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RENAL REPLACEMENT THERAPY FOR AKI IN DOGS AND CATS. A CHANGE OF PERSPECTIVE

When the kidney function fails dramatically, only limited time is available to establish a diagnosis of the underlying etiology, to initiate an appropriate treatment, and for the kidney to recuperate sufficient function in a first phase to survive and later to live with a good quality of life. A major improvement of azotemia with fluid therapy overnight is almost always an indication for the correction of a pre- or post-renal acute kidney injury (AKI), rather than for an intrinsic AKI. Renal tubular necrosis, apoptosis, or other cellular damage and severe interstitial inflammation require much longer to recover, even with appropriate therapy. Therefore, when limited to conventional medical therapy alone, we can only use the full recuperation potential of the kidney in mild cases. Even severe parenchymal injury retains a recovery potential for many weeks to months, depending mostly on the underlying etiology. Infectious (e.g., leptospirosis, pyelonephritis) and ischemic causes tend to have a more favorable prognosis, whereas toxic insults vary a lot from favorable (e.g., aminoglycosides) to grave (e.g., ethylene glycol). In polysystemic diseases such as sepsis and multiple organ failure, the prognosis is usually dictated by the overall picture, but it has been increasingly shown that even a minor episode of AKI worsens the outcome significantly. An early diagnosis is therefore essential for meaningful decision-taking in AKI.

These limitations of medical therapy reflect well in the factors associated with outcome. The degree of azotemia has been linked repeatedly to a worse outcome when treatment was limited to medical therapy. In most studies including blood purification techniques, the degree of azotemia is no longer associated with outcome. It merely describes the grade of AKI, but dogs and cats with severe azotemia are just as likely to recover as animals with milder elevations of renal values, if recuperation time can be given and they can exploit their full potential of renal recovery. In the author's institution with a very high caseload of acute canine leptospirosis, the survival rate for this infection before and after the introduction of hemodialysis (HD) as part of the treatment modalities for AKI increased from 40% to 80%. And the difference would be even more pronounced for diseases with a slower recovery than leptospirosis, such as some toxicities (e.g., grape toxicity in the dog, lily toxicity in the cat).

Blood purification techniques therefore allow to bridge the time gap from functional failure to sufficient recovery necessary to survive with a decent quality of life. By themselves they offer little direct effect promoting recovery, except for providing a more physiological milieu, avoiding secondary renal injuries due to overhydration and hypertension, and allowing a more adequate therapeutic support, including nutrition and correction of fluid, electrolyte, mineral and acid-base disturbances. They will however not contribute, enhance or accelerate renal recovery, that is mostly defined by the underlying etiology. Recovery has been so far mostly refractory to pharmacological manipulations despite intensive research in the field.

Renal replacement therapies (RRT) include peritoneal dialysis and extracorporeal therapies provided as intermittent (e.g., intermittent hemodialysis, iHD) or continuous treatments (e.g., continuous renal replacement therapy, CRRT). Although differing markedly in the treatment design, in the resulting fluctuations in azotemia and fluid load, and in the requirements in staffing, equipment, and costs, the choice of the dialytic modality is mostly guided by availability and personal preferences, especially in the veterinary sector. Despite the non-physiological conditions with intermittent bouts of clearance provided by iHD, a clear outcome benefit for CRRT has not really been proven in large-scale studies in human medicine and the discussion around this in veterinary medicine is probably not very relevant.

However, with the evolution of the techniques, these therapies have progressively evolved from an empirical experimental therapy mostly based on human protocols more or less adjusted to the perceived needs of small animals to a form of treatment based on evidence, with an increasing number of protocols specifically designed for the needs of dogs and cats. Specific training is also increasingly offered (e.g., Hemodialysis Academy as an on-line training course in the theory of blood purification techniques, University of California Davis) and available to most motivated clinicians willing to perform high-quality medicine. With this, the perspective changed also markedly for the treated animals, progressing from an experimental therapy to a standard-of-care. A clear consequence is that RRT are no longer offered as a last-ditch effort (euthanasia or RRT), but as a specific therapy with indications, contraindications, risks and expectations derived from an extensive worldwide experience basis.

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Current recommendations for RRT include mostly AKI from etiologies with a high likelihood of recovery (e.g. leptospirosis, other infectious diseases, ischemic injuries, and some toxicities). When the cause of AKI cannot be found non-invasively, RRT can provide metabolic stabilization if necessary in order to proceed to a kidney biopsy to better characterize the disease. In cats, RRT may be indicated for stabilization before surgery (e.g., SUB placement for ureteral obstruction). Other indications include toxicities (e.g., lily) and infections (e.g., pyelonephritis). Although technically feasible, RRT for end-stage chronic kidney disease is typically limited by time (3 treatments per week, every week) and financial (1000-2000€ per week) constraints rather than by medical difficulties, especially in the first 6 months.

In conclusion, RRT has become a reality in the armamentarium of the clinician for the treatment of AKI. In small animals, it has made a tremendous progress from an experimental therapy to a standard-of-care that should be provided by specifically trained staff. As such the clinician can have high expectations on the appropriate treatment quality and the limitation should not be the treatment but the disease itself. This can however only be achieved with a timely referral of animals in a clinical condition allowing them to tolerate the therapy. Early consultation with a nephrologist is therefore strongly encouraged.