

Hypertension Phenotype and 24-hour Ambulatory Hemodynamic Monitoring

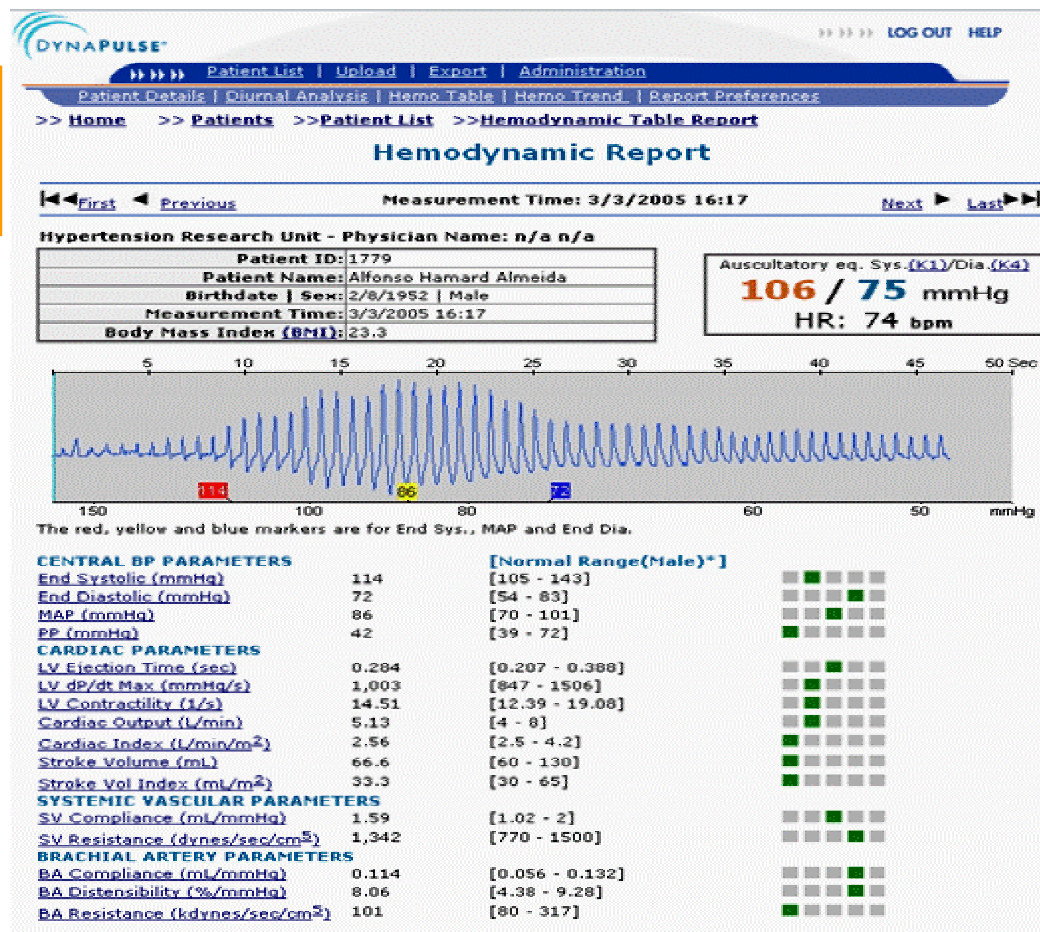
(Examples provided by Professor Antonio Delgado-Almeida, MD, FAHA, Head, Clinical Research Unit & Ion Transport Laboratory, University of Carabobo Medical School Hypertension Research Unit, Valencia, Venezuela)*

Our Goal in Cardiovascular Medicine:

Normal BP & Normal Hemodynamics

Normotensive 53 y old subject
with normal Cardiovascular
Hemodynamic and Supra-Systolic
Waveform analysis in resting
study (DP200M)

Fig. 1

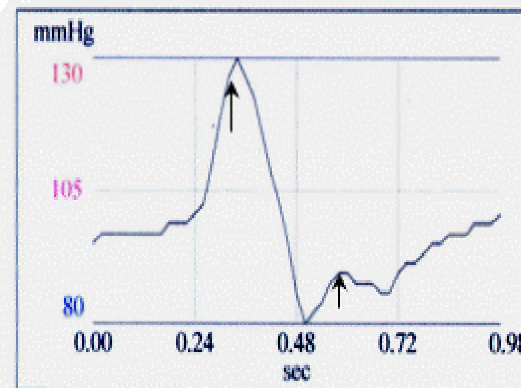


Hypertension Phenotype

Non-Invasive suprasystolic aortic waveform in young (26 y) healthy females, with (top) and without (bottom) family history of hypertension. Large arrows identify peak LV dP/dT, pressure-time ejection; small ones, peak pressure of reflected waves

Top: normal LV dP/dT, transit time (248 ms) and pressure of reflected wave filling the coronary arteries in diastole. Bottom: restricted LV dP/dT and ejection period by rapid transit time (122 ms) that lessened diastolic pressures required for optimal coronary flows

Fig. 2



130

Systolic

80

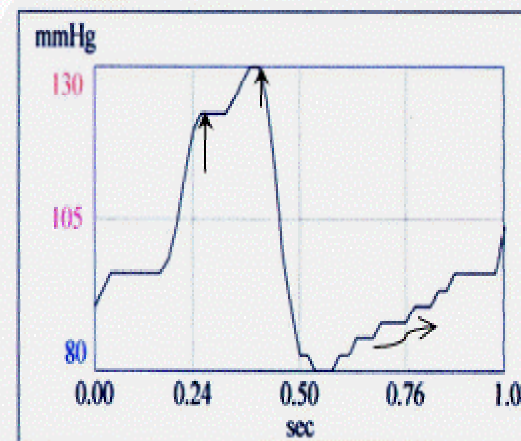
Diastolic

95

Mean

71

Pulse



130

Systolic

80

Diastolic

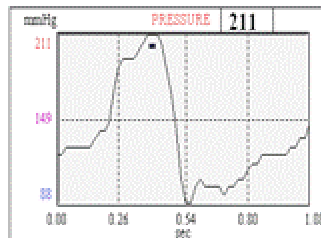
96

Mean

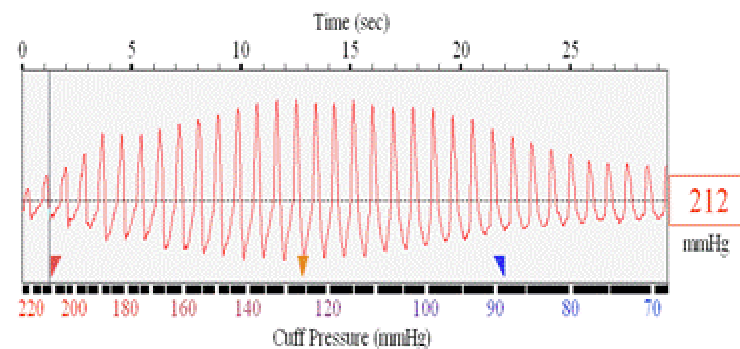
75

Pulse

Measurement 11/03/2006 12:42



211 Systolic	127 Mean	Date: 11/03/2006
88 Diastolic	67 Pulse	Time: 12:42



Supra-Systolic Analysis: Aortic reflection wave* type IV in Systolic Hypertension resting study (DP200M)

Fig. 3a



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Hemodynamic Report

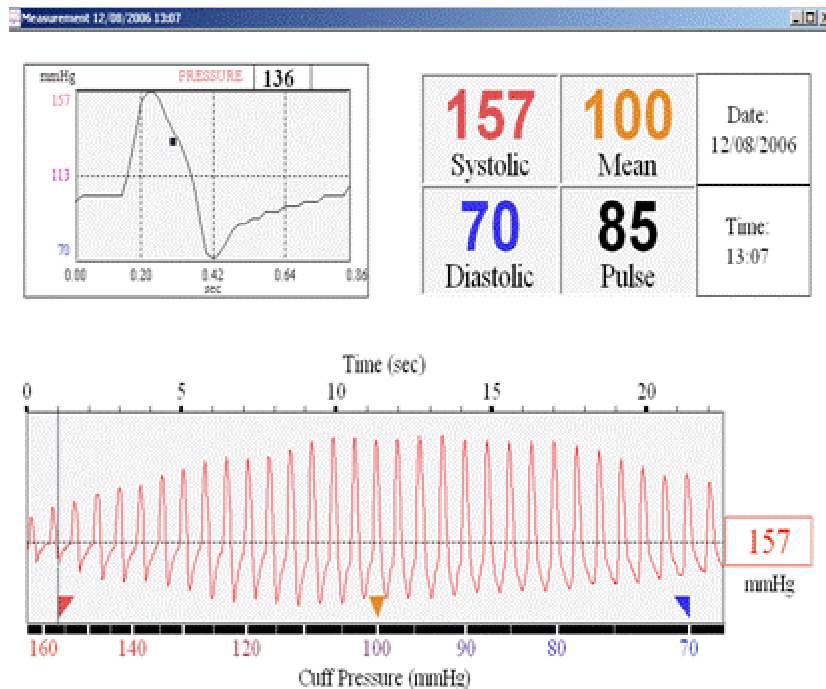
Measurement Time: 11/3/2006 12:42 [First](#) [Previous](#) [Next](#) [Last](#)

Hypertension Research Unit - Physician Name: n/a n/a

Patient ID: 2421	Auscultatory eq. Sys.(K1)/Dia.(K4)
Patient Name: Ana Granados de Gonzalez	192 / 96 mmHg
Birthdate Sex: 10/22/1939 Female	HR: 67 bpm
Measurement Time: 11/3/2006 12:42	
Body Mass Index (BMI): 25.7	

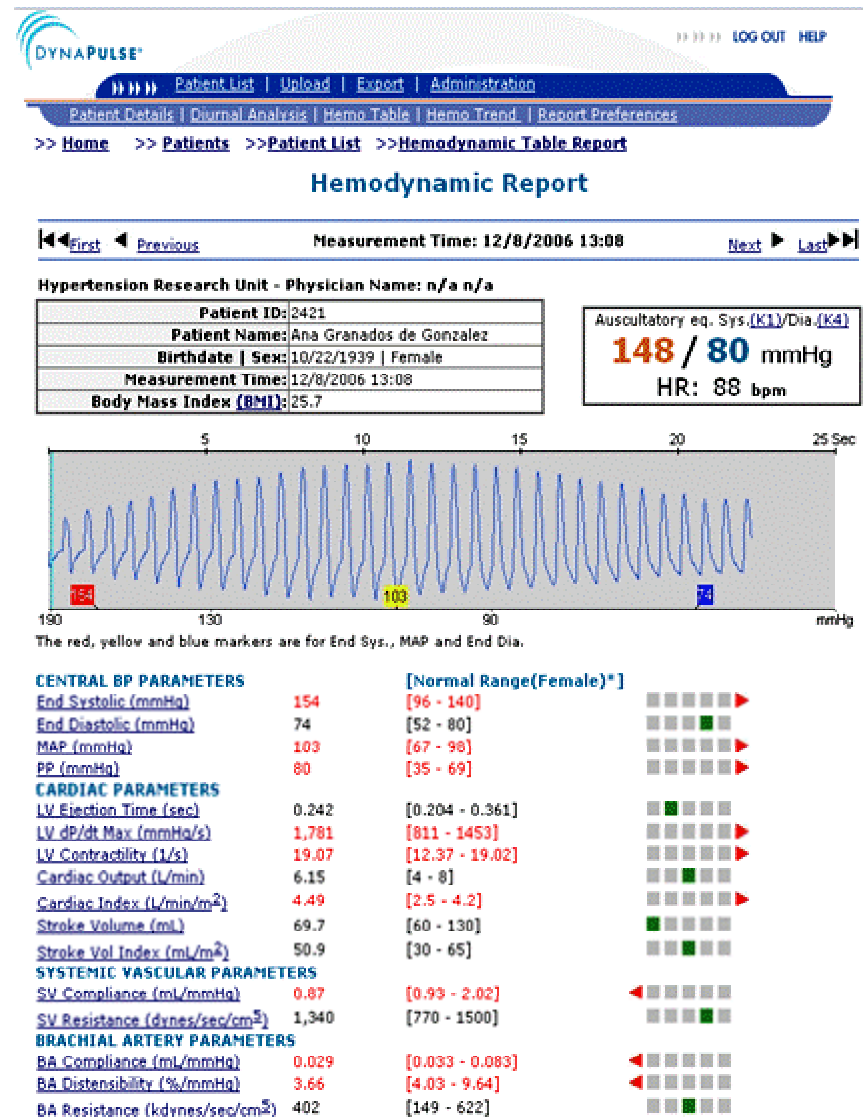
The red, yellow and blue markers are for End Sys., MAP and End Dia.

CENTRAL BP PARAMETERS		[Normal Range(Female)*]
End Systolic (mmHg)	211	[96 - 140]
End Diastolic (mmHg)	88	[52 - 80]
MAP (mmHg)	127	[67 - 98]
PP (mmHg)	123	[35 - 69]
CARDIAC PARAMETERS		
LV Ejection Time (sec)	0.307	[0.204 - 0.361]
LV dP/dt Max (mmHg/s)	2,225	[811 - 1453]
LV Contractility (1/s)	17.39	[12.37 - 19.02]
Cardiac Output (L/min)	4.66	[4 - 8]
Cardiac Index (L/min/m ²)	3.40	[2.5 - 4.2]
Stroke Volume (mL)	68.3	[60 - 130]
Stroke Vol Index (mL/m ²)	49.9	[30 - 65]
SYSTEMIC VASCULAR PARAMETERS		
SV Compliance (mL/mmHg)	0.56	[0.93 - 2.02]
SV Resistance (dynes/sec/cm ⁵)	2,181	[770 - 1500]
BRACHIAL ARTERY PARAMETERS		
BA Compliance (mL/mmHg)	0.023	[0.033 - 0.083]
BA Distensibility (%/mmHg)	2.51	[4.03 - 9.64]
BA Resistance (kdynes/sec/cm ⁵)	667	[149 - 622]



**Supra-Systolic Analysis: Aortic reflection wave*
type II in Systolic Hypertension resting study:
Improved BP/hemodynamic in 1 month therapy
(DP200M)**

Fig. 3b





24-hour Ambulatory Hemodynamics (DP5000A) In heart failure: Hemodynamic deterioration during arrhythmia episodes (9:02 am), improved in sinus rhythm (12:32 pm)

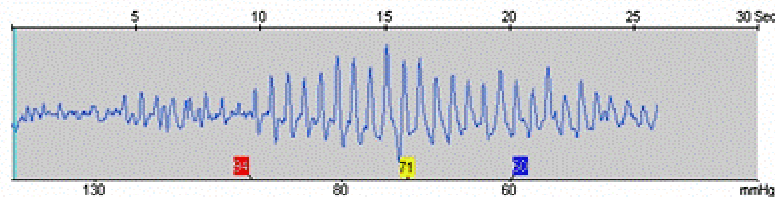
Hemodynamic Report

Measurement Time: 12/9/2005 09:02

Hypertension Research Unit - Physician Name: n/a n/a

Patient ID:	LEG01
Patient Name:	Leonardo E. Gomez
Birthdate Sex:	2/27/1935 Male
Measurement Time:	12/9/2005 09:02
Body Mass Index (BMI):	26.8

Auscultatory eq. Sys.(K1)/Dia.(K4)
93 / 64 mmHg
HR: 91 bpm



The red, yellow and blue markers are for End Sys., MAP and End Dia.
Possible movement artifacts or irregular heart beats detected in waveform

CENTRAL BP PARAMETERS

		[Normal Range(Male)*]	
End Systolic (mmHg)	94	[105 - 143]	■
End Diastolic (mmHg)	60	[54 - 83]	■
MAP (mmHg)	71	[70 - 101]	■
PP (mmHg)	34	[39 - 72]	■

CARDIAC PARAMETERS

LV Ejection Time (sec)	0.223	[0.207 - 0.388]	■
LV dP/dt Max (mmHg/s)	747	[847 - 1506]	■
LV Contractility (1/s)	13.09	[12.39 - 19.08]	■
Cardiac Output (L/min)	5.97	[4 - 8]	■
Cardiac Index (L/min/m ²)	3.02	[2.5 - 4.2]	■
Stroke Volume (mL)	63.6	[60 - 130]	■
Stroke Vol Index (mL/m ²)	32.2	[30 - 65]	■

SYSTEMIC VASCULAR PARAMETERS

SV Compliance (mL/mmHg)	1.87	[1.02 - 2]	■
SV Resistance (dynes/sec/cm ⁵)	952	[770 - 1500]	■

BRACHIAL ARTERY PARAMETERS

BA Compliance (mL/mmHg)	0.142	[0.056 - 0.132]	■
BA Distensibility (%/mmHg)	11.56	[4.38 - 9.28]	■
BA Resistance (kdynes/sec/cm ⁵)	73	[80 - 317]	■

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Hemodynamic Report

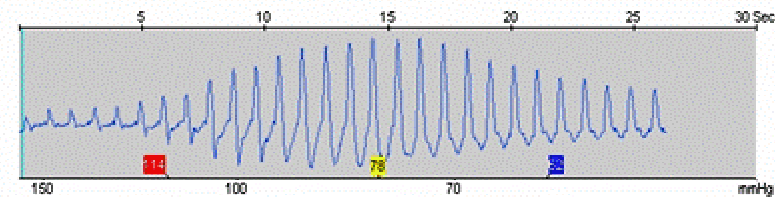
Fig. 4

Measurement Time: 12/9/2005 12:32

Hypertension Research Unit - Physician Name: n/a n/a

Patient ID:	LEG01
Patient Name:	Leonardo E. Gomez
Birthdate Sex:	2/27/1935 Male
Measurement Time:	12/9/2005 12:32
Body Mass Index (BMI):	26.8

Auscultatory eq. Sys.(K1)/Dia.(K4)
106 / 64 mmHg
HR: 63 bpm



The red, yellow and blue markers are for End Sys., MAP and End Dia.

CENTRAL BP PARAMETERS

		[Normal Range(Male)*]	
End Systolic (mmHg)	114	[105 - 143]	■
End Diastolic (mmHg)	62	[54 - 83]	■
MAP (mmHg)	78	[70 - 101]	■
PP (mmHg)	52	[39 - 72]	■

CARDIAC PARAMETERS

LV Ejection Time (sec)	0.297	[0.207 - 0.388]	■
LV dP/dt Max (mmHg/s)	934	[847 - 1506]	■
LV Contractility (1/s)	13.51	[12.39 - 19.08]	■
Cardiac Output (L/min)	4.52	[4 - 8]	■
Cardiac Index (L/min/m ²)	2.29	[2.5 - 4.2]	■
Stroke Volume (mL)	70.8	[60 - 130]	■
Stroke Vol Index (mL/m ²)	35.8	[30 - 65]	■

SYSTEMIC VASCULAR PARAMETERS

SV Compliance (mL/mmHg)	1.36	[1.02 - 2]	■
SV Resistance (dynes/sec/cm ⁵)	1,381	[770 - 1500]	■

BRACHIAL ARTERY PARAMETERS

BA Compliance (mL/mmHg)	0.083	[0.056 - 0.132]	■
BA Distensibility (%/mmHg)	6.37	[4.38 - 9.28]	■
BA Resistance (kdynes/sec/cm ⁵)	181	[80 - 317]	■

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* Above data were presented at the 4th Venezuela and 2nd Latin-American Heart Failure Congress held at Valencia, Venezuela, March 4-6, 2010