Bilateral transcranial doppler monitoring in patients with neurocardiogenic syncope.


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Prior reports have demonstrated cerebrovascular autoregulation abnormalities in patients with neurocardiogenic syncope. Till Test examination (TT) only assesses changes in blood pressure and heart rhythm. Transcranial Doppler (TCD) monitoring of middle cerebral artery blood flow velocities (MCA-BFV) allows non-invasive assessment of changes in cerebral circulation during syncope provocation maneuvers. The aim of the present investigation was to evaluate the cerebral circulation using bilateral TCD monitoring of MCA-BFV during TT in patients with diagnosis of neurocardiogenic syncope or pre-syncopal events. We studied 93 subjects aged 49±23 years (55 males/58 females). TT with TCD monitoring was performed using standard criteria after a 3-hour fasting period. Patients were placed in supine position during 10 minutes (baseline conditions), then moved to 60° for 45 minutes, and to 80° for 15. MCA-BFV were monitored continuously; baseline velocity and lowest velocity during TT were recorded. Heart rate and blood pressure were registered. Paired and unpaired Student's t tests (two-tailed) were used for statistical analysis. 56 patients (60%) had syncopal or pre-syncopal events. MCA-BFV in this group diminished from 64±16 cm/sec at baseline to 26±11 cm/sec during TT (p<0.0001). Clinical and hemodynamic changes were preceded in every case by marked deepening of the dicrotic notch on the MCA-BFV waveform. 37 patients (35%) had syncopal or pre-syncopal events during TT (asymptomatic group). MCA-BFV in this group diminished from 61±18 cm/sec at baseline to 49±16 cm/sec during TT (p<0.0001). Dicrotic notch deepening was observed in 7 patients. There were no differences in MCA-BFV at baseline between symptomatic and asymptomatic groups. However, percentage drop in MCA-BFV was larger in symptomatic subjects, 57±19% vs 25±15% (p<0.0001). In conclusion, patients with neurocardiogenic syncope have distinct cerebrovascular alterations during TT including marked lowering of BFV and deepening of the dicrotic notch. These changes are more profound in patients who developed symptoms during TT and often precede clinical and hemodynamic changes. We hypothesize that they probably reflect impaired cerebrovascular autoregulation. The routine use of TCD monitoring during TT may help better define the characteristics of the neurocardiogenic response in these patients and may increase the usefulness of the test.
Role of galanin in the genesis of vasovagal syncope

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Galanin (Gal) is a neuropeptide, distributed in the central and peripheral nervous systems, that interacts with autonomic system and neurotransmitters. The aim of this study was to investigate whether Gal may play a role in the genesis of vasovagal syncope (VVS). Twelve patients (pts) with history of VVS and 6 healthy subjects underwent tilt test; Gal and catecholamine plasma levels were measured during the test. Seven pts developed syncope, whereas no healthy subject had a positive response. In healthy subjects, Gal did not change during tilting. In pts with VVS and negative response, Gal increased (p<0.02) at 3 min of tilting and then showed further increases. In pts with positive response, Gal did not change. In pts with positive response, epinephrine markedly increased during the prodromic symptoms and the loss of consciousness, whereas norepinephrine remained practically unchanged. This study shows a different behaviour of Gal during tilting in healthy subjects and in pts with a history of VVS and suggests a role for Gal in the adaptive responses to orthostatic stress in these pts, preventing VVS.

Complementarity of tilt test and ATP test

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Recently the ATP test proved to be a simple, safe bedside test which identify patients at risk for cardiovascular (vasovagal) syncope (CVS). The aim of our study was to assess the complementarity of HUT and ATP tests. We selected 25 patients (pts.) with documented positive HUT for CVS (group A) and 27 pts. with documented positive ATP test (group B). The pts. in group A performed HUT test on two different occasions and the pts. in group B performed passive and isoperistaltic HUT by standard protocol on two different occasions. A positive HUT was defined by the reproduction of CVS – in both occasions. A positive ATP test was defined by a phase III response with a pause greater than 10 seconds after injection of 20mg of ATP - in both occasions. Among group A 5 pts. (20%) had a positive ATP test and among group B 6 pts. (22%) had a positive HUT. All these 11 pts. with two positive tests had cardiac diseases and older age.

Conclusion: HUT and ATP tests seem to identify different mechanisms of cardiovascular syncope. The positivity of both tests seem to correlate with older age and the presence of cardiac disease.

Hospital diagnostic pathway (HDP) of syncope: guidelines impact analysis

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OBJECTIVES: compare appropriateness and costs of an HDP reflecting usual clinical practice and new HDP, after introduction of guidelines.

METHODS: using Activity Based Management diagnosed syncope costs were calculated considering all syncope patients admitted to the ER of S.Chiara Hospital between 1/8/99 and 31/10/99 and between 1/3/00 and 31/5/00.

RESULTS: no relevant changes between the two phases were identified because of low compliance to guidelines, doctors were interviewed to detect reason for such result. LOS increased from 9 to 11.3 days, although hospitalization decreased from 53% to 42%, and diagnostic tests from 2.6 to 2.9 per patient. Significant increase of tilt test and carotid echo Doppler. Patients without diagnosis decreased from 51% to 45.8% and principal causes were: vascular brain disease (35.1% phase 1 vs 33.7% phase 2), neurolymphatic mechanisms (35.3% vs 42.2%) and cardiac problems (50.2% vs 16.2%). Waiting lists to diagnostic procedures drove total costs that increased from 3.474 to 3.647 Euro. LOS represented main cost driver (84%).

CONCLUSIONS: guidelines introduction for syncope patients needs structure flexibility and multidisciplinary approach, both difficult to implement without a dedicated ambulatory.

Tilt training in neurocardiogenic syncope: a time-dependent benefit?

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Recently, tilt training has been reported to be effective in preventing symptoms in patients resistant to or intolerant of traditional pharmacotherapy, but the duration of such a tilt training program has not been established yet. Thus, to assess whether the positive effects of tilt training would be time-dependent the following prospective study was undertaken.

Methods: Twelve patients (Pts; mean age 32.9 ± 10 years) with severe recurrent syncope (6.1 ± 2.3 yearly episodes), previously rendered symptom-free by once- or twice-a-day tilt training sessions of 20 (5 Pts), 30 (5 Pts) or 40 minutes (2 Pts), who failed to comply with the program after a mean period of 23 ± 4 months (range: 2-20), were retrospectively asked for syncope recurrence. Results: Only 3 Pts (25%) are still symptom free after 9 months. The other nine Pts (75%) became symptomatic for syncope within a mean period of 3.25 ± 1.0 months (range 1.25 - 7). No correlation between tilt training duration and time to symptoms’ relapse was observed (r = - 0.43). Conclusions: The effects of tilt training on neurocardiogenic syncope seem to be time-dependent, since most of the Pts who failed to comply with the program experienced symptoms. The duration of the program does not correlate with the time to symptoms’ relapse.
Prevention of recurrent vasovagal syncope by dual chamber pacing.
Identification of potential responders with initial positive tilt test.

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In vasovagal syncope (VVS) identified by positive tilt testing (TT +), whether a permanent cardiac pacing could prevent syncope recurrence remains unclear. Pacemaker (PM) with algorithm able to assess the cardiac systolic function (dp/dt) and to initiate a compensatory rapid pacing could be adapted for detecting the abrupt drop of BP occurring during VVS with TT (+) and to prevent syncope recurrences. The goal of this preliminary study is to assess the potential efficacy of such pacing in VVS pts with TT (+) before PM implantation.

Methods. After a reference Wesminster TT (+), 10 VVS pts (5 M, 5 F, mean age 65.5 years) underwent an EP study (EPS) followed by a 2nd TT performed on a temporary DDD pacing at 110 bpm. with an AV delay of 120 ms. The time to syncope occurrence was compared between both tests. These pts were compared with a control group of 10 VVS pts with negative TT.

Results. For the 10 TT (+) pts, syncope was reproduced in all pts after 10 min. (range 2-29 min.) during the reference TT; BP dropped by 58% from 140/107 to 70/84 mm Hg and HR by only 20% (NS). The EPS was negative in all pts. The 2nd TT was still positive in 9 pts; syncope occurred after 1.5 min; BP and HR dropped by 43%. In the last pt., BP dropped by 60% but, as syncope was delayed (62 min), a Blotronik® Ions-CLS was implanted which improved his follow-up.

Conclusion. VVS patients with TT + who might benefit from a permanent dual chamber pacing must be carefully identified. A temporary rapid DDD pacing performed during a 2nd tilt testing could represent a constructive approach.

Neurocardiogenic syncope: sensitivity and specificity of tilt test using clomipramine as drug challenge.

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In the present study, we evaluated the diagnostic utility of clomipramine (CLPR), a serotonin re-uptake inhibitor, as a new drug challenge during tilt test for the diagnosis of NCS. We studied 81 patients (pts. mean aged 38±11 years, with typical history of neurocardiogenic syncope (group 1) and 32 healthy sex and age-matched controls (group 2). All subjects were sequentially tilted, in a randomized way, to 60°-a) for 30minutes (min.), followed by up to 10μg isoproterenol (ISO) iv infusion and b) for 20min with 5mg CLPR infused during the first 5min of tilt. Intervals between tests were 24 hours. The development of syncope/presyncope associated with significant bradycardia/asystole and concomitant fall in blood pressure was considered as positive response.

Positive test responses
Tilt + ISO Tilt + CLPR
Positive history [n=81] 41 68
Controls [n=32] 2 4
Test sensitivity 51% 94%
Test specificity 94% 87%

Tilt tests with CLPR were positive 6/12 min after the beginning of drug infusion. Therefore, if we consider typical NCS history the gold standard for NCS diagnosis, CLPR challenge during tilt increases significantly the sensitivity without affecting the specificity of the test. Therefore, this test might be a valuable tool in the study of pts with syncope of unknown etiology.
Role of chronotropic intervention by pacing in carotid sinus syndrome
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Heart Institute (InCor) University of Sao Paulo Medical School, Brazil

Objectives: To verify the role of heart rate increasing provided by pacing in order to improve hemodynamic and alleviate symptoms of carotid sinus syndrome (CSS).

Patients and Methods: We’ve studied 13 patients with dual-chamber pacemaker and CSS. All patients underwent blood pressure monitoring by Finapress system at rest and during carotid sinus compression. Symptoms were registered and correlated with the exams findings. Evaluations were performed in the following conditions: condition 1) pacing off, condition 2) pacing at standard programming, condition 3) high rate pacing (90 - 100 bpm).

Results: Mean blood pressure during the carotid sinus compression: condition 1) 56.9mmHg, condition 2) 63.2mmHg, condition 3) 67.7mmHg. A significant statistical difference (p=0.03) was observed between condition 3 and 1 but not between condition 2 and 1, showing an additional benefit due to chronotropic intervention. The same behavior was observed in respect of symptoms: a significant reduction of the number of symptomatic patients at condition 2 and 3.

Conclusions: The chronotropic increasing due to artificial stimulation, as acute therapeutic intervention, in patients with CSS is effective in improving clinical and hemodynamic performance.

Pathophysiology of vasovagal syncope: a biochemical study
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University of Debrecen, 1st Department of Medicine, Hungary

It has been reported that in patients (pts) with vasovagal syncope (VVS) during head up tilt test (HUTT) noradrenaline levels were elevated just before syncope. The aim of our study was to evaluate the changes in endothelin-1 (ET-1) and NOx levels during HUTT and the test at the onset of VVS, and 3 hours later. Basal levels of ET-1 were higher (1.55±0.17 pg/mL vs. 0.32±0.15 pg/mL, p<0.05) and NOx were lower in VVS pts than they were in controls (20.58±16.17 vs. 38.28±16.17 pg/mL, p<0.01). The levels of NOx in all examined pts increased while levels of ET-1 decreased during HUTT. In CI pts (18%) the NOx level transiently decreased (from 38±61548±2 M to 15±61548±9 M after the initiation of HUTT, and remained low 1 hour after event. In VD group (40%) no changes in the NOx levels were observed, and in MX pts (42%) NOx increased during HUTT (from 39±61548±2 M to 78±61548±9 M) and returned to baseline after 1 hour of event. At the same time ET-1 were stable during HUTT in CI group, increased slightly in VD group, and decreased in MX pts.

Conclusions: The results suggest a dysfunction of endothelium in NCS.

Spontaneous baroreflex and non-baroreflex sequences during tilt test
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Hospital de Agudos Juan A Fernandez, Santa Rosa, Buenos Aires, Argentina

In order to evaluate the behavior of slopes of spontaneous baroreflex (BRS) and non-baroreflex sequences (NBRS) during tilt test (TT), 12 pts with syncope (TT+: n=6, mean age=29.3 years, and TT-: n=6, mean age=35.2 years) were studied. The sequences were analyzed during equal or more than 3 consecutive cycles from continuous beat to beat non invasive records of cycle length and systolic blood pressure (SBP), and were classified as BRS (cordan type 0/0 and 0/1), and as non BRS (discordant changes, +/- or -/-). The slope (ms/mmHg) of each sequence with coefficients of correlation (r2) >0.85 was calculated. The mean slopes during baseline and during TT were obtained for 15 minutes or until syncope occurred.

Conclusions: Spontaneous BRS and NBRS slopes decrease during TT in pts with TT+. Slopes of BRS of TT- are lower during tilt in pts with positive outcome. This behavior may indicate a failure in the baroreflex and non-baroreflex homeostatic mechanisms during TT in patients with vasovagal syncope.
The aim of this study was to evaluate whether adenosine test (Ado-test) could be a useful, non-invasive method for the diagnosis of sick sinus syndrome (SSS) in patients (pts) with syncope or presyncope.

In 30 pts, 12 f and 18 m, mean age 67.2±17.9 y, with a history of syncope or presyncope and normal 12-lead ECG, under continuous ECG monitoring and with defibrillator available, a bolus of 0.3 mg/kg adenosine was administered through the antecubital vein. The longest post-adenosine SCL (Ado-cSNRT) was corrected for the baseline SCL (Ado-cSNRT) and administered through the antecubital vein. The longest post-adenosine SCL (SSS) in patients (pts) with syncope or presyncope.

Does clomipramine tilt test assess the therapeutic efficacy in neurocardiogenic syncope?

In pts with recurrent neurocardiogenic syncope (NCS), we prospectively compared clomipramine head-up tilt test (Clo-HUTT) with isoproterenol head-up tilt test (Iso-HUTT) in order to evaluate the response to treatment. Forty-four consecutive pts (18 m and 28 w, mean age 36±17 y) with history of recurrent NCS underwent both Clo-HUTT and Iso-HUTT in a randomized sequence. An interval of 24 h was interspersed between the two tests. Following 6 months of treatment with clomipramine or propranolol, the two HUTTs were repeated. We compared the response to both HUTTs before treatment with that during treatment.

Motor vehicle accident with complete loss of consciousness due to neurocardiogenic syncope

In a 23-year-old man was admitted to the hospital after a motor vehicle accident with complete loss of consciousness due to neurocardiogenic syncope (NCS). He had no previous cardiac or neurological history. He awoke in the emergency ward with no memory of the accident and reported no presyncopal symptoms. After convalescence for serious injuries, he underwent a complete cardiac and neurologic assessment. Cardiac non-invasive tests and cardiac electrophysiology results were normal. After a 60-degree HUTT test was used and the vasodepressor type of NCS occurred. After start of 50 mg metoprolol, the HUTT was repeated under the same conditions. During the 45 minutes of HUTT test syncope did not recur. In an 18-month follow-up period the pt with combined therapy of tilt training and 50 mg metoprolol was free of symptoms. This case report represents a potentially fatal accident injury due to NCS, and it has to be taken into consideration during decision making for issue of driving license in patients with NCS.
The role of pacing in preventing syncope in repeated head up tilt test - preliminary report

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In some patient with vasovagal syncope (VVS) DDD pacing do not prevent syncope. The aim of this study was to evaluate efficacy of dual chamber pacing (ACTIONS D and DR - Biotelemetry) in preventing syncope during head up tilt test (HUT).

Study group of 8 pts. with pacemaker implanted for VVS in whom pacing was activated during HUT. In 3 pts. Group I pacemaker was activated during prodromal symptoms. In 5 pts (Group II) pacemaker activation do not prevent syncope during HUT

Methods Pacemaker was programmed according to the manufacturer instructions: basic rate 100ppm, hysteresis -50ppm. HUT was performed according to the Westminster protocol and if negative with 300 µg s.i. glyceryl trinitrate (GTN). Blood pressure was measured non-invasively with Fortipress Model - 2 (TNO-TPD Biomedical Instrumentation, Amsterdam). Ambulatory ECG was performed during HUT. Mean diastolic blood pressure was recorded: after 5 minutes in upright position meanBP-5L, in the moment of pacemaker activation meanBP-paced and 10 sec after pacing meanBP+pace. Time from the beginning of BP drop to pacemaker activation (d-RR/pace), time from HR drop to pacemaker activation (d-HR/pace) were recorded. Difference between d-RR/pace and d-HR/pace was calculated.

Results

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>Group I</th>
<th>Group II</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>meanBP-5l</td>
<td>87±16.1</td>
<td>83.2±15.3</td>
<td>0.76</td>
</tr>
<tr>
<td>meanBPpace</td>
<td>56±5.6</td>
<td>35.2±3.6</td>
<td>0.09</td>
</tr>
<tr>
<td>meanBP-paced</td>
<td>64±3.7</td>
<td>23.2±2.2</td>
<td>0.08</td>
</tr>
<tr>
<td>d-RR/pace</td>
<td>95.7±104.9</td>
<td>102.6±62.2</td>
<td>0.92</td>
</tr>
<tr>
<td>d-HR/pace</td>
<td>103±104</td>
<td>87.8±80.6</td>
<td>0.94</td>
</tr>
<tr>
<td>d-HR/pace - sec</td>
<td>2.7±2.5</td>
<td>20.5±9.9</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Statistical analysis was performed with chi 2 test (p=0.11

1. It seems that pacemaker activation in the beginning of vasovagal reaction, when BP starts to drop, is crucial for prevention of syncope.
2. Start of pacing with basic rate after significant BP drop (>40mmHg) does not increase BP during HUT
3. In patients with significant difference between beginning of drop of BP and HR pacing do not prevent syncope

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Does the glyceryl trinitrate (GTN) administration during the head-up tilt test increase the number of side effects?

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Side effects observed during Head-up tilt (HUT) table test with pharmacological provocation are the essential problem. The aim of the study was to assess the frequency of the side effects during passive HUT and tiltting with GTN provocation. The study group consists of 2B3 pts. All the patients underwent passive HUT, performed according to the Westminster protocol. In 164 pts pharmacological provocation with GTN was used. 300µg of GTN was administered sublingually after 45 minutes negative passive HUT. The following side effects were assessed: prolonged hypotension (longer than 10 minutes after horizontal position, despite Trendelenburg position), severe hypotension (longer than 10 minutes after horizontal position), vomiting, and required fluid infusion, prolonged bradycardia required atropine administration, cardio-pulmonary resuscitation (CPR), vomiting and headache.

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Passive HUT</th>
<th>GTN HUT</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prolonged hypotension</td>
<td>5pts (1.8%)</td>
<td>21pts (12.8%)</td>
<td>0.0002</td>
</tr>
<tr>
<td>Severe hypotension</td>
<td>1pts (0.4%)</td>
<td>12pts (7.0%)</td>
<td>0.0001</td>
</tr>
<tr>
<td>Prolonged bradycardia</td>
<td>2pts (0.7%)</td>
<td>6pts (3.9%)</td>
<td>0.02</td>
</tr>
<tr>
<td>CPR</td>
<td>1pt (0.4%)</td>
<td>2pts (1.2%)</td>
<td>0.28</td>
</tr>
<tr>
<td>Vomiting</td>
<td>2pts (1.2%)</td>
<td>12pts (7.0%)</td>
<td>0.0001</td>
</tr>
<tr>
<td>Bradycardia</td>
<td>6pts (2.1%)</td>
<td>16pts (9.8%)</td>
<td>0.0003</td>
</tr>
</tbody>
</table>

Statistical analysis was performed with chi 2 test (p<0.01)

Conclusions: Side effects were observed significantly frequent after GTN administration than in passive HUT. Severity of them may require the additional treatment.
Evaluation of tilt training in the treatment of recurrent neurally mediated syncope
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Recently tilt training (TT) was proposed for the treatment of recurrent neurally mediated syncope. Aim of this randomized study was to test the efficacy of TT on head-up tilt testing (HUT) reproducibility in patients with recurrent neurocardiogenic syncope.

Of 57 enrolled pts (20 men, mean age 39±19 years), with reproducibility positive nitroglycerin HUT, 31 pts were randomized to TT (daily 30-minutes session of upright standing against a vertical wall), 26 pts to no therapy (group of control). At least 3 weeks a control HUT was performed. Three pts of both groups refused to perform control HUT. Pts randomized to TT performed a mean number of 12±6 TT sessions for a mean total amount of 178±216. 252 minutes. One pt (4%) discontinued TT at the first session, because of intolerance; 6 other pts (19%) did not perform TT adequately (<12 sessions), because of poor compliance. At control HUT, of 28 pts on TT, 12 (43%) had a negative HUT, 16 (57%) still had positive HUT. Of the 23 pts in the group of control, 9 (39%) had a negative third HUT, 14 (61%) still had positive HUT. There was no significant difference in the outcome of control HUT between 2 groups.

Conclusions: In our study tilt training was not effective in reducing positivity rate of tilt testing in patients with neurocardiogenic syncope.

Diagnosis of unexplained syncope: clinical results
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The aim of this study was to assess the interest of the bradyarrhythmia/tachycardia diagnosis function. This software was loaded in the RAM of Chorus RM pacemakers, in patients pts implanted for unexplained syncope. This RAM algorithm records pauses in 30 bpm, if tachycardia (TT) presenting an acceleration ≥5% and a rate ≥163 bpm. Arrhythmia events were diagnosed by the physicians using stored marker chains. 16 pts were included (10 Men, 71±14 years): 10 had no other indication for implant; 3 disclosed infra-hisian conduction disturbances and 2 sinus node dysfunction after electrophysiologic study; i had brady-tachy syncope. The following events were documented during follow-up (50±26 weeks):

Pauses Tachycardia
- Physicians
  7 AV block 3
  3 supra-ventricular T
diagnoses
  2 sino-auricular block
  3 ventricular T
- 1 pt did not present any episode.

The algorithm recorded pauses in 56% of the pts. 67% being correlated with syncope or dizziness. This algorithm may be a useful tool to diagnose unexplained syncope in paced pts, while offering a secure backup pacing in half of this population.
**Closed Loop Stimulation in cardioinhibitory malignant vasovagal syndrome**

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2 Friedrich-Alexander University Erlangen-Nürnberg, Erlangen, Germany

Closed Loop Stimulation (CLS) pacemaker (PM) systems regulate pacing rate according to contraction dynamics variations and therefore the potential to prevent the cardioinhibitory (type 2A) vasovagal syncope (VVS) which is known to be preceded by a sympathetic tone increase provoked by the reduced venous filling. The aim of this study was to evaluate therapeutic effects of CLS in patients with VVS. The inclusion criteria were at least one malignant drug refractory VVS in the previous 6 months and two positive pre-implantation head-up tilt tests (HUTTs) showing prominent cardioinhibitory component. To date four female patients aged 53±17 years have been enrolled in the study. Before implantation, VVS was induced at 8.2±1.1 min after the onset of tilting and the systolic blood pressure fell below 90 mmHg in all patients. One week after the IntraCL PM implantation (Biotronik, Germany) the HUTT was repeated and the patients were completely symptom-free. CLS rate exceeded the sinus rate at 5.3±3.4 min after the onset of tilting, maximum CLS rate was by 2±5 bpm faster than the baseline sinus rate (65±7 bpm vs. 71±6 bpm, p=0.002), and the systolic blood pressure dropped marginally from 142±18 mmHg (baseline) to 111±4 mmHg (minimum during HUTT), p=0.19. No VVS has been reported by the patients during a 12±6-month follow-up after the institution of CLS therapy. Promising preliminary follow-up results encourage further research.

**Heart rate variability and hemodynamics in neurocardiogenic syncope**

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Aim: Investigate heart rate variability (HRV) and hemodynamics during tilt test (TTT) in relation to outcome of TTT in patients with unexplained syncope.

Methods: HRV was calculated with an autoregressive algorithm as ln(power [Hz]) and coefficient of component variance in the low- and high-frequency range during 5 min segments before tilt-up and in 5 min segments until symptoms in 115 patients referred with syncope. Blood pressure was assessed by Finapres. The association between parameters and a positive TTT was evaluated in a multivariate model by Cox proportional hazards analysis.

Results: TTT was positive in 75% and negative in 36%. Values at baseline and the immediate reaction to tilt-up were not associated to outcome. During tilt, only the relative increase in heart rate and decrease in systolic blood pressure from tilt-up until symptoms and an absolute low level of high frequency HRV until symptoms, were independently associated with a positive TTT.

Conclusion: TTT-positive patients are characterised by a slightly decreased level of systolic blood pressure, gradual increase in sympathetic activity and a low level of vagal activity during tilt.

**Electroencephalography in vasovagal syncope**

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We evaluated electroencephalographic (EEG) changes occurring during syncope induced by head-up tilt testing. EEG monitoring was done during head-up tilt testing in a group of 42 patients (14 males and 28 females; mean age 38.4) with a history of recurrent syncope of unknown origin. Two patients were on anti-epileptic drugs. Vasovagal syncope occurred in 19 of 42 patients (45.2%) and was found to be cardiogenic in 11 of 19 (57.8%), vasodepressor in 3 of 19 (15.8%) and mixed type in 5 of 19 (26.3%). All patients with a negative result in head-up tilt testing showed no significant EEG modifications. In patients with a positive response to head-up tilt table testing we observed changes: slowing of EEG activity, theta and delta range waves. Two patients supposed to have epileptic seizures turned out to have vasovagal syncope with no ictal activity observed in EEG. The introduction of EEG monitoring during head-up tilt testing proves to be a useful method in differential diagnosis of syncope. The method allows description of specific electroencephalographic abnormalities during different types of vasovagal syncope.
Is tilt test important before VDD pacemaker implantation?

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Our aim was to estimate indication to head-up tilt test in patients before implantation of VDD-SL pacemakers. Material and methods.

From 108 pts with VDD-SL pacemaker (57±7, age 56±17 years) because of a-v block, there were 24 pts (43±7, age 64±16 years) without structural pattern of conduction disturbances (as heart malformation, postinfarct blocks,iatrogenic: RF ablation, cardiosurgery).

Results. During 6-57 months (35±17) follow-up syncope occurs in 2 females (40 and 18 years). Both of them had an a-v block during ECG with Holter method. In this pts during HUTT cardiodepressive vasovagal syndrome was diagnosed. In 1 pt pacemaker was changed for DDD (Actros D - Biotronik), the second pt takes propranolol as prophylactic. 8 pts from analyzed group had a-v conduction disturbances in distal part of the His bundle. There were no syncope in this group after the implantation VDD-SL pacemaker. Vasovagal syndrome was confirmed in 2 from 16 pts (12.5%) without distal block.

Conclusion. Before implantation VDD-SL pacemaker in pts without structural heart dis ease, with a-v conduction disturbances and normal sinus node function HUTT is recommended.

Vasovagal syndrome as a cause of syncope in mitral valve prolapse

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We assessed prevalence of the mitral valve prolapse (MVP) in the vasovagal syncope population.

We retrospectively analysed 335 patients with syncope: 174 with recognised vasovagal syndrome (VVS) and 161 with other causes of faints (OFS). We stated that MVP occurred in 14 (8.1%) patients with VVS and in 8 (4.8%) with OF. Age of patients with syncope and MVP (+) or (-) was 39.6±14.6 and 36.1±5.3 respectively. Among 22 patients with MVP and syncope 14 (63.6%) have VVS. Mixed type of VVS occurred in 57.1% of patients with MVP (+) and in 59.2% without MVP(-); cardioinhibitory - 21.45% MVP (+) and 28.5% MVP (-); vasodepressor - 21.45% MVP (+) and 12.6% MVP (-). Presence of mitral regurgitation 56.3% of patients. There were the same prevalence of regurgitant jet in patients with VVS (+) and VVS (-).

Conclusions: 1) The vasovagal syndrome is often cause of syncope in mitral valve prolapse population. 2) It seems that vasodepressor type of VVS are more often in patients with mitral valve prolapse.