DETERMINATION OF UREA, CREATININE AND CARDIAC ENZYMES LEVELS BEFORE AND AFTER HEMODIALYSIS.

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ABSTRACT.
Chronic kidney disease (CKD) has been described as a global health concern. A complex inter-relationship exists between the kidney and the heart. This study was aimed to determine the pre- and post-dialysis levels of urea, creatinine and cardiac enzymes among Yemeni patients undergoing intermittent maintenance hemodialysis.
Fifty Yemeni subjects, aged 18-65 years, diagnosed with chronic renal failure (CRF) and undergoing intermittent maintenance hemodialysis (MHD) for at least six months at the Dialysis Unit of Al-Thawra hospital in Ibb city were enrolled in this study. Non-fasting blood samples were collected and analyzed for serum urea, creatinine, creatine kinase (CK), aspartate aminotransferase (AST) and lactate dehydrogenase (LDH). The mean urea pre- and immediately post-dialysis was 20.9 ± 8.7 and 10.2 ± 6.4 mmol/L, respectively. The mean creatinine pre- and immediately post-dialysis was 88 ± 110 and 324 ± 96 μmol/L, respectively.
Levels of urea and creatinine were decreased significantly (P<0.05) by about 51% and 63% respectively. Levels of AST, CK and LDH were increased non-significantly (P>0.05) by about 121%, 89% and 39% respectively. These results show that urea and creatinine were removed by hemodialysis. These results also confirm increased levels of serum cardiac enzymes, which are only roughly proportional to the extent of tissue disorder and/or tissue damage. Furthermore, all above enzymes are not specific indicators for only cardiac muscle damage. Researchers suggested that, the use of cardiac enzymes only as indicators for the extent of cardiac disorder and/or cardiac tissue damage in hemodialysis patients is inadequate.
Key words: Urea, Creatinine, Cardiac Enzymes, Hemodialysis.
INTRODUCTION

Chronic kidney disease (CKD) has been described as a global health concern (Tonelli et al, 2006; Zhang and Rothenbacher, 2008). A complex inter-relationship exists between the kidney and the heart (Ilion, and Fumeron, 2005). Cardiovascular morbidity and mortality is increased in patients who reach end-stage renal disease (ESRD) (Foley et al, 1998; Sarnak, 2003) as well as in milder degrees of renal dysfunction (Foley, et al 2005; Go, et al 2004; Vanholder et al 2005). Urea is the major disposal form of amino groups derived from amino acids, and accounts for about ninety percent of the nitrogen-containing compounds of urine (Champe et al, 2008; Stiller et al, 2001). The prime aim of chronic dialysis is to remove the nitrogenous metabolic end-products and excess fluid (Foley et al, 1998). During hemodialysis reduction in the urea concentration in the intracellular fluid (ICF) compartment will lag behind that in the extracellular fluid (ECF) compartment, and following the end of dialysis (Al-Wakeel, 1998). Creatine and creatine phosphate spontaneously cyclize at a slow but constant rate to form creatinine, which is excreted in the urine. The amount of creatinine excreted is proportional to the total creatine phosphate content of the body, and thus can be used to estimate muscle mass (Champe et al, 2008). In addition, any rise in blood creatinine is a sensitive indicator of kidney malfunction, because creatinine normally is rapidly removed from the blood and excreted (Champe et al, 2008; Marshal and Bangert, 2008). Small amounts of intracellular enzymes are present in the blood as a result of normal cell turnover. When damage to cells occurs, increased amounts of enzymes will be released and their concentrations in the blood will rise. Historically, the cardiac enzymes commonly used to diagnose myocardial infarction (MI) included creatine kinase (CK), aspartate aminotransferase (AST) and lactate dehydrogenase (LDH) (Gaw et al, 2004; McDonnell, et al, 2009). This study was aimed to determine the pre- and post-dialysis levels of urea, creatinine and cardiac enzymes among Yemeni patients undergoing intermittent maintenance hemodialysis in Ibb city, Yemen.

PATIENTS AND METHODS

Fifty Yemeni subjects, aged 18-65 years, diagnosed with chronic renal failure (CRF) and undergoing intermittent maintenance hemodialysis (MHD) for at least six months at the Dialysis Unit of Al-Thawra hospital in Ibb city, were enrolled in this study, during the period from 1st February to 30th of June 2009. The subjects were on twice per week, 3-hourly haemodialysis sessions, typically in the morning or afternoon and were none fasting. They were interviewed for details of their age, sex, smoking habit, qat chewing, current medications and history of diabetes, coronary heart disease (CHD), and hyperlipidemia. Dialysis in each subject was on changed poly sulfone dialyser on a Fresenius 4800S Haemodialysis machine (Fresenius, Germany) and bicarbonate dialysate (Fresenius, Germany). Non-fasting blood samples were collected from each subject immediately prior to dialysis (pre-dialysis), and immediately on completion (post-dialysis) of the dialysis session on the same day. Serum has been obtained, separated and studied. The pre-and post-dialysis samples were analyzed for serum urea, creatinine, creatine kinase (CK), aspartate aminotransferase (AST) and lactate dehydrogenase (LDH). Reagents were
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purchased from Spinreact Company (Spain) and Spectrophotometer made by Spectronic Company (USA) was used for analysis.

Data was reported as means ±SD. P-value less than 0.05 was considered statistically significant. Pre-and post-dialysis levels of the different analytes were compared for the subjects, using student's t tests. The statistical software used for analysis was SPSS, Version 10.0.

RESULTS AND DISCUSSION

Levels of urea, creatinine, AST, CK, and LDH in the study group (means ± SD)

<table>
<thead>
<tr>
<th>Analyte</th>
<th>(normal range)</th>
<th>Pre-dialysis</th>
<th>Post-dialysis</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urea</td>
<td>(2.5-8 mmol/L)</td>
<td>20.9 ± 8.7</td>
<td>10.2 ± 6.4</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Creatinine</td>
<td>(40-130 µmol/L)</td>
<td>884 ± 150</td>
<td>324 ± 96</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>AST</td>
<td>(12-48 U/L)</td>
<td>63.3 ± 29.6</td>
<td>139.8 ± 114.1</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>CK</td>
<td>(&lt;150 U/L)</td>
<td>183.2 ± 84.5</td>
<td>346.5 ± 328.6</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>LDH</td>
<td>(230-525 U/L)</td>
<td>247.9 ± 75</td>
<td>344.5 ± 174.1</td>
<td>&gt;0.05</td>
</tr>
</tbody>
</table>

* Gaw et al., 2004

Table indicates the pre- and post-dialysis levels of urea, creatinine and cardiac enzymes in the study group. The mean urea pre- and immediately post-dialysis was 20.9 ± 8.7 and 10.2 ± 6.4 mmol/L, respectively. These results confirm that post-dialysis urea is clinically important phenomenon and should be considered in the evaluation of dialysis efficiency and clearance. Furthermore, immediate post dialysis urea does not, in fact, reflect the actual concentration of urea in the body and may overestimate dialysis efficiency and clearance. The mean creatinine pre- and immediately post-dialysis was 884 ± 110 and 324 ± 96 µmol/L, respectively. The increasing of pre- dialysis creatinine approximately seven times greater than normal value confirms that serum creatinine is a better indicator of renal function than either that of urea or that of uric acid because serum creatinine is not affected by diet, exercise or hormones, factors that influence the levels of urea or uric acid (Perrone, et al., 1992; Marshal, and Bangert, 2008). Levels of urea and creatinine fell significantly respectively by about 51% for urea and 63% for creatinine. Our results confirm that urea and creatinine, as metabolic toxic waste products in the blood were removed by hemodialysis which is the main goal of the dialysis (Foley, et al., 1998). These results also show that our dialysis machines were functioning properly. Furthermore, these findings are in accordance with a previous study (Al- Wakeel, 1998).

There have been no published data to confirm pre- and post dialysis levels of cardiac enzymes. Pre-dialysis levels of AST, CK and LDH were 63.3 ± 29.6, 183.2 ± 84.5 and 247.9 ± 75 U/L respectively; while post dialysis levels were 139.8 ± 76.1, 346.5 ± 168.6 and 344.5 ± 174.1 U/L respectively. Levels of AST, CK and LDH were increased non significantly by about 121%, 89% and 39% respectively. It should be noted that increases in serum cardiac enzyme activity is only roughly proportional to the extent of tissue damage (Gaw, et al., 2004). Furthermore all above enzymes are not specific only for cardiac muscle damage. Moreover CK and LDH have isoenzymes (enzymes are present in the plasma in two or more molecular forms).
Isoenzymes are more specific indicators of cardiac muscle damage and are increasingly used in the investigation of cardiac damage (Gaw, et al, 2004). These results are in agreement with a previous study which stated that with repeated dialysis coronary heart disease (CHD) may get progressively worse and further accentuate coronary heart disease (Al-Rashidi, et al, 2004). In conclusion, post-dialysis urea and creatinine were reduced by hemodialysis, while AST, CK and LDH were increased after hemodialysis.
REFERENCES

تحديد مستويات البروتين والكربونات في الأنيتمات القلبية قبل وبعد الدياليز الدموي (الفسيل الكلوي).

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المفهوم

تشكل امراض الكبد المزمن مشكلة صحية عالمية وعائدة علاجية بيئة وثيقة بآلية الكبد والقلب. هدفت هذه الدراسة إلى تحديد مستويات البروتين والكربونات والأنيتمات القلبية عند المرضى الذين يتعرضون لعملية الفسيل الكلوي قبل وبعد الفسيل.

أجريت هذه الدراسة على عدد 50 مريضاً من مصابين بالفشل الكلوي المزمن ويتعرضون لعملية الفسيل الكلوي لمدة تزيد عن ستة أشهر في وحدة فسيل الكبد في مستشفى الثورة العام بمدينة الباحة. تم اخذ عينات الدم غير الصبيانية من كل مريض مباشرة قبل الفسيل وبعد الفسيل مباشرة في نفس اليوم ومن ثم قياس مستويات البروتين والكربونات والأنيتمات القلبية في كل من كبار وسابات. وظائف الأداء ونفاذ الفيروزيات وناقلات الدهون في الفسيل قبل الفسيل وعند 324 ± 110 مم. م/ق. لتر. على التوالي. كان متوسط تركز الكربونات قبل وبعد الفسيل مباكرًا 66 ± 250 مم. م/ق. لتر. على التوالي. ونفاذ الفيروزيات وناقلات الدهون في الفسيل قبل الفسيل مباكرًا 68 ± 899 مم. م/ق. لتر. على التوالي. كان هذا الاختلاف غير دال إحصائياً (P>0.05). هذه النتائج تظهر أن تأثيرات هذه الدراسة على مستويات البروتين والكربونات يتميز بشكل كبير فيعد الفسيل الكلوي، حيث تؤثر كلما أن ارتفاع مستويات الأنيتمات القلبية في المصل يتسبب مع وجود خلل مريض أو إصابة في عضل القلب. علاوة على ذلك فإن كل الإنيتمات القلبية 무엇اً لا تتعرض للإصابة فقط، لكنها تعتبر نشاطية يقوم بذلك في حالة عدم استخدام الإنيتمات القلبية لوحدها كمؤشر فعال لتقييم وجود إصابة أو/و مدى هذه الإصابة عند مرضى الفسيل الكلوي.

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