INTRADIALYTIC HYPOTENSION IN DIABETIC HEMODIALYSIS PATIENTS

Thesis

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SUMMARY

Symptomatic intradialytic hypotension (IDH) is a common complication of hemodialysis (HD). It remains an important cause of morbidity and mortality in hemodialysis (HD) patients

So, the aim of the current research is to evaluate intradialytic hypotension in diabetic hemodialysis patients and its associated risk factors. The study included 60 patients under maintenance hemodialysis. They comprised 35 males (58.3 %) and 25 females (41.7 %) with a mean age of 42.8 ± 13.7 years.

In the current study, comparison of the demographic characteristics between the studied group didn't reveal any significant differences.

Comparison of the hematological parameters between the studied groups shows no significant differences. In respect to the serum electrolyte levels, the present study didn't reveal any significant differences between the studied groups.

As regards the other laboratory parameters, the present study failed to prove any significant differences between the studied groups.

LIST OF ABBREVIATIONS

ADMA	Asymmetric dimethylarginine
AGEs	Advanced glycation end products
AHSG	Alpha2-heremans schmid glycoprotein
ANS	Autonomic nervous system
APC	Antigen-presenting cell
BP	Blood pressure
CAD	Coronary artery disease
cAMP	Cyclic adenosine monophosphate
CAN	Cardiac autonomic neuropathy
CHD	Coronary heart disease
CHF	Congestive heart failure
CHOIR	Correction of hemoglobin and outcomes in renal insufficiency
CKD	Chronic kidney disease
CNAUSA	Canada-usa
CRF	Chronic renal failure
CRP	C-reative protein
CV	Cardiovascular
DAN	Diabetic autonomic neuropathy
DDS	Dialysis disequilibrium syndrome
DN	Diabetic nephropathy
ECG	Electrocardiography
eGFR	Estimated glomerular filtration rate
ESRD	End stage renal disease

ET-1	Endothelin 1
EUTox	European uremic toxin
FDA	United states food and drug administration
GFR	Glomerular filtration rate
GI	Gastrointestinal
HD	Hemodialysis
HOPE	Heart outcomes prevention evaluation
HRT	Heart rate turbulence
IDH	Intradialytic hypotension
KDOQI	Kidney disease outcomes quality initiative
LDF	Laser-doppler blood flowmeter
LDL	Low density lipoprotein
LVH	Left ventricular hypertrophy
MDRD	Modification of diet in renal disease
MIA	Malnutrition, inflammation and atherosclerosis
NICE	National institute for health and clinical excellence
NO	Nitric oxide
ONTARGET	Ongoing telmisartan alone and in combination with ramipril global endpoint trail
PAD	Peripheral arterial disease
PDV	Periflux blood flow decreasing velocity
PET	Photon emission computed tomography
PTH	Parathyroid hormone
PVB	Premature ventricular beat
SDMA	Symmetric dimethylarginine

SGA	Subjective global assessment
T1DM	Type 1 diabetes milletus
T2DM	Type 2 diabetes milletus
TNF	Tumor necrosis factor
UF	Ultrafiltration
UKPDS	Uk prospective diabetes study
UKRR	United kingdom renal registry

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CHRONIC KIDNEY DISEASE AND HEMODIALYSIS

Definition

KDOQI defined chronic kidney disease either by a reduced glomerular filtration rate (GFR), irrespective of etiology, or by signs of kidney damage such as proteinuria (including microalbuminuria), hematuria, or abnormal imaging or biopsy findings. Somewhat arbitrarily, reduced GFR is defined as GFR < 60 mL/min/1.73 m^2. To exclude cases of acute kidney injury, these abnormalities have to be present for more than 3 months, and 2 out of 3 urine samples obtained at different times have to be positive for protein or albumin. Also arbitrarily, 5 stages of CKD were defined (Table 1). Stages 3–5 are defined solely on the basis of GFR, whereas stages 1 and 2 require the presence of markers of kidney damage ***(National Kidney Foundation, 2002).***

Increased urinary excretion of albumin and protein are the primary signs of kidney damage. Microalbuminuria refers to increased albumin excretion above 30 mg/day but less than 300 mg/day. With these small amounts of albumin excretion, the urine dipstick is usually negative for protein. Macroalbuminuria or overt proteinuria means more than 300 mg albumin excretion per day; the dipstick is usually positive, unless the urine is very dilute. For the assessment of GFR, an estimating equation was developed ***(Matz, 2002).***

$$CL_{cr}\ (mL/min)\ =\ IBW\ or\ adjusted\ body\ weight) \times (0.85\ if\ female) \times (140 - age)/(72 \times Cr)$$

Another equation was developed from the CKD population participating in the MDRD (Modification of Diet in Renal Disease) trial ***(Levey et al., 1999).***

Table-1 Stages of CKD

Stage 1	GFR ≥ 90 mL/min/1.73 m^2, with signs of kidney damage
Stage 2	GFR 60–89 mL/min/1.73 m^2, with signs of kidney damage
Stage 3	GFR 30–59 mL/min/1.73 m^2
Stage 4	GFR 15–29 mL/min/1.73 m^2
Stage 5	GFR <15 mL/min/1.73 m^2

The abbreviated version requires only serum creatinine, age, sex, and race, and is the recommended formula for estimating GFR ***(European Best Practice Guidelines Expert Group on Hemodialysis, 2002)***:

eGFR (mL/min/1.73m^2) = 186 × (serum creatinine)$^{-1.154}$ × (age)$^{-0.203}$ × 1.212 (if the subject is African-American) × 0.742 (if female).

Many laboratories have implemented automatic reporting of reduced estimated GFR (< 60 mL/min/1.73 m^2). Standardized

creatinine assays should be used by all labs to improve the accuracy of GFR estimates ***(Hallan et al., 2004).*** Standardized serum creatinine assays yield creatinine values that are 5% lower than those obtained with other assays. It is important to be aware of the limitations of these estimating equations. They are inaccurate at higher ranges of GFR, in Asians, in the elderly, in people with extremes of body composition, and with changing levels of renal function, for example in acute renal failure ***(Stevens et al., 2006).***

Epidemiology

Chronic kidney disease (CKD) has been recognized as a major health problem worldwide ***(Levey et al., 2007).*** It is common in the general population and associated with major health care expenditures ***(Coresh et al., 2008).*** For instance, there were nearly half a million patients receiving renal replacement therapy in the United States in 2005, costing Medicare over $20 billion and non-Medicare payers over $12 billion ***(Foley and Collins, 2007).*** Patients with end-stage renal disease (ESRD) represent only the "tip of the iceberg" of the entire population with CKD. There are an estimated 26 million people with CKD (not on dialysis) in the United States ***(Coresh et al., 2007).*** Medicare costs for CKD were estimated at $42 billion in 2005 ***(USRDS, 2007).***

The prevalence of CKD has been estimated from data in the National Health and Nutrition Examination Surveys (NHANES). These are large, nationally representative surveys of the non-

institutionalized US population, conducted by the National Center for Health Statistics. The prevalence of CKD stages 1–4 was about 10% in the 1988–1994 sample (n =15,488) and increased to 13% in the 1999–2004 sample (n = 13,233). The increased prevalence of obesity, diabetes, and hypertension, together with the aging of the population, is likely responsible for the increasing prevalence of CKD. Of the 13% with CKD, about 5% had stages 1 and 2 and 8% had stages 3 and 4. About 26 million US adults have CKD. Similar prevalence rates have been found in other countries worldwide. A population-based study from Beijing also found a 13% prevalence rate for CKD. A survey from Australia reported an even higher prevalence, about 16% of the adult population. CKD is particularly common in the elderly, with 38% of US subjects older than 70 years affected ***(Coresh et al., 2007).***

Worldwide, a recent systematic review reported a 23% to 36% prevalence of CKD in persons age 64 or older ***(Zhang and Rothenbacher, 2008).*** However, it is important to bear in mind that these prevalence estimates are based on the MDRD equation for estimating GFR. This equation was developed from a much younger study population, and none of the subsequent validation studies included large numbers of elderly (only 13% of all study participants were older than 65 years) ***(Stevens et al., 2007).***

Therefore GFR estimation from the MDRD equation may not be accurate in the elderly and may lead to inflated numbers of affected people ***(Campbell and O'Hare, 2008).*** The risk of progression to