

HOW VALUABLE IS THE SWAN-GANZ CATHETER IN CRITICALLY ILL PATIENTS? A PROSPECTIVE STUDY.

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In critically ill patients with pulmonary edema, hypotension, or both, Swan-Ganz catheterization is commonly performed to differentiate cardiac from non-cardiac causes. We hypothesized that clinical assessment of such patients (history, physical examination, chest radiograph and electrocardiogram) may be as reliable as Swan-Ganz catheterization data in distinguishing cardiac from non-cardiac causes. Accordingly, 45 patients (33 men, 16 women, mean age 61 ± 15 years) admitted to our critical care units with pulmonary edema and/or hypotension, who had Swan-Ganz catheterization performed, were prospectively analyzed. Clinical assessment and Swan-Ganz Catheterization data were concordant in only 33 of the 45 (73%) patients ($p < 0.001$). Concordance was noted in 17 of 20 (85%, $p = 0.23$) with pulmonary edema, 7 of 11 with hypotension (64%, $p = 0.04$), and 9 of 14 with both (65%, $p = 0.04$).

Based upon this prospectively performed study, we conclude that Swan-Ganz catheterization provides useful additional information in approximately one-fourth of critically ill patients. It is particularly useful in patients with hypotension or hypotension with pulmonary edema. In patients with pulmonary edema alone, its benefit, however, may be only marginal beyond routine clinical assessment.

Influence of Pulmonary Hypertension on Left Ventricular Regional Wall Motion in Man

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Little is known about the impact of pulmonary hypertension on regional left ventricular function in man. Therefore, we digitized ventriculograms from eleven patients with pulmonary hypertension (range: mean pulmonary artery pressure 30-70 mmHg and right ventricular pressure 60/10-125/30 mmHg) and no coronary artery disease and 18 normal subjects. Wall motion analysis was done by creating functional images capable of displaying regional transient abnormalities using a previously presented frame by frame video intensity technique which compares global intensity to regional. All 18 normal subjects showed synchronous function throughout the cardiac cycle. In all pulmonary hypertensive patients early diastolic abnormalities were present whose duration ranged 100-200 ms and size 4-20% of the ventricular area. In four patients abnormalities were also noted in early systole. Distribution of abnormal regions were as follows: Anterobasal in 2 patients, Anterolateral in 8, Apical in 9, Inferoapical in 2, and Inferobasal in 1 patient. Our data are comparable with the theory that asynchronous relaxation of the left ventricle in pulmonary hypertension corresponds to reversal of the septal transmural pressure and prolongs global relaxation.

DIASTOLIC FUNCTION IN THE HUMAN LEFT VENTRICLE BY CINE MAGNETIC RESONANCE IMAGING

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By achieving a good temporal resolution with cine MR, curves of volume as a function of time can be generated to allow detailed analysis of regional left ventricular diastolic filling. This initial experience evaluated patterns of left ventricular diastolic filling in 5 healthy volunteers (aged 21 to 57 years; group 1), and 5 patients with global cardiac diseases (group 2). Images (at 1.5 T), were acquired 22 to 32 times per level (TR=31ms, TE=17ms). True short axis cine series were initiated at 3 different levels in the group 1 (mid-ventricle, apex and base) and only one level (mid-ventricle) in patients of the group 2. At each tomographic level, curves of left ventricular volume versus time were constructed throughout the cardiac cycle, by identifying the endocardial border, calculating the area multiplied by the slice thickness (10 mm). Segmental early diastolic filling data were fit to a third order polynomial curve. Time to peak filling rate (TPFR), absolute peak filling rate (PFR) or referenced to tomographic left ventricular diastolic volume (PFR/EDV) were determined for each level.

Results	TPFR(ms)	PFR(ml/s)	PFR/EDV(s ⁻¹)	EDV(ml)	EF(%)
gr.1 Mid-LV	140±61	58.5±30.9	4.1±.51	14.2±5.5	75±4.9
Base	114±100	60±15	3.1±.55	13±7.4	65±8
Apex	152±55	46±24	6.8±3.23	8.3±2.1	78.5±12
gr.2					
Hypertrophy	147	67	3.73	17.9	68
Amyloidosis p1/p2	168/115	32/35	3.56/2.90	9.1/12.1	62/57
Allograft*/.	129/148	41/62	2.96/4.90	13.9/12.8	76/77
+/. Rejection/ no Rejection					

Left ventricular diastolic function is variable from apex to base in normal human. Cine MR at 1.5 T was sufficient to accurately define time dependant volumetric data. PFR/EDV was less variable and should be the best criterion to evaluate diastolic LV function.

MODIFICATION OF A-V CONDUCTION USING A PERCUTANEOUS COMBINED LASER-ELECTRODE CATHETER

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A new bipolar electrode catheter has been developed with a window between 2 electrodes for delivery of laser energy. A 350 um core silica fiber was used to deliver a continuous wave Nd-YAG laser beam through the window at a 90° angle to the long axis of the catheter. Using the femoral vein, 10 dogs (6 acute; 4 chronic) underwent modification of the atrioventricular (AV) junction with the new catheter. In 8 dogs complete heart block (CHB) was successfully created with a mean of 5 ± 2 exposures at a peak power of 40-50 watts with average energy flux of 928 J/mm^2 . CHB was maintained for 30 minutes prior to sacrifice in 6 acute dogs. In 2 chronic dogs second degree AV block (2:1 conduction) was achieved with 2 exposures at peak power of 40 watts and average energy flux of 688 J/mm^2 . Two chronic dogs with sustained CHB were maintained with an implantable VVI pacer until sacrifice. Surface ECG, 2-D echo and doppler performed on 4 chronic dogs at 1-4 weeks follow up showed persistent AV block and no evidence of valvular or ventricular dysfunction. Gross examination of the hearts of 6 acute dogs revealed a 1-2 mm² area of thermal damage above the tricuspid ring with no cardiac perforations or thrombi at the irradiated sites. By histologic examination, thermal damage to the myocardium at the treated site was limited to a depth of 2-3 mm. Examination of 3 chronic dogs sacrificed at 1 month revealed minimal or no gross effects. Conclusion: Transvenous ablation of the AV junction to produce second degree AV block or CHB is feasible with a Nd-YAG laser delivered through a specially designed electrode catheter. The precision with which the laser beam can be directed and the consistent safe production of second degree AV block or CHB may make laser ablation of the AV junction preferable to other energy sources.