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Relationship of Conjunctival and Corneal Calcification with Secondary Hyperparathyroidism in Hemodialysis Patient.

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Abstract:

Hyperphosphatemia is the consequent of End-Stage-renal failure . Inadequate control of serum phosphorus results in elevated $\text{Ca}\times\text{P}$ product and resultant soft tissue deposition consist of conjunctival and corneal calcification. In this study we evaluated the relationship of conjunctival and corneal calcification with secondary hyperparathyroidism in hemodialysis patients.

This is a descriptive – analytic study was done on 24 hemodialysis patients. We measured serum calcium, phosphorus, alkaline phosphatase, iPTH and conjunctival and corneal calcification by using slip – lamp microscope according to a modification of porters criteria.

Total patients were 24. The duration of hemodialysis were 30.7 ± 21.7 months.

The results of biochemical values were : Ca: 9.1 ± 0.8 mg/dl , P: 6.5 ± 2.2 mg/dl, ipTH: 488 ± 326 pg/ml , $\text{Ca}\times\text{P}$: 51.5 ± 16.6

The mean of conjunctival and corneal calcification score was 7.1 ± 4 .

There were a positive correlation between conjunctival and corneal calcification with duration of hemodialysis ($p=0.033$, $r=0.436$) , $\text{Ca}\times\text{P}$ product ($p=0.007$, $r=0.538$). P($p=0.006$, $r=548$) and ipTH ($p=0.028$, $r=0.449$).

There were not any correlation between conjunctival and corneal calcification with ages of the patients , serum calcium and alkanin phosphatase. Positive correlation of serum phosphorus, $\text{Ca}\times\text{P}$ product and iPTH with conjunctival and corneal calcification and no significant correlation of corneal and conjunctival calcification with serum calcium means that there is a central role for phosphorus in calcium-phosphorus deposition in soft tissues like cornea and conjunctivae, needs to further attention to phosphorus control in hemodialysis patients.

Key Words: Conjunctival and Corneal Calcification, Secondary Hyperparathyroidism in Hemodialysis.

Introduction:

Hyperphosphatemia develops invariably with kidney failure. Inadequate control of serum phosphorus(P) results in an elevated calcium-phosphorus (ca×p) product, that is associated with harmful conditions in CRF, including vascular calcifications, cardiovascular disease and soft tissue depositions (1,2).

In this study we evaluated the relationship between severity of conjunctival and corneal calcification with serum calcium (Ca), alkaline phosphatase (ALP), phosphorus (P), ca×p-products and intact PTH (iPTH).

Materials and Methods:

This is a descriptive – analytic study was done on 24 hemodialysis patients. None of the patients had history of malignancy or primary hyperparathyroidism and none taking drugs affect bone metabolism.

Calcium, phosphorus, alkaline phosphatase were done by commercial kits. iPTH was done by DSL-8000 kit made in USA.

The hemodialysis adequacy was measured by Urea Reduction Rate (URR) formula.

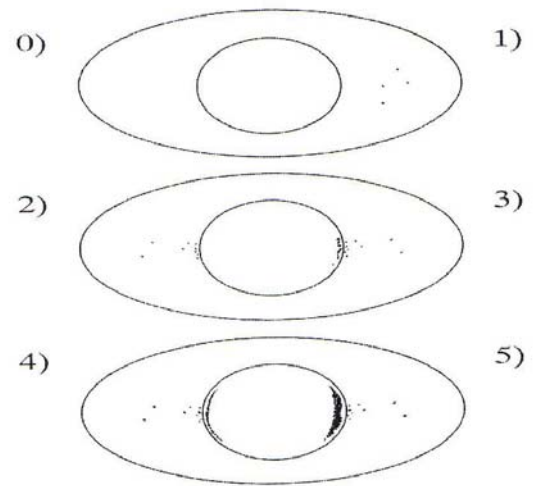
The severity of conjunctival and corneal calcification was evaluated by ophthalmologist by using slit-lamp microscope and classified into the following 6 grades (scores 0-5) according to a modification of porters criteria (3) (fig 1)

0 = no deposits, 1= conjunctival deposits only, 2= conjunctival and strictly limbal deposits, 3= conjunctival deposits and irregular corneal deposits, 4= clear single line of corneal and conjunctival deposits, and 5= more extensive corneal deposits and conjunctival deposits. The severity of conjunctival and corneal callification was determined by the total score (0-20 points)

obtained at 4 regions (nasal and temporal side of the 2 corneas)

all datas analyzed by SPSS software with using pearson coefficient test.

Fig1. scoring the severity of conjunctival and corneal calcification



Results:

Total patients were 24. 48.8 percent of patients were male. Mean of ages were 49.7 ± 17.1 . The duration of hemodialysis were 30.7 ± 21.7 months. The results of biochemical values were Ca: 9.1 ± 0.8 mg/dl, P: 6.5 ± 2.2 mg/dl, iPTH: 488.1 ± 326 pg/ml (normal 13-54 pg/ml), Ca×p: 51.5 ± 16.6 . The mean of conjunctival and corneal calcification score was 7.1 ± 4 . The results of biochemical parameters and conjunctival and corneal calcification were shown in Table 1. Table 2, show the frequency distribution of conjunctival and corneal calcification.

In this study there were a positive correlation between conjunctival and corneal calcification with duration of hemodialysis (Fig1) (P=

0.033 , $r = 0.436$), $Ca \times p$ product (fig 2) ($p = 0.007$, $r = 0.538$), P (fig 3) ($p = 0.006$, $r = 0.548$) and also positive correlation with iPTH ($p = 0.028$, $r = 0.449$) (fig 4).

There were not any correlation between conjunctival and corneal calcification with

ages of the patients ($p = 0.449$, $r = -0.162$), and no correlation with serum Ca ($p = 0.809$, $r = 0.052$). There was not signification correlation between eye scores with Alp ($p = 0.903$, $r = -0.026$).

Table 1: the profile of the ages, duration of hemodialysis, biochemical parameters in patients.

Results	Age years	Duration of dialysis months	iPTH pg/ml	Alp IU/lit	Ca mg/dl	P mg/dl	$Ca \times p$	URR %	Conjunctival & corneal calcification score
Mean	49.7	30.7	488.1	431.4	9.1	6.5	51.5	59.4	7.1
\pm SD	17.1	21.7	326	234.5	0.8	2.2	16.6	5.6	4
Maximum	79	87	1200	1280	11	10	95	70	15
Minimum	17	4	25	130	4	3	30	20	2

Table 2, frequency distribution of conjunctival and corneal calcification scores in Patients

Frequency	Number	Percent
Score (0-3)	6	25
Score (4-7)	7	29.2
Score (8-11)	6	25
Score (12-15)	5	20.8

Fig2- Association of corneal and conjunctival calcification with duration of hemodialysis

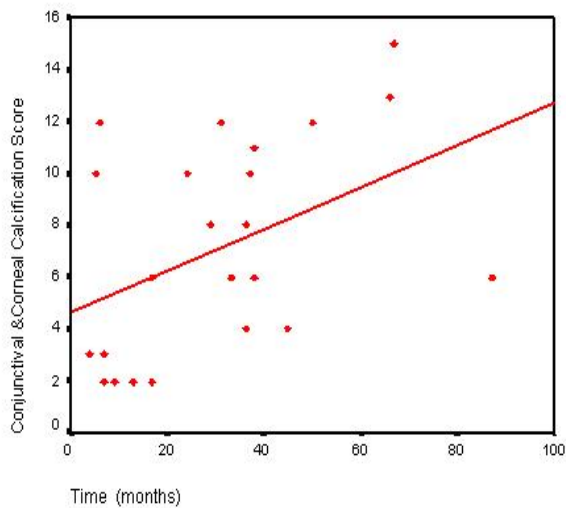


Fig3- Association of corneal and conjunctival calcification with $Ca \times P$ product.

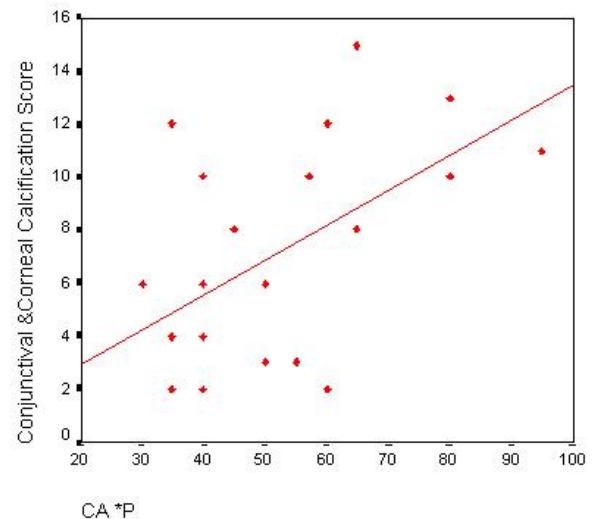


Fig4- Association of corneal and conjunctival calcification with serum phosphorus

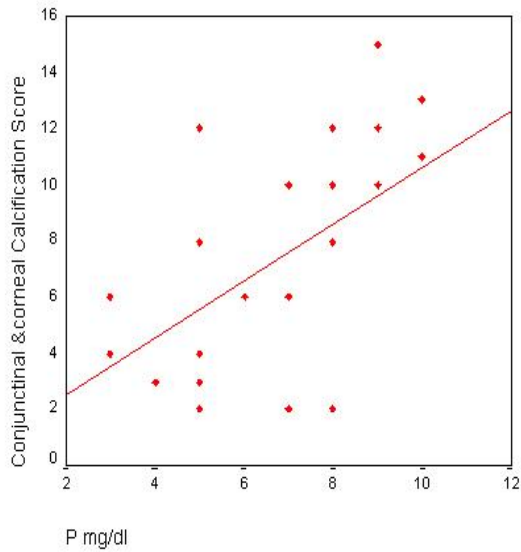
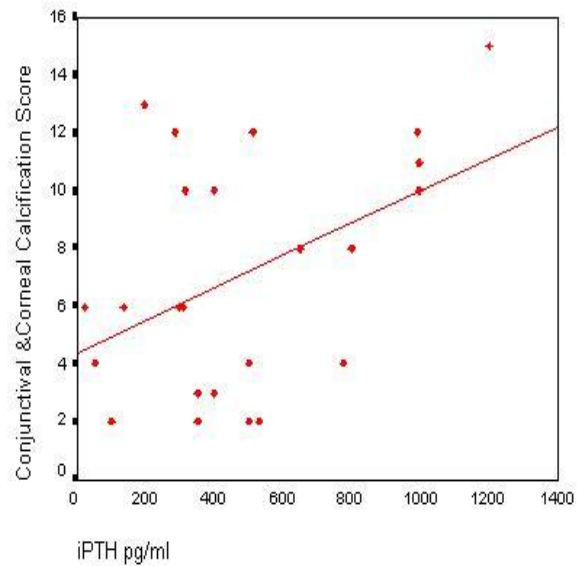


Fig5- Association of corneal and conjunctival calcification with serum iPTH



Discussion:

This study showed a positive correlation between conjunctival and corneal calcification with serum phosphorus, iPTH, $\text{Ca} \times \text{P}$ -product and duration of dialysis. We could not show significant correlation between patients age, serum calcium and Alp with conjunctival and corneal calcification scores. In contrast with the study of Takuyama et al. (4) We could not find a significant correlation between conjunctival and corneal calcification and Alp .

We and takuyama could not show any correlation between serum calcium and conjunctival and corneal calcification, means that there is a central role for phosphorus in calcium – phosphorus deposition in soft tissues likes cornea and conjunctivae. In addition, the alkalosis of the ocular surface may increase the severity of conjunctival and corneal calcification (4,5). Other investigators also showed abnormal Ca and P results in conjunctival and corneal calcification in hemodialysis patients. (5,6,7)

Chronic renal failure alters the Ca and P balance and results in secondary hyperparathyroidism (1,8). The most important problem in hemodialysis patients is control of hyper phosphatemia (1,2). Hyperphosphatemia has a central role in ectopic calcifications is caused by an abnormal balance of Ca and P metabolism in hemodialysis patients (1) also It seems that relatively high alkalinity resulting from the diffusion of carbon dioxide (CO_2) from the exposed eye surface, which promotes the precipitation of Ca-phosphate salts in a high serum $\text{Ca} \times \text{P}$ product in the cases of conjunctival and corneal calcification (4,5,7).

Because of improved and progressed treatmental modalities in dialysis therapy we rarely find patients with severe conjunctival and corneal calcification developing into band keratopathy (7), However, the increased frequency of conjunctival and corneal calcification in patients undergoing prolonged hemo dialysis showed the presence of secondary hyperparathroidism and bone

metabolic disorder in hemodialysis patients (4) as also reflected in our study.

In this study we showed the serious problem of hyperphosphatemia and secondary hyperparathyroidism in hemodialysis patients. In fact every patient entering dialysis treatment should be investigated and counseled by dieticians in order to improve nutrition in term of energy, protein and phosphorus intake (1). On a standard thrice-weekly dialysis schedule hyperphosphatemia and positive phosphorus balance are frequent despite the use of phosphate binders, especially in well-nourished patients (1,2,8).

As the course of conjunctival and corneal calcification can be easily followed. The evaluation of the clinical courses of conjunctival and corneal calcification is very useful for assessing the severity of Ca and P imbalance and bone metabolic disorder in hemodialysis patients (4,8). we proposed to evaluate the relationship of conjunctival and corneal calcification with other sites of soft tissue calcification like heart and vascular system by other investigators.

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