nakajima et al., 2025; Bell et al., 2021; Koirala et al., 2025).

Laboratory monitoring should include serum creatinine, estimated glomerular filtration rate (eGFR), electrolytes, and proteinuria every 1–2 weeks during the acute phase, then every 3–6 months thereafter. Serological testing, when available, should include ANCA and anti GBM antibodies to detect potential relapse (Aghsaee Fard & Zahedian, 2024; Bell et al., 2021; Alberici et al., 2025).

Conclusion

This case report describes a patient with RPGN. Negative serology for ANA and anti dsDNA excluded lupus, making pauci immune or idiopathic RPGN the most likely type. Aggressive therapy with high dose steroids, PLEX, and hemodialysis resulted in a rapid clinical response, increased the likelihood of remission, and preserved renal function. Routine laboratory monitoring, ANCA/anti GBM testing when available, and patient education on medication adherence and blood pressure control are essential to prevent relapse and long term complications.

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References

Aghsaee Fard, Z., & Zahedian, S. (2024). Rapidly Progressive Glomerulonephritis: Etiology, Treatment, and Prognosis: A Review Literature. Translational Research in Urology, 6(4), 170–175. https://doi.org/10.22034/tru.2024.490611.1207

Alberici, F., Flossmann, O., Lamprecht, P., Loudon, K. W., Padoan, R., Popov, T., ... & Mohammad, A. J. (2025). Antineutrophil cytoplasmic antibody-associated vasculitis: insights into relapse risk and future management directions. Frontiers in Immunology, 16, 1655326. https://doi.org/10.3389/fimmu.2025.1655326

Arimura, Y., Muso, E., Fujimoto, S., Hasegawa, M., Kaname, S., Usui, J., Ihara, T., Kobayashi, M., Itabashi, M., Kitagawa, K., Hirahashi, J., Kimura, K., & Matsuo, S. (2016). Evidence-based clinical practice guidelines for rapidly progressive glomerulonephritis 2014. Clinical and Experimental Nephrology, 20(3), 322–341. https://doi.org/10.1007/s10157-015-1218-8

Bell, S., Lattanzio, N., Abdelal, Q., Teklie, Y., Alkayali, T., Wiese-Rometsch, W., & Sastry, A. (2021). A Rare Case of Double Antibody-Positive Rapidly Progressive Glomerulonephritis: A Therapeutic Challenge. Journal of Investigative Medicine High Impact Case Reports, 9. https://doi.org/10.1177/23247096211013193

Berrocal, C., Arbeláez-Cortés, Á., Arellano, A., Peña, A., Nati-Castillo, H. A., Mejia, N., ... & Izquierdo-Condoy, J. S. (2026). PR3-ANCA-Associated Vasculitis in IgGκ MGUS: A

Fatal Case of Rapidly Progressive Glomerulonephritis. Journal of Clinical Medicine, 15(7), 2554. https://doi.org/10.3390/jcm15072554

Berti, A., Cornec-Le Gall, E., Cornec, D., Casal Moura, M., Matteson, E. L., Crowson, C. S., Ravindran, A., Sethi, S., Fervenza, F. C., & Specks, U. (2019). Incidence, prevalence, mortality and chronic renal damage of anti-neutrophil cytoplasmic antibody-associated glomerulonephritis in a 20-year population-based cohort. Nephrology Dialysis Transplantation, 34(9), 1508–1517. https://doi.org/10.1093/ndt/gfy250

Cortazar, F. B., Cerda, J., Dhanani, R., Roglieri, J., & Santoriello, D. (2023). Avacopan in Patients With Rapidly Progressive Glomerulonephritis Requiring Dialysis. Kidney International Reports, 8(8), 1687–1691. https://doi.org/10.1016/j.ekir.2023.05.017

Covic, A., Brinza, C., Burlacu, A., Covic, A., Gener, I., Giusca, S. E., ... & Căruntu, I. D. (2025). Biopsy-proven glomerular diseases: a systematic review of global kidney biopsy registries. Journal of nephrology, 38(9), 2571-2585. https://doi.org/10.1007/s40620-025-02449-5

Floege, J., Barratt, J., Cook, H. T., Noronha, I. L., Reich, H. N., Suzuki, Y., ... & Rovin, B. H. (2025). Executive summary of the KDIGO 2025 clinical practice guideline for the management of immunoglobulin A nephropathy (IgAN) and immunoglobulin A vasculitis (IgAV). Kidney International, 108(4), 548-554. https://doi.org/10.1016/j.kint.2025.04.003

Gettings, J. V., Chafjiri, F. M. A., Patel, A. A., Shorvon, S., Goodkin, H. P., & Loddenkemper, T. (2025). Diagnosis and management of status epilepticus: improving the status quo. The Lancet Neurology, 24(1), 65-76. https://doi.org/10.1016/S1474-4422(24)00430-7

Gluhovschi, C., Gadalean, F., Velciov, S., Nistor, M., & Petrica, L. (2023). Three Diseases Mediated by Different Immunopathologic Mechanisms—ANCA-Associated Vasculitis, Anti-Glomerular Basement Membrane Disease, and Immune Complex-Mediated Glomerulonephritis—A Common Clinical and Histopathologic Picture: Rapidly Progressive Cresc. Biomedicines, 11(11). https://doi.org/10.3390/biomedicines11112978

Godbole, N., Tiwari, M., Jotwani, P., Verma, J., Law, J., Roofeh, D., ... & Maroun, M. C. (2026). Triple-Positive Serology in Rapidly Progressive Glomerulonephritis: A Diagnostic Dilemma. Kidney Medicine, 101270. https://doi.org/10.1016/j.xkme.2026.101270

Graňák, K., Vnučák, M., Kleinová, P., Blichová, T., Kollár, A., & Dedinská, I. (2025). Rapidly progressive glomerulonephritis as an unusual type of renal involvement in sarcoidosis: a case report. Journal of Medical Case Reports, 19(1), 33. https://doi.org/10.1186/s13256-025-05042-3

Grillo, S., Isler, B., Bonet-Basiero, A., Roselló-Díez, E., & Escolà-Vergé, L. (2025). Does biological sex determine the natural history and management of infective endocarditis?. Canadian Journal of Cardiology.

Guo, W., & O'Donnell, M. (2025). Renal-Limited Anti-GBM Disease in Dual-Antibody Positive RPGN: A Case Report. Journal of Brown Hospital Medicine, 4(3), 141754. https://doi.org/10.56305/001c.141754

Han, C., Cui, X., Tan, Z., Li, Y., & Qiao, Y. (2023). Antiglomerular basement membrane antibody type rapidly progressive glomerulonephritis with seizures: Two cases and literature review. Immunity, Inflammation and Disease, 11(11), 1–9. https://doi.org/10.1002/iid3.1074

Hull, R., Faggad, A., & Willcocks, L. (2026). Treatment of immunoglobulin A nephropathy with targeted-release budesonide (Kinpeygo® ▾). Journal of Kidney Care, 11(2), 60-66. https://doi.org/10.12968/jokc.2026.0014

Jakubowska, Z., Wantoch-Rekowski, F., Małyszko, J. S., & Małyszko, J. (2026). IgA Nephropathy: Epidemiology, Outcomes, and Insights for Primary Glomerulonephritides. Journal of Clinical Medicine, 15(5), 2046. https://doi.org/10.3390/jcm15052046

Jauhal, A., Mustafa, R., Mathew, A., Girard, L., Barbour, S., Prasad, B., ... & Hladunewich, M. (2026). Canadian Society of Nephrology Commentary on the Evolving Kidney Disease Improving Global Outcomes Adult Glomerulonephritis Guidelines. Canadian Journal of Kidney Health and Disease, 13, 20543581251409874.

Kamalo, B. M. K., Musung, J. M., Yumba, G. N., Kakisingi, C. N., Mukuku, O., & Mwamba, C. M. (2026). In-Hospital Mortality and Predictors Among People with Diabetes in Lubumbashi, Democratic Republic of the Congo: A Prospective Observational Study. International Journal of General Medicine, 595138. https://doi.org/10.2147/IJGM.S595138

Koirala, A., Singh, A., & Geetha, D. (2025). Recurrence of Glomerular Diseases (GN) After Kidney Transplantation: A Narrative Review. Journal of Clinical Medicine, 14(18), 6686. https://doi.org/10.3390/jcm14186686

Kurts, C., von Vietinghoff, S., Krebs, C. F., & Panzer, U. (2025). Kidney immunology from pathophysiology to clinical translation. Nature Reviews Immunology, 25(6), 460-476. https://doi.org/10.1038/s41577-025-01131-y

Leon-Astudillo, C., Salabarria, S. M., Chadwick, C. B., Zingariello, C. D., Berthy, J., Prascak, J., ... & Byrne, B. J. (2026). Sirolimus for the treatment of steroid-refractory hepatotoxicity following AAV gene therapy in patients with Duchenne muscular dystrophy. Journal of Neuromuscular Diseases, 22143602261424971.

Meena, J., Sinha, A., Krishnasamy, S., Alba, A. A., Aziz, M. A., Begum, A., ... & Glomerular Disease Working Group, Asian Pediatric Nephrology Association. (2026). AsPNA Clinical Practice Guidelines for the management of infection-related glomerulonephritis. Pediatric Nephrology, 1-15. https://doi.org/10.1007/s00467-026-07146-4

Mohamed, O. N., Ibrahim, S. A., Saleh, R. K., Issa, A. S., Setouhi, A., Rabou, A. A. A., Mohamed, M. R., & Kamel, S. F. (2024). Clinicopathological characteristics and predictors of outcome of rapidly progressive glomerulonephritis: a retrospective study. BMC Nephrology, 25(1), 1–17. https://doi.org/10.1186/s12882-024-03532-y

Moorani, K. N., Aziz, M., & Amanullah, F. (2022). Rapidly progressive glomerulonephritis in children. Pakistan Journal of Medical Sciences, 38(2), 417. https://doi.org/10.12669/pjms.38.ICON-2022.5774

Nakajima, K., Kaneko, S., Usui, J., Tsuboi, N., Sugiyama, H., Maruyama, S., Isaka, Y., Narita, I., & Yamagata, K. (2025). Temporal changes of the life and renal prognoses of patients with rapidly progressive glomerulonephritis in Japan, 1989–2019. Clinical and Experimental Nephrology, 29(7), 937–952. https://doi.org/10.1007/s10157-025-02643-6

Nelson, C. E., Kauffman, K. D., Sakai, S., Newbolt, T., Buchanan, J., Foreman, T. W., ... & Barber, D. L. (2026). Glucocorticoids suppress early lung inflammation and impair control of SARS-CoV-2 in non-human primates. *Plos one*, *21*(3), e0342849. https://doi.org/10.1371/journal.pone.0342849

Oberiukhtin, D., Chernitskiy, A., Hu, D., & Sarapultsev, A. (2026). Cyclophosphamide-

Induced Nephrotoxicity and Nephroprotection in Rodent Models: A Systematic Review and Random-Effects Meta-Analysis (2010–2025). Journal of Xenobiotics, 16(2), 48. https://doi.org/10.3390/jox16020048

Odler, B., Riedl, R., Geetha, D., Szpirt, W. M., Hawley, C., Uchida, L., Wallace, Z. S., Walters, G., Muso, E., Tesar, V., Pusey, C. D., Little, M. A., Merkel, P. A., Walsh, M., Jayne, D. R. W., & Kronbichler, A. (2025). The effects of plasma exchange and glucocorticoids on early kidney function among patients with ANCA-associated vasculitis in the PEXIVAS trial. Kidney International, 107(3), 558–567. https://doi.org/10.1016/j.kint.2024.11.029

Palma, R. H., Soares, R. G. L., Meinerz, G., & Keitel, E. (2025). Current epidemiological overview of glomerulonephritis in Latin America: a systematic literature review. Journal of Nephrology, 38(9), 2587-2598.

Rashed, A. N. (2022). Clinical guidelines-Diagnosis and treatment manual For curative programmes in hospitals and dispensaries Guidance for prescribing. Clinical guidelines-Diagnosis and treatment manual.

Rovin, B. H., Adler, S. G., Barratt, J., Bridoux, F., Burdge, K. A., Chan, T. M., Cook, H. T., Fervenza, F. C., Gibson, K. L., Glassock, R. J., Jayne, D. R. W., Jha, V., Liew, A., Liu, Z. H., Mejía-Vilet, J. M., Nester, C. M., Radhakrishnan, J., Rave, E. M., Reich, H. N., … Floege, J. (2021). KDIGO 2021 Clinical Practice Guideline for the Management of Glomerular Diseases. Kidney International, 100(4), S1–S276. https://doi.org/10.1016/j.kint.2021.05.021

Sahu, T. J., Mankar, P., & Soni, R. R. (2025). Association between Clinical Features and Histopathological Spectrum in Glomerular Diseases: A Study of 50 Patients at a Tertiary Care Center. Journal of Medical Excellence, 2(2), 59-63. https://doi.org/10.4103/JOME.JOME_52_24

Turra, V., Rombach, S., Manzi, J., Zaragoza, S., Guerra, G., Vianna, R., & Abreu, P. (2026). Enhancing Kidney Transplantation Outcomes Through Robotic-Assisted Paired Kidney Exchange: A Case Report. Case reports in transplantation, 2026(1), 9302274. https://doi.org/10.1155/crit/9302274

Wenhong, Z., Liping, Z., Ruiying, W., Weimin, J., Yuekai, H., Yuxian, H., ... & Yuxian, H. (2025). Fever of Unknown Origin in Infectious Diseases. In Fever of Unknown Origin: Integration of Clinical Practice (pp. 15-155). Singapore: Springer Nature Singapore. https://doi.org/10.1007/978-981-95-1401-4_2

Zepeda, Z. G. P., Fernandes, L. F. R., Bolaños, V. G. T., Diaz, J. C. O., & Arredondo, M. I. G. (2023). Rapidly progressive glomerulonephritis and ANCA-negative pauci-immune vasculitis: an unusual presentation. A case report. Kidneys, 12(3), 132–135. https://doi.org/10.22141/2307-1257.12.3.2023.415

Zhou, K. (2024). The ICU Observer, Nocturnist with Closed ICU, and Palliative Care Medicine. In Internal Medicine Training Notes and Survival Guide: An Insider's Roadmap for the Journey from Resident to Attending Physician (pp. 215-246). New York, NY: Springer US. https://doi.org/10.1007/978-1-0716-4039-5_10

Zisman-Ilani, Y., Rhee, C. M., Al Ammary, F., & Kalantar-Zadeh, K. (2026). Shared decision making and decision aids in the management of kidney disease and renal replacement treatment options. Current Opinion in Nephrology and Hypertension, 35(1), 13-20. https://doi.org/10.1097/MNH.0000000000001140