Technological Advances in Hemodialysis

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The technological evolution of hemodialysis started from the simple recording of some parameters of the dialysis monitors, then switched to the recording of some clinical parameters by means of the so called biosensors, such as for example the blood volume reduction during dialysis. Lastly, by linking some clinical and monitor's parameters, a true biofeedback was possible, such as for example the blood volume tracking.

A further step in the technological evolution of hemodialysis was the introduction of the on-line systems. Hemodiafiltration (HDF) is the strategy enabling the high potential of hydraulic and solute permeability of synthetic membranes to be most properly exploited. On-line production of unlimited amount of sterile dialysate at low cost has favored its extensive diffusion in the recent years. However, to achieve the most efficient convective transport, ultrafiltration rate must be forced towards its physical limits, paying attention to the safety of the patient and to the integrity of the system. The infusion mode variably influences the dialyzer performance and the efficiency of the technique. With respect to standard and high-flux hemodialysis (HD), increased removal of solutes in the small and middle molecular weight range was reported with on-line HDF in several recent studies. Some of these compounds have a pathogenic role or are markers of the most frequent long-term complications and causes of death in HD patients, such as dialysis related amyloidosis, cardiovascular disease, inflammation and malnutrition. Even in the absence of definite evidence, coming from large data base studies, there are strong indications to recommend the use of this dialytic strategy, which combines the benefits of the high biocompatibility of the membrane and the sterile dialysis fluid with increased removal by convection of uremic toxins in the middle molecular weight range.