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Dialysis access type and modality selection for CKD patients: "Yes we can"

Opção terapêutica e acesso de diálise para o doente renal crónico: "está nas nossas mãos"

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INTRODUCTION

Life-sustaining peritoneal dialysis (PD) and haemodialysis (HD) require durable dialysis accesses to the peritoneal and circulatory systems, respectively. While evidence from randomized controlled trials is lacking, there is a broad consensus that dialysis access type not only contributes to patient morbidity but also contribute independently to patient mortality. The use of HD catheters and arteriovenous grafts (AVG) is associated with a substantially greater risk of sepsis, hospitalization and mortality compared to the use of an arteriovenous fistula (AVF)[1-8]. Despite this broad consensus, incident HD catheter use remains prohibitively high in the United States (approximately 80%)[9] and, according to the DOPPS registries, also in the United Kingdom, Belgium, Sweden and Canada at least 23% of prevalent HD patients used a catheter in 2005-2007. The high prevalent use of catheter in HD patients has even increased in many European countries and Canada. For example, the use of HD catheters increased 2- to 3-fold in Italy, France, Germany and Spain between the DOPPS I and DOPPS III study intervals. In Portugal, the use of an AVF in incident HD patients has decreased from 43.8% to 40.7% between 2007 and 2012 (Portuguese Society of Nephrology registry). Furthermore, increased dependence upon catheters is not limited to elderly patients with extensive comorbidities. In non-diabetic HD patients 18-70 years old, the use of catheters increased 2-fold in the United States and › 3-fold in France, Germany, Italy and Spain from DOPPS I to III[9,10].

Studies comparing dialysis access-related complications of incident PD patients with those initiating HD using different vascular access types are scarce in the literature[11-16]. Evidence suggests that although incident HD and PD patients have similar overall rates of infection, HD patients have a higher risk of bacteraemia and the early risk for bacteraemia in HD patients is related to the use of HD catheters as the initial access. The United States Renal Data System Wave 2 Study identified initial dialysis access as the main antecedent of bacteraemia. The risk for bacteraemia for PD catheters was not significantly different from those for AVGs or AVFs but was substantially less than those for permanent or temporary HD catheters[17]. Recently, two observational studies reported that patients who choose PD experienced a lower risk of invasive dialysis access interventions than patients who choose HD[12,16]. Also, Perl *et al.*[15] identified the impact of dialysis access type on patients' survival among CKD patients electively starting dialysis therapy. Patients starting HD using a central venous catheter had a higher risk of death in the first year compared with those who started

PD, whereas there was no difference in survival between HD-AVF/AVG and PD patients.

With this information one can ask the reason for an increased use of HD catheters, the decrease use of AVFs and the underutilization of PD observed in Europe during the last decades.

GLOOMY LEGACY

Forty years ago, patient selection for dialysis was relatively stringent, and most patients were young, non-diabetic men with minimal comorbidities. Within this selected population, the arteries and veins were generally well preserved allowing construction of AVFs in the wrist. In recent years, as a result of more liberal selection criteria, the chronic dialysis population has become substantially older, more likely to be female and diabetic, and has higher comorbidity, including extensive atherosclerotic vascular disease. Many of these patients appear to have poor vessels for construction of AVFs. Perhaps this is the answer most often heard when nephrologists are asked about the current reality of vascular access epidemiology. However, practice patterns do have a major impact on the prevalence of patients dialyzing with AVFs. First, we must not forget that increased emphasis on dialysis adequacy (Kt/V) has led to the "misfortune" recognition that higher blood flows could improve urea clearance, and thereby permitted delivery of "adequate" dialysis to patients without entailing substantial increases in dialysis times. Even more disturbing was the fact that many other patients were submitted to "short-dialysis" as they presented with arteriovenous accesses with high blood flows. These considerations have led to increased utilization of AVGs and decreased use of AVFs, mainly in the United States. Second, and most important, long-term use of an AVF requires overcoming at least four hurdles: (a) first, the surgeon must be able and willing to place an AVF; (b) second, the newly constructed AVF must mature sufficiently to be cannulated with large-bore needles and deliver an acceptable dialysis blood flow; (c) third, the dialysis staff must be proficient in monitoring and surveillance of AVFs and; (d) fourth, the mature AVF must remain patent. Problems occurring at each of these levels can have a cumulative negative effect on the overall prevalence of patients dialyzing with AVFs. Achieving optimal vascular access outcomes, therefore requires agreement on a common set of goals by all individuals involved in the management of vascular access, including nephrologists, access surgeons, radiologists, dialysis nurses, and the patient. Nephrologists need to deal with the vascular access management problem with the same priority and interest as the other major problems affecting a dialysis population. We need to become experts in vascular access and we need to occupy a pivotal position in directing the decisions that are made and affect dialysis patients' welfare.

PRE-DIALYSIS "UN"CARE

Another well recognized major contributing factor for the "unexpectedly" increased use of HD catheters and the disuse of AVFs and PD in Europe is the rather frequent late-referred chronic kidney disease (CKD) patients[18-25]. In the DOPPS II, HD catheter use was higher for those patients seen by a nephrologist < 1 month before dialysis start, compared to those having seen a nephrologist > 4 months prior to dialysis onset[10]. A recently published systematic review reported that patients referred earlier to a nephrologist demonstrated significantly reduced short- and long-term mortality and hospitalization, perhaps as a result of better preparation and placement of dialysis access[18]. Also, several studies suggested that pre-dialysis care is associated with a greater probability of selection of PD[18,26-28]. Recently, Quinn *et al.*[29] examined the relative risk of mortality on PD compared with HD in individuals with at least 4 months of pre-dialysis care, all of whom started dialysis electively, as outpatients. The authors were able to conclude that PD and HD associate with similar survival among incident dialysis patients who initiate dialysis electively and, therefore, selection bias rather than an effect of the treatment itself, likely explains the described change in the relative risk of death over time between HD and PD. Recently, Mendelssohn *et al.*[19,20] defined an interesting concept of "suboptimal" dialysis start referring to initiation of dialysis as an inpatient and/or without a permanent access placed (AVF, AVG or PD catheter) and/or with a patient not starting on their chronic modality of choice. In this elegant paper[20], the authors investigated whether a "suboptimal" initiation of dialysis would be associated with worse health outcomes in the first six

months of dialysis. The authors concluded that "suboptimal" initiation of dialysis is common in patients referred early or late to the nephrologist and that the benefits of early referral are lost if dialysis is initiated "suboptimally". In other words, of nothing worth being referred early to a nephrologist and subsequently start dialysis as an inpatient or with an HD catheter. An integrated dialysis access management strategy is, therefore, required for optimizing dialysis access use. To adequately inform patients about access options, nephrologists are ethically obligated to systematically explain to patients the harms of HD catheters. If catheters must be used to initiate dialysis, nephrologists should present catheters only as a "rescue measure" and "unsafe for long-term use". Interestingly, the K/DOQI guidelines[30] recommend that a "PD catheter may also be used as a bridge for a fistula in 'appropriate' patients". The type of dialysis access should, therefore, be regarded as a key factor to be taken into account in the choice of dialysis modality. Optimal pre-dialysis care is most likely an effective strategy in the long-term management of the patient with CKD.

PHYSICIAN BIAS

Beyond medical and psychosocial factors responsible for the slow-down in the proportion of PD patients in some Western countries, the misconception of PD catheter as an "inadequate" dialysis access for CKD patients may also play a role. A common perception is that PD is associated with a higher risk for dialysis access-related invasive interventions and infection compared with HD[31,32]. However, as previously stated, evidence suggests the contrary[8,11-13,16,17]. Insufficient level of continuous medical education and fellow training investment is a possible explanation for such fact. In Europe, the widespread HD catheter placement by nephrologists and renal fellows and the limited timely insertion of a PD catheter may be a strong contributing factor for the underutilization of PD. In this regard, several studies have suggested that PD catheter insertion by nephrologists can have a positive impact on the utilization of PD[33,34]. Moreover, in the unplanned setting, the reports from Povlsen *et al.*[35] and Lobbedez *et al.*[36] showed that the immediate use of a PD catheter right after insertion did not increase the risk of infectious complications nor did it affect long-term PD technique or patient survival. These data suggest that PD is a safe and feasible modality for unplanned start on dialysis. Recently, Koch *et al.*[37] compared the outcomes of acute unplanned PD and HD on a prospective observational study. The authors observed that HD patients had a significant higher risk of bacteraemia compared to PD patients and a tendency for higher overall and infectious mortality risk.

ECONOMICS OF DIALYSIS

Finally, it is well recognized that the economic structure of the nation's health-care system may influence dialysis modality selection and dialysis access placement[38-40]. Therefore, it is pertinent to ask ourselves what are the financial consequences of inadequate dialysis modality selection and access placement. First, a key factor influencing the cost of dialysis care is the timing of referral to a nephrologist. Early referral and planned start result in cost savings and improved survival[41-42]. When patients are either referred late to a nephrologist's care or have to initiate dialysis urgently without a planned access, they are generally sicker, require longer hospitalization and are nearly always started on HD. Patients who are referred earlier to a nephrologist have an extended time prior to starting renal replacement therapy during which access may be planned and placed, and patients may be objectively educated about their treatment choices. Patients who have been exposed to pre-dialysis modality education are more likely to choose PD or to start HD with a functioning AVF and, therefore, contribute to consuming fewer resources to the payer and society. Second, hospitalization and dialysis access-related costs contribute substantially to total expenditures for dialysis patients and are considered the most variable costs in caring for dialysis patients. Up to 30% of hospital admissions in HD patients are related to vascular access complications and, significant outpatient resources – including vascular access monitoring and diagnostic radiology – are used to maintain access patency. At present, only few studies have reported in detail the cost of dialysis access on the basis of access type[16,43-45]. Consistently, all of these studies reported that the cost of access care was highly variable depending on the access type, with HD catheters and AVGs incurring the highest annual costs, in comparison with AVFs and PD catheters.

In summary, recent evidence suggests that: a) dialysis access strongly contributes to patient morbidity/mortality and annual health care costs; b) HD patients with a catheter have a higher risk of death, in comparison with both HD patients with an AVF/AVG and PD patients and; c) PD and HD patients with a functioning AVF incur the lowest annual health care costs. Therefore, if our aim is to improve CKD patients' care while optimizing economic resources, efforts should be made to provide patients with dialysis modality selection and appropriate dialysis access placement. Can we make it? My answer is, "Yes we can".

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