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In Shortly about Kidneys

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Abstract

The kidneys from the blood take in excess water and unnecessary substances and convert them to urine. Urine is then released from the body. Most people have two kidneys. A person can live and be healthy with one kidney. If the kidneys cease to perform their function, excess body fluid and unnecessary substances cannot be released from the body. This can be due to illness or damage resulting from the injury.

Keywords: *Kidneys, AKI, Health, Medicine.*

Introduction

Evidence-based medicine is broadly defined as using the best available evidence to guide decision making in the care of patients [1]. It has become a hugely popular movement in medicine over the past decade and the term ''evidence base'' is frequently used to inform decision making in other disciplines. The rise of the evidence-based movement reflects a number of key changes in society over the past two decades. First, there is a vast and daily growing medical literature that makes it virtually impossible for a dedicated clinician to keep up-to-date in his or her own chosen field. Second, with increased investment in health care in most economies, governments, health care providers, and the public wish to be assured that new monies are spent appropriately and not wasted on treatments, whose efficacy is in doubt. Third, the global increase in Internet access has meant that information, once limited to academic journals can now be sourced through a suitable search engine by anyone with access to a modem.

Normal kidneys can be thought of as providing four main functions—glomerular function, tubular reabsorption, tubular secretion and urine excretion—which maintain homeostasis of fluids and electrolytes in the blood within a very narrow range despite wildly varying intake and production, by excreting or reabsorbing excessive fluid or solutes [2]. Acid–base balance is maintained by several buffering systems with the kidney excreting excess bicarbonate or hydrogen ions to maintain stability. Thus, when the kidney sustains injury or insult, a wide array of biochemical and fluid derangements can result. The kidney has a role in maintaining blood pressure and AKI (Acute Kidney Injury) can result in hypertension which could be hormonally driven or resulting from salt and water retention. The kidney in addition has a significant role in regulating bone biochemistry, and producing erythropoietin; these have increasing importance if the renal impairment persists over a prolonged period. Even in an acute intensive care situation once renal failure has persisted for more than a week or two, the monitoring and management of chronic renal disease needs to be undertaken, closely with the nephrology team.

Acute kidney injury (AKI) is frequent among hospitalized patients, especially in the intensive care unit (ICU) setting (incidence rates of 20–30%), with 2–5% of cases requiring renal replacement therapy (RRT) [3]. The average mortality risk associated with AKI still remains very high, though highly variable (16–49%) according to severity of illness, clinical setting, and comorbidities. In critically ill patients, AKI seldom occurs as an isolated organ failure and more often represents a key component of the multiple organ failure syndrome. Thus, the implications of the syndrome might go beyond the

already complex role of the organ in fluid, electrolyte/acid-base homeostasis, blood pressure control, and waste product excretion. The physiologic role of the kidney extends in fact to multiple endocrine functions. The occurrence of endocrine abnormalities during AKI may be expected for several reasons: (a) several hormones are synthesized or activated in the kidney (erythropoietin, angiotensins I and II, vitamin D, etc.); (b) the organ is very important for metabolism and excretion of hormones; (c) the kidney is a target organ for several hormones involved in the regulation of its excretory and endocrine functions; and (d) AKI is a heterogeneous syndrome caused by different etiological factors and mechanisms and is characterized by profound derangements of the internal milieu, influencing the secretion, transport, transformation, degradation, and action of hormones.

Urology

Therearemany types of questions that a urologist needs to ask (or be asked in turn by a patient or relative) [1].These may include questions concerning etiology, diagnosis, prognosis, harm, effectiveness, and qualitative outcomes. Different questions require different study designs. To find out what living with a condition (e.g., advanced prostate cancer) is like, a qualitative study that explores the patient experiences is required. In contrast,aqualitative study relying only on the subjective experiences of individuals could be unhelpful when trying to establish whether an intervention or treatment works. The best design for effectiveness is the randomized controlled trial (RCT). A hierarchy of evidence exists, published by the Oxford Centre for Evidence-Based Medicine, by which different methods of collecting evidence are graded as to their relative levels of validity. The design of a study (such as a case report for an individual patient or a double-blind randomized control trial) and the end points measured (such as survival or quality of life) affect the strength of the evidence. A cross-sectional survey is a useful design to determine the frequency of a particular condition. However, when determining anaccurate prognosis for someone diagnosed with, say, lower urinary tract symptoms, a cross-sectional survey (that observes people who have the disease and describes their condition) can give a biased result. A design more suited for a prognosis in question is an inception cohort—a study that follows up a recently diagnosed patient and records what happens to the mover an extended period of time.

Cell Biology

Cell biology is a discipline that is no longer solely the domain of the bench-bound scientist [4]. Mainstream awareness of the concepts that this discipline entails is increasing, and while many a patient may not know what DNA stands for, they will be well aware of the impact of genetics. As the field of cell biology has expanded and diversified, so have its translational applications within the clinic. Cell biologists are identifying novel key drug targets and gaining a more thorough understanding of the cellular action of currently available therapies. In turn, medical professionals can design therapeutic regimes specifically targeted to the needs of the individual patient, thus narrowing the gap between the bench and the bedside.

How then is cell biology important to urologists? Like in any branch of medicine, a keen knowledge of the biology of the cell allows for an appreciation of the molecular basis of pathologies and the resulting cellular dysfunction, and how this dysfunction can manifest at the level of the tissue and/or organ. Within the field of urology, many recent developments have stemmed from better understanding of the molecular and cellular processes in disease, including urological oncology and andrology.

The susceptibility of developing acute renal failure depends on the ability of the kidney to recover from acute injury and regain normal function [5]. Recently, the possible contribution of stem cells (SCs) to the regeneration of acute tubular injury has been investigated. There is evidence indicating that, under pathophysiological conditions, SCs derived from bone marrow are able to migrate in the injured kidney but they seem to play a minor role in tubular regeneration in regard to the resident cells. However, the administration of ex vivo expanded bone marrow-derived mesenchymal SCs has proven to be beneficial in various experimental models of acute renal failure. The mechanism underlining this beneficial effect is still matter of debate. The transdifferentiation or fusion of SCs to repopulate tubules is considered to play a minor role. The administered SCs may, however, modify the microenvironment by inducing dedifferentiation and proliferation of tubular cells surviving to injury or by allowing expansion of resident SCs. The recent identification of resident progenitor/SC populations

in the adult kidney supports the hypothesis that resident SCs may play a critical role in the repair of renal injury. Therefore, therapeutic strategies to exploit the regenerative potential of SCs may be based on the administration of ex vivo expanded SCs or on stimulation of expansion and differentiation of local progenitor/SC populations.

Immune System

The immune system plays a key role in maintaining health and preventing disease [6]. It has the capacity to destroy a very wide range of pathogens to prevent infection. In addition, it plays a key role in the recognition and destruction of transformed body cells and the prevention of cancer. To do that, it has to sense ''danger'' and respond by unleashing an effective and flexible arsenal to fight disease-causing organisms and cancerous cells. The immune system is not a discrete organ but a whole body system. To be effective, it must have the ability to respond to anything ''dangerous'' anywhere in the body. In reality, the immune system faces ''outward'' toward our barriers with the environment (musosal surfaces, skin) and is a highly dynamic, well-organized system.

It will explain the role of inflammation in the activation of immune effector mechanisms capable of destroying intracellular and extracellular pathogens. A well-functioning immune system represents a balance between making effective responses against dangerous agents while ignoring harmless things such as normal body components, food, and commensal organisms. This is a very exciting area of research in immunology, and it is clear that regulatory mechanisms exist to moderate the destructive capacity of immune responses. This harmful potential of immune responses are well demonstrated by the damage associated with immunopathologies seen in diseases such as glomerulonephritis, rheumatoid arthritis, and the extreme vigor of acute allograft rejection. The morbidity associated with genetic or induced immunodeficiency is also indicative of the importance of effective immune responses.

There are two systems of immunity: the innate (or natural) responses that are phylogenetically older and present in all multicellular organisms and the acquired (or adaptive) responses, which are only present in vertebrates (with a jaw, including fish, reptiles, birds, and mammals) and evolved approximately 400 million years ago. The key difference between these responses is how they recognize danger. Innate receptors are not ''specific'' but recognize unique microbial structures found on pathogens. They are commonly referred to as ''pattern recognition receptors'' and they recognize ''pathogen associated molecular patterns'' (PAMPs), generally carbohydrates and lipids. These receptors can be most simply described as being biased to the enemy. Pathogens generally have a short cell cycle (minutes or hours) and can evolve rapidly to avoid recognition and destruction. However, we also possess adaptive receptors, which are produced by combining a diverse range of antigen receptor genes randomly. Each individual, therefore, also has many different rearranged antigen receptors and they can be most simply described as nonbiased. They are only expressed by T and B lymphocytes and generally recognize proteins.

Complaints

The most common urological complaints that trigger the need for referral to a primary care doctor or urological surgeon can be divided into those referable to the lower urinary tract and those referable to the upper urinary tract [7]. Although a careful history may be diagnostic in patients with, for example, renal colic or testicular torsion, very often non-specific features are more difficult to unravel.

The bladder has been described as an unreliable witness. Sensory innervation is mediated largely through parasymapathetic nerves, with pain from overdistension mediated through the sympathetic nervous system. The precision with which the site and cause of symptoms in the lower and upper urinary tracts can be identified from this autonomic innervation is limited. Similar symptoms may occur as the result of different pathology. The art of urological evaluation on the basis of symptoms depends on understanding how much reliance can be placed on the patient's account of different symptoms and symptom complexes. This also depends on the ability of the doctor to phrase questions so that the patient is clear about their meaning.

Blood Purification

Blood purification is administered in cases of acute intoxication when the substance causing the intoxication is to be eliminated or when the substance

leads to a case of organ dysfunction, such as in renal or hepatic failure [8]. The causative substances cover a wide range, from medical drugs or agrichemicals to natural poisons (such as poisonous mushrooms). In removing these substances, gastric lavage, activated carbon administration, laxative administration or enema cleaning are the preferred methods, and blood purification is not routinely conducted. However, when the causative substance is unknown or when there are several causative substances, it is not easy to immediately grasp the disposition of the patient and so judge whether or not blood purification should be performed. In such cases, blood purification must be conducted in a timely manner and in accordance with the crisis management principle of 'prepare for the worst'. In general, substances whose molecular weight is within the removal spectrum, having a small distribution volume and a low protein-binding rate, are easier to remove.

The prognosis of patients with an acute accumulation of pathogenic or toxic substances in their body fluids – a condition that severely affects survival – can be significantly improved by blood purification [9]. The most appropriate blood purification method and the duration for which it should be used must be selected on the basis of efficacy and cost. Several blood purification techniques – such as hemodialysis (HD), hemofiltration (HF), hemodiafiltration, continuous hemofiltration (CHF), hemadsorption and plasma exchange – have been developed. Each modality has different removal capacities and limitations; therefore, it is necessary to thoroughly evaluate the time and the duration of use in the case of different disease conditions. The survival rate of patients treated with HF with 35 ml/min of average filtrate is higher than that observed after conventional HD. In patients with systemic inflammatory response syndrome and multiple organ dysfunction syndrome, proinflammatory cytokines should be removed by HF or CHF, as should the toxins accumulated in the original disease. Thus far, no ideal filter has been developed for the removal of a considerable amount of proinflammatory cytokines with minimal albumin loss. In the case of acute liver failure, ammonia, amino acid metabolites and albumin-binding bilirubin should be removed by a combination of HF and plasma exchange. The use of fresh frozen plasma as a replacement fluid in plasma exchange is also important in order to replenish the deficient coagulation factors and essential metabolic factors. Activation of tissue/organ regeneration by the removal of pathogenic factors or by the substitution of factors essential for regeneration might be important in the case of multiple organ dysfunction syndrome. In critically ill patients with composite conditions, the use of more than two blood purification techniques at the same time or at different times during the course of the diseases can improve patient prognosis more than the use of single methods.

Trials

It has been shown that the number of trials in kidney disease lags behind all other specialties, and the standard quality reporting domains of allocation concealment, blinding, and intention to treat analysis are low and not improving [10]. Nephrology patients deserve the same quality of evidence-based care as patients with cancer. This can only occur when the standard of clinical care is for participation in a trial of a new promising intervention versus the current standard of care that is large enough to answer the question and in which simple outcomes that matter to patients are measured in all participants, both benefits and harms. This model of a large, simple trial, which has been adopted so successfully in cardiology and oncology, is a long way from the current model in nephrology. The typical current model is a small trial (presumably because of large per-patient recruitment costs or a lack of a cohesive recruiting network) and one that sometimes compares a new intervention against a nonstandard, clinically inferior intervention. Superiority is typically demonstrated, but such trials have questionable ethics and give results with uncertain policy relevance where the best standard care is expected to be the comparator. Trials may also be short term (months), and not all patient-relevant outcomes are reported, suggesting outcomes reporting bias in which only favorable outcomes are reported. In nephrology trials, the generic call for mandatory registration of trials and study protocols, and for complete reporting of all outcomes, both harmful and beneficial, should be heeded. The nephrology community needs to follow the example of other disciplines and develop a consensus on what outcomes should be reported in trials and what definitions should be used.

Evidence-based clinical practice has been defined as the "conscientious, explicit and judicious use of

current best evidence in making decisions about the care of individual patients."[11]. Clinical decision making should combine patient preferences and values with the best available evidence when making treatment choices for individual patients. Inherent in this philosophy of practice is that a hierarchy of evidence exists; certain study types provide higher quality evidence than others.

A central tenet of evidence-based practice is that a hierarchy of evidence exists. Among individual studies, the randomized controlled trial (RCT) provides the highest level of evidence, although ideally a meta-analysis of several RCTs will provide better estimates of treatment effects than a single RCT.

Randomized controlled trials are unique in the hierarchy of evidence, as participants in the trial are not selected for specific interventions but instead are allocated randomly to a specific therapy or control. With appropriate methodological safeguards, RCTs have the potential to provide the highest level of evidence for questions of therapy. For this reason, informed consumers of the urologic literature should understand how to appropriately interpret the results of a clinical trial. RCTs form only a small proportion of published studies in the urologic literature, likely due to several barriers to the conducting of surgical RCTs, including the lack of equipoise among surgeons and patients regarding interventions and lack of expertise among urologists with respect to clinical research methodology. In addition, new techniques inherently involve a learning curve; technical proficiency is a requisite for unbiased conduct of a RCT.

Conclusion

Experts warn that most people with kidney disease are not even aware of it. This is because kidney disease usually has no symptoms until the problem worsens to such an extent that these vital organs are no longer able to perform their function. There are numerous health conditions that can lead to kidney damage. The high blood pressure at the top is the leaves. Also at risk are those with type 2 diabetes and those with a family history of kidney disease.

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