Cardio Mag

Volume 1|Issue 20|2020

Dear Doctor,
*Greetings from Micro Labs Limited. We are happy to bring you "**Cardio Mag**", which contains latest and interesting news in the field of Cardiology.*

This issue contains

- ***Arterial stiffness as a factor for hospitalization in heart failure with preserved left ventricular ejection fraction.***
- ***After Systemic Thrombolysis appearance of Blood Cyst on Mitral Valve in an Adult – A case report.***
- ***Energy from Body to Monitor Heart Health by Nanogenerators.***

Should you require any specific article or medical information, please feel free to contact us at ***medicalservices@microlabs.in***

Looking forward to your valuable feedback.
Best Regards,
Medical Team, Micro Labs Limited

1. Arterial stiffness as a factor for hospitalization in heart failure with preserved left ventricular ejection fraction.

Heart failure (HF) is becoming a worldwide economic burden. Guidelines-directed therapies for HF are usually dichotomized according to the EF status.
Aim of the study was to evaluate arterial stiffness status using the cardio-ankle vascular index (CAVI), which has been widely applied to assess arterial stiffness in patients with known cardiovascular disease.
Arterial stiffness is an important contributor to the pathophysiology of left ventricular (LV) diastolic dysfunction and thus would be associated with the development of HFpEF.

Methods:
A retrospective case-control design involving 60 patients in case group and 140 patients in control group to determine the factors necessitating hospitalization for HFpEF patients whose LVEF was >50%.

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Patients excluded patients were those with atrial fibrillation (AF), Aortic regurgitation because the CAVI would be inaccurate in these patients

In control group, outpatients with preserved EF and with hypertension, diabetes mellitus, dyslipidemia, and/or coronary artery disease but who did not present with HF symptoms and had never been diagnosed or treated for HF during the same period.

The association between hospitalized HFpEF and clinical variables were analysed using conditional logistic regression models.

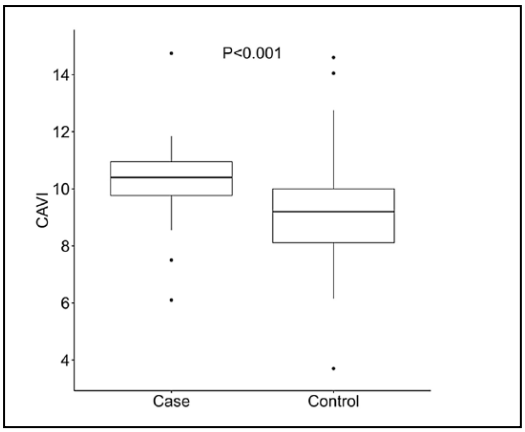
The CAVI measured using a device , the brachial and ankle pulse waves were determined using inflatable cuffs, with the pressure maintained between 30 and 50 mmHg to ensure that the cuff pressure had minimal effect on systemic hemodynamics.

Blood and pulse pressures were determined simultaneously, with the subjects lying supine after they had first rested for 10 min in a quiet room. The CAVI recorded for the study was the mean of the left and right values. CAVI was calculated using the formula:

$$\mathrm{CAVI} = a\{(2\rho/\Delta P) \times \ln(Ps/Pd)PWV^2\} + b$$

Results:

The CAVI value was significantly higher in patients with hospitalized HFpEF compared with patients with the control [10.4 (9.8–11.0) vs. 9.2 (8.1–10.0), p < 0.001).



Great association between a high CAVI and a high risk of hospitalization for HFpEF patients was seen.

On univariate analysis, the risk of hospitalization for HFpEF patients with high CAVI (≥10.0) was approximately 2.5 times higher than the rate for those who had a low CAVI (72% vs. 27%) [odds ratio (OR) 11.2, 95% CI 4.27–29.3, p < 0.001]

Multivariate logistic regression analysis, high CAVI (OR 6.76, 95% CI 2.28–20.10, p < 0.001) and anemia (OR 3.91, 95% CI 1.47–10.40, p = 0.006) were independently associated with hospitalization of HFpEF patients.

Discussion:

Arterial stiffness could contribute to the development of HFpEF. Patients with a high CAVI should be screened for cardiovascular and non-cardiovascular comorbidities, which, if present, should be managed with interventions known to alleviate their symptoms .

Directly modulating the arterial stiffness may also be beneficial.

Conclusion:
High CAVI was independently associated with the hospitalization of HFpEF patients.

Reference:
Takagi K et al. Clinical significance of arterial stiffness as a factor for hospitalization of heart failure with preserved left ventricular ejection fraction: a retrospective matched case-control study. J Cardiol. 2020;76(2):171-176.

2. After Systemic Thrombolysis appearance of Blood Cyst on Mitral Valve in an Adult – A case report.

Intracardiac hematic cysts are benign in nature, thin-walled structures lined by cobblestone-shaped epithelium, filled with non-organized blood.
Blood cysts over valves are very rare entities in adults, which can be distinguished through their echocardiographic features.
Current is a case pf blood cyst in Mitral valve occurring post thrombolysis.

Case presentation:
A 56-year-old obese woman complained of abdominal pain, urinary symptoms, and fever. Her medical history was positive for systemic arterial hypertension, type 2 diabetes mellitus, and nephrolithiasis.
Before ten days of symptoms' onset, she underwent a dental procedure for tooth decay. she was treated in another facility for ketoacidosis, renal failure, and bacterial urinary tract infection, developing pneumonia as well. She required renal replacement therapy and received a course of antibiotics including aminopenicillins, carbapenems, and glycopeptides.
Patient suddenly presented with right calf pain; a duplex ultrasound was requested evidencing deep venous thrombosis of soleal and peroneal veins. She complained as well of dyspnea, chest pain, and palpitations, raising the suspicion of pulmonary embolism (Wells' criteria: 4.5 points).
CT angiography of Thorax showed thrombosis of the pulmonary trunk and both main branches, and the initial transthoracic echocardiography (4 days after admission) reported left ventricle diastolic dysfunction with impaired relaxation, trivial mitral regurgitation, mild right ventricle dilation, mild tricuspid regurgitation, and an intermediate probability of pulmonary hypertension (PSAP 40mmHg)

Thrombolysis with streptokinase was the chosen treatment for the high-risk pulmonary embolism; subsequently, she was started on enoxaparin with bridge therapy to warfarin.
After thrombolysis, the patient remained febrile with chest discomfort despite antibiotic treatment suggesting dialysis catheter-related infection or bacterial endocarditis.
Transesophageal echocardiogram revealed a mitral valve mass considered as a bacterial vegetation, and therefore, she continued receiving vancomycin.
Her vital signs were normal (36.8°C, 95 beats per min, 20 breaths per min, 132/55 mmHg, SpO2 94% on room air), but she was pale and cardiopulmonary auscultation was positive for S3 sound. No heart murmurs, abnormal breath sounds, or jugular ingurgitation was detected.
Laboratory analysis showed leukocytosis (13.010 cells/µL), moderate anemia (7.4 g/dL), mild thrombocytopenia (146.000/µL), and increased C-reactive protein levels (17 mg/L, normal concentrations up to 5 mg/L).
Renal function was severely compromised (creatinine 5.3 mg/dL and blood uremic nitrogen 42 mg/dL) and arterial blood gases showed metabolic acidosis (pH of 7.37, HCO3 13.9 mmol/L, PCO2 24mmHg, SaO2 87%, and base excess -10.6).
Urine cultures positive for IRT-resistant Escherichia coli and azole-sensitive Candida albicans, while no germs could be isolated on blood cultures. Consequently, fluconazole was added to the antibiotic regimen.
After 2 weeks of admission, Transesophageal echocardiogram demonstrated preserved left ventricular dimensions and ejection fraction. Mitral valve exhibited a rounded image of 10 × 10mm with hyperrefringent edges and hypoechogenic content within the anterior ring, corresponding to A1 and A2 segments.
Lesion did not compromise the valve function nor obstructed the left ventricle outflow tract. The rest of the valves, cavities, and vessels were normal, except for a small left pleural effusion. The density of the mass and the absence of any other imaging features compatible with endocarditis (i.e., highly and asynchronously mobile pedicled mass) supported the diagnosis of a blood cyst.
Patient did not fulfill any other Duke's criteria and blood cultures were negative. Besides, there was no valvular regurgitation that supported the diagnosis of a leaflet aneurysm and the cyst remained the same size in transesophageal echocardiogram despite anticoagulation, being less likely that it corresponded to a thrombus adhered to the valve in a patient with no predisposing factors.
After 10 days of antifungals, the inflammatory response completely resolved and the antibiotic course was not extended as bacterial endocarditis was disregarded.
Patient did not have any bleeding or embolic events and was discharged without any disability.

Discussion:

In adults, blood cysts can be the consequence of blunt trauma and valvular surgery. Intracardiac cysts IS related to a variety of symptoms including dyspnea, chest pain at rest and on exertion. Three a few hypothesis for occurring of blood cysts, entrapment of blood during valve

development; vascular occlusion in the setting of inflammatory, autonomic, metabolic, or hemorrhagic conditions generating subvalvular hematomas; presence of heteroplastic tissue from the embryonic pericardium; valvular blood vessel ectasia; and tumor proliferation in the form of angioma.

Conclusion:

A case of blood cyst in mitral valve was successfully managed with medical treatment.

Reference:

Ramirez- Mesias DC et al. Blood Cyst of the Mitral Valve Diagnosed in an Adult after Systemic Thrombolysis. Case Reports in Cardiology. 2020; 4320269: 1- 4 page

IN FOCUS

3. Energy from Body to Monitor Heart Health by Nanogenerators.

Medical devices such as continuous heart rate monitors, insulin pumps, and neural stimulators usually need access to an electric power source in order to function.

A great deal of wasted energy that our body emits that can be harvested to power such devices, making it actually happen using biocompatible materials has proven to be challenging.

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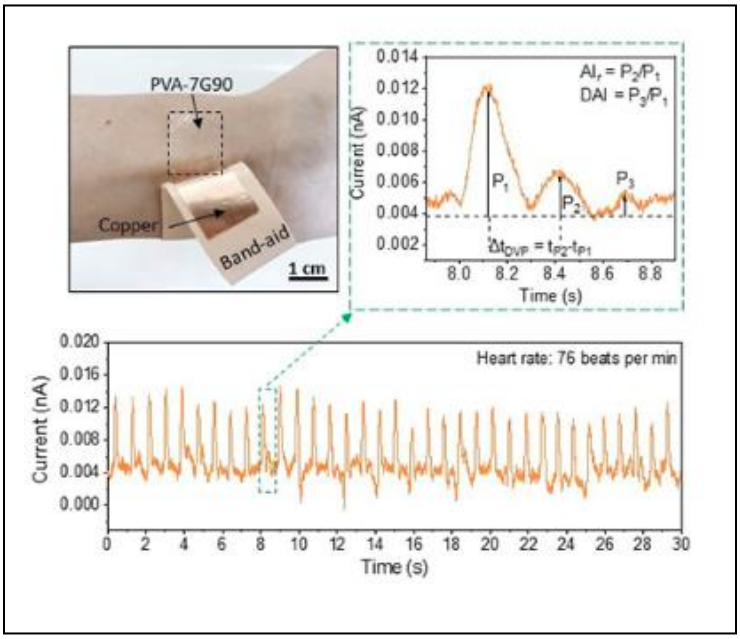
A team of engineers at Purdue University has shown that polyvinyl alcohol (PVA), one of the most common polymers used in biomedicine, can be used to produce efficient triboelectric nanogenerators (TENGs) that can also act as cardiac activity monitors. PVA-based TENGs has shown great potential for self-powered biomedical devices and open doors to new technologies that use widely deployed biocompatible materials for economically feasible and ecologically friendly production of functional devices in energy, electronics and sensor applications.



One of the most widely used polymers PVA for biomedical applications, into wearable, self-powered triboelectric devices which can detect the imperceptible degree of skin deformation induced by human pulse and capture the cardiovascular information encoded in the pulse signals with high fidelity.

The new generators are indeed impressively sensitive, detecting the slight physical movement of the skin with each heart beat and at a high resolution. Moreover, the amount of electricity generated should be sufficient to energize small devices and further advancements may lead to the production of enough energy to even power things such as insulin pumps.

Reference:

Wang R et al. Holistically Engineered Polymer–Polymer and Polymer–Ion Interactions in Biocompatible Polyvinyl Alcohol Blends for High-Performance Triboelectric Devices in Self-Powered Wearable Cardiovascular Monitorings. Advanced Materials. 2020 Jun 28:2002878.