Table 1. Associates of vascular calcification

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Ref | Time | doi | PMID | Country | Relation | Variable |  | Gender | Calcification | Complications | CKD stages | sample |
| (1) | 2012 | 10.1371/journal.pone.0039241 | 22723973 | UK | associates | Male gender | +24% compared to no calcification | v | AAC | Left ventricular mass index | 3 | 120 |
| (2) | 2011 | 10.2215/CJN.03910411 | 21940840 | USA | Associates | Female gender | Female -> Osteoprotegerin: 10.2% (0.2%– 21.3%) | v | OPG (percentage difference) |  | 1-5 | 351 |
| (2) | 2011 | 10.2215/CJN.03910411 | 21940840 | USA | Associates | Female gender | Female -> Osteoprotegerin: 10.2% (0.2%– 21.3%) | v | OPG (percentage difference) |  | 1-5 | 351 |
| (3) | 2010 | 10.2215/CJN.02560310 | 20576822 | Turkey | associates | Male gender | R = -0.181, p = 0.016 | v | Gensini score |  |  |  |
|  |  |  |  |  |  |  | The Gensini score values significantly correlated in univariate analysis with gender (R = -0.181, P = 0.016), presence of hyperension (R = 0.203, P = 0.007), HDL cholesterol level (R = -0.158, P = 0.047), eGFR (R = -0.315, P 0.001), iPTH (R = 0.152; P = 0.044), FGF 23 (R = 0.868; P = 0.001), and fetuin A levels (R = 0.491; P = 0.001) but not with the vitamin D values. |  |  |  |  |  |
| (4) | 1988 | 10.1159/000184864 | 3340252 | France | Associates | Male gender | Simple covariance coefficient = 1.97, p < 0.01 | V | Linear calcifications of the abdominal aorta and of the iliac and femoral arteries |  | 5D (HD) | 24 |
| (5) | 2008 | 10.1053/j.jrn.2008.04.003 | 18721733 | France | associates? | Female gender | Vitamin D deficient vs. sufficient: 53% vs. 28%, p < 0.05 | ? | semiquantitative (0 to 6) score of vascular calcification by using x-rays, in accordance with London et al. |  | 5D (HD) | 253 |
|  |  |  |  |  |  |  | Vitamin D deficiency was reported to be  associated with cardiovascular calcification, 5 |  |  |  |  |  |
| (6) | 2011 |  | 22259897 | Lebanon | Associates | Gender | No association between VC and gender | x | Hand X-rays |  | 5D (HD) | 43 |
| (7) | 2019 |  | 31122190 | Taiwan | Associates? | Female gender | OPG tertile 1/2/3: 62.5% / 55.0% / 32.%, p = 0.008\* | v | OPG |  | 5D (HD) | 120 |
|  |  |  |  |  |  |  | Bone loss -> OPG -> calcification |  |  |  |  |  |
| (8) | 2014 | 10.1186/1471-2369-15-190 | 25465028 | Brazil | Associates? | Gender (M/F) | Low vs High sclerostin: 24/22 vs. 31/14, p = 0.103 | x | Sclerostin |  | 5D (HD) | 91 |
| (9) | 2019 | 10.1159/000501392 | 31291619 | USA | associates | Male gender (%) | Stable PWV vs. increased PWV: 33% vs. 75% | v | Pulse wave velocity as surrogate |  | 5D (PD) | 24 |
| (10) | 2008 | 10.1093/ndt/gfn571 | 18852190 | France | associates | Male gender | Score 3 vs. score 0: 77% vs. 45% | v | diffuse VCs with aortic, iliac, femoral, popliteal and arm artery VCs |  | 5D (HD) | 161 |
| (11) | 2018 | 10.1007/s11255-017-1758-9 | 29236239 | Thailand | Associates | Male gender (%) | AAC > 6 vs. ≤ 6: 44.4 vs. 62.6 (in CKD 2-5) |  | AAC |  | 2-5T | 419 |
| (12) | 2014 | 10.1016/j.bone.2014.03.048 | 24709688 | Austria | associates | Male vs. female | Total score: 1535 [789–2281] vs. 514 [117–911], p = 0.01 | v | CAC score (Agatston) |  | 5D (HD) | 66 |
|  |  |  |  |  |  |  | Left main artery: 46 [6–86] vs. 6 [0–15], p = 0.035 |  |  |  |  |  |
|  |  |  |  |  |  |  | Left anterior descending: 630 [333–927] vs. 208 [68–349], p = 0.018 |  |  |  |  |  |
|  |  |  |  |  |  |  | Circumﬂex artery: 193 [2–384] vs. 57 [0–123], p = 0.24 |  |  |  |  |  |
|  |  |  |  |  |  |  | Right coronary artery: 667 [298–1035] vs. 242 [0–519], p = 0.017 |  |  |  |  |  |
|  |  |  |  |  |  | Male vs. female | Men CAC score <100 vs. CAC score ≥100 vs. Women CAC score <100 vs. CAC score ≥100: s289 vs. 241 vs. 228 vs. 189, p =0.03 |  | Total bone density (Dtot) |  |  |  |
|  |  |  |  |  |  |  | Men CAC score <100 vs. CAC score ≥100 vs. Women CAC score <100 vs. CAC score ≥100: 14 12 11 9, p = 0.03 |  | Bone volume (BV/TV) |  |  |  |
| (13) | 2007 | 10.1159/000099095 | 17259697 | Italy | associates | Male gender | Male-Dialysis (D) vs. Male-Transplant (Tx) vs. Female-D vs. Female-Tx: 1944 vs. 945 vs. 157 vs. 35, p < 0.02 |  | CACS (Agatson) |  | 5D-5T | 100 |
| (14) | 2012 | 10.1016/j.amjcard.2012.07.044 | 22980963 | US (CRIC study) | associates | Male gender | 0 vs. 0-100 vs. >100: 41.9% vs. 53.3% vs. 63.6%, p < 0.0001 |  | Total Agaston score |  | 2-4 | 2018 |
| (15) | 2012 | 10.1016/j.atherosclerosis.2011.11.028 | 22169112 | Republic of Korea | associates | Female gender | OR 3.892 (1.678–9.025) | ? | Vitamin D (25D) deficiency |  | 5D (HD) | 289 |
|  |  |  |  |  | Associates | 25D level | r = −0.170, P = 0.004 |  | Vascular calcification score (Kauppila index) |  |  |  |
|  |  |  |  |  |  |  | 25D serum levels and VCS (r = −0.170, P = 0.004) at the end of the summer, but not at the end of the winter (r = −0.114, P = 0.054; Fig. 2). Therefore, we analyzed the data to reveal the association of serum 25D level with vascular calciﬁcation at the end of the summer, when vitamin D levels were found to peak. |  |  |  |  |  |

Table 2. Causes of vascular calcification

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Ref | Time | doi | PMID | Country | Relation | Variable |  | Gender | Calcification | Complications | CKD stages | sample |
| (16) | 2013 | 10.1186/1471-2369-14-221 | 24119158 | Spain | causes | Male sex | All patients: OR 4.218 (1.403-14.207)  eGFR < 30: OR 4.167 (1.050-20.178) | v | Abdominal aortic calcification (AAC) (Kauppila Index) |  | 3-4 | 178 |
|  |  |  |  |  |  |  | Lack of a FEP-FGF23 correlation in patients with severe AAC (KI > 5) suggested a role for an impaired phosphaturic response to FGF23 but not to PTH in AAC. Logistic and zero-inflated analysis confirmed the independent association of age, CKD stage, male gender and CP with AAC, and also identified a threshold FEP/FGF23 ratio of 1/3.9, below which the chances for a patient of presenting severe AAC increased by 3-fold. |  |  |  |  |  |
| (17) | 2009 | 10.1111/j.1525-1594.2009.00814.x | 19681840 | Turkey | causes | Male gender | HR 0.87 (0.56–0.91, p=0.87) | v | Coronary artery calcification score (CACS) |  | 5D (HD) | 102 |
|  |  |  |  |  |  | HD vintage | HR 0.85 (0.58–0.95)  Independent of other influencing factors, HD vintage and serum PTH levels were significant determinants of low bone mass and T-scores in all anatomical sites whereas fetuin-A was an independent predictor in proximal radius, femoral neck, and trochanter |  | CACS |  |  |  |
|  |  |  |  |  |  | Serum PTH | Standard regression coefficient -0.21– -0.33 |  | Bone mineral densities (BMD) |  |  |  |
|  |  |  |  |  |  | Fetuin-A | Standard regression coefficient -0.29– -0.41 |  | BMD |  |  |  |
| (18) | 2013 | 10.1186/1471-2369-14-122 | 23758931 | Greece | causes | Gender | β = -0.163 | v | Common carotid intima-media thickness (ccIMT) |  | 5D (HD) | 81 |
| (19) | 2017 | 10.1159/000360230 | 27988970 | Austria | causes | Male gender | total iliac: 1.00 (0.25-1.75) vs. 0.50 (0.13-1.13) | v | Iliac vascular calcification grade |  | 5T | 205 |
|  |  |  |  |  |  | Male gender | external iliac: 1.00 (0.00-1.50) vs. 0.00 (0.00-0.50) |  |  |  |  |  |
|  |  |  |  |  |  | Male gender | left common iliac: 1.00 (0.50-2.00) vs. 1.00 (0.00-1.88) |  |  |  |  |  |
|  |  |  |  |  |  |  | \*Not adjusted for age |  |  |  |  |  |
|  |  |  |  |  |  | Older than 55 yrs | 1.25 (0.50-2.00) vs. 0.50 (0.00-1.16) |  | Total iliac calcification (without distal aortic segment) |  |  |  |
|  |  |  |  |  |  |  | Median total calcification score was 3 (2.2-3) in the patients declined for renal  transplantation, with similar results in the different regions of the iliac arteries. |  |  |  |  |  |
| (20) | 2020 | 10.1186/s12882-020-1710-6 | 32033584 | Sweden | causes | Male gender | OR 4.4 (1.6–11.1) | v | Inferior epigastric artery & CACS |  | 5-5D | 149 |
|  |  |  |  |  |  |  | Male -x copeptin: β = −0.08 (0.31) |  |  |  |  |  |
|  |  |  |  |  |  | Copeptin (1-SD increase) | OR 1.6 (1.1–2.6) |  |  |  |  |  |
|  |  |  |  |  |  |  | Mechanisms of vascular calcification in CKD. In the setting of uraemic milieu, activation of renin-angiotensin and vasopressin systems,  upregulation of sodium-dependent phosphate transporter Pit-1 promotes osteochondrocytic transformation and apoptosis of vascular smooth muscle cell (VSMC) and, in consequence, accelerated vascular calcification |  |  |  |  |  |
|  |  |  |  |  |  | Higher Age (1-SD increase) | OR 2.5 (1.5–4.1) |  |  |  |  |  |
|  |  |  |  |  |  | Diabetes | OR 23.2 (2.5–210.5) |  |  |  |  |  |
| (2) | 2011 | 10.2215/CJN.03910411 | 21940840 | USA | Causes | Osteoprotegerin (OPG) | Reference |  | Aortic pulse wave velocity |  | 1-5 | 351 |
|  |  |  |  |  |  |  | Tertile 2 (5.05 to 7.45 pmol/L): 1.06 (0.97– 1.15) |  |  |  |  |  |
|  |  |  |  |  |  |  | Tertile 3 (7.46 to 22.31 pmol/L): 1.10 (1.01– 1.20) |  |  |  |  |  |
| (21) | 2019 | doi.org/10.1186/s12882-019-1235-z | 30777028 | Sweden | causes | Total body bone mineral density (tBMD) in female | β = −0.27, se = 0.12, p = 0.03 | v | CACS |  | 5 | 174 |
|  |  |  |  |  |  | BMD at legs in female | β = −0.28, se = 0.12, p = 0.02 |  |  |  |  |  |
|  |  |  |  |  |  |  | Multivariate generalized linear model  (GLM) analysis adjusted for age, diabetes and hsCRP showed that in females per SD higher CAC score (1057 AUs) was  predicted by either per SD (0.13 g/cm2) lower tBMD or per SD (0.17 g/cm2) lower BMD at legs. **No such associations were found in male** **ESRD patients**. |  |  |  |  |  |
| (22) | 2017 | 10.1111/eci.12718 | 28036114 | Sweden | Causes | Male gender | After adjustments for confounders by GLM (age, gender, BMI, diabetes, inflammation), only age, male gender, diabetes and statins remained significantly related to high CAC score. | v | CACS |  | 5D-5T | 240 |
|  |  |  |  |  |  |  | Model with hsCRP: estimate = −0.38, se = 0.11, p = 0.005 |  |  |  |  |  |
|  |  |  |  |  |  |  | Model with IL-6: estimate = 0.40, se = 0.13, p = 0.002 |  |  |  |  |  |
|  |  |  |  |  |  |  | Model with TNF but without statins: estimate = 0.35, se = 0.13, p = 0.008 |  |  |  |  |  |
|  |  |  |  |  |  | Statins | Model with hsCRP: estimate = 0.29, se = 0.11, p = 0.009 |  |  |  |  |  |
|  |  |  |  |  |  |  | Model with IL-6: estimate = 0.44, se = 0.14, p = 0.001 |  |  |  |  |  |
| (23) | 2008 |  | 19259046 | Republic of Macedonia | causes | Male gender | +27% compared to female (80/91 vs. 36/59) | v | Arterial intimal & media calcification (AIC & AMC) |  | 5D (HD) | 150 |
|  |  |  |  |  |  |  | The present results suggest a few emerging risk factors for the occurrence of arterial  calcifications, especially of AIC in our HD patients, such as age older than 55, male gender, diabetes, as well as higher CRP (> 4.5 mg/L), blood leucocytes (> 6.5 × 109L), corrected total serum Ca (> 2.35 mmol/L), serum triglycerides (> 1.8 mmol/L), PP (> 60 mmHg) and BMI (> 23 kg/m2). |  |  |  |  |  |
|  |  |  |  |  |  |  | Our findings of significantly higher percentages of ACA in patients who were younger (under  55 yrs at inclusion and 45 yrs at the start of HD), predominantly female, without diabetes and with higher percentages of K/DOQI guideline recommended levels for serum Ca, are supportive of the previous reports [11, 15, 17]. |  |  |  |  |  |
| (24) | 2012 | 10.1093/ndt/gfs219 |  | Romania | causes | Male gender | T ratio = 2.15, p = 0.04 | v | Aortic calcification score (ACS) |  | 3-5 | 106 |
| (25) | 2013 | 10.1016/j.ejmhg.2013.07.003 |  | Egypt | Causes | Male gender |  | ? | SVCS |  | 5-5T | 73 |
|  |  |  |  |  |  |  | VC was significantly associated with older age, male gender, longer HD duration, lower albumin, higher LDL-c, higher carotid plaques and lower BMD at the lumbar spine and the T-score value but had no significant association with the following parameters: duration of transplantation, blood pressure, total cholesterol, TG, Ca, PO4, Ca·PO4, iPTH, CRP, fetuin A, e-GFR and IMT. Also no significant association was seen between fetuin-A gene polymorphism and VC. Patients with VC had higher CRP than those without but did not reach a significant value. (Table 10). | P = 0.056 不應該相關，但是內文說相關 |  |  |  |  |
| (26) | 2015 | 10.1093/ndt/gfv200.30 |  | Germany? | Causes | Gender? | HR 0.50 (0.28-0.87) | v | Adragao calcification scores | All-cause mortality | 5D (HD) | 220 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| (27) | 2009 | 10.1159/000221064 | 19468238 | Serbia | Causes | Male gender | 2.75 (1.41–5.38) | v | Adragao calcification score |  |  |  |
|  |  |  |  |  |  |  | 2.32 (1.19–4.52) |  | Composite score |  |  |  |
| (28) | 2005 | 10.1093/ndt/gfi236 | 16263735 | UK | causes | Male gender | Calcification tertile 1/2/3: 18 (46%) / 28 (71%) / 39 (81%), P<0.001 | v | Multi-slice spiral CT scanning of a 5 cm standardized  segment of superficial femoral artery |  | 4-5D | 134 |
| (29) | 2014 | 10.1371/journal.pone.0114358 | 25479288 | Brazil | causes | Male gender | OR 4.92 (2.07–11.70) | v | CACS |  | 2-5 | 117 |
|  |  |  |  |  |  | Pericardial fat | OR 1.85 (1.00-3.42) |  |  |  |  |  |
| (30) | 2018 | 10.1186/s12882-018-0872-y | 29558928 | Japan | Causes | Male gender | OR 3.29 (1.27–8.53) | v | Abdominal aortic calcification index |  | 5D (HD) | 184 |
| (31) | 2014 | 10.1111/nep.12210 | 24447254 | Thailand | causes | Male gender | Kidney transplant, univariate: OR 2.36 (1.13–4.91), p = 0.02\* | v | Total vascular calcification score |  | 5-5T | 261 |
|  |  |  |  |  |  |  | Kidney transplant, multivariate: OR 2.49 (0.87–7.14), p = 0.09 |  |  |  |  |  |
|  |  |  |  |  |  |  | CKD 5-5D, univariate: 1.44 (0.71–2.91), p = 0.32 |  |  |  |  |  |
|  |  |  |  |  |  |  | CKD 5-5D, multivariate: 2.02 (0.71–5.78), p = 0.19 |  |  |  |  |  |
| (32) | 2015 | 10.1210/jc.2015-3056 | 26505822 | Belgium | causes | Male gender (F 1) | β = -0.64, t = 5.6, p = 0.0001 | v | Baseline CACS |  | 5T | 268 |
|  |  |  |  |  |  |  | β = -0.32, t = 2.3, p = 0.008 |  | Baseline aortic calcification |  |  |  |
| (32) | 2015 | 10.1210/jc.2015-3056 | 26505822 | Belgium | causes | Male gender (F = 1) | β = -0.64, t = 5.6, p = 0.0001 | v | Baseline CACS |  | 5T | 268 |
|  |  |  |  |  |  |  | β = -0.32, t = 2.3, p = 0.008 |  | Baseline aortic calcification |  |  |  |
|  |  |  |  |  |  | Male gender | P = 0.002 |  | Sclerostin |  |  |  |
|  |  |  |  |  |  |  | In multivariate regression analysis, higher age (P =.0001), **male gender (P =.002)**, lower eGFR (P =.002), lower PTH (P =.0001) and lower calcitriol levels (P =.05) were identified as independent determinants of higher levels of circulating **sclerostin**. |  |  |  |  |  |
|  |  |  |  |  |  | Sclerostin | Remarkably, **a lower circulating sclerostin** **level** was identified as independent determinant of a higher baseline AoC score in the final regression model, ie, **after adjustment** for traditional (older age, male gender, high BMI, presence of  diabetes, hypertension) and nontraditional (inflammation, high PTH, low calcidiol, long dialysis vintage) risk factors |  | baseline aortic calcification score |  |  |  |
| (33) | 2019 | 10.1159/000501687 | 31437840 | Sweden | causes | Male gender | β = 0.413, p = 0.030 | V | AAC volume |  | 3-4 | 84 |
| (34) | 2018 | 10.1159/000494441 | 30347400 | Japan | causes | Male gender | β = 0.221, 95%CI 0.124–0.319, p <0.0001 | v | AoAC score |  | 5D (HD) | 216 |
| (35) | 2004 | 10.1053/j.jrn.2004.09.027 | 15648030 | Japan | Causes | Male gender | OR 3.380 (1.289-8.860) | V | Vascular calcification |  | 5D (HD) | 332 |
| (36) | 2010 | 10.1038/ki.2010.70 | 20237457 | USA | Causes | Male gender | Using multivariate linear regression analysis, increasing age  (P = 0.001), male gender (P = 0.01), and non-Latino whites (P = 0.003) were independently associated with a higher log-  transformed baseline CAC score. | 沒有列詳細數據 | CAC |  | 1-5 | 225 |
| (37) | 2017 | 10.1007/s11255-017-1515-0 | 28124305 | Serbia | causes | Female gender | OR 0.134 (0.04–0.45) |  | calcification in arteriovenous fistula (AVF)-blood vessels |  | 5D (HD) | 90 |
| (38) | 2014 | 10.1159/000368476 | 25571879 | Japan | Causes | Male gender (%) | Grade 0 vs. 1 vs. 2+3: 98/126 vs. 63/112 vs. 37/63, p = 0.0009 | v | AoAC |  | 5D (HD) | 301 |
| (39) | 2015 | 10.1159/000380823 | 25823466 | Serbia | causes | Male gender | β = –0.432, p < 0.001 | v | overall calcification  score |  | 5D (HD) | 90 |
| (40) | 2002 | 10.1007/s00125-002-0920-8 | 12378387 | Japan | causes | Male gender | OR 3.380 (1.289-8.860) | 重複 | Vascular calcification |  | 5D (HD) | 421 |
| (41) | 2016 | 10.1007/s11255-016-1231-1 | 26865177 | Turkey | causes | Male gender | RR 4.14 (2.01–8.51) | v | CACS |  | 5D (HD) | 224 |
|  |  |  |  |  |  | FGF-23 (per 50 pg/ml) | RR 1.17 (1.05–1.30) |  |  |  |  |  |
| (42) | 2013 | 10.1159/000334597 | 22143191 | Belgium | causes | Male gender (%) | PWV ≤ 7.35 m/s vs. > 7.35 m/s: 74 vs. 56, p = 0.05 | v | PWV |  | 5T | 115 |
| (43) | 2011 | 10.1016/j.bone.2011.01.016 | 21281749 | UK | Causes | Male gender | β = 0.29, t =2.04, p =0.049 |  | Arterial Stiffness (SIDVP) |  | 1-4 | 145 |
| (44) | 2015 | 10.1038/ki.2015.194 | 26331407 | Sweden | causes | Male gender | RR 1.82 (1.03–1.16) | v | Vascular calcification |  | 5T | 89 |
|  |  |  |  |  |  | Sclerostin | middle+high sclerostin tertiles vs. low sclerostin tertile: RR 3.67 (1.23–11.02) |  |  |  |  |  |
| (45) | 2016 | 10.1159/000443845 | 26890570 | France | Causes | Female gender | OR 0.16 (0.075−0.362) | v | Serum sclerostin level |  | 5D (HD) | 227 |
| (46) | 2010 | 10.5414/cnp73360 | 20420796 | Japan | causes | Male gender | Male gender was identified as an independent determinant for CAP. |  | Coronary artery plaque (CAP) |  |  |  |
| (47) | 2002 | 10.1016/s0735-1097(01)01781-8 | 11849871 | Multicenter (USA & Europe) | causes | Female gender | Parameter estimate = -0.587547, p = 0.0167 | v | Coronary artery calcification |  | 5D (HD) | 205 |
| (48) | 2009 | 10.1159/000157629 | 18802328 | Japan | Causes | Male gender | HR 3.034 (1.028–8.948) | v | OPG level |  | 5D (HD) | 99 |
| (49) | 2010 | 10.5414/cnp74091. | 20630128 | HEMO Study | causes | Male gender | The lower serum alkaline phosphatase group was associated with older age, **male gender**, non-black race and shorter dialysis years as well as higher serum calcium, higher serum calcium-phosphorus product and lower parathyroid hormone levels. |  | Lower alkaline phosphate |  | 5D (HD) | 1827 |
| (13) | 2007 | 10.1159/000099095 | 17259697 | Italy | causes | Male gender | OR 10.5 (3.2–34.4) |  | CACS (Agatson) |  | 5D-5T | 100 |
| (50) | 2012 | 10.1016/j.transproceed.2011.11.031 | 22483469 | Taiwan | causes | Female gender | β = -1.61, p = 0.0021 | v | CACS |  | 5T | 99 |
| (51) | 2008 | 10.1038/ki.2008.458 | 18800030 | Serbia | Causes | Male gender | OR 5.08 (2.18–11.86) | v | Vascular access calcification |  | 5D (HD) | 212 |
| (52) | 2009 | 10.1093/ndt/gfp301 | 19574342 | France | causes | Male gender | OR 4.95 (2.36–10.37) | v | CACS ≥ 100 |  | 1-5 | 133 |
|  |  |  |  |  |  | Osteoprotegerin | 769.26–1063.62 pg/mL: OR 7.57 (2.06–27.85) |  |  |  |  |  |
|  |  |  |  |  |  |  | ≥1063.62 pg/mL: OR 8.54 (2.14–34.11) |  |  |  |  |  |
|  |  |  |  |  |  |  | ROC -> cutoff 757.7 pg/mL |  |  |  |  |  |
| (53) | 2008 | 10.1016/j.atherosclerosis.2007.03.047 | 17524408 | USA | causes | Male gender | Estimate = 735.82, p = 0.0366 |  | CACS (R-square 0.37) |  | 5D | 142 |

Table 3. Modifiers of vascular calcification

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Ref | Time | doi | PMID | Country | Relation | Variable |  | Gender | Calcification | Complications | CKD stages | sample |
| (22) | 2017 | 10.1111/eci.12718 | 28036114 | Sweden | Modifier | Statins | 0 (0-531) AUs to 273 (0-1256) AUs after 1.5 years of RRT |  | CACS |  | 5D-5T | 240 |
| (54) | 2002 | 10.1053/ajkd.2002.30955 | 11774125 | France | modifiers | Male gender | Indeed, this observation is reminiscent of our own observation regarding the **extension of calcification** assessed prospectively on 3 years in 24 hemodialysis patients who never received vitamin D derivatives. The calcifications were measured on lateral and frontal X rays of lumbar spine and pelvis at the level of aorta, iliac, and femoral arteries.' This extension was exponential, and simple covariance analysis showed that the main significant risk factors for extension were **male gender**, age (only in male patients) | v | Extension of calcification |  | 5D (HD) | 24 |
| (32) | 2015 | 10.1210/jc.2015-3056 | 26505822 | Belgium | modifiers | Male gender | β = -0.45, t = 4.01, p = 0.0001 |  | Annualized CACS change |  | 5T | 268 |
| (55) | 2007 | 10.2215/CJN.02190507 | 17928470 | UK | modifiers | Male gender | OR 8.82 (1.82 to 42.65) | v | Vascular calcification progression during 24 months |  | 4-5D | 134 |
| (56) | 2011 | 10.5551/jat.5595 | 21139318 | Japan | modifiers | Male gender | F-value = 5.092, β = 0.969, p = 0.0192 | v | AoACS progression (5 years) |  | 5D (HD) | 127 |
| (57) | 2006 | 10.1093/ndt/gfl118 | 16554319 | Republic of Korea | Modifiers | Male gender | B = 1.365, SE = 0.639, β = 0.317, p = 0.040 |  | annualized change of square root-transformed CAC  score |  | 5D (HD) | 40 |

Table 4. Adjusted risk of complications of vascular calcification or gender difference

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Ref | Time | doi | PMID | Country | Relation | Variable |  | Gender | Calcification | Complications | CKD stages | sample |
| (58) | 2017 | 10.1186/s12882-017-0480-2 | 28253835 | Netherlands | complications | AAC score | OR 1.19 (1.07–1.30) | v | AAC | Coronary artery disease | 5D | 90 |
|  |  |  |  |  |  | Male gender | Univariate: 2.59 (1.00–6.68)  Multivariate: 2.73 (0.95–7.82) |  |  |  |  |  |
| (1) | 2012 | 10.1371/journal.pone.0039241 | 22723973 | UK | complications | Male gender | β = -0.34 (-13.45– -4.48) | v | AAC | Left ventricular mass index | 3 | 120 |
|  |  |  |  |  |  | Mean femoral Z-score | β = -0.23 (-4.75– -0.85) |  |  |  |  |  |
| (59) | 2021 | 10.1186/s12882-021-02251-y | 33541279 | Finland | complications | Male gender | B = 31.0 | v |  | Maximal ergometry workload (WMAX) | 4-5 | 174 |
|  |  |  |  |  |  | AAC score | B = -1.44 |  | AAC | WMAX% < 50% |  |  |
|  |  |  |  |  |  |  | AAC and TnT showed fair predictive power for WMAX% less than 50% of the expected value with AUCs of 0.70 and 0.75, respectively. |  |  |  |  |  |
| (60) | 2014 | 10.1159/000360230 | 24847332 | Taiwan | complications | Male gender | HR 2.354 (1.371 – 4.042) | v | AAC | Cardiovascular mortality | 5D (HD) | 712 |
|  |  |  |  |  |  | AAC Grade 3 | HR 2.497 (1.237 – 5.043) |  |  | Cardiovascular mortality |  |  |
|  |  |  |  |  |  |  | HR 1.604 (1.058 – 2.431) |  |  | All-cause mortality |  |  |
| (22) | 2017 | 10.1111/eci.12718 | 28036114 | Sweden | Complications | CACS | HR 1.52 (1.12-2.06) | v | CACS | Mortality | 5D-5T | 240 |
| (61) | 2015 | 10.3109/0886022X.2015.1077316 | 26336882 | Portugal? | complications | Simple  vascular calcification score (SVCS) | https://www.tandfonline.com/na101/home/literatum/publisher/tandf/journals/content/irnf20/2015/irnf20.v037.i09/0886022x.2015.1077316/20151009/images/medium/irnf_a_1077316_f0002_c.jpg | v | SVCS | Vascular access flow (DU-Qa) | 5D (HD) | 50 |
|  |  |  |  |  |  | Male gender | P = 0.575 |  |  |  |  |  |
| (62) | 2008 | 10.1111/j.1365-2362.2008.02032.x | 19021697 | Sweden | complications | Low fetuin-A | HR 2.3 (1.2–4.5) | x | Fetuin-A inhibits vascular calcification | Mortality | 5D (HD) | 222 |
|  |  |  |  |  |  |  | Patients with low fetuin-A levels (< median) had higher mortality (Hazard ratio ‘HR’ 2·2; CI 1·4–3·5, P< 0·001), but this association was lost after adjustment for age, gender, comorbidities score, dialysis vintage and inflammation (CRP > median). In inflamed patients with low fetuin a significantly independent association with mortality (HR 2·3; CI 1·2–4·5, P= 0·01) was observed compared to non-inflamed patients with high fetuin-A, after adjusting for the same variables. |  |  |  |  |  |
| (63) | 2016 | 10.15386/cjmed-515 | 27004031 | Romania | complications | male gender | HR 14.96 (2.09-106.98) | v | vascular or  other soft tissue calcifications (VC) by plain film | all-cause mortality | 5D (HD) | 92 |
|  |  |  |  |  |  | VC score | HR 1.30 (1.05-1.59) |  |  |  |  |  |
|  |  |  |  |  |  |  | HR 1.387 (1.095-1.757) |  | Cardiovascular mortality |  |  |  |
|  |  |  |  |  |  |  | Multivariable Cox analysis of CdV mortality used  as covariates age, gender, HD vintage, presence of DM,  VC score, presence of ROD, Ca in dialysis solution, oral  Ca salts, vitamin D treatment, serum Ca, P, iPTH, ALP,  creatinine, Hb, cholesterol, trygliceride, CRP, albumin,  ferritin levels, URR, spKt/V baseline renal disease, initial  CdV disease. The method was Forward LR stepwise.  VC score (HR=1.387; 95.0% CI 1.095-1.757; p=0.007)  and URR (HR=0.942; 95.0% CI 0.888-0.999; p=0.046)  remained in the ecuation. **Increased VC score and decreased**  **URR represent risk factors for CDV mortality.** |  |  |  |  |  |
| (64) | 2014 | 10.1007/s00223-013-9811-x | 24193439 | China | complications | Male gender | HR 0.225 (0.100-0.509) | ? |  | All-cause mortality | 5D | 120 |
|  |  |  |  |  |  |  | HR 0.043 (0.008-0.241) |  |  | cardiocerebrovascular  mortality |  |  |
| (65) | 2013 | 10.1186/1471-2369-14-263 | 24289833 | Canada | complications | Aortic arch calcification score (AoAC) | Score 1 1.52 [0.99, 2.34] 0.06 | x | AoAC | Mortality | 5D (HD) | 824 |
|  |  |  |  |  |  |  | Score 2 1.22 [0.72, 2.05] 0.47 |  |  |  |  |  |
|  |  |  |  |  |  |  | Score 3 2.49 [1.28, 4.82] 0.01 |  |  |  |  |  |
| (8) | 2014 | 10.1186/1471-2369-15-190 | 25465028 | Brazil | Complications? | Male sex (versus  female) | HR 0.82 (0.39-1.75), p = 0.620 | x |  | Mortality | 5D (HD) | 91 |
|  |  |  |  |  |  | Sclerostin | HR 2.18 (1.41-3.38) |  |  |  |  |  |
| (66) | 2018 | 10.1080/0886022X.2018.1455588 | 29619867 | Lithuania | Complications | Male gender | HR 2.89, p = 0.357 | x | aortic arch calcification | Cardiovascular event | 5T | 37 |
|  |  |  |  |  |  |  | Multivariate linear regression revealed that **donor age, donor gender, and recipient eGFRdischarge (R-squared 0.65, p = 0.002)** better predict eGFR1year than AoAC combined with recipient eGFRdischarge (R-squared 0.35, p = 0.006). During 1-year follow-up, four (10.81%) patients experienced **cardiovascular events**, which were predicted by **PWV ratio** (HR 7.549, p = 0.045), but **not related to AoAC score** (HR 1.044, p = 0.158). |  |  |  |  |  |
| (38) | 2014 | 10.1159/000368476 | 25571879 | Japan | Complications | Male gender | Univariate: HR 1.502 (0.624-4.163), p = 0.3772 |  |  | Cardiovascular mortality | 5D (HD) | 301 |
|  |  |  |  |  |  |  | Univariate: HR 1.485 (0.746-3.215), p = 0.2690 |  |  | All-cause mortality |  |  |
|  |  |  |  |  |  | AoAC Grade 1 | Univariate: HR 2.838 (1.053-8.920), p = 0.0390 |  |  | Cardiovascular mortality |  |  |
|  |  |  |  |  |  |  | Multivariate: HR 1.731 (0.616-5.623), p = 0.3065 |  |  |  |  |  |
|  |  |  |  |  |  | AoAC Grade 2+3 | Univariate: HR 4.636 (2.794-9.149), p = 0.0011 |  |  |  |  |  |
|  |  |  |  |  |  |  | Multivariate: HR 2.629 (1.455-5.124), p = 0.016 |  |  |  |  |  |
|  |  |  |  |  |  | AoAC Grade 2+3 | Univariate: HR 3.409 (2.015-5.781), p = 0.0261 |  |  | All-cause mortality |  |  |
|  |  |  |  |  |  |  | Multivariate: HR 1.699 (1.052-2.680), p = 0.0222 |  |  |  |  |  |
| (67) | 2011 | 10.1093/ndt/gfr089 | 21414968 | The Netherlands | Complications | Female gender | B = 3.14, β = 0.23, 95% CI -0.05–6.32, p = 0.05 | v |  | Capillary recruitment | 5D | 35 |
|  |  |  |  |  |  |  | Male -> rarefaction |  |  |  |  |  |
| (42) | 2013 | 10.1159/000334597 | 22143191 | Belgium | complications | Gender | Parameter estimate = 1.07001, p = 0.0182, HR 2.915 (1.2–7.08) |  |  | Cardiovascular events | 5T | 115 |
|  |  |  |  |  |  | AC present | Parameter estimate = 3.07957, p = 0.0024, HR 21.749 (2.97–159.4) |  | Aortic calcification |  |  |  |
|  |  |  |  |  |  | AC score | Parameter estimate = 0.16250, p <0.0001, HR 1.176 (1.11–1.244) |  |  |  |  |  |
| (68) | 2012 | 10.1159/000334597 | 22143191 | Belgium | complications | Female gender | Univariate: Parameter estimate = –7.9, p = 0.05, R2 = 0.014 | v |  | Prolonged corrected QT interval | 5T | 193 |
|  |  |  |  |  |  | Aortic calcification score | Univariate: Parameter estimate = 1.12, p= 0.0017, R2 = 0.045 |  | Aortic calcification score |  |  |  |
|  |  |  |  |  |  |  | In multivariate linear regression analysis, female gender, a higher aortic calcification score, hematocrit and PTH levels and lower calcium and potassium levels were found to be independently  associated with QTc. These variables explain 21% of the variability of QTc. Similar associations were found for JTc. |  |  |  |  |  |
| (11) | 2018 | 10.1007/s11255-017-1758-9 | 29236239 | Thailand | Complications | Male gender | CKD 2-5: HR 2.35 (0.93–5.91) |  |  | Mortality | 2-5T | 419 |
|  |  |  |  |  |  |  | CKD 5D: 1.14 (0.49–2.65) |  |  |  |  |  |
|  |  |  |  |  |  |  | KT: 1.36 (0.41–4.52) |  |  |  |  |  |
|  |  |  |  |  |  | AAC > 6 | CKD 2-5: HR 2.35 (1.05–5.25)\* |  | AAC |  |  |  |
|  |  |  |  |  |  |  | CKD 5D: HR 1.84 (0.77–4.39) |  |  |  |  |  |
|  |  |  |  |  |  |  | KT: HR 2.93 (0.9–9.22) |  |  |  |  |  |
|  |  |  |  |  |  | pelvic arterial calcification (PAC) > 1 | CKD 2-5: HR 3.04 (1.33–6.96)\*\* |  | PAC |  |  |  |
|  |  |  |  |  |  |  | CKD 5D: HR 2.64 (1.14–6.08)\* |  |  |  |  |  |
|  |  |  |  |  |  |  | KT: HR 13.9 (3.74–51.3)\*\* |  |  |  |  |  |
| (69) | 2006 | 10.1159/000095362 | 16940716 | Italy | Complications | Male gender | RR 0.85 (0.81–0.76), coefficient = –2.01, p = 0.001 | v |  | QT dispersion (QTd) | 4-5D (HD) | 46 |
|  |  |  |  |  |  | TC score ??? | RR 11.2 (8.22–16.7), coefficient = 1.571, p = 0.0001 |  |  |  |  |  |
|  |  |  |  |  |  |  | TC score到底是甚麼? |  |  |  |  |  |
| (70) | 2014 | 10.1007/s11255-013-0620-y | 24318369 | Japan | Complications | CS | OR 9.9759x1030 (12.528–7.9429x1060) |  | Calcification score |  | 5D (HD) | 49 |
|  |  |  |  |  |  | Male gender | OR 23.194 (1.452–370.372) |  |  |  |  |  |
| (71) | 2013 | 10.1093/ndt/gft039 | 23605174 | Belgium | complications | Male gender | HR 0.55 (0.25–1.19), p = 0.13 |  |  | All-cause mortality | 5D (HD) | 100 |
|  |  |  |  |  |  | Sclerostin | HR 0.33 (0.15–0.73) |  |  |  |  |  |
| (72) | 2016 | 10.1016/j.bone.2016.08.007 | 27519971 | Sweden | complications | CAC (>100 vs. ≤100 AUs) | RR 2.86 (1.26–6.45) 0.01 |  |  | Low Vertebral bone density (VBD) | 5 | 231 |
|  |  |  |  |  |  | Male gender | RR 1.22 (0.62–2.39), p = 0.57 |  |  |  |  |  |
| (73) | 2009 | 10.1093/ndt/gfp253 | 19491380 | UK | complications | Male gender | OR 8.06 (1.34–48.450) |  |  | All-cause mortality | 4-5D | 134 |
|  |  |  |  |  |  | OPG >25 pmol/L | OR 5.31(1.35–20.88) |  |  |  |  |  |
| (74) | 2005 | 10.1111/j.1523-1755.2005.00345.x | 15882283 | Sweden | Complications | Male gender | RR 1.30 (0.83-2.02), NS |  |  | All-cause mortality | 5 | 258 |
|  |  |  |  |  |  |  | RR 1.32 (0.77–2.25), NS |  |  | Cardiovascular mortality |  |  |
|  |  |  |  |  |  | Fetuin-A | 2.58 (1.64–4.07) |  |  | All-cause mortality |  |  |
|  |  |  |  |  |  |  | 2.63 (1.51–4.59) |  |  | Cardiovascular mortality |  |  |
| (75) | 2005 | 10.1111/j.1523-1755.2005.00233.x | 15780108 | France | Complications | Male = 1, female = -1 | β = −0.48, HR 0.62, p = 0.0043 |  |  | First fatal or nonfatal cardiovascular event | 5D (HD) | 179 |
|  |  |  |  |  |  | Log (calciﬁcation score) | β = 0.90, HR 2.46, p <0.0001 |  |  |  |  |  |
|  |  |  |  |  |  |  | 18% of variance explained. |  |  |  |  |  |
| (76) | 2016 | 10.5301/jva.5000591 | 27516144 | Singapore | Complications | Male gender | OR 1.99, SD = 0.22 |  |  | Arteriovenous fistula secondary patency | 5D | 436 |
|  |  |  |  |  |  | Calcified radial artery | Secondary patency vs. primary failure: 12% vs. 25%, p = 0.002 |  |  |  |  |  |
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