

## Edema from the Cardiac Point of View

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Starling forces, those are hydrostatic pressure and colloid oncotic pressure, regulate the disposition of fluid between intravascular space and interstitium. The hydrostatic pressure within the vascular space and the colloid oncotic pressure in the interstitium tend to move fluid from vascular to extravascular space. Edema is defined as a clinically apparent increase in the interstitial fluid volume.

Incomplete ventricular emptying (systolic heart failure) and/or inadequate ventricular relaxation (diastolic heart failure) both lead to elevate the ventricular diastolic pressure. The impairment of right ventricular function (and left ventricular dysfunction finally influences the right ventricle) so that induce elevation of the pressures in the systemic veins and capillaries, augmenting the fluid into the interstitial space, as a result of peripheral edema.

On the other hand, cardiac output decreases, lowering the effective arterial volume and renal blood flow. Through the activation of sympathetic system and the renin-angiotensin-aldosterone system, more salt and water are reabsorbed by the kidney. If the cardiac disorders are not corrected, the excessive water pools in the venous system and accentuates the peripheral edema.

The characteristics of cardiac origin-edema is low protein-content, therefore pitting; generalized, more extensive in the legs and accentuated in the evening determined largely by posture. In contrast with it, the edema caused by hypoproteinemia though the same generalized, is especially evident in the soft tissues of eyelids and face, most pronounced in the evening.

To determine whether the edema is cardiac-origin, clinically we search the evidences on 3 aspects: from history, dyspnea with exertion, often associated with orthopnea or paroxysmal nocturnal dyspnea; from physical examination, elevated jugular venous pressure, S3 gallop and occasionally associated with displaced or dyskinetic apical pulse; and from laboratory findings, elevated BUN/Cr ratio, often diminished serum sodium and occasionally elevated liver enzymes with hepatic congestion. Noninvasive tests such as echocardiography and radionuclide angiography may be helpful in establishing the diagnosis of heart failure.

A simple and effective bedside examination is useful to differentiate cardiac origin-edema from other causes. That is central venous pressure, estimated by the level of jugular venous distension. With the patient in semisitting posture, the

distance of the top of the neck veins above the sternal angle is measured. If it is more than 3 cm, the central venous pressure elevates above 8 cm, indicating cardiac disease or pulmonary hypertension at least partially responsible for the edema.