Interesting Papers in JASE 2021

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No disclosures

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Highlights of 2021

- 1 Guidelines and Standards document
  - Recommendations for adult sonographers performing echo to screen for congenital heart disease in the newborn
- 9 Review Articles
  - Agitated saline for intracardiac shunts; stress echo for cardio-oncology; pulmonary venous Doppler in cardiac ds; myocardial work; rheumatic MS; mitral annular calcification + calcific MS; transcatheter edge-to-edge repair (TEER) for complex MR; TEER MV repair impact on right heart; ultrasound imaging of abdominal aorta
- 5 Imaging Strategies
  - 3DE of SAM; TEE of celiac trunk and superior mesenteric artery in aortic dissection; fetal echo for vascular rings and pulmonary slings; lung ultrasound; TEE guidance of Lampoon procedure
- 2 ASE Statements
  - Pediatric, fetal, and congenital heart disease echo services in the evolving COVID-19 Pandemic; Hypersensitivity Reactions to Ultrasound Enhancing Agents in Patients with Allergy to Polyethylene Glycol (PEG)
- 13 Editorials
  - RV normal values; carotid atherosclerotic neovascularization; exercise PA pressure in asymptomatic MR; tissue perfusion with contrast; delayed echo enhancement with nanodroplets for MI size; assessing value of echo in absence of randomized trials; combined stress echo and carotid ultrasound for CAD; Z scores in Kawasaki disease; mid systolic notch and pulmonary hypertension; age related cardiac remodeling; AS progression; myocardial work in AS; machine learning in echo: cluster analysis

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- January 2022
  - Focus issue on echocardiography and structural heart interventions
    - Includes ASE standards for TEE screening for structural heart interventions

Papers to discuss

- Prognostic value of peak RV systolic pressure (PA pressure) in asymptomatic MR
  - Back to the future
- LA mechanics
  - Value in cryptogenic stroke
  - Prognostic value in CKD
- Which COVID patients need an urgent TTE ?

Prognostic Value of Peak Exercise Systolic Pulmonary Arterial Pressure in Asymptomatic Primary Mitral Valve Regurgitation

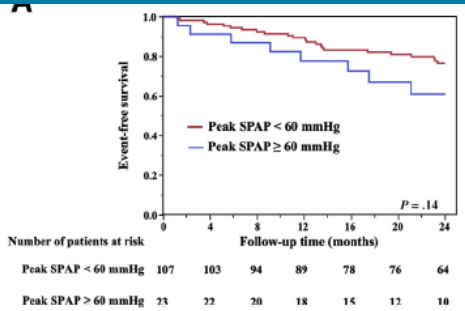
Dimitri Arangalage, MD, PhD, Léa Cattan, MD, Marc Eugène, MD, Claire Cimadevilla, MD, Pierre Monney, MD, MD, Bernard Iung, MD, Eric Brochet, MD, Ian G. Burwash, MD, Alec Vahanian, MD, and David Messika-Zeitoun, MD, PhD, *Paris, France; Lausanne, Switzerland; and Ottawa, Ontario, Canada* a

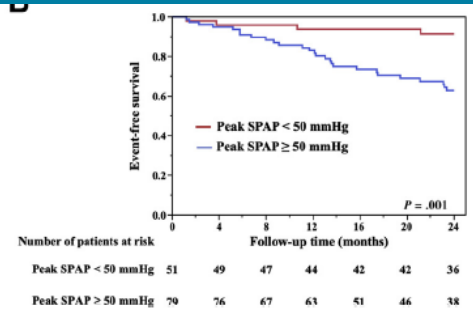
September 2021 (page 932-940)

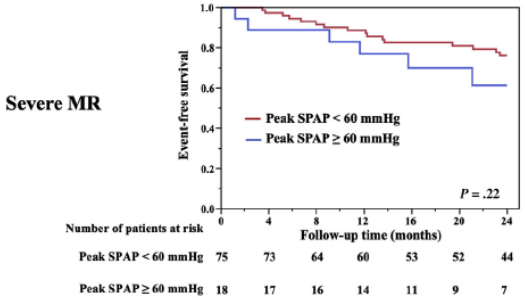
- Retrospective study
- 177 with moderate to severe or severe degenerative MR and preserved LVEF
  - In sinus rhythm
  - Referred for clinically indicated exercise echo
    - 10 mm HG used for RA pressure in RVSP assessment
  - F/U for MR-related events (19 ± 7 months)
    - All-cause death
      or development of:
    - Symptoms, heart failure, AF, LVEF < 60%, LVIDes ≥ 45 mm or resting SPAP > 50 mm HG

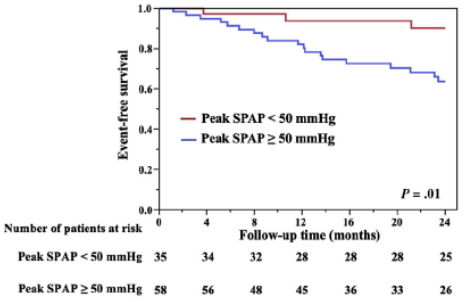
- MR Characteristics on resting TTE
  - EROA 48 ± 16 mm^2, Reg Vol 74 ± 26 ml, RV SP 32 ± 7 mm Hg
- 47 excluded due ex echo results triggering surgery (37) or lost to f/u (10)
- 31 MR-related events (31/130 =24%)
- Peak exercise SPAP predictive of outcomes in univariate analysis
  - Adjusted for age, gender, MR severity, resting SPAP
  - Peak exercise SPAP ≥ 50 mm HG assoc with worse event free survival (HR 5.24)
  - Guideline cutoff of ≥ 60 mm HG was not associated with worse outcomes

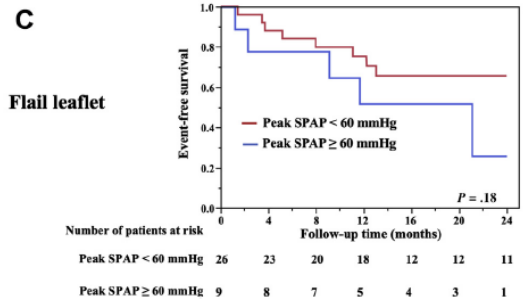
Arangalage et al JASE 2021;34:942-940

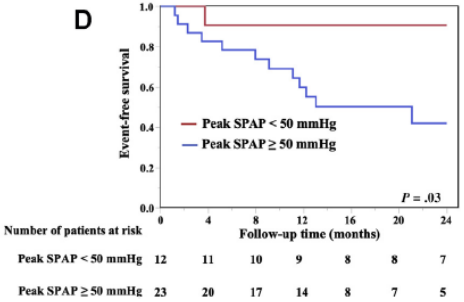












- Why 50 not 60 mm HG like in past ?
  - Younger 56 ± 13 years
  - Less LV and LA remodeling than prior reports
  - ? Better chamber compliance
  - Lower RV SP at baseline

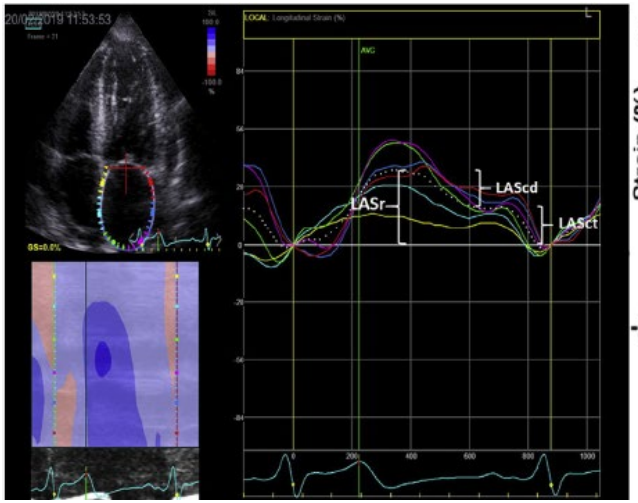
Summary

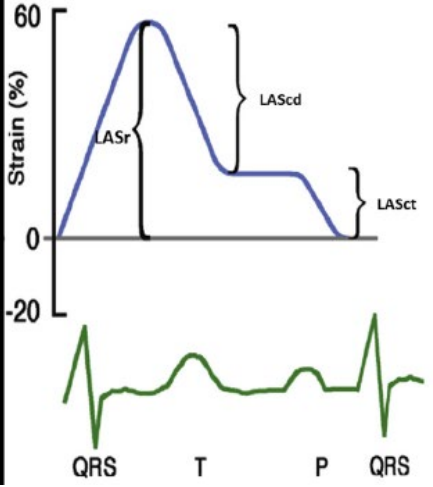
- Supports use of exercise echo in asymptomatic degenerative MR with significant MR for timing of intervention
  - Lower exercise SPAP threshold than in past

- Retrospective, single center, observational
  - Small #'s yet largest study to date on the topic
  - Prospective, multicenter would be ideal
- Only degenerative MR
- While 60 mm HG RVSP did not discriminate only 23 reached that value
  - Would not change findings of the 50 mm Hg cut off
- Did not assess early increase in RVSP at low level exercise
- Exercise RVSP>50 mm Hg can be seen in healthy individuals
  - Specificity low but sensitivity high – absence of rise is reassuring
    - Integrate with other parameters

LA mechanics by speckle tracking

- PALS
  - peak atrial longitudinal reservoir strain
    - Measure of diastolic function
- LASr reservoir strain
- LAScd conduit strain
- LASct contractile strain
  - aka booster pump strain





Left Atrial Strain Is the Best Predictor of Adverse Cardiovascular Outcomes in Patients with Chronic Kidney Disease

Gary C. H. Gan, MBBS, FRACP, Krishna K. Kadappu, MBBS, MD, MRCP (UK), FRACP, PhD, Aditya Bhat, BMedSc, MBBS, FRACP, MPH, Fernando Fernandez, AMS, BSC, Kennith H. Gu, MBBS, Lawrence Cai, MBBS, Karen Byth, BSc (Hons), CStat RSS, PhD, Suzanne Eshoo, MBBS, FRACP, PhD, and Liza Thomas, MBBS, FRACP, PhD, *Sydney, New South Wales, Australia*

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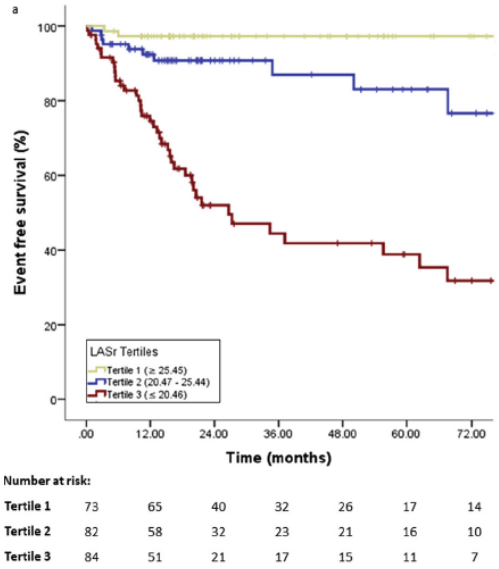
- CV risk is underestimated by traditional risk stratification algorithms
  - Can echo help ?
- 243 prospectively recruited Stage 3/4 CKD patients
  - No prior CV disease
  - TTE in all and then followed 3.9 $\pm$ 2.7 years
  - Primary end points
    - CV death, MACE
  - Secondary end point
    - Composite of all-cause death and MACE

- 54 met 1^{o} end point, 65 the 2^{o} end point
- Predictors of primary end point
  - Older age, DM, anemia, greater LV mass, worse LV GLS, larger LAVI, higher E/e', worse LA reservoir strain
  - Multivariate analysis
    - Only LA reservoir strain independent predictor of 1^{o} and 2^{o} end points
- LA reservoir strain stronger predictor of adverse events than Framingham or Atherosclerotic CV clinical risk scores or LV parameters or LA volume

Gan et al, JASE 2021;34:166-75



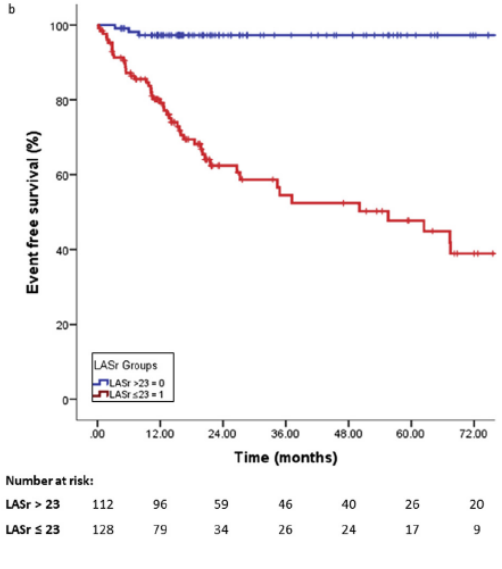


Table 2 Multiple Cox proportional hazards model for primary outcome of cardiovascular death and MACE

Covariates	HR (95% CI)	*P* value
Nested model 1: clinical variables		
Age, years	1.03 (1.01–1.06)	.02
Diabetes mellitus	1.81 (1.03–3.17)	.04
Anemia	1.51 (0.85–2.69)	.16
Nested model 2: echocardiographic variables		
E/e′	1.03 (0.98–1.09)	.25
LVMI, g/m^2	1.01 (0.99–1.01)	.85
LV GLS, %	0.98 (0.90–1.06)	.57
LAVI, mL/m^2	1.02 (0.99–1.05)	.31
LASr, %	0.89 (0.84–0.93)	<.01
Nested model 3: clinical and echocardiographic variables		
Age, years	1.00 (0.97–1.03)	.96
Diabetes mellitus	1.64 (0.94–2.86)	.08
LASr, %	0.86 (0.82–0.90)	<.01

Left Atrial Mechanics Assessed Early during Hospitalization for Cryptogenic Stroke Are Associated with Occult Atrial Fibrillation: A Speckle-Tracking Strain Echocardiography Study

Sébastien Deferm, MD, Philippe B. Bertrand, MD, PhD, Timothy W. Churchill, MD, Richa Sharma, MD, MPH, Pieter M. Vandervoort, MD, Lee H. Schwamm, MD, and Danita M. Yoerger Sanborn, MD, MMSc, *Genk and Diepenbeek, Belgium; Boston, Massachusetts; and New Haven, Connecticut*

February 2021 pages 156-65

- Can LA mechanics help identify those with paroxysmal AF in cryptogenic stroke patients ?

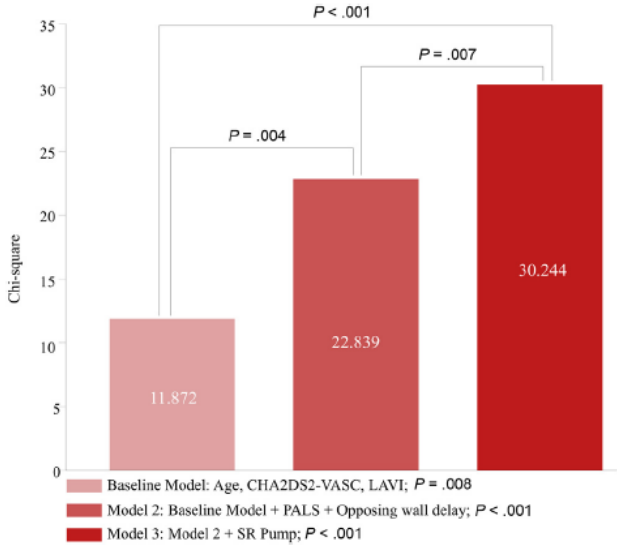
- Retrospective study of 191 patients with cryptogenic stroke
  - No AF during hospital monitoring
  - TTE during stroke admission
    - Median time embolic stroke to TTE 1 day (IQR 1-2)
  - 30 day mobile outpatient cardiac telemetry
    - Later AF diagnosed by routine clinical followup
  - f/u 25 months (IQR 10-43)

- 28 (15%) developed AF
  - 10 during 30 day telemetry, 18 at a median f/u 25 months (IQR 10-43)
  - Similar CV risk profile to those without AF
  - Entry LA mechanics worse in those who developed AF
  - Booster pump strain rate strongest predictor
    - Independent of age, LAVI, E/e', LASr
    - Better than opposing LA wall delay
- Multivariate model to predict AF improved with addition of LASr + LASRct

Deferm et al, JASE 2021;34:156-65

Table 5 ROC analysis of conventional and strain-derived echocardiographic parameters to predict AF

Variable	AUC	*P* value	95% CI	Cutoff	Sensitivity, %	Specificity, %
LAVI, mL/m^2	0.69	.001	0.58-0.80	38.6	58	74
PALS, %	0.74	<.001	0.63-0.84	20.4	75	69
SR pump, sec^{-1}	0.77	<.001	0.68-0.87	−0.67	73	65



- LA strain and strain rate immediately after cryptogenic stroke in those in sinus rhythm adds predictive value for future AF. Could be used to identify patients would might benefit from long term rhythm monitoring or prophylactic anticoagulation
- Why booster pump strain rate ?
  - LA stunning from spontaneous cardioversion or underlying LA fibrosis ?
- Limitations
  - Retrospective (selection bias)
  - AF could be underestimated (30 d telemetry then clinical f/u)
  - LA strain not quantifiable in 9.5%

Determining Which Hospitalized Coronavirus Disease 2019 Patients Require Urgent Echocardiography

Neal Yuan, MD, Stephanie Wu, MD, Florian Rader, MD, and Robert J. Siegel, MD, *Los Angeles, California*

August 2021 pages 831-9

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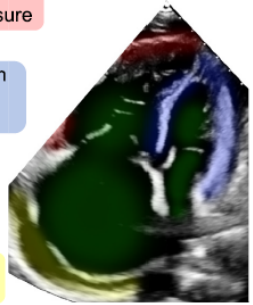
- TTEs ordered often in hospitalized patients with COVID-19
  - Cardiac abnormalities not unusual
  - Not all of these abnormalities result in change in management
  - Performing TTE in recently infected patient increase transmission risk

- Hypothesis
  - Biomarkers can help distinguish in which patients with COVID-19 the TEE can be safely delayed until infection risk subsides

- Retrospective, EHR review
  - all patients hospitalized with COVID-19
  - Cedars-Sinai multisite health care system, March 1, 2020-January 15, 2021
  - TTE within 14 days of 1st + COVID-19 result
    - BNP or Troponin measured within 7 days of TTE
- Outcome
  - 1 or more urgent echo findings
    - LVEF≤ 35%, WMSI ≥ 1.5, moderate or greater RV dysfunction, moderate or greater pericardial effusion, intracardiac thrombus, RV SP > 50 mm Hg, at least moderate to severe valve disease

Yuan et al JASE 2021:34:831-8

COVID Cardiac Complication	Urgent Echocardiographic Findings	Changes in Management
Pulmonary embolism Pulmonary hypertension	≥ Moderate RV dysfunction Elevated PA systolic pressure	Anticoagulation/Thrombolysis Diuresis RV support (medical, MCS)
Cardiomyopathy Myocarditis Acute coronary syndrome	≥ Moderate LV dysfunction Wall motion abnormalities Severe valvular disease	Ischemic evaluation Revascularization Diuresis Valve repair/replacement LV support (medical, MCS)
Pro-thrombotic state	Intracardiac thrombus	Anticoagulation
Pericarditis	Large pericardial effusion Cardiac tamponade	Pericardiocentesis



- 2,956 patients hospitalized with COVID during study period
  - 434 eligible (~15%)
    - Mean age 66 ± 16 years
    - 3.4 ± 3.6 days between COVID test and TTE
    - 35% were in the ICU at time of TTE
    - High prevalence of CV comorbidities (305)
    - Troponin or BNP abnormal in 311 (72%)
    - Urgent findings in 105 patients (24%)
      - Heart failure, Troponin I > 0.04 ng/ml, BNP > 100 pg/ml independent predictors
    - No urgent TTE findings in 95% with normal Troponin and BNP (91% in ICU)

Yuan et al JASE 2021:34:831-8

Characteristic	All patients (N = 434)	Patients with no CV disease (n = 129)	Patients with CV disease (n = 305)	*P* value, no CV disease vs CV disease
One or more urgent findings on TTE	105 (24.2)	18 (14.0)	86 (28.2)	.002
LV ejection fraction ≤ 35%	55 (12.7)	5 (3.9)	50 (16.4)	.001
Wall motion score index ≥ 1.5	72 (16.6)	7 (5.4)	65 (21.3)	<.001
Cardiac thrombus	2 (0.5)	0 (0.0)	2 (0.7)	.88
Right ventricular dysfunction moderate or greater	38 (8.8)	9 (7.0)	29 (9.5)	.51
Pericardial effusion moderate or greater	1 (0.2)	0 (0.0)	1 (0.3)	1.0
Pulmonary artery systolic pressure > 50 mm Hg	16 (3.7)	4 (3.1)	12 (3.9)	.89
Moderate to severe or severe valvular stenosis/regurgitation	10 (2.3)	2 (1.6)	8 (2.6)	.74

Yuan et al JASE 2021:34:831-8

Hospitalized COVID-19 Patients	Troponin ≤ 0.04 ng/mL and BNP ≤ 100 pg/mL	Troponin > 0.04 ng/mL or BNP > 100 pg/mL
No Urgent TTE Findings	N = 117	N = 213
Urgent TTE Findings	N = 6	N = 99

Negative Predictive Value = 95.1%

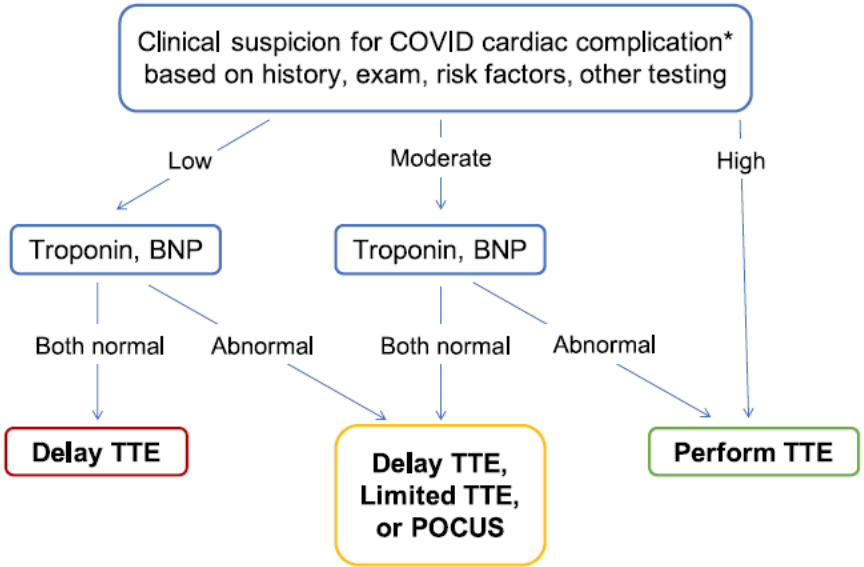
False Negative Rate = 5.7%

ICU COVID-19 Patients	Troponin ≤ 0.04 ng/mL and BNP ≤ 100 pg/mL	Troponin > 0.04 ng/mL or BNP > 100 pg/mL
No Urgent TTE Findings	N = 42	N = 77
Urgent TTE Findings	N = 4	N = 29

Negative Predictive Value = 91.3%

False Negative Rate = 12.1%

Yuan et al JASE 2021:34:831-8



- If troponin and BNP normal in patient recently infected with COVID-19 and risk for cardiac complications is low or moderate can safely delay TTE until peak infectious window has passed

- Limitations
  - + biomarkers have positive predictive value of 32% and false + rate 65%
  - Restricted to one healthcare network in California
  - TTE readings not blinded to clinical history or labs
    - Could impact subject assessment of RV function
  - TTE indication such as mechanical circulatory support not considered


Thank you
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