INFLUENCE OF SUBENDOCARDIAL ISCHEMIA ON TRANSMURAL MYOCARDIAL FUNCTION.

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Previous studies utilizing intraventricular ultrasound crystals under conditions of low flow ischemia characteristic of "hibernating" myocardium have suggested an un-
coupling of diastolic function and, to a lesser degree, systolic function. To better evaluate this relationship we employed a non-
traumatic epicardial (single crystal) pulse Doppler tech-
nique, which permits complete transmural assessment of
myocardial thickening. Low flow ischemia was produced in
6 open-chested dogs by partial LAD occlusion, adjusted to
maintain the distal LAD pressure at 40% of baseline for
3 hrs. Serial measurements of thickening fraction (TF) in ischemic (IS) and nonischemic (NI) regions were measured
at end diastole while the end diastolic tapered flow gradient under the crystal was assessed by radio-
labeled microspheres injected at baseline, and during low
flow at 30 min (LFI) and 180 min (LFT2). Minimal endocar-
dial (EN) necrosis was evident by TTC staining in 3 dogs.
Peak (PL) and TF were calculated for EN (PL) and TF
regions. During ischemia (LFI and LFT2), changes in TF
and PL correlated in EN (r=0.73) but not in NI (r=0.42)
or EN (r=0.26) respectively. Values (SDM) at IS depicted as
a percent of baseline were:

<table>
<thead>
<tr>
<th>Region</th>
<th>PL (SD)</th>
<th>TF (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN</td>
<td>108%±9%</td>
<td>25±7%</td>
</tr>
<tr>
<td>NI</td>
<td>106±12%</td>
<td>23±4%</td>
</tr>
<tr>
<td>HF</td>
<td>110±10%</td>
<td>26±8%</td>
</tr>
<tr>
<td>EF</td>
<td>114±20%</td>
<td>19±3%</td>
</tr>
</tbody>
</table>

Depressed endocardial thickening in the ischemic region,
EP function was disproportionately reduced, com-
parable to that seen in the EN. Hypokinesia was seen in
the nonischemic region.

Thus, subendocardial ischemia results in an uncoupling of
the transmural flow/function relationship in the ischemic
region with compensation of transmural hyperkinesia in the
nonischemic region.

Wednesday, March 21, 1990
4:00PM–5:00PM, Room 43
Cardiac Function in Heart Failure

THE ROLE OF IMPAIRED DIASTOLIC PERFORMANCE IN DETERMINING
THE FUNCTIONAL CLASS OF PATIENTS WITH HEART FAILURE
Martin R. Berk, M.D., Solomon Xie, M.D., Barbara Cutshaw,
M.D., Anthony Marlar, M.D., F.A.C.C.; University of
Kentucky Medical Center, Lexington, Kentucky

The role of impaired diastolic performance in determining
the functional class of pts with heart failure (CHF) re-
mains uncertain. Hypothesized that, among CHF pts with
similar ejection fractions (EF), we could identify a subset
in whom diastolic dysfunction with diminished atrial
transport was associated with reduced functional status.
We studied 23 pts with CHF and EF 20% to 30% due to either
chronic coronary artery disease or cardiomyopathy. Pulsed Doppler
recordings of transmural flow velocities were obtained
from the mitral annulus area in apical 4-chamber view.
Measurements included peak early (E) and late atrial (A)
velocities in cm/sec. Functional classification was estab-
lished clinically according to New York Heart Asso-
ciation. On the basis of atrial transport, pts were divided
into two cohorts: Group 1 (normal A) with A>30 cm/sec, 14
pts; Group 2 (reduced A) A<30 cm/sec, 9 pts. No differences
were observed between Group 1 and Group 2 in regard to
age, heart rate, and incidence or grade of mitral
regurgitation. However, pts in Group 2 were significantly
more symptomatic and had a worse functional class than
Group 1 as follows:

<table>
<thead>
<tr>
<th>Functional Class</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 1</td>
<td>57%</td>
<td>36%</td>
<td>7%</td>
</tr>
<tr>
<td>Type 2</td>
<td>0%</td>
<td>22%</td>
<td>78%</td>
</tr>
</tbody>
</table>

Thus, Doppler recordings enable identification of a
subgroup of patients with advanced LV systolic dysfunction
in whom atrial transport is diminished. This cohort of pts
exhibits severe impairment of functional class than
pts with comparable reductions in LVEF. These data support
the contribution of disturbed LV filling in the production
of symptoms in pts with LV systolic dysfunction.

REMOHYDRAINIC EVALUATION OF THE DYNAMIC CARDIOMYOPLASTY BY
AORTIC FLOW DOPPLER STUDY

Barthol MEHTALEM, M.D., J.C. CHACHAKES, M.D., Patrick PERIER,
M.D., Alain CARRERGER, M.D., Hôpital Broussais; Paris.

Between January 1985 and March 1989, 14 pts (10 males
and 4 females) had a cardiomyoplasty operation with a lat-
issimus dorsi muscle flap (LDM), LV was stimulated and
trained by a Medtronic's cardiomyostimulator. 9/12 survivors
had a more than 6 months postoperative assessment (full
trained LD) with a Diasonics DRF 100 C and a Vingmed SD 100
Device. Automatically computed LV stroke volume (SV), car-
diac output (CO) were obtained from the aortic flow inten-
segregation and recorded during 5 min without stimulation and
then under 1.2 cycles stimulation of the LD without
any changes in the patient or probe position. The aver-
age values of the SV and CO were expressed as the percent-
tual variation of the stimulated cycle against the non-
stimulated cycle (SV) and as the percentage variation of
the CO under 1.2 stimulation versus the basal state.

3/5 pts didn't demonstrated any modification of the SV or
the CO; 6/10 pts had a mean increase of SV of 25.6% (+12% to +42% of the stimulated cycle against the non-
stimulated one). CO had a mean increase of 11% (+7% to
+19%) between the basal state and the 1.2 cycles LD sti-
ulation.

Full trained LD stimulation and contraction increased SV
and CO in 6/9 investigats pts at more than 6 months post-
operatively. Sternal echo-Doppler examination seems to
be the more safe and investigative method for the LD training
and hemodynamic effect monitoring.

CONTINUOUS WAVE DOPPLER ESTIMATION OF LEFT ATRIAL
PRESSURE IN PATIENTS WITH CONGESTIVE HEART FAILURE
AND MITRAL REGURGITATION

John Gorcsan, M.D., Frank R. Snow, M.D., Walter Paulsen,
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Richmond, Virginia.

A completely noninvasive method for determination of
left atrial pressure (LAP) in patients with mitral
regurgitation utilizing continuous-wave Doppler
echocardiography has been devised. This technique was applied to 34 patients, aged 60±15 yrs (LVEF 36±10%)
with congestive heart failure and Doppler-detected mitral
regurgitation, and correlated with simultaneous catheter
recordings of pulmonary capillary wedge pressure (PCWP)
at end-expiration. Patients with aortic stenosis or LV
outflow tract obstruction were excluded. LAP was
estimated by first determining transmural pressure
gradient (P) from continuous-wave Doppler measurements
of mitral regurgitant jet velocity (V), using P=4V²; then
subtracting P from simultaneous measurements of left
systolic blood pressure (SBP), (SBP-P=LAP). Five of the
34 patients had inadequate Doppler tracings and were
excluded. For the group, peak mitral regurgitant jet
velocity was 4.5±0.5 m/s, peak SBP was 113±27 mmHg,
and mean PCWP was 29±7 mmHg. Correlation of noninvasive
estimates with mean PCWP was r=0.9, SEE=4 mmHg, p<0.001,
y=0.6x+7. In conclusion, continuous-wave Doppler
echocardiography and systolic blood pressure may be used
for accurate noninvasive estimation of left atrial
pressure in patients with congestive heart failure and
mitral regurgitation.