

Major North American breakthrough for dialysis patients

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Suffering from end-stage renal disease (ESRD), a growing number of patients at the Centre hospitalier de l'Université de Montréal (CHUM), have become the beneficiaries of a North American breakthrough: high efficacy hemodiafiltration (HDF).

An extracorporeal blood purification technique, HDF is indicated for ESRD patients. Since the HDF unit was introduced in CHUM's Nephrology section, preliminary results show a clear advantage of high efficacy HDF over conventional hemodialysis in several areas, including the following:

- Improved removal of uremic toxins;
- Decreased number of hospitalization days;
- A better tolerance for patients;
- Minimizes the state of chronic inflammation that too often may lead to complications over a long course of dialysis;
- Diminished need for certain medications.
- Increased biocompatibility across the blood-dialysis system interface.

"Conventional hemodialysis continues to save lives, but we now have the technology to improve the lot of dialysis patients," says Dr. Rénee Lévesque, nephrologist and lead physician in the HDF program at CHUM, and a professor with the medical faculty of the Université de Montréal. "At CHUM, we're proud to soon be accepting a cohort of forty patients undergoing HDF." Dr. Lévesque added that the CHUM Nephrology section is putting much efforts behind the new process, and

hopes that one day soon all dialysis patients will be treated in this fashion.

Recent retrospective clinical data indicate that HDF reduces the mortality rates of dialysis patients and randomized studies are under way to provide clear proof of increased survival rates for patients. Among these, the CONTRAST study compares hemodialysis with online hemodiafiltration HDF in overall performance relative to cardiovascular morbidity and mortality. The study seeks to recruit seven hundred test subjects and follow them over a three-year period. CHUM is the only medical centre in North America to take part in this study, currently the largest in terms of the size of the randomized cohort.

Hemodiafiltration : the best of both worlds

HDF combines the elements of two processes, conventional hemodialysis (HD) and hemofiltration (HF). Renal replacement therapy for ESRD is based on two processes: diffusion and convection.

Conventional HD is diffusive; blood is circulated in an artificial kidney machine on one side of a semi-permeable membrane, while a special dialysis fluid is circulated on the other side. Small molecules of metabolic waste seep out into a dialysis solution flowing in the opposite direction on the other side of the membrane, mimicking the kidneys and washing wastes and toxins out of the bloodstream. One major toxin is urea. HD is the most widely used renal replacement function technology for ESRD.

Hemofiltration (HF) or ultrafiltration is exclusively convective, forcing blood through a filter under high pressure. The principle consists of applying a hydrostatic pressure gradient (high pressure on one side, low pressure on the other) across the membrane or filter. This results in an ultrafiltrate (water and electrolytes) on the other side. The quantity of

ultrafiltrate lost in this process must be compensated by a matching infusion of replacement fluid. HF is used primarily in continuous mode and in acute care or intensive care.

In HDF, the diffusive component of HD is combined with the convective component of HF. As is the case in HF, the excessive loss of liquid must be compensated by the reinfusion of a sterile and apyrogenic (not producing fever) fluid. Recent developments have led to the "on-line" production of large volumes of ultrapure liquid of high quality. This has led to higher quality physicochemical and microbiological properties in these solutions, in comparison with HD.

Some statistics on the treatment of end-stage renal disease:

- At the end of 2003, there were 29,551 Canadians undergoing renal substitution treatment and that number is expected to double over the next ten years;
- Among that number, 61 % were in dialysis. Of these patients, 81 % were in hemodialysis and 19 % followed a regiment of peritoneal dialysis, e.g. from the abdomen.

Source: Université de Montréal Hospital Centre

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