# PREDICTIVE VALUE OF KAUPPILA INDEX IN HEART VALVE CALCIFICATIONS PREVALENCE

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## Introduction and Aims

Vascular calcification (VC) and cardiac valvular calcifications (CVc) are causes of cardiovascular events presented with high incidence in Hemodialysis (HD) patients. KDIGO guidelines recommend lateral abdominal radiography to detect the presence or absence of VC and echocardiogram to determine the existence of CVc. Kauppila (KI) and Adragao (AI) indices are two radiographic accepted scoring systems for evaluation of VC.

The presence of inflammatory cells, lipoproteins and bone matrix proteins in the calcified regions of cardiac valves, along whith common risk factors, suggests that CVc and VC are syndromes dependent on common pathogenetic mechanism.

Our aim was to study the prediction of CVc presence in echocardiogram based on KI and AI.

## Methods

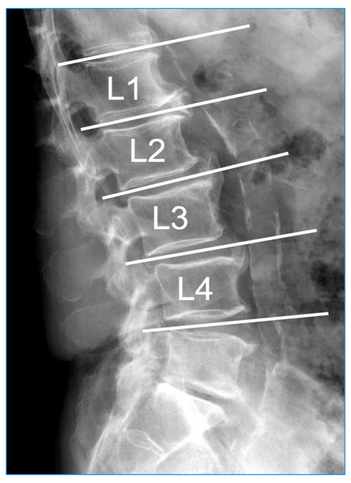
Cross-sectional study in 54 HD patients. CVc was determined by bidimensional Echocardiogram, VC in abdominal aorta by lumbar spine radiographs in lateral projection for evaluation of KI. To determine AI, VC was studied in iliac/femoral and radial/digital arteries by pelvic and hand radiography. Demographic characteristics, analytical and pharmacological treatment were compared by non-parametric tests among patients with and without CVc. ROC curve analysis was used to determine a possible cut-off value of KI and AI associated with the presence of CVc. Measurements were made by two observers (Nephrologist and Radiologist) and intraclass correlation coefficient (ICC) and Bland-Altman graphical method were determined.

## Results

57.41% presented CVc, being the most affected the Aortic valve in 35.2% of the population. This group of patients was significantly younger but with higher comorbidities. CVc group had a longer HD vintage, higher volumes and dialysis blood flows and significantly higher levels of 25OH-VitD. KI showed significant differences between groups with and without CVc, but not AI. Logistic regression analysis showed as predictors of CVc occurrence: age, time in HD, Charlson index and KI. In the ROC analysis curves it was determined that an KI > 6 points is associated with the presence of CVc [Area under the curve (AUC) = 0.709; CI: 0.601-0.817; p=0.0001] with a sensitivity of 63.3%, specificity of 70.3%, positive predictive value of 70.37% and negative of 63.33%. The inter-observer ICC was 0.88 (95% CI 0.38-0.96, p=0.0001), with a cloud of uniform distribution points on the Bland-Altman chart.

## Conclusion

**Vascular calcification screening using an affordable, low-cost method such as lumbar radiography followed by Kauppila Index estimation may help to identify patients with a high likelihood of presenting Cardiac Valve calcification to earlier and active intervention to attenuate your progression.**




**Kauppila I** (0-24 points)

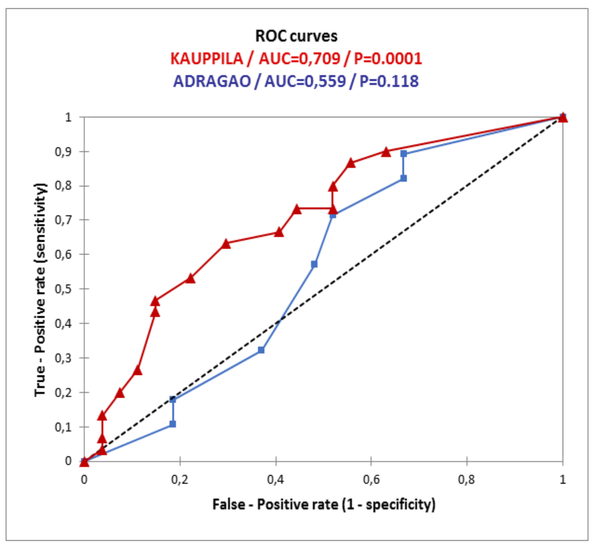
### Anterior and posterior wall L1-L4:

- No calcification = **0 points**
- Small Calcification = **1 point**
- Moderate Calcification = **2 points**
- Big Calcification = **3 points**

## PATIENTS CHARACTERISTICS AND ECHOCARDIOGRAM CALCIFICATION PRESENCE – ROC ANALYSIS

| | | Without Calcif. Echocardiogram | With Calcif. Echocardiogram | P |
|---|---|---|---|---|
| | n | 30 | 31 | |
| Demographics | Age (years) | 76.23 ± 8.83 | 71.54 ± 14.45 | 0.049 |
| | HD vintage (Months) | 38.17 ± 39.01 | 63.45 ± 47.86 | 0.013 |
| | Charlson I. By age | 5.77 ± 2.18 | 6.94 ± 1.44 | 0.025 |
| | Female % | 16.67 % | 29.03% | 0.251 |
| | Diabetes % | 46.67% | 38.71% | 0.53 |
| | HBP % | 86.67% | 93.55% | 0.367 |
| | Smoking % | 46.67% | 35.48% | 0.375 |
| | Dyslipidemia % | 56.67% | 61.29% | 0.714 |
| | Cardiovascular dis. % | 63.33% | 80.65% | 0.132 |
| | OSAHS % | 6.67% | 9.68% | 0.668 |
| | LV hypertrophy % | 86.67% | 96.77% | 0.15 |
| | Previous transplant % | 3.33% | 9.68% | 0.317 |
| Index | KAUPPILA I. | 4.35 ± 4.59 | 7.53 ± 4.61 | 0.009 |
| | ADRAGAO I. | 3.58 ± 3.1 | 3.93 ± 2.46 | 0.575 |
| Blood test | Hct % | 35.29 ± 6.14 | 35 ± 4.78 | 0.603 |
| | Hb g/dl | 11.52 ± 1.9 | 11.53 ± 1.56 | 0.801 |
| | P mg/dl | 4.56 ± 1.4 | 4.63 ± 1.04 | 0.724 |
| | Ca mg/dl | 9.11 ± 0.56 | 9.14 ± 0.44 | 0.68 |
| | Ca*P (mg/dl)² | 41.33 ± 12.21 | 42.25 ± 9.63 | 0.644 |
| | iPTH ng/l | 305.37 ± 416.27 | 262.58 ± 151.96 | 0.569 |
| | 25-OH ng/ml | 17.17 ± 6.99 | 20.59 ± 7 | 0.023 |
| | Glucose mg/dl | 127.03 ± 70.39 | 98.42 ± 28.46 | 0.27 |
| | Hb A1C % | 7.15 ± 1.74 | 5.98 ± 0.83 | 0.054 |
| | Total protein. g/dl | 6.74 ± 0.56 | 6.78 ± 0.58 | 0.84 |
| | Albumin g/dl | 4.02 ± 0.38 | 3.93 ± 0.42 | 0.15 |
| | B2-mg mg/L | 27.95 ± 7.3 | 32.07 ± 10.7 | 0.056 |
| | HDL mg/dl | 47.63 ± 14.97 | 41.45 ± 14.38 | 0.078 |
| | LDL mg/dl | 77.4 ± 31.84 | 77.67 ± 31.9 | 0.851 |
| | Total Col mg/dl | 147.97 ± 36.84 | 145.61 ± 38.33 | 0.931 |
| | TG mg/dl | 118.23 ± 64.76 | 132.16 ± 71.67 | 0.544 |
| | Alk. phosphatase UI/L | 98.6 ± 40.32 | 101 ± 39.82 | 0.54 |
| | Pre HD Cr mg/dl | 8.04 ± 2.16 | 7.63 ± 1.44 | 0.639 |
| | C-RP mg/L | 11.77 ± 14.08 | 17.62 ± 20.04 | 0.191 |
| | Fibrinogen mg/dl | 488.07 ± 106.91 | 491.58 ± 96.18 | 0.69 |
| | Ferritin g/l | 438.53 ± 301.78 | 443.94 ± 264.65 | 0.724 |
| | TSAT % | 30.8 ± 15.43 | 28.61 ± 8.1 | 0.795 |

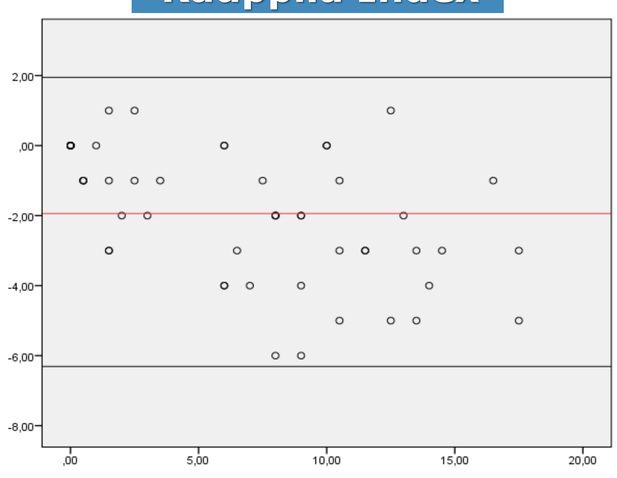
| | | Without Calcif. Echocardiogram | With Calcif. Echocardiogram | P |
|---|---|---|---|---|
| | n | 30 | 31 | |
| Index | KAUPPILA I. | 4.35 ± 4.59 | 7.53 ± 4.61 | 0.009 |
| | ADRAGAO I. | 3.58 ± 3.1 | 3.93 ± 2.46 | 0.575 |
| Anemia treatment | Pts with Iron | 40,00% | 41.94% | 0.878 |
| | Fe IV µg/month | 150 ± 112.82 | 173.08 ± 191.07 | 0.733 |
| | Fe IV µg/Kg/month | 2.38 ± 2.03 | 2.62 ± 2.97 | 0.765 |
| | Pts with EPO | 83.33% | 74.19% | 0.384 |
| | EPO mes | 16133.33±17574.93 | 12000 ± 19361.47 | 0.086 |
| | UI/Kg/week | 60.66 ± 74.81 | 41.16 ± 67 | 0.096 |
| | ERI | 5.51 ± 6.84 | 4 ± 6.92 | 0.096 |
| HD clinics parameters | A-V fistula (%) | 46.67% | 67.74% | 0.096 |
| | Qb ml/min | 362.63 ± 36.08 | 379.45 ± 31.28 | 0.036 |
| | Qd ml/min | 418.8 ± 56.23 | 414.9 ± 45.05 | 0.925 |
| | Treatement min/week | 704.17 ± 85.06 | 723.84 ± 101.85 | 0.8 |
| | Blood Vol L/week | 255.77 ± 42.87 | 274.13 ± 37.31 | 0.042 |
| | Kt/V OCM | 1.73 ± 0.31 | 1.83 ± 0.35 | 0.168 |
| | Kt OCM | 49.22 ± 5.17 | 50.53 ± 7.26 | 0.292 |



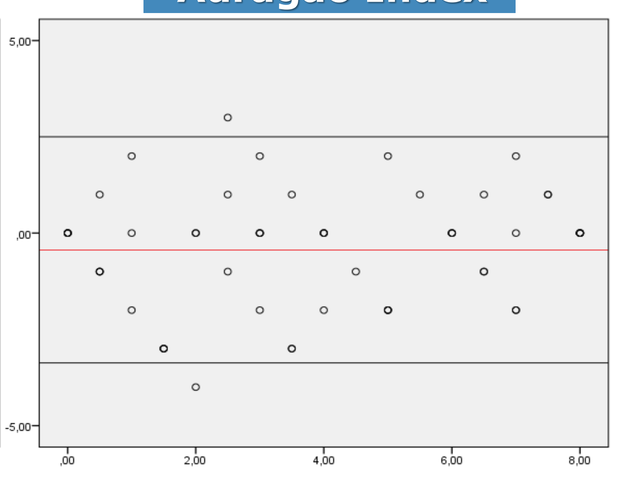

## Bland - Altman Graph

| | CCI | 95% CI | | P |
|---|---|---|---|---|
| | | Lower | Upper | |
| **Kaupilla** | 0.883 | 0.388 | 0.96 | <0.0001 |
| **Adragao** | 0.836 | 0.73 | 0.902 | <0.0001 |

### Kauppila Index




### Adragao Index

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