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Use of continuous Nicardipine infusion in treating elevated systemic vascular resistance in patient with acute heart failure: A change in approach

Naser Yamani, Lydia Issac and Burhan Mohamedali
J. H. Stroger Jr Hospital of Cook County, USA

Introduction: Systemic Vascular Resistance (SVR) is a measurement of resistance and impediment of the systemic vascular bed to blood flow. SVR is a frequently used clinical index for left ventricular afterload. Elevated SVR is a major factor in inability to increase Stroke Volume (SV) of the left ventricle and increase the Left Ventricle End Diastolic Pressure (LVEDP). Sodium Nitroprusside is a pure after load reducing agent and has been used traditionally to decrease SVR, which leads to increase in stroke volume and increase in Cardiac Output (CO). Several studies in past have demonstrated effectiveness of Nitroprusside in treatment of acute or chronic heart failure of different etiologies. In our case, we used continuous Nicardipine infusion as an alternative agent in decreasing the Systemic Vascular Resistance, which is more cost effective, with more favorable side effect profile and provided the desired effects of decreasing the SVR.

Case: 53 y/o F with PMH of systolic Heart failure, Paroxysmal Supraventricular Tachycardia s/p ablation 2010(unknown specifics), asthma/COPD on home 2L O2, HTN, HLD, DM2 who was admitted to our coronary intensive care unit as an outside hospital transfer for acute on chronic CHF exacerbation. Patient initially presented to community hospital with symptoms of heart failure and was admitted to telemetry unit for Heart failure exacerbation secondary to non-compliance. IV diuresis was initiated but patient had minimal urine output, and elevation of creatinine, and hypotension with SBPs 90's. Patient was transferred to CCU for IV diuresis and inotrope support. She was started on dobutamine with some improvement but was unable to be weaned of dobutamine drip hence she was transferred to our institution for evaluation for advanced care for evaluation of LVAD and Heart Transplant. On arrival to our institution her vital signs were BP 127/83, pulse 92, RR 18, sating 93% on 2 L of O2. On admission she was short of breath on walking few steps. She reports 3 pillow orthopnea, PND, and worsening LE edema over the last month. She denied chest pain, tightness, and palpitations. EKG showed ventricular rate of 105, Right axis deviation, Wandering pacemaker. Examination revealed No JVD elevation. Heart sounds were regular without murmur and rubs, Rest of examination was normal. CBC was normal except Hg of 11. Serum Creatinine of 1.69 mg/dl and GFR of 39. Day 2 of admission patient underwent Left and Right Heart catheterization and was found to have non occlusive coronary artery disease and dynamics showed Cardiac output (CO) 2.67, Cardiac Index (CI) 1.44, Peripheral vascular resistance (PVR) 149.9, systemic vascular resistance (SVR) 2128.38 DSc, SVR-26.61 wood units, SVI 3937 DSc. Swanz Ganz catheter was placed for monitoring of hemodynamics. Trans Thoracic Echocardiogram showed LVEF 25-30%, with severe diffuse hypo kinesis, G2DD, Right ventricular systolic function was moderately reduced, dilated left and right atrium, structurally normal Mitral valve with Moderate Mitral regurgitation. Normal Aortic valve without stenosis or regurgitation. Mild to moderate tricuspid regurgitation. Trivial Pulmonary regurgitation, PASP of 55 Mm Hg

Discussion: Due to elevated Systemic Vascular Resistance (SVR) it was decided to use sodium nitroprusside which is a pure afterload reducing agent in effort to reduce her afterload in anticipation of decreasing systemic vascular resistance and in turn increasing Cardiac output. Due to unavailability of nitroprusside, it was decided to use Nicardipine infusion to achieve the target of reducing after load. Hemodynamics recording through Swanz ganz reading on Hospital day 3 on Nicardipine titration to maintain Mean Arterial Pressure (MAP) around 70 mm Hg showed reading of CO of 5.2 liters, CI of 2.8 liters, SVR of 1169 DSc. As MAP was maintained dobutamine drip was weaned off and patient was started on oral Hydralazine and Amlodipine. Day 4 of admission her CO was maintained and SVR was reduced hence Nicardipine drip was weaned off and stopped. Her creatinine improved with diuretics adjustment. After being weaned of the dobutamine and Nicardipine she maintained her MAP ~ 70 Mm HG. Her fluid status improved and she was discharged in stable condition. 2 weeks later, she was evaluated in Heart failure clinic, with improved exercise tolerance and marked improvement of her heart failure symptoms. Hence aggressive interventional procedure like LVAD was avoided at this time.

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naser_ice@yahoo.com

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