Title

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Journal

JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY, 1(2)

ISSN

0735-1097

Authors

TOBIS, J
WONG, YB
NALCIOGLU, O
et al.

Publication Date

1983

Tuesday, March 22, 1983
8:30-10:00AM
Imaging Techniques in the Assessment of Cardiac Function

ABSOLUTE LEFT VENTRICULAR VOLUME OBTAINED WITH VIDEODENSITOMETRY AND DIGITAL SUBTRACTION ANGIOGRAPHY.

Jonathan Tobis, MD, FACC; Yibing Wong; Orhan Nalcioglu, Ph.D.; Walter Henry, MD, University of California, Irvine, CA.

We have developed a method for deriving absolute LV volumes from digital subtraction angiograms. First pass 30 degree RAO intravenous left ventriculograms were obtained with real time digital subtraction processing in 15 patients. Videodensitometric analysis of the digitized iodine signal produced density-time curves with density proportional to end-diastolic (EDV) and end-systolic volumes (ESV). From these relative volumes, ejection fraction was computed in a manner similar to that used in nuclear angiography. Because digital ventriculograms yield good resolution of LV boundaries, we used this ability to derive absolute LV volumes. From an end-diastolic image the diameter of a 1.0cm wide section of LV was measured approximately 2/5th the distance from aorta to apex (i.e. where the LV was widest). The volume of this segment was calculated by assuming the segment was circular in cross-section. Contrast density in this volume was measured, corrected for background, and density/ml was determined. This value was used as a correction factor to derive absolute LV EDV. Once correction was made for one frame, it was applied to the density-time curve so that LV volume could be measured throughout the cardiac cycle. These derived volumes correlated closely with those obtained from area-length analysis of the same LV images ($r = 0.96$ for EDV and $r = 0.85$ for ESV). This combination of videodensitometric and boundary tracing techniques requires minimum geometric assumptions and provides a relatively simple method for determining continuous changes in LV volume throughout the cardiac cycle.