Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
Introduction: CAC scoring achieved Class IIA status in both the most recent AHA & ESC guidelines for risk stratification of asymptomatic moderate risk patients. Despite this endorsement, CAC scoring remains largely without insurance coverage due to the absence of randomized clinical trials. Advancements of iterative/deep learning reconstruction & volumetric CT has led to decreases in radiation dose while maintaining image quality.

Methods: 4,215 prospective cases of CAC with-or-without CCTA obtained on 256 slice volumetric Revolution CT (GE Healthcare) at a single-site from 06/2016-11/2020. All exams were evaluated by Radiometrics (Bayes) using Monte Carlo simulation for the gated non-contrast series. Individualized gender & size specific equivalent organ doses & effective whole body doses (Deff) were generated using tissue weighting factors (Wt) from ICRP 103. Continuous variables’ associations were tested using univariable linear regression. Median differences were compared between genders using Mann Whitney tests with Bonferroni correction for multiple comparisons. The population is 46.9% women, averaged 63 years (SD 11.9) with a mean BMI of 28kg/m² (SD 6.1). 120 kVp was used for all exams, with 2.5 mm thick slices.

Results: Deff was 0.61mSv (IQR: 0.47-0.85). Both BMI & water equivalent diameter (WED) were positively associated with both Size Specific Dose Estimate (SSDE)(mGy) & Deff (r>0.6, p<0.001). BMI was strongly associated with Deff (r=0.70, p<0.001), & this association was observed while controlling for sex differences. Median organ-specific mSv were lower in every organ for women except breast (p<0.001); because of this, median Deff is higher in females (0.65 mSv) than males (0.59 mSv) (p<0.001).

Conclusions: The results show that CAC scoring using a newer generation scanner requires very low radiation exposure while producing adequate studies with radiation dose while maintaining image quality. The negligible radiation required in CAC scoring allows consideration of more widespread screening to reach greater numbers of individuals.

CT RADIOMICS OF CORONARY ARTERY CALCIIFICATION DISTINGUISH VULNERABLE PLAQUES IN ACUTE CORONARY SYNDROME- A PROPENSITY-MATCHED STUDY WITH ASYMPTOMATIC SUBJECTS WITH SAME CALCIIFIED PLAQUE BURDEN

M. Wu 1, E. Huang 1, H. Lin 1, Y. Chen 1, G. Mar 1, C. Yen 1, Y. Huang 1, S. Tsao 1, J. Yu-Jeng 1, G. Kiczka 1, K. Koahsiung Veterans General Hospital, Kaohsiung, Taiwan 2 National Sun Yat-Sen University, Kaohsiung, Taiwan 3 National Yang Ming University, Taipei, Taiwan 4 University of Washington, Washington, WA, United States

Introduction: Measurement of coronary artery calcium (CAC) using Agatston score (AS) is widely used to predict the risk of acute coronary syndrome (ACS). However, many ACS victims have AS < 100, while many asymptomatic subjects have AS > 400. We hypothesize that CT radiomics can distinguish the vulnerability of CAC in subjects with similar AS.

Methods: We retrospectively identified 85 patients with ACS who had a CAC scan prior to recanalization. We used 1:2 propensity score matching with traditional risk factors (age, sex, BMI, hypertension, diabetes, dyslipidemia, smoking, family history) and AS ranks to enroll 170 asymptomatic subjects. Radiomics texture features were extracted using the LIIFex package. Generalized linear model and forward conditional logistic regression was used for analysis.

Results: For per plaque analysis, lower coefficient of variance, lower median of HU, lower skewness, and higher kurtosis of Hounsfield (HU) were all favored of ACS (p<0.05 for all). Multivariable analysis showed that higher HU kurtosis (OR=18.7, p<0.001) and lower median HU per plaque (OR=0.97, p<0.001) are associated with ACS. In subgroup analysis, increased HU kurtosis (OR=12.6, p<0.001) and lower median HU (OR=0.97, p<0.004) remain associated with ACS among patients with AS>100. Alternatively, among patients with AS<=100, higher HU kurtosis (OR=22.9, p<0.001) and lower AS per plaque (OR=0.86, p<0.023) are associated with increased risk of ACS

Conclusions: Radiomics of CAC plaque suggest that higher HU kurtosis and lower AS or median HU may distinguish the vulnerability of CAC plaques in subjects with the equivalent risk of CAC burden and TRF.

EFFECT OF THE COVID-19 PANDEMIC ON CORONARY ARTERY CALCIUM TESTING AND SUBSEQUENT STATIN PRESCRIPTION

M. Shetty 1, P. Imas 1, A. Pursnani 1, NorthShore University Health System, Evanston, IL, United States 2 University of Chicago (NorthShore), Evanston, IL, United States

Introduction: The 2018 ACC/AHA Cholesterol Guideline advocates for the use of coronary artery calcium (CAC) screening in intermediate risk patients in whom the decision about statin therapy is uncertain, and suggests that statin therapy is generally indicated for all patients with CAC score >100. We sought to assess temporal trends with the impact of the COVID-19 pandemic on the use of CAC testing and downstream statin prescription in patients with a CAC >100.

Methods: We analyzed data from a 4-hospital community-based health system using our electronic medical records including CAC score, monthly volumes of studies between January 2019 to February 2021 and initiation of statin prescription within 6 months of CAC scoring. In order to mitigate financial barriers to testing, the health system started providing CAC testing for $50 in June 2019.

Results: The study sample included 2,806 CAC score orders on different individuals from Jan 2019 to Feb 2021. Average age was 59 years and 41% of patients identified as female. There was a significant increase in number of CAC tests ordered after the introduction of the $50 test in June 2019. The first wave of the COVID-19 pandemic hit Illinois in March 2020 and a subsequent sharp decrease in CAC tests was observed from March to May 2020. The median rate of statin initiation prior to March 2020 was 30.6%, between March to May 2020 was 22.9% and from June 2020 to Feb 2021 was 32.1% [Fig 1].

Conclusions: The COVID-19 pandemic significantly affected preventative screening with CAC, especially from the months of March to May 2020. Despite the fall in CAC orders, the rate of statin prescription was higher for patients with a CAC > 100, thus emphasizing the role of this objective measure in advocating for statin initiation and also its importance in the primary care preventative setting. Lastly, for patients with CAC > 100, rate of initiation of statin therapy
was not affected by the COVID-19 pandemic (Fig 1- pink line). In fact, in February 2021, 76% of patients with CAC > 100 received a statin prescription. It is reassuring that despite the pandemic, the highest risk individuals based on CAC still received statin therapy.

CORRELATION BETWEEN NON-CONTRAST CHEST CT FINDINGS AND CLINICAL OUTCOMES IN HOSPITALIZED PATIENTS WITH COVID-19 PNEUMONIA WITH POSITIVE PCR FOR SARS-COV-2 DURING THE FIRST WAVE

J. Verdugo, A. Mená, G. Cavada, C. Silva, C. Ramos, C. Varela, J. Díaz, J. Alegria.
Clínica Alemana de Santiago, Santiago, Chile

Introduction: As the global Covid-19 pandemic continues, current efforts have shifted to determine early prognostic factors that may tailor the therapeutic options and subsequent mortality risk. Recent studies have shown a close relationship between cardiovascular (CV) risks and infected patients’ evolution. Imaging biomarkers such as coronary artery calcium (CAC) score have an established role in long-term CV event risk stratification but might also provide prognostic information. The purpose of this study is to evaluate the relation between non-contrast chest CT findings and clinical outcomes on a representative sample of inpatients with Covid-19 during the first wave of the pandemic.

Method: This IRB-approved clinical series included 326 cases with a mean age of 56.8 years +/-16.5, ranging from 17 to 93 years hospitalized between May 1 and June 31. CT images were retrospectively analyzed, and multiple CT variables recorded, such as the RSNA-STR-ACR Consensus Statement pattern, presence of organizing pattern (OP), presence of CAC, total volume and average density of the pulmonary opacities (PO), lung injury extent, and average density of the liver, among others. On those with measurable CAC, Agatston Score (AS) from non-ECG gated chest CT was calculated using semi-automated software (SynoVia). After a stepwise selection with a probability threshold of 10%, multivariable logistic regression was modeled to evaluate these variables’ relationship, using patient outcomes as a dependent variable.

Results: Of the 326 cases, 103 had CAC, with a mean score of 486 UA (SD 965 range: 2 - 5648 UA). In multivariate regression, the findings related to a higher mortality odd were the absence of OP, a high average density of PO, and CAC in the LM and the RCA (table). Mortality risk was directly associated with AS

| Variable          | OR     | p      | 95% CI |
|-------------------|--------|--------|--------|
| Absence of OP     | 4.44   | 0.03   | 1.12 - 17.18 |
| Average density of PO (Per 100 HU) | 1.8    | 0.01   | 1.19 - 2.48 |
| RCA Calcium       | 4.7    | 0.01   | 1.34 - 16.68 |
| LM Calcium        | 5.6    | 0.01   | 1.43 - 21.86 |

Conclusions: The absence of OP, the higher average density of PO, and CAC in the LM and the RCA were associated with higher mortality risk.

278

INFLUENCE OF SLICE THICKNESS AND ITERATIVE RECONSTRUCTION ON CORONARY ARTERY CALCIFICATION QUANTIFICATION

C. Mekkhal, N. Mekkhal, M. Eckstein, J. Podzus, F. Ammon, D. Battles, M. Goller, S. Smolka, S. Achenbach, M. Marwan. University of Erlangen, Erlangen, Germany

Introduction: Reconstruction parameters including iterative reconstruction algorithms and slice thickness influence the quantification of coronary calcification. Moreover, with modern scanner platforms and increasing use of iterative reconstruction algorithms, assessment of coronary calcium quantification will ultimately be affected. We sought to analyze the influence of slice thickness and iterative reconstruction on quantitative parameters of coronary calcification.

Methods: Consecutive patients referred for coronary CT angiography for suspected coronary artery disease were included in this analysis. All native CT data were acquired using a third-generation dual source CT system (Somatom Force, Siemens Healthineers, Forchheim, Germany). Besides the standard reconstruction (3.0 mm thickness), 5 additional reconstructions were rendered using 2 mm and 1 mm thickness as well as 3 mm, 2 mm and 1 mm thickness with iterative reconstruction (IR) level 2 (Admire®, Siemens Healthineers). Data sets were transferred to a dedicated workstation and calcium scoring was performed using commercially available software (ZioStat3D, Ziosoft inc., Tokyo, Japan). All reconstructions were compared to the standard reconstruction of 3 mm without IR concerning Agatston score and calcium volume.

Results: 104 patients (624 reconstructions) were included (mean age 67±10 years, 62 males). Compared to standard 3 mm reconstructions, Agatston score and calcium volume showed a significant positive correlation using all other reconstruction parameters (r>0.96, p<0.00001 for all). With decreasing slice thickness, median Agatston score was significantly higher compared to standard reconstruction (3 mm vs. 2 mm and 1 mm, p<0.0001). With the use of iterative reconstruction level 2, a significant underestimation of Agatston score was observed compared to standard reconstruction (3 mm without IR, vs. 3 mm + IR, p<0.0001 and 1 mm + IR, p<0.002). Bland Altman analysis showed significant systematic overestimation of the Agatston score when thin slices were used for reconstruction (mean bias [95% limits of agreement]: -31 [-350 to 287] for 2 mm and mean bias -99 [-491 to 292] for 1 mm). Furthermore, significant underestimation of coronary calcification was noticed when IR was added (mean bias 80 AU [-235 to 296] for 3.0 mm + IR). This systematic underestimation was slightly compensated with thinner slices however with wide limits of agreement. Similar patterns were observed using the volume method.

Conclusions: Slice thickness and iterative reconstruction significantly influence the quantification of coronary calcification. Iterative reconstruction causes significant underestimation of calcified disease, this should be kept in consideration especially when assessing calcified disease burden using contrast enhanced data sets with iterative reconstruction.

279

CORONARY ARTERY CALCIUM PROGRESSION AFTER CORONARY ARTERY BYPASS GRAFT SURGERY

R. Abazid, J. Romsa, C. Akincioglu, J. Warrington, Y. Bureau, B. Kiai, W. Vezina. London Health Sciences Centre, LONDON, ON, Canada

Introduction: Accelerated atherosclerosis is a well-established phenomenon after coronary artery bypass surgery (CABG). In this study we analyzed coronary artery calcium (CCS) progression after CABG.

Methods: We retrospectively measured the CCS Agatston score (AS), volume score (VS) and mass score (MS) of 39 patients before and after CABG. The annualized CCS percent change of the non-grafted coronary artery segments proximal and distal to anastomosis were acquired using a third-generation dual source CT system (Somatom Force, Siemens Healthineers, Forchheim, Germany). Besides the standard reconstruction (3.0 mm thickness), 5 additional reconstructions were rendered using 2 mm and 1 mm thickness as well as 3 mm, 2 mm and 1 mm thickness with iterative reconstruction (IR) level 2 (Admire®, Siemens Healthineers). Data sets were transferred to a dedicated workstation and calcium scoring was performed using commercially available software (ZioStat3D, Ziosoft inc., Tokyo, Japan). All reconstructions were compared to the standard reconstruction of 3 mm without IR concerning Agatston score and calcium volume.

Results: 104 patients (624 reconstructions) were included (mean age 67±10 years, 62 males). Compared to standard 3 mm reconstructions, Agatston score and calcium volume showed a significant positive correlation using all other reconstruction parameters (r>0.96, p<0.00001 for all). With decreasing slice thickness, median Agatston score was significantly higher compared to standard reconstruction (3 mm vs. 2 mm and 1 mm, p<0.0001). With the use of iterative reconstruction level 2, a significant underestimation of Agatston score was observed compared to standard reconstruction (3 mm without IR, vs. 3 mm + IR, p<0.0001 and 1 mm + IR, p=0.002). Bland Altman analysis showed significant systematic overestimation of the Agatston score when thin slices were used for reconstruction (mean bias [95% limits of agreement]: -31 [-350 to 287] for 2 mm and mean bias -99 [-491 to 292] for 1 mm). Furthermore, significant underestimation of coronary calcification was noticed when IR was added (mean bias 80 AU [-235 to 296] for 3.0 mm + IR). This systematic underestimation was slightly compensated with thinner slices however with wide limits of agreement. Similar patterns were observed using the volume method.

Conclusions: Slice thickness and iterative reconstruction significantly influence the quantification of coronary calcification. Iterative reconstruction causes significant underestimation of calcified disease, this should be kept in consideration especially when assessing calcified disease burden using contrast enhanced data sets with iterative reconstruction.