



# Il nuovo protocollo italiano «Tilt Fast»

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## Recommendations for tilt table testing and other provocative cardiovascular autonomic tests in conditions that may cause transient loss of consciousness

Consensus statement of the European Federation of Autonomic Societies (EFAS) endorsed by the American Autonomic Society (AAS) and the European Academy of Neurology (EAN)








### Indications

TTT and other provocative cardiovascular autonomic tests primarily aim to obtain a pathophysiological correlate for orthostatic intolerance and TLOC. The fundamental tool for the differential diagnosis is history taking of patients and eyewitnesses [2, 4]. TTT may provide an important addition to history taking if the initial evaluation does not yield a definite or highly likely diagnosis. TTT should neither be used as a substitute for history taking nor isolated from history taking.

## Tilt testing

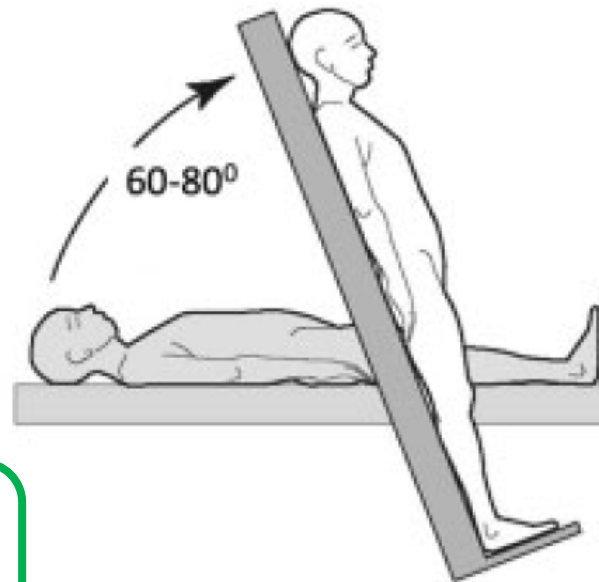
Recommendations	Class <sup>a</sup>	Level <sup>b</sup>
<b>Indications</b>		
Tilt testing should be considered in patients with suspected reflex syncope, OH, POTS, or PPS. <sup>23,24,105–109,111–117</sup>	IIa	B
Tilt testing may be considered to educate patients to recognize symptoms and learn physical manoeuvres. <sup>119–121</sup>	IIb	B
<b>Diagnostic criteria</b>		
Reflex syncope, OH, POTS, or PPS should be considered likely if tilt testing reproduces symptoms along with the characteristic circulatory pattern of these conditions. <sup>23,24,105–109,111–117</sup>	IIa	B
<p><b>Additional advice and clinical perspectives</b></p> <ul style="list-style-type: none"> <li>• A negative tilt table response does not exclude a diagnosis of reflex syncope.</li> <li>• While sensitivity and specificity are at acceptable levels when measured in patients with VVS and healthy controls, in usual clinical settings of syncope of uncertain origin tilt testing suggests the presence of a hypotensive susceptibility, which may exist not only in reflex syncope but also with other causes of syncope including some forms of cardiac syncope. The concept of hypotensive susceptibility rather than diagnosis has important practical utility, because the presence or absence of hypotensive susceptibility plays a major role in guiding pacemaker therapy in patients affected by reflex syncope and in the management of hypotensive therapies, which are frequently present in the elderly with syncope (see sections 5.1 and 5.2).</li> <li>• A positive cardioinhibitory response to tilt testing predicts, with high probability, asystolic spontaneous syncope; this finding is relevant for therapeutic implications when cardiac pacing is considered (see section 5.2.6). Conversely, the presence of a positive vasodepressor, a mixed response, or even a negative response does not exclude the presence of asystole during spontaneous syncope.<sup>122,123</sup></li> <li>• Tilt testing may be helpful in separating syncope with abnormal movements from epilepsy.<sup>137</sup></li> <li>• Tilt testing may have value in distinguishing syncope from falls.<sup>23</sup></li> <li>• Tilt testing may be helpful in separating syncope from PPS. In suspected PPS, the tilt test should preferably be performed together with EEG monitoring; a normal EEG helps to confirm the diagnosis.<sup>116,117</sup> In the absence of an EEG, a video recording will be helpful in confirming the diagnosis.</li> <li>• Tilt testing should not be used to assess the efficacy of a drug treatment.<sup>118</sup></li> </ul>		

# Tilt testing remains a valuable asset

Richard Sutton <sup>1\*</sup>, Artur Fedorowski <sup>2</sup>, Brian Olshansky <sup>3</sup>, J. Gert van Dijk<sup>4</sup>, Haruhiko Abe<sup>5</sup>, Michele Brignole <sup>6</sup>, Frederik de Lange <sup>7</sup>, Rose Anne Kenny<sup>8</sup>, Phang Boon Lim<sup>9</sup>, Angel Moya<sup>10</sup>, Stuart D. Rosen<sup>11</sup>, Vincenzo Russo<sup>12</sup>, Julian M. Stewart <sup>13</sup>, Roland D. Thijs <sup>4</sup>, and David G. Benditt<sup>14</sup>

## Diagnostic Utility in VVS

1. Reproducing Spontaneous Symptoms
2. Identifying Haemodynamic Features
  - a. Mixed
  - b. Cardioinhibitory
  - c. Vasodepressor
3. Understanding Contributions of Brady/Asystole vs Vasodepression to LoC





## Typical Tilt-Test Recordings

1. ECG
2. Beat-to-beat BP
3. Others on Selected Basis
  - a. EEG
  - b. Video
  - c. Measures of Cerebral Perfusion

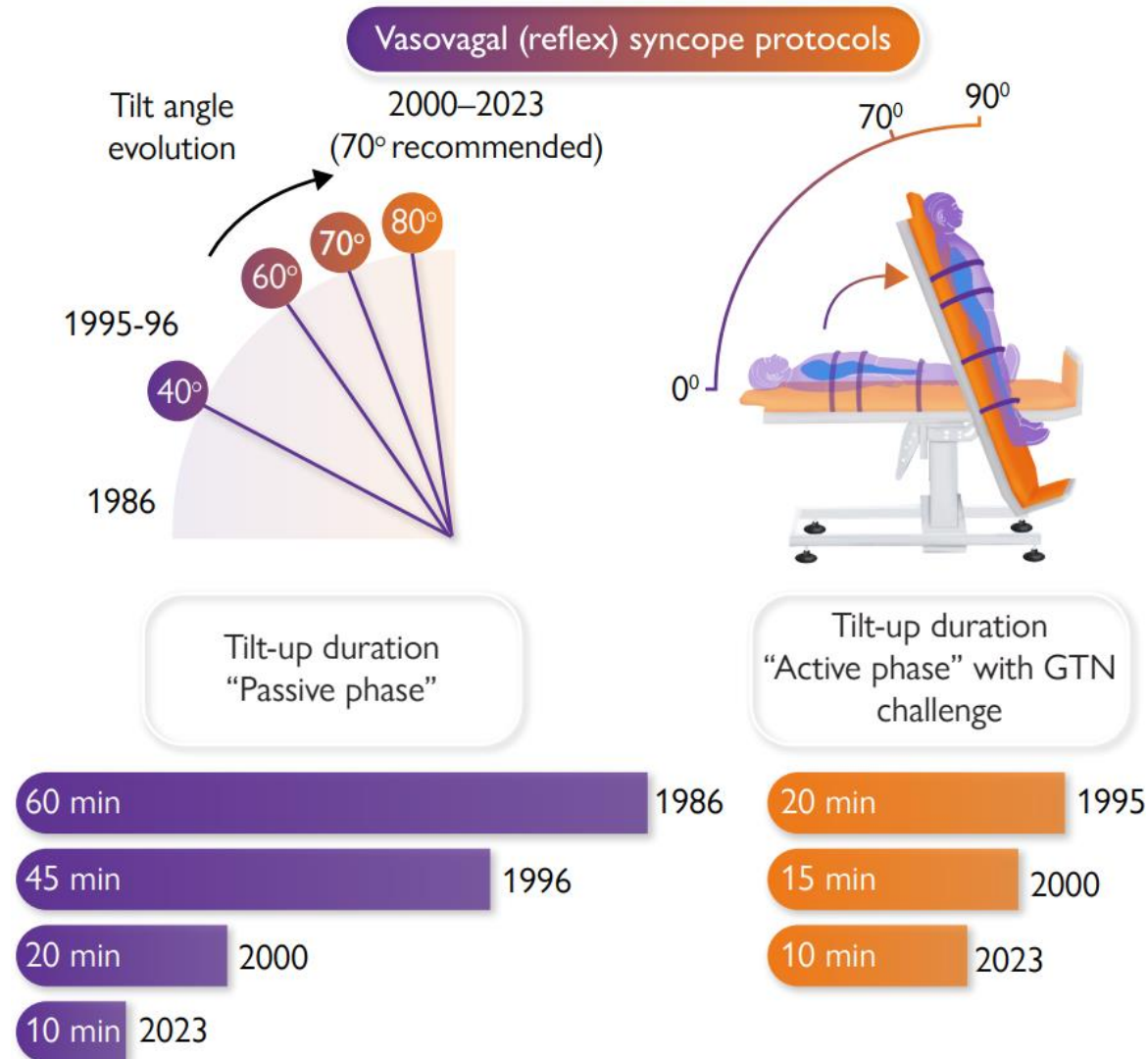
## Utility in Symptom Management

1. Warning Symptom Recognition
  - a. Understanding Importance and Nature of Prodromes
  - b. Initiate Protective Movement
2. Therapy Intervention
  - a. Reassurance
  - b. Counter-pressure Manoeuvres
  - c. Potential Pacing Utility

# Tilt testing evolves: faster and still accurate

Artur Fedorowski <sup>1,2,\*</sup>, Robert Sheldon <sup>3</sup>, and Richard Sutton <sup>2,4</sup>

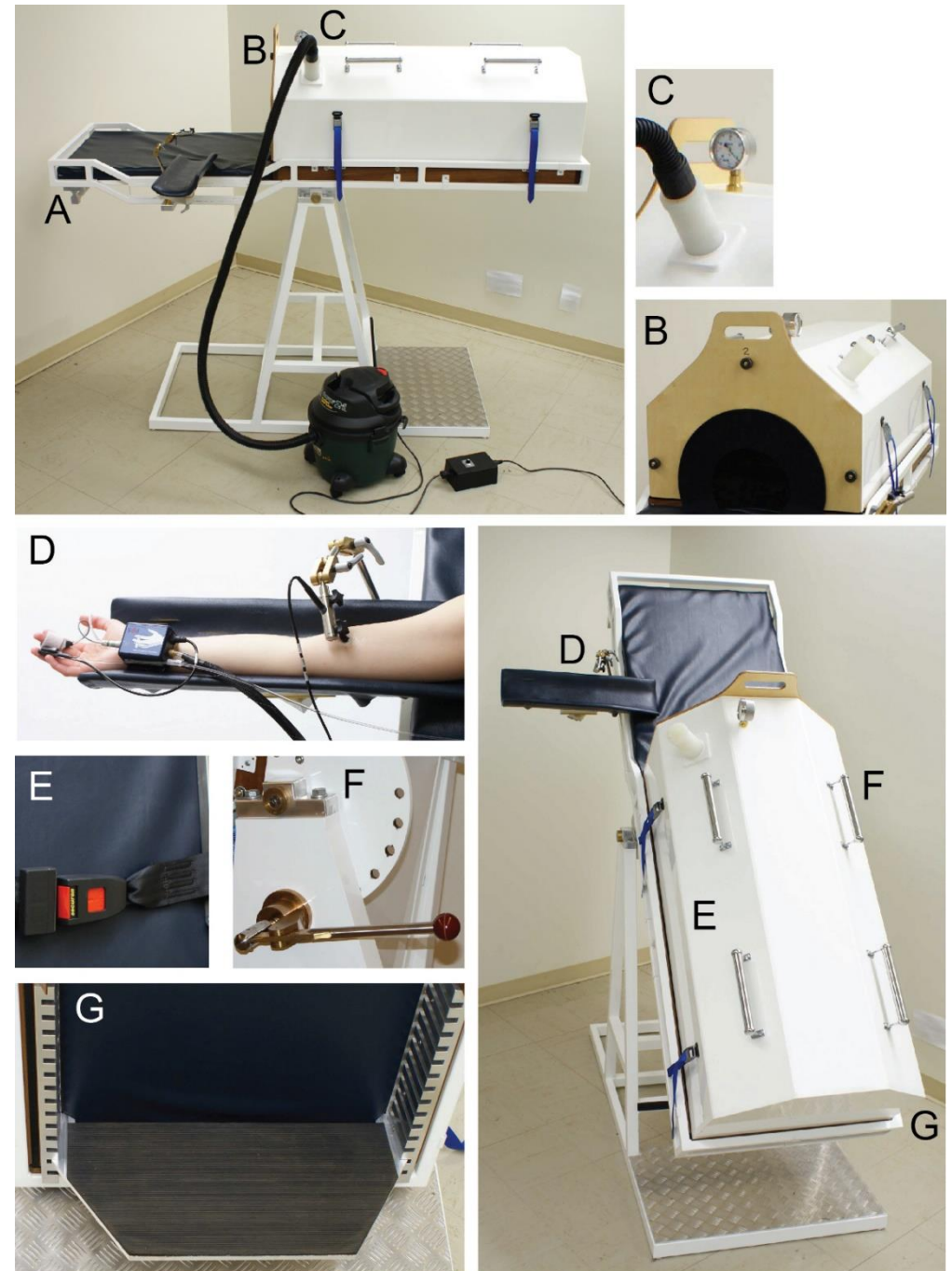
Evolution of tilt test protocol for syncope and autonomic dysfunction (1986–2023)



# Combined Head-Up Tilt and Lower Body Negative Pressure as an Experimental Model of Orthostatic Syncope

PAUL LELORIER, M.D., GEORGE J. KLEIN, M.D., ANDREW KRAHN, M.D.,  
RAYMOND YEE, M.D., ALLAN SKANES, M.D., and J. KEVIN SHOEMAKER, Ph.D.\*

- SUPINE STABILIZATION FOR 5 MINUTES
- TILT UP 60° FOR 5 MINUTES
- INCREMENTAL LEVELS OF LBNP -10 MMHG, 5 MINUTES EACH
- LBNP STAGES ADVANCED UNTILL PRESYNCOPE OCCURRED



# **PROVOCATION OF BRADYCARDIA AND HYPOTENSION BY ISOPROTERENOL AND UPRIGHT POSTURE IN PATIENTS WITH UNEXPLAINED SYNCOPE**

ADRIAN ALMQUIST, M.D., IRVIN F. GOLDENBERG, M.D., SIMON MILSTEIN, M.D., MENG-YANG CHEN, M.D., XIAOCHUN CHEN, M.D., RONNELL HANSEN, CHARLES C. GORNICK, M.D., AND DAVID G. BENDITT, M.D.

## **Upright TT protocol**

TILT UP 80° FOR 10 MINUTES

## **Upright TT during isoproterenol infusion**

SUPINE IV INFUSION OF ISOPROTERENOL 1 MCG/MIN FOR 5 MINUTES

TILT UP 80° FOR  $\leq$  10 MINUTES

If the patient remained asymptomatic during the upright phase, the procedure was repeated  
With use of graded infusion rate of up to 5 mcg/min

# **‘The Italian Protocol’: a simplified head-up tilt testing potentiated with oral nitroglycerin to assess patients with unexplained syncope**

A. Bartoletti<sup>1</sup>, P. Alboni<sup>2</sup>, F. Ammirati<sup>3</sup>, M. Brignole<sup>4</sup>, A. Del Rosso<sup>5</sup>,  
G. Foglia Manzillo<sup>6</sup>, C. Menozzi<sup>7</sup>, A. Raviele<sup>8</sup> and R. Sutton<sup>9</sup>

Methodology of the nitroglycerin-head-up tilt according to ‘The Italian Protocol’:

Stabilization phase: 5 min in the supine position





Passive phase: 20 min of passive tilt at 60°

Provocation phase: further 15 min after sublingual spray of nitroglycerin 400 µg at 60°

Test interruption: (1) Completion of the protocol in the absence of symptoms  
(2) Syncope  
(3) Progressive (>5 min) symptomatic orthostatic hypotension.



# Short-duration head-up tilt test potentiated with sublingual nitroglycerin in suspected vasovagal syncope: the fast Italian protocol

Vincenzo Russo <sup>1\*</sup>, Erika Parente<sup>1</sup>, Marco Tomaino<sup>2</sup>, Angelo Comune<sup>1</sup>, Antonella Sabatini<sup>2</sup>, Nunzia Laezza<sup>1</sup>, Domenico Carretta<sup>3</sup>, Gerardo Nigro <sup>1</sup>, Anna Rago<sup>1</sup>, Paolo Golino <sup>1</sup>, and Michele Brignole <sup>4</sup>

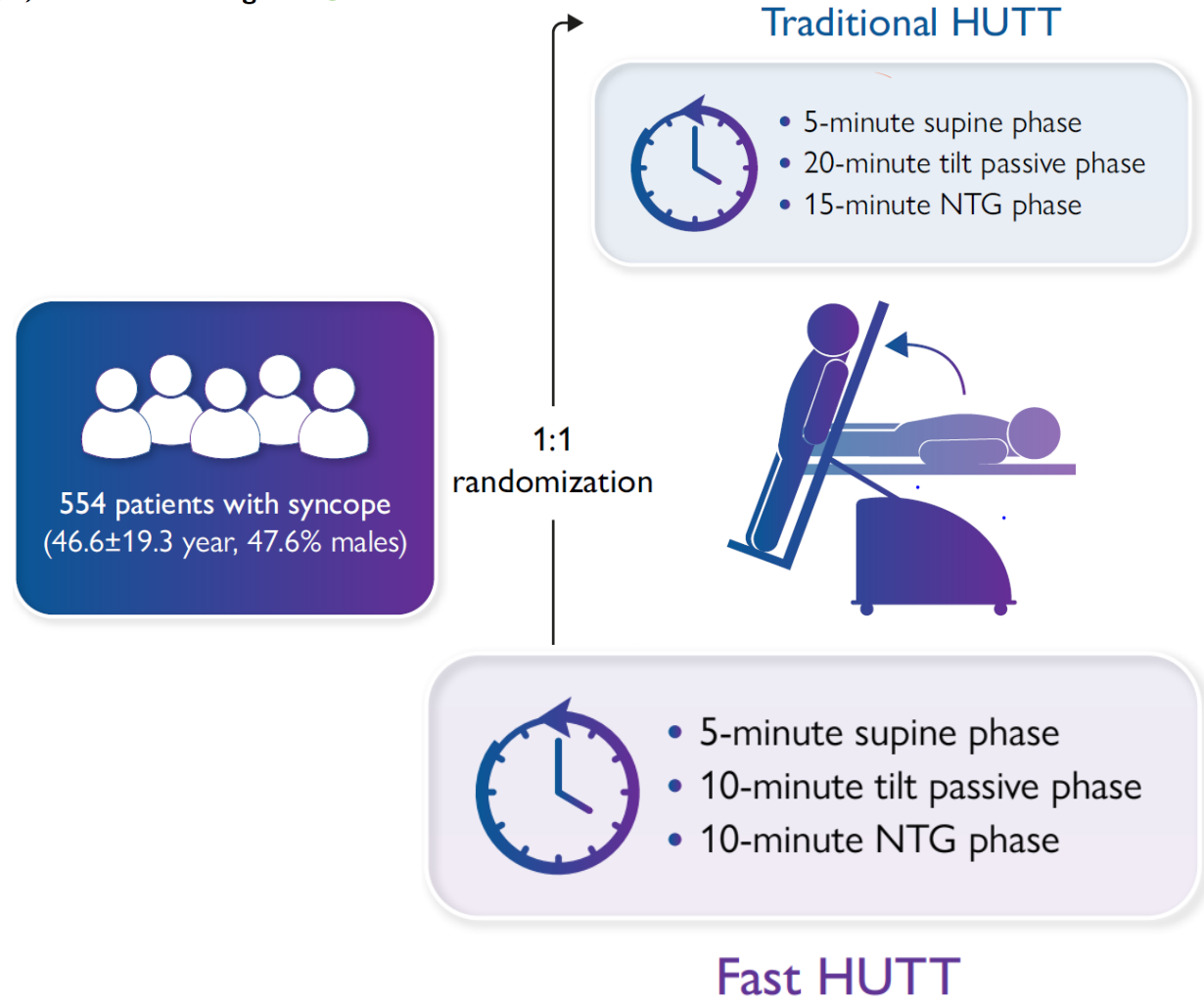
## Key Question

- The widely used nitroglycerin (NTG) potentiated head-up tilt test (HUTT) protocol is time-consuming.
- The diagnostic yield of a short-duration protocol may not be inferior to traditional HUTT.

# Short-duration head-up tilt test potentiated with sublingual nitroglycerin in suspected vasovagal syncope: the fast Italian protocol

Vincenzo Russo <sup>1\*</sup>, Erika Parente <sup>1</sup>, Marco Tomaino <sup>2</sup>, Angelo Comune <sup>1</sup>, Antonella Sabatini <sup>2</sup>, Nunzia Laezza <sup>1</sup>, Domenico Carretta <sup>3</sup>, Gerardo Nigro <sup>1</sup>, Anna Rago <sup>1</sup>, Paolo Golino <sup>1</sup>, and Michele Brignole <sup>4</sup>

ALMOST THE SAME RATE OF POSITIVE RESPONSES  
58.5% VS 60.3%



*Come interpretare la stessa positività,  
nonostante la riduzione della durata?*

**Table 2** HUTT positivity and responses among patients who underwent fast or traditional protocols

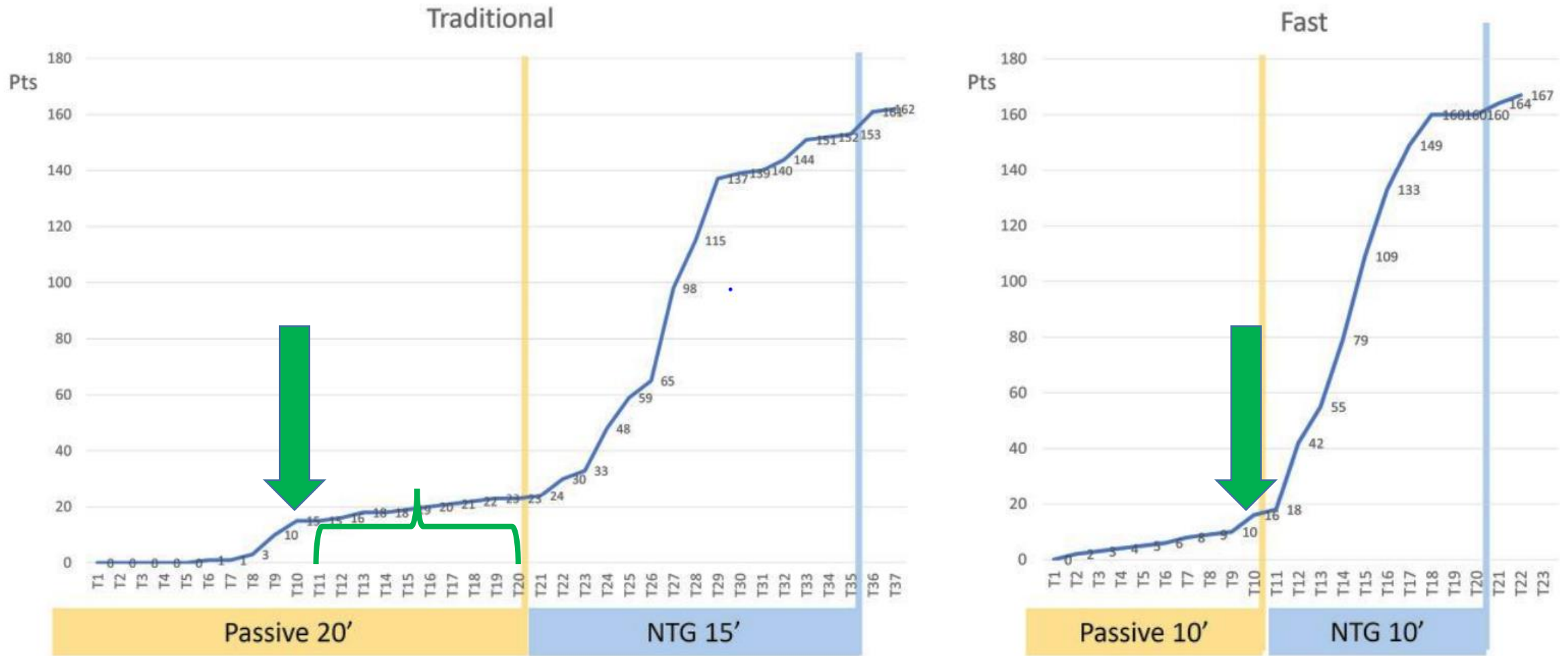
	Fast HUTT		Traditional HUTT		<i>P</i> -value
	<i>n.</i> 277		<i>n.</i> 277		
	<i>n</i> (%)	95% CI	<i>n</i> (%)	95% CI	
Overall positivity <i>n</i> (%)	167 (60.3)	54.3–66.1	162 (58.5)	52.4–64.3	0.73
Passive phase <i>n</i> (%)	16 (5.8)	3.3–9.2	26 (9.4)	6.2–13.4	0.07
Active phase <i>n</i> (%)	151 (54.5)	48.4–60.5	136 (49.1)	43.1–55.1	0.23
M	<p>In the Fast group, there was a trend of lower prevalence of vasodepressor response than in the Traditional group (14.8% vs. 20.6%), which was significant during the passive phase (<math>P = 0.01</math>).</p>				
C					
Active phase <i>n</i> (%)	53 (19.1)	14.7–24.3	46 (16.6)	12.4–21.5	0.51
Vasodepressor form <i>n</i> (%)	41 (14.8)	10.8–19.5	57 (20.6)	16.0–25.8	0.09
Passive phase <i>n</i> (%)	4 (1.4)	0.4–3.7	16 (5.8)	3.3–9.2	0.01
Active phase <i>n</i> (%)	37 (13.3)	9.6–17.9	41 (14.8)	10.8–19.5	0.61

**Table 3** Systolic and diastolic blood pressure and heart rate during HUTT in the fast and traditional groups

	Systolic BP, mmHg			Diastolic BP, mmHg			Heart rate, b.p.m.		
	F-HUTT n. 277	T-HUTT n. 277	P-value	F- HUTT n. 277	T-HUTT n. 277	P-value	F-HUTT n. 277	T-HUTT n. 277	P-value
Supine pre-tilt,	124.9 ± 15.3	123.0 ± 18.3	0.18	75.4 ± 10.9	74.3 ± 10.3	0,22	68.0 ± 9.2	67,0 ± 13.4	0.30
Passive 1 min,	128.5 ± 17.4	127.4 ± 16.8	0.45	79.6 ± 10.7	80.0 ± 11.8	0.68	78.2 ± 14	80,0 ± 18.8	0.20
Passive 10 min,	122.5 ± 17.0	123.1 ± 16.6	0.67	72.8 ± 8.8	73.5 ± 10.7	0.40	81.4 ± 13.1	80.2 ± 17.8	0.37
Passive 20 min,	-	126.8 ± 16.7	-	-	78.7 ± 10.4	-	-	80.1 ± 18.0	-
NTG 1 min,	111.4 ± 13.4	112.9 ± 16.1	0.23	70.2 ± 9.9	72.4 ± 11.7	0.17	98.7 ± 19.0	100.6 ± 19.1	0.24

Values are reported as mean ± SD.

BP = blood pressure; F-HUTT = Fast head-up tilt test; T-HUTT = Traditional head-up tilt test; NTG = nitroglycerin.

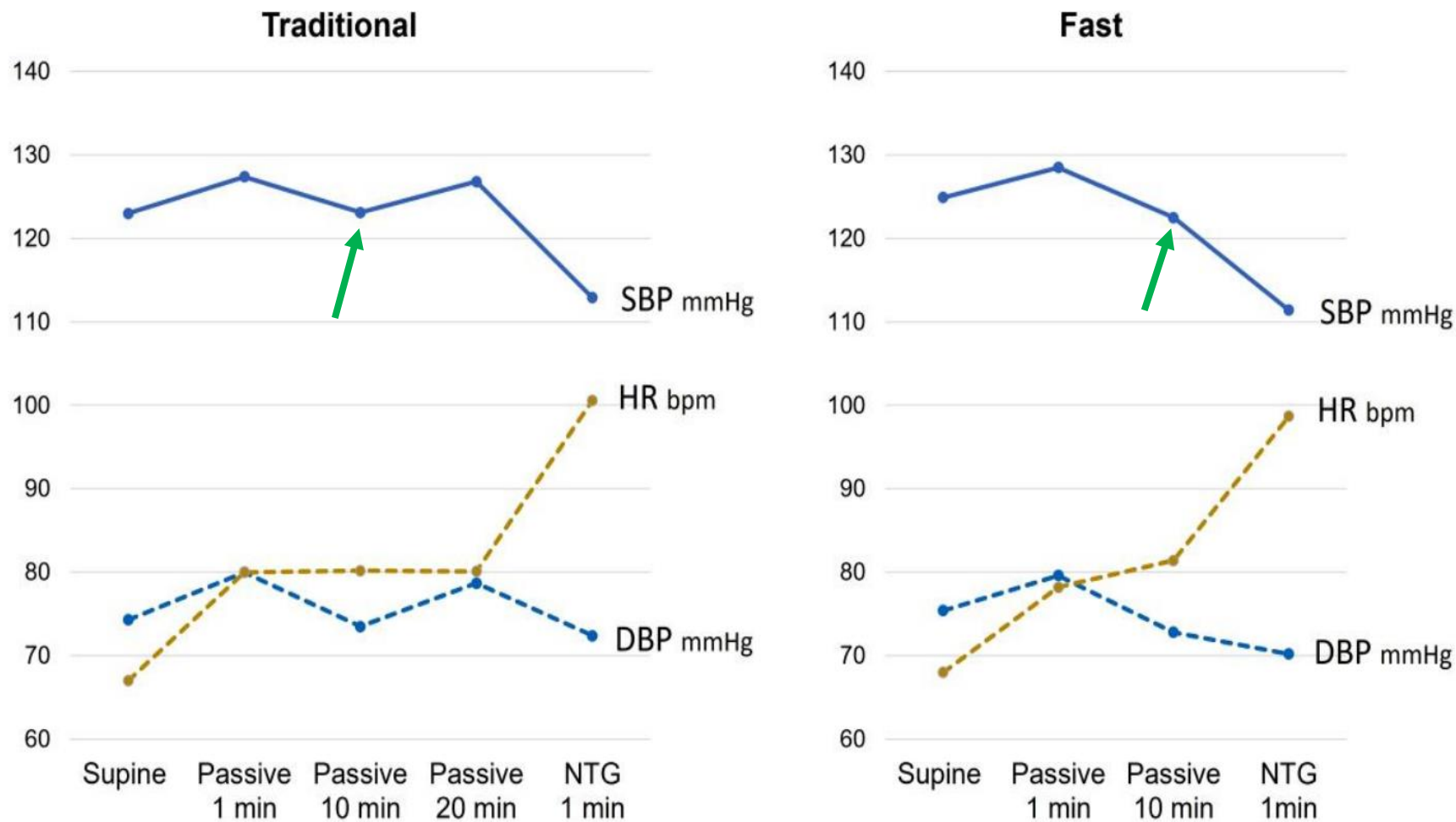


**Figure 1** Cumulative number of patients with positive HUTT response (by 1 min time frame) during both passive and NTG phases in the two groups. Pts: patients; T: time

*a total of 16 (5.8%) and 26 (9.4%) patients had syncope during the passive phase (P = 0.07).*

The effect of orthostatic stress was maximum at the 10th minute

The hemodynamic effect of NTG was more powerful and rapid when administered in an already predisposed critical situation





**Figure 2** Pattern of blood pressure and heart rate changes observed during both passive phase in the two groups. SBP: systolic blood pressure; DPB: diastolic blood pressure; HR: heart rate

## NTG PHASE DURATION

The boost effect of NTG administration at the 10th minute of the passive phase was able to speed up and facilitate the vasovagal reflex in the Fast group which showed a shorter time to syncope. Indeed, we showed a significantly increased HUTT positivity during the 10 min NTG phase in the Fast group compared to the first 10 min of NTG phase in the Traditional group (151 vs. 101 patients,  $P = 0.0001$ ). As a consequence, the duration of the NTG phase could be reduced from 15 min in the Traditional to 10 min in the Fast protocol.



# Short-duration head-up tilt test potentiated with sublingual nitroglycerin in suspected vasovagal syncope: the fast Italian protocol

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## Key Finding

- Patients were randomized to fast (n=277) or traditional HUTT (n=277) protocol.
- The test was positive in 167 (60%) patients with fast and in 162 (59%) patients with traditional HUTT.
- Fast protocol did not significantly influence the type of haemodynamic response.

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## Take Home Message

- The diagnostic yield of the fast protocol is similar to that of traditional HUTT.
- The duration of the test is reduced by 38% from 40 min to 25 min.

## Practical implications

The total duration of the Fast protocol is 25 min (including the initial 5-min supine pre-tilt phase) and it is similar to that of other non-invasive provocative tests widely used in cardiology such as pharmacological stress echo, exercise testing, or stress scintigraphy. We are confident that the Fast Italian HUTT will be accepted by physicians who can save time and by health administrators who can reduce costs, thus finally favoring its widespread utilization in clinical practice.