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Precision Treatment of IgA Nephropathy: Current and Future Directions

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Precision Treatment of IgA Nephropathy: Current Advances and Future Perspectives Abstract IgA nephropathy (IgAN) is the most common primary glomerular disease worldwide and remains a leading cause of chronic kidney disease and kidney failure, particularly in Asian populations. Advances in understanding disease mechanisms have substantially reshaped the therapeutic landscape of IgAN, driving a transition from conventional supportive care toward mechanism-oriented precision therapy. Current evidence supports a central role for galactose-deficient IgA1 (Gd-IgA1), mucosal immunity, complement activation, and mesangial cell injury in disease initiation and progression. The evolving concept of the gut–kidney axis has further expanded our understanding of cross-organ immune regulation in IgAN and provided the rationale for gut-targeted therapeutic strategies. Parallel progress in translational research has accelerated the development of targeted therapies, including targeted-release budesonide, endothelin receptor antagonists, complement inhibitors, and BAFF/APRIL-directed therapies, several of which have demonstrated promising clinical efficacy in recent trials. Emerging multi-omics and mechanistic studies are also providing new insights into mesangial biology, immune complex deposition, and intracellular trafficking pathways involved in renal injury. Recent studies investigating Gd-IgA1 deposition, mesangial receptors, and endocytic trafficking mechanisms may further refine the current pathogenic framework of IgAN and facilitate the identification of novel therapeutic targets. With the continued integration of genomics, transcriptomics, proteomics, imaging technologies, and translational therapeutics, IgAN research is entering an era of biomarker-guided and mechanism-based precision medicine. Future advances are expected to promote earlier intervention, more individualized treatment strategies, and improved long-term renal outcomes for patients with

IgAN.

Keywords: Precision treatment, IgA nephropathy, pathogenesis