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Alana Kosches B.A.

Advisor(s): Jason Lazar M.D., MPH

Co-author(s): Louis Saliccioli, MD, Thomas Monaghan, MD, PhD, Jeffrey Weiss, MD, PhD

Is Nocturia Associated with an Abnormal Valsalva Maneuver Blood Pressure Response?

Background

Nocturia is a urological symptom increasingly recognized as a manifestation of cardiovascular disorders such as hypertension, vascular disease and heart failure. The mechanisms underpinning these associations are not well understood. We postulated fluid overload as a unifying hypothesis and used the Valsalva maneuver to assess volume status by measuring changes in arterial blood pressure (BP) during forced expiration across a closed glottis to examine potential relations between nocturia and blunted BP responses during the Valsalva maneuver.

Methods

We prospectively enrolled 100 patients from Downstate's outpatient cardiology clinics. Subjects performed the Valsalva maneuver, and associated BP changes were analyzed. Subjects then completed a single nighttime only frequency volume chart of measured urine volumes. Urinary indices included #voids, nocturnal urinary production rate (NUP, ml/hour), and the modified nocturia index (MNI), calculated as nocturnal urine volume divided by the maximum voided volume, which reflects the balance between urine production and bladder storage. Pulse oximetry waveforms were continuously recorded during Valsalva, and the pulse amplitude ratio (PAR) was calculated from systolic (S)BP during Valsalva phase 2 divided by baseline SBP.

Results

Among 100 patients, mean age 67 years, 73% female, 45% had edema. For the entire group, blunted PAR was associated with the presence of edema, BMI, and higher SBP, but not with #voids, NUP, or MNI. In subjects without edema, the PAR was correlated with MNI ($r=.37$, $p=.013$), NUP ($r=.34$, $p=.02$), and trend towards #voids ($r=.28$, $p=.08$). On multivariate analysis, PAR was an independent predictor of NUP ($p=.026$).

Conclusion

Nocturia is associated with fluid overload, as evidenced by the presence of edema or, in patients without obvious edema, a blunted Valsalva response. A nocturia history may be a simple inexpensive screening tool for early detection of mild degrees of fluid overload.