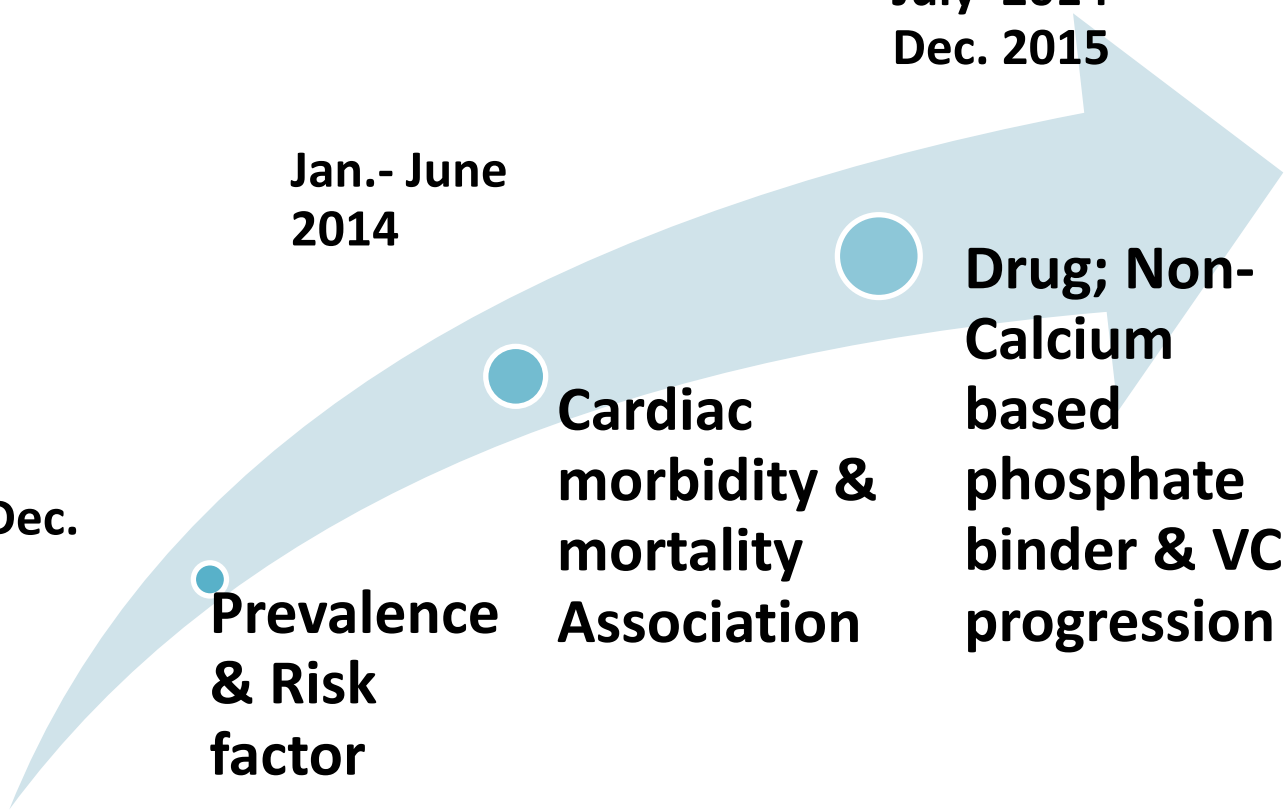

Milestone

Theme: Vascular Calcification

Study Timeline

- ✓ Ethic approval
- ✓ Data Collection
- ✓ Statistical Analysis
- ✓ Menuscript Writing
- ✓ Paper Submission
- ✓ Publication



Theme: Vascular Calcification

Title	Design	Pop n	Duration	Intervention

Prevalence and Risk Factors of Vascular Calcification in Peritoneal Dialysis Patients

September 6, 2013

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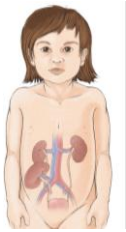
Introduction

- Chronic Kidney Disease (CKD) → progress loss of renal function
- CKD → End Stage Renal Disease (Kidney function < 15%) → Renal Replacement Therapy(RRT)
- RRT 3 modalities
  - Kidney Transplantation
  - Hemodialysis
  - Peritoneal dialysis



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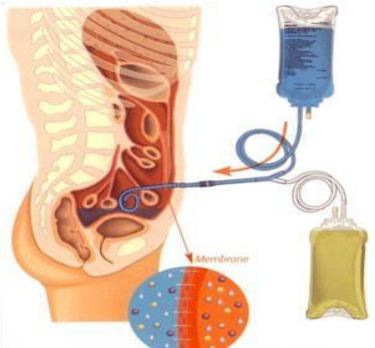
HD



PD

Introduction

- **Cardiovascular disease (CVD) is a major cause of death in both HD and PD patients.**

- **2 groups of risk factors for CVD**

  1. Conventional

  ; Old age, Male, DM, HT, Smoking…

  2. Kidney disease related

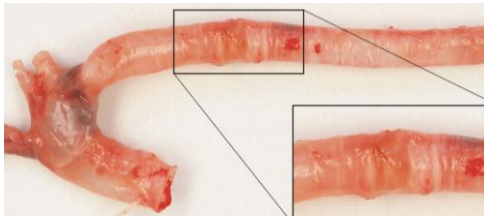
  ; Calcium-phosphate imbalance , Anemia, Malnutrition, Inflammation…..

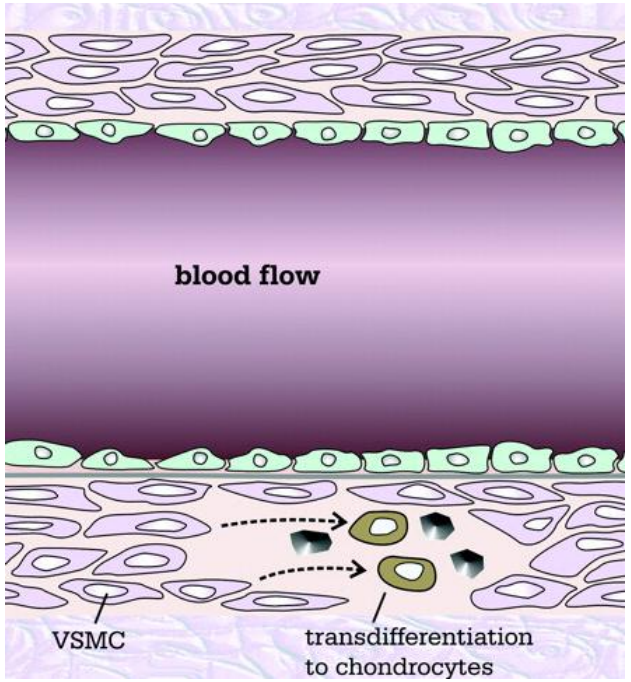
Introduction

- **Calcium-Phosphate (Ca-P) abnormality is a common problem in dialysis, resulting in Ca-P precipitation in the body.**

- **“ Vascular calcification (VC) ”**

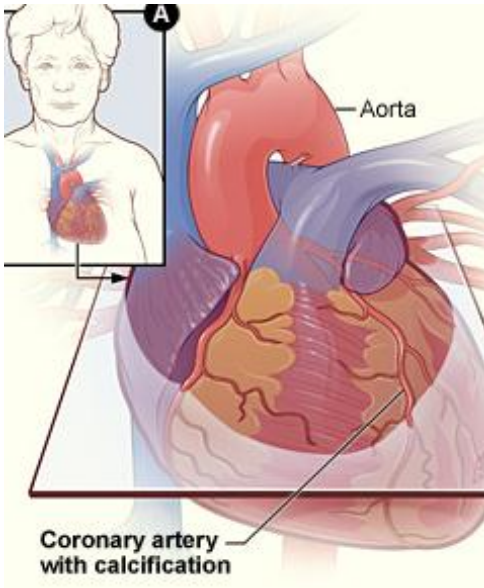
: Ca-P precipitated & deposited within vessel wall.





Introduction

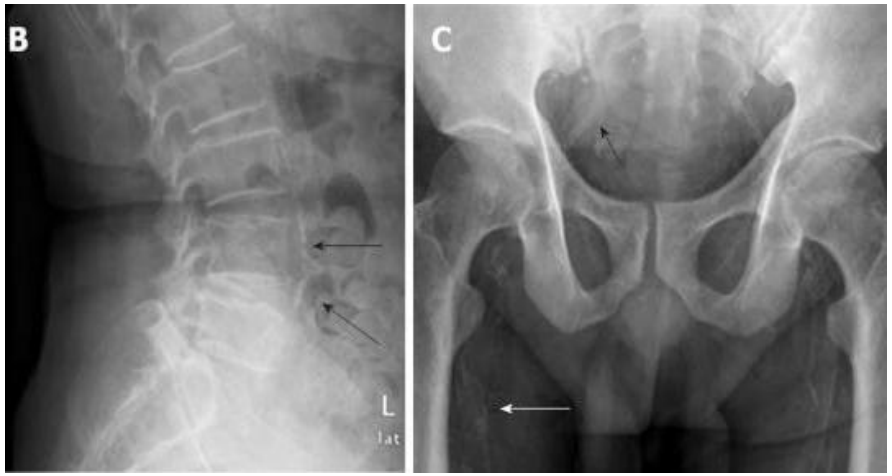
- **Why is VC important for dialysis patients ??**
  - **High prevalence of VC in PD 60-80 %. [1]**
  - **Strong predictor of all-cause mortality & cardiovascular death. [1-3]**
- **And how ??**
  - **VC, causing vascular stiffness & the vascular lumen obstruction.**
    → decreased blood flow to organs
  - **Coronary a. → Myocardial infarction**



1.Adragao T, et al. NDT 2004 2.London GM, et al. NDT 2003 3.Wang AY, Arch Intern Med 2005

Introduction

- VC diagnosis by using
  - Plain film x-ray of
    - Lateral lumbar spine for Abdominal Aorta calcification
    - Pelvis for Ileofemoral axis calcification



" The early VC detection, the early treatment "

Objective

- **To determine prevalence and risk factors of VC in CAPD patients.**

Material & Methods

- **Study Design**: Multicenter cross-sectional study
- **Population**: CAPD patients from 10 hospitals in the Northeast region of Thailand
- **Inclusion Criteria:**
  1. CAPD patient who is under Thai PD First Policy
  2. Age 15-90 years
  3. CAPD outpatient
- **Duration:** January - December, 2011

Material & Methods

- **The research information is given to CAPD patients, after that sign a consent form if they want to participate in study.**
- **All enrolled patients have to do the x-ray of**
  1. Lateral Lumbar Spine
  2. Pelvis
- **All films x-ray are sent to Srinagarind hospital, read by single radiologist and assess the VC Score by using Bellasi criteria.[4]**

4. Bellasi A. KI 2006

Material & Methods

- **Data Collection**
  1. **Demographic data**

     : Age, Gender, DM, Duration of Dialysis(Vintage), Phosphate binder dose
  2. **Lab. Parameter**

     : Serum Phosphate, Serum Calcium, Parathyroid level, Serum albumin
  3. **VC score (assessed by single radiologist at Srinagarind hospital)**
- **All data are sent from each hospital to Srinagarind hospital.**

Statistical Analysis

- **Mean±SD** : numerical continuous data
- **Percentage** : counting or discrete data
- **The multivariate logistic regression with log likelihood analysis** : assess the association between risk factor & VC.
- The results are reported as the **prevalence ratio and 95% CI**, computed by using Stata version 10.

Results

TABLE 1 Demographic and clinical characteristics of the patients with VC and Non-VC (Total 633 patients)

Characteristic	VC N= 162	Non VC N= 471	p-value
1. Gender (Number)(%)			0.09
1.1 Male	74(22.77%)	251(77.23%)	
1.2 Female	88(28.57%)	220(71.43%)	
2. Age (year)(mean±SD)	53±14.18	52±13.18	
2.1 Age <30	12(27.91%)	31(72.09%)	0.91
2.2 Age 30-39	13(28.26%)	33(71.74%)	
2.3 Age 40-49	34(26.36%)	95(73.64%)	
2.4 Age 50-59	48(23.65%)	155(76.35%)	
2.5 Age ≥60	54(27.27%)	144(72.73%)	
3. DM (Number)(%)	55(25.23%)	163(74.77%)	0.87
Non DM	107(25.78%)	308(74.22%)	
4. Dialysis Vintage (Month)(mean±SD)	21.90±13.04	20.75±12.37	
4.1 Dialysis vintage <12 months (Number)(%)	40(24.69%)	122(75.31%)	0.90
4.2 Dialysis vintage 12-24 months	55(26.32%)	154(73.68%)	
4.3 Dialysis vintage >24 months	63(26.58%)	174(73.42%)	
5. CaxP Product (mg/dL)(mean±SD)	36.93±15.02	36.26±14.40	
5.1 CaxP >55 mg/dL (Number)(%)	17(28.81%)	42(71.19%)	0.55
6. Serum Phosphate (mg/dL)(mean±SD)	4.13±1.72	4.13±1.61	
6.1 Serum Phosphate >5.5 mg/dL (Number)(%)	23(25.84%)	66(74.16%)	0.98
7. Serum Calcium (mg/dL)(mean±SD)	8.94±0.99	8.81±0.97	
7.1 Serum Calcium >10.2 mg/dL (Number)(%)	11(28.95%)	27(71.05%)	0.62

TABLE 1 Demographic and clinical characteristics of the patients with VC and Non-VC (Total 633 patients)

Characteristic	VC N= 162	Non VC N= 471	p-value
8. iPTH (ng/ml)(mean±SD) 8.1 iPTH >315 ng/ml (Number) (%)	251.32±362.48 26(20.47%)	266.78±346.48 101(79.53%)	0.17
9. Calcium based phosphate binder dose (mg/day)(mean±SD) 9.1 Calcium based phosphate binder dose >1,800 mg/day (Number) (%)	1,476.23±582.77 62(22.79%)	1,574.67±641.61 210(77.21%)	0.15
10. Serum Albumin (g/dL)(mean±SD) 10.1 Serum Albumin ≤ 3g/dL(Number)(%)	3.24±0.58 45(25.14%)	3.33±0.62 134(74.86%)	0.81
11. Vascular calcium score >0 of orta (mean±SD)	6.43±5.47	0	
12. VC at iliac artery (Number)(%)	21(14.58%)	0	
13. VC at femoral artery (Number)(%)	27(18.75%)	0	

Table 2. Prevalence ratio of risk factors to vascular calcification

VC Risk Factor		Prevalence Ratio	95% CI
1. Female vs. Male		1.25	0.96-1.63
2. Age (year)			
2.1 Age <30		1.05	0.60-1.85
2.2 Age 30-39		1.07	0.62-1.84
2.3 Age 40-49		1	
2.4 Age 50-59		0.89	0.61-1.31
2.5 Age ≥60		1.03	0.71-1.49
3. DM vs. Non DM		0.97	0.73-1.29
4. Dialysis Vintage (months)	>24 vs. ≤24	1.03	0.78-1.36
5. CaxP Product (mg/dL)	>55 vs. ≤55	1.13	0.74-1.74
6. Serum Phosphate (mg/dL)	>5.5 vs. >5.5	1.00	0.68-1.47
7. Serum Calcium (mg/dL)	>10.2 vs.<10.2	1.14	0.67-1.91
8. PTH (ng/ml)	>315 vs. <315	0.77	0.52-1.13
9. Calcium based phosphate binder dose (mg/day) >1,800 vs. ≤1,800		0.77	0.55-1.09
10. Serum Albumin (g/dL)	≤3 vs. >3	0.96	0.71-1.30

Discussion

- **CVD is the leading cause of death in dialysis with the prevalence of 45%.**
- **VC is recognized as a marker of CVD and it is associated with cardiac & all-cause mortality in dialysis patients.**
- **From previous studies, VC prevalence in PD is about 60-80% but from our study, VC prevalence of abdominal aorta is only 25.60 %.**

Discussion

- **The low VC prevalence may be from**
  1. **Malnutrition with low phosphate intake (<700 mg/day)**
  2. **Short duration of dialysis**

Discussion

- **The low VC prevalence may be from**
  1. **Malnutrition with low phosphate intake (<700 mg/day)**
     - ✓ **Low protein & dairy products intake, Diet restriction**
     - ✓ **Dialysis protein & phosphate loss**
     - ✓ **Uremia**

Malnutrition → **Low in Phosphate** → **Low VC formation rate**

Discussion

- **The low VC prevalence may be from**
  2. **Short duration of dialysis; nearly 2 years**
     - → **Short VC risk exposure such as…**
       - **Chronic inflammatory state**
       - **Atherosclerotic process**
       - **Uremia**
       - **Prolonged used of calcium based phosphate binder**

Discussion

- **2 potential risk factors for VC**

  1. Prolonged dialysis vintage

  : Dialysis duration > 24 months

  : Prevalence risk 1.03 (95% CI: 0.78-1.36)

  : Longer dialysis, longer VC risk exposure → VC formation

  2. Hypercalcemia

  : Serum calcium > 10.2 mg/dL

  : Prevalence risk 1.14 (95% CI: 0.67-1.91)

  : High Ca + High P → Ca-P crystal precipitation → causing VC formation

Discussion

- **2 potential protective factors for VC**

  1. Hyperparathyroidism

  : Serum PTH > 315 ng/ml

  : Prevalence risk 0.77 (95% CI: 0.52-1.13)

  : High PTH → High bone turnover rate → Low VC formation

  2. Dose of calcium based phosphate binder

  : Calcium dose > 1,800 mg/day, used for Phosphate binding to reduce the serum phosphate.

  : Prevalence risk 0.77 (95%CI: 0.55-1.09)

  : The more calcium dose, the more phosphate reduction → low in phosphate → Low VC formation

Discussion

- **From our study, we suggest to keep serum Calcium & Phosphate within normal range by using calcium based phosphate binder in dose > 1,800 mg/day.**

- **According to KDIGO guideline, maintained serum PTH level between 2-9 times of upper reference limit (70-315 ng/ml), our study suggest to keep PTH level > 315 ng/ml.**

Strength & Limitation

- Multicenter study
- Large population
  - Valid
  - Reliable
- Protective factors → apply for treatment
- Some missing data from some centers
- Lack of diversity
  - Thai
  - Asia

Conclusion

- **Prevalence of VC in CAPD patients from our study is quite low when compared to HD.**
- **Malnutrition & short duration of dialysis are the causes of low VC prevalence.**
- **Dialysis vintage more > 24 months & hypercalcemia > 10.2 mg/dL are at high risk for VC.**
- **VC Monitoring and proper treatment should be done earlier in high risk patient.**