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Correlation Between Serum Level Parathormone, Alkaline Phosphatase, Calcium and Phosphorus of Patients Hemodialysis in Zahedan

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Secondary hyperparathyroidism and its effects on bone tissue are among the most important complication of end-stage renal disease. In the present study, we investigated correlation between the serum parathormone level (PTH) of hemodialysis men and women with calcium (Ca), phosphorus (Pi) and alkaline phosphatase (ALP). We studied 30 chronic renal failure hemodialysis patients 16 men and 14 women, aged 22-66 years old (average 44 years old) with dialysis duration of 5 months to 14 years. We measured the serum Ca, Pi and ALP in intervals of 3 months and serum PTH levels was measured in 3 month. Data analysis was performed using SPSS software. Our results showed that serum PTH and ALP levels were higher in women than in men (90% versus 70%), but abnormal range of serum Ca and Pi levels were higher in men then women (Ca : 8% versus 2%, Pi :58% versus 50%). Hemodialysis patients showed correlation between PTH and ALP ($p<0.05$), but the correlation of PTH with Ca and Pi levels was not statistically significant. No correlation was observed between PTH and ALP and Pi in men, however it was significant between PTH and Ca ($p<0.08$, $r = -0.63$). The women showed correlation between PTH and ALP ($p<0.05$), but not between Ca and Pi levels. Based on the findings of this study, Secondary hyperparathyroidism and its effects on bone tissue were greater in women than men hemodialysis.

Key words: PTH, ALP, Ca, Pi, hemodialysis

INTRODUCTION

Dialysis is not an appropriate therapy for kidney disease, as endocrine disorder can not be dialysed. In spite of apparent efficient dialysis it may be possible bone disease and uremic neuropathy. Generally may occur and even conditions may remain aggravated in dialysis patients, aggravation bone assimilation can occur and thus lead to decrease in bone formation. Clinical abnormalities and laboratory finding may vary largely; For e.g., in some of the patients this difference may only be observed by laboratory results such as increased ALP. (Sanches Navarro and Fernandes Conde, 2002). Where as intense pain, weakness and break down of bone may be observed in the remaining patients.

Usually in advanced renal insufficiency Pi concentration is elevated (Nolan and Qunibi, 2003).

The concentration of ALP derived from bone is elevated in the patients with chronic renal failure and it is a marker for investigation of uremic osteodystrophy (Oste and Bervoets, 2005).

Calcium administration and other substances similar to vitamin D must be controlled until the abnormal levels of serum Ca and Pi are inhibited (Fournier and Oprisiu, 1998). Calcium sedimentation in body tissues may interfere in some of renal failure systemic manifestation (Schucker and Ward, 2000). In spite of considerable treatment for control of existing metabolic disorders of Ca, Pi and parathyroid hormone, hyperthyroidism can possibly develop (Kutlay and Atli, 2005). Pi absorbed by the alimentary canal can obviously establish secondary hyperthyroidism and practically it is not possible to limit intensely the uptake of Pi by reducing the quantity of Pi in food, because such foods are not testy.

In hemodialysis patients hyperparathyroidism is a distinct marker for diagnosis and there exists correlation between dialysis and hyperparathyroidism (Chertow and Plone, 2005). This study was performed for considering the correlation of serum PTH level with Ca, Pi and ALP in hemodialysis patients, they were under the therapy of calcium carbonate and rocaltrol drug in Zahedan.

MATERIALS AND METHODS

This is a kind of descriptive and analytical study performed on 30 patients (16 men and 14 women) with an

average age of 44 years old, that visited Zahedan Central Hospital for treatment. These persons had hemodialysis twice or thrice a week. The duration of hemodialysis treatment given for the above chosen patients ranged from 5 month to 14 years and at the end of each month of three consecutive monthly hemodialysis. Blood samples were collected after certain clinical examinations such as weight, blood pressure in hemodialysis from each patient. These blood samples were sent to clinical laboratory investigation at Zahedan Center Hospital and ALP measured by RA 1000 apparatus and Ca, Pi by Zist Chemi Kit. Later 0.5 mL blood sample from the above each patient was collected at the end of third month and sent to Central laboratory for PTH measurement by RIA method. Data collected were analysed by employing SPSS software methods.

RESULTS

The laboratory result of consecutive months blood sample for Ca, Pi and ALP showed elevated Ca level in 8% of participants that is above normal range of 8.6-10.6 mg dL⁻¹ (Table 1). Two percent of women and 8% men that had hemodialysis showed elevated serum calcium more than normal range. At the same time serum Pi level in 58% of total participant was higher than normal range (2.5-4.5 mg dL⁻¹), that is according to sex 50% of women and 58% men showed serum Pi level more than normal range (Table 2). Serum ALP results of hemodialysed individuals of more than 77% of patients showed elevated ALP activity higher than normal range.

According to sex 90% of women and 77% of men showed elevated serum ALP activity higher than normal range (Table 3). At the end of third months the measurement of PTH level noticed in 92% of women and 63% men was higher than normal range, that is more than 63% of individuals under survey had elevated PTH level higher than normal values (Table 4).

Result revealed the levels of ALP and PTH secretion were higher than that of in men. In regards to minerals Ca and Pi abnormal levels were more in men than in women. Table 5 showed PTH correlation with ALP.

Ca and Pi with the help of the above Table 5 it is clear that there exists correlation between PTH and ALP (0.73) and this is a significant correlation (p<0.05). Sex wise there is no correlation between PTH with ALP and Pi in men. It

Table 1: Abundant distribution of Calcium in hemodialysis patient based on sex

Sex parameter	Male				Female			
	Normal	(%)	Abnormal	(%)	Normal	(%)	Abnormal	(%)
Serum Ca on first month	15	78.5	2	12.5	14	100	0	0
Serum Ca on secondary month	15	64.0	1	6.0	13	93	1	7
Serum Ca on third month	15	94.0	1	6.0	14	100	0	0
Normal and abnormal (%)	92		8		98		2	

Table 2: Abundant distribution of Pi in hemodialysis patient based on sex

Sex parameter	Male				Female			
	Normal	(%)	Abnormal	(%)	Normal	(%)	Abnormal	(%)
Serum Pi on first month	7	44.0	9	56.0	8	57	9	43
Serum Pi on secondary month	6	37.5	10	62.5	6	43	8	47
Serum Pi on third month	7	44.0	9	56.0	7	50	7	50
Normal and abnormal (%)	42		58		50		50	

Table 3: Abundant distribution of ALP in hemodialysis patient based on sex

Sex parameter	Male				Female			
	Normal	(%)	Abnormal	(%)	Normal	(%)	Abnormal	(%)
Serum ALP on first month	4	25.0	12	75.0	1	7.5	13	92.8
Serum ALP on secondary month	3	18.7	13	81.3	1	7.2	13	92.8
Serum ALP on third month	4	25.0	12	75.0	2	14.3	12	85.7
Normal and abnormal (%)	23		77		10		90	

Table 4: Abundant distribution of PTH in hemodialysis patient based on sex

Sex parameter	Male				Female			
	Normal	(%)	Abnormal	(%)	Normal	(%)	Abnormal	(%)
Serum PTH	6	37	10	63	1	7	13	93

Table 5: PTH correlation with ALP, Ca, Pi, in hemodialysis patients

Parameter	Mean	SD	PTH correlation
PTH	186.5	170.93	-
ALP	604.5*	584.30	0.73
Ca	8.99**	0.9	-0.06
Pi	5.47***	1.69	-0.2

*p<0.05 in comparison with PTH, ** p>0.05 in comparison with PTH, *** p>0.05 in comparison with PTH

Table 6: PTH correlation with ALP, Ca, Pi, depending on sex

Parameter	Male			Female		
	Mean	SD	PTH correlation	Mean	SD	PTH correlation
PTH	141.5	121.78	-	231.8	241.5	-
ALP	428.5**	485.2	0.44	808.79	636.9∞	0.86
Ca	8.98*	0.78	-0.63	9.0	1.1∞	0.2
Pi	5.61**	1.3	-0.02	5.32	2.0∞	0.18

*p<0.05 in comparison with PTH in male, ** p>0.05 in comparison with PTH in male, ∞ p<0.05 in comparison with PTH in women, ∞ p>0.05 in comparison with in women

is evident from the table six that secreted level of PTH in men was increased, but there was not parallel increase in serum Ca (r = - 0.63 and p = 0.008). In women, there exist correlation between PTH with ALP (r = 0.86) and this a significant meaningful correlation. But there is no any correlation between PTH with Ca and Pi (Table 6).

DISCUSSION

Secondary hyperparathyroidism and its effects on bone are main problem in chronic renal failure. Ca and Pi balance encounters a problem and this difficulty can be overcome by compensatory mechanism of bone metabolism. (Hercs, 2001). Hypercalcemia is usually seen in hemodialysis patients depending on the conditions of the drug that block Pi absorption and or blood PTH level (William and Owen, 2000). The analoges of vitamin D can

have an effect on Pi homeostasis and cause to increase serum Pi level (Schucker and Ward, 2005). In correct management of Pi level leads to increased production of Ca and Pi. Treatment of secondary PTH with calcitriol effect the intestinal absorption of Ca and Pi. This increase in absorption can cause disorders such as calcium deposition in blood vessels, heart disease and death at the end. For these individuals regulations of 3-5 mg dL⁻¹ of blood Pi a long with Pi absorption blocking drugs free of calcium are recommended (Block, 2000).

It is known in the patients with advanced chronic renal failure the concentration of Pi is an important marker in stimulation PTH secretion from various routes (William and Owen, 2000). In these patients accumulation of Pi can decrease Ca response to PTH (Rodrigues and Martin, 1991). Regulation of serum Pi level can inhibit significant the release of PTH with out causing change in calcium level (Tabata and Shoji, 1991). The results obtained reveal that the abundant abnormal accumulation of Ca inos and Pi in hemodialysis men was more than that of in women.

However in men coefficient correlation is between PTH and Pi secretion does not exist, but a significant correlation is between PTH and Ca (r =- 0.63, p<0.008). In women hemodialysis patients a meaningful significant relation between PTH with Ca, Pi secretion is not observed.

With consideration of rocalcrol and calcium carbonate drug treatment given to patients included in this study, their results revealed much similarity with that of other well-known researcher.

For diagnosis of ALP activity is a distinctive key. The measurement of ALP is an important guide for monitoring therapy of PTH and calcitrol. In hypercalcemic dialysis

patients elevated serum ALP and as well as PTH secretion and bone pain are seen. Vitamin D therapy caused a fall in the level of blood Ca and serum ALP and PTH and thus tend to bring those to normal (Hara and Nezasa, 2000). PTH secretion led to level increased of secretion of isoforms of bone ALP (Mognusson and Sharp, 2001). In decreased of secretion of ALP and PTH during the time of hemodialysis resulted in decreasing the density of bone tissue (Oba and Sikano, 1992). Age and hemodialysis duration of time are two main factors in decreasing the tissue demity in both hemodialysis men and women (Oda and Yrioka, 1995). Inadequate Estrogen level in women may have caused decrease in bone tissue. It looks the destructive effects of PTH in women of menopause do not have any effect on blood hormone level. In reality sex hormones involve in prevention of PTH destructive action. Inhibition of secretion PTH level does not act on the destructive decrease effects on bone tissue.

Survey shows 25-30% of hemodialysed female patients menopausal rapidly and their blood estrogen level was below normal and consequently caused reduction in bone tissue (Matuszkiewicz and Rowinska, 1999). A decrease in bone tissue density and also rapid demolition of bone tissue are evidently seen young dialysis amenorrhea women when compared with young dialysis natural menstruation women (Weisinger and Gonzales, 2000). The results of these investigation show that female hemodialysis patients secret more PTH and ALP than male hemodialysis patients. There exist a meaningful relation between PTH secretion with that of ALP in female hemodialysis patients ($p < 0.05$). And this fact do not exist in male hemodialysis patients and it reals more bone tissue degeneration in female hemodialysis patients. Ultimately it is necessary to measure the blood estrogen level in hemodialysis women, because compensatory mechanisms like hormone therapy (Estrogen therapy) result in decreased Ca. releasing mechanism especially of skeletal system. Eventually serum Ca and ALP secretion level fall and a little increase in PTH secretion level is seen.

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