Falling: should one blame the heart?
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DECREASED LEFT VENTRICULAR (LV) FUNCTION IS ASSOCIATED WITH HIP-FRACTURES
DECREASED LEFT VENTRICULAR (LV) FUNCTION IS ASSOCIATED WITH HIP-FRACTURES

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ABSTRACT

BACKGROUND
Several risk factors for falls and hip-fractures have been recognized, but controversy still exists towards the importance of structural cardiac abnormalities as a potentially modifiable risk factor for recurrent falls. Aim of this study was to determine the association between echocardiographic abnormalities and hip-fractures.

METHODS
Design: case-control study within consecutive patients undergoing hip-surgery in an academic hospital. Cases: patients with traumatic hip-fractures. Controls: patients undergoing planned hip surgery (non-traumatic). Inclusion criteria: age ≥50 years, presence of pre-operative echocardiogram. Exclusion criteria: high energy trauma, pathological and/or previous hip-fracture. Outcome: echocardiographic abnormalities (ventricular function, atrial enlargement, valve stenosis and/or regurgitation, pulmonary hypertension (pulmonary artery pressure (PAP) ≥35 mmHg)). Multivariate logistic regression was performed to calculate odds ratios (OR) and to correct for confounders.

RESULTS
We included 197 patients (141 cases). Mean age was 77 years (SD), 65% female. After adjustment for potential confounders, decreased LV systolic function was associated with hip-fractures (OR 3.2 [95%CI 1.1 – 9.1]). Increasing severity of LV dysfunction was also associated with hip-fractures (p for trend = 0.012).

DISCUSSION
In conclusion, patients with traumatic hip-fracture had greater risk of decreased LV function than patients who underwent planned hip-surgery. Possibly, decreased LV function is an underestimated risk factor for injurious falls.
Hip-fractures in older persons form a substantial and growing health-care burden. Hip-fractures lead to an excess one-year mortality rate of 25% and of survivors of hip-fractures, 50% suffers from an important decline in quality of life. Prevention of hip-fractures is therefore of great importance. Since >90% of hip-fractures are due to a fall, a multifactorial intervention is warranted when assessing treatable risk factors to prevent (recurrent) injurious falls.

Several general population studies have shown that heart failure is a risk factor for hip-fractures. Also, decreased LV function and heart valve abnormalities have been shown to be predictors for falls. Emerging evidence shows that there is considerable overlap between the symptoms of falls and syncope. As structural cardiac abnormalities are important causes of syncope, cardiovascular evaluation is recommended as part of a comprehensive falls assessments. Despite this recommendation and available evidence, cardiovascular risk factors for falls and fractures in older persons are still under-evaluated in current clinical practice.

Studies that have investigated associations between structural cardiac abnormalities, such as LV dysfunction and heart valve abnormalities, and hip-fractures in hospitalized patients are limited. In the current study, we therefore investigated whether structural cardiac abnormalities, assessed through echocardiography, were associated with hip-fractures in a cohort of patients undergoing hip-surgery.

**METHODS**

**Population**

The study was designed as a sub-study of a case control study within hip-surgery patients, in which electrocardiographic (ECG) abnormalities were studied. All patients admitted for either planned or emergency hip-surgery from January 1996 to May 2011 in a tertiary university teaching hospital were screened for eligibility. Cases were defined as patients with traumatic hip-fracture who underwent subsequent proximal femur fracture surgery. Controls were defined as patients who underwent elective hip surgery for non-traumatic reasons, mainly total hip replacement. Inclusion criteria were age ≥ 50 years and pre-operative ECG present in hospital records. Exclusion criteria were previous hip-fracture, high energy trauma and pathological fracture. Of eligible patients, those with echocardiograms present in hospital records that were carried out at any moment were included in the present study. The study was conducted according to the principles expressed in the Declaration of Helsinki. The medical ethics committee of the Academic Medical Center (Amsterdam) approved the conduction of this study and waived the necessity for informed consent because of the observational design.

**Baseline characteristics**

For data collection, all electronic and paper medical records and summaries were retrieved. Admission duration was recorded in days. All functional limitations and comorbid diagnoses (noted in medical records and/or referral letters) were recorded. Functional limitations included a previous fall (mention of a fall in the past medical history), use of a mobility aid (walker, cane or wheelchair), visual impairment or deafness. Comorbidity was scored according to the validated Charlson Comorbidity-Index (CCI). The CCI is a sum-score of comorbidity, comprising several conditions such as diabetes, cardiovascular disease, renal disease and malignancy. The CCI has been shown to independently predict short- and long-term mortality in acutely admitted older persons.

Further comorbid diagnoses included coronary artery disease (angina pectoris, myocardial infarction/Percutaneous transluminal coronary angioplasty or Coronary Artery Bypass Graft-surgery), hypertension, heart failure, heart-valve disorder, cerebrovascular accident, atrial fibrillation, pacemaker or internal cardiac defibrillator, Parkinsonism, Cognitive impairment, alcohol abuse, diabetes mellitus, chronic obstructive pulmonary disease (COPD), hemiplegia/paraplegia, epilepsy, peripheral vascular disease, syncope, depression, and urinary tract problems.

Drugs were listed and grouped according to ATC codes. The following drugs were considered as potential fall-risk-increasing drugs: neuroleptics (antipsychotics) (‘N05A’), hypnotics (‘N05B’), anxiolytics (‘N05B’), antidepressants (‘N06A’), cardiac therapy (cardiac glycosides, class I and III antiarrhythmics, cardiac stimulants, vasodilators and other cardiac preparations (‘C01’), antihypertensives (‘C02’), diuretics (‘C03’), peripheral vasodilators (‘C04’), beta blockers (‘C07’), calcium channel blockers (‘C08’), agents acting on the renin-angiotensin system (‘C09’), alpha-adrenergic antagonist urologicals (‘G04CA’) and beta-blocker anti-glaucoma preparations (‘S01ED’), non-steroidal anti-inflammatory drugs (‘M01A’), opioids (‘N02A’) and sympathomimetics (‘N07A’).
**Echocardiographic findings**

Results from all echocardiograms that were performed for clinical reasons at any moment before surgery were used for analyses. All echocardiograms were carried out in the Academic Medical Center according to local protocol. Echocardiograms were performed by echocardiographers and/or cardiologists (in training), and supervised by a cardiologist. Left and right ventricular (RV) systolic function was scored as good, fair, moderate or poor. Left and RV were assessed for hypertrophy and dilatation. Valvular stenosis and regurgitation were assessed for all valves. Valvular regurgitation was categorized as mild, moderate or severe on basis of the jet extension. Pulmonary hypertension was defined as a systolic PAP of 35 mmHg or higher.

**Statistical analysis**

Baseline differences between cases and controls were tested using an independent t-test for continuous variables. Continuous variables that were not normally distributed were log-transformed, and if a non-normal distribution was still present, Mann-Whitney-U test was used. Chi-square test was used to assess baseline differences for dichotomous variables.

For associations, OR were calculated through univariate logistic regression analysis. For this, binary variables for echocardiographic abnormalities were computed (no or trivial abnormalities versus mild to severe abnormalities). To adjust for possible confounders, covariates were included one-by-one in the age- and gender adjusted multivariate model. The following covariates were considered and tested for possible confounding: age, gender, CCI, time from echocardiogram to surgery, use of mobility aid, cognitive impairment, alcohol abuse, number of drugs, number of fall-risk increasing drugs and number of cardiovascular drugs. Covariates that changed the regression coefficient 10% or more were maintained in the final model.

To assess whether increasing severity of the echocardiographic abnormality was associated with an increased risk of hip fracture, trend analyses were performed within the multivariate models. In these models, firstly the echocardiographic abnormalities were entered as a continuous variable to assess the linear association between hip fractures and increasing severity of the abnormality. Secondly, the echocardiographic abnormalities were treated as categorical variables, in order to estimate the risks for the separate categories of the severity of the abnormalities. As all echocardiograms that were performed at any moment before surgery were included in the analyses, interaction terms for echocardiographic abnormalities and time from echocardiogram to surgery were tested in the multivariate models, to assess necessity of stratification for moment of echocardiogram. A p-value of <0.05 was used as threshold for statistical significance. Statistical analyses were performed using IBM SPSS Statistics (Version 18.0 for Windows. IBM Corp. Released 2010. Armonk, NY).

**RESULTS**

**Baseline characteristics**

In total, 3505 consecutive patients who underwent hip-surgery between January 1996 to May 2011 were screened for eligibility. Of those, 1894 were eligible for the ECG study, of whom 199 had underwent echocardiography also. In two patients, the echocardiogram contained too little information and they were therefore excluded from analysis. In total, 197 patients were included in the final analysis (141 cases, 56 controls). Further details on inclusion are shown in **FIGURE 1**.
Baseline characteristics of cases and controls are shown in **TABLE 1**. Cases and controls showed significant differences in age, Charlson comorbidity index, a medical history of heart failure, atrial fibrillation, cognitive impairment, COPD and use of anti-arrhythmic drugs. Time of echocardiogram to surgery was not different between cases and controls.

**TABLE 1. BASELINE CHARACTERISTICS OF HIP-FRACTURE PATIENTS AND CONTROLS**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Cases n = 141</th>
<th>Controls n = 56</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>81 (78, 88)</td>
<td>68 (59, 77)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Gender, female</td>
<td>67.4% (94)</td>
<td>37.1% (32)</td>
<td>0.176</td>
</tr>
<tr>
<td>Time between echocardiogram and surgery (days)</td>
<td>516.7 ±(601.3)</td>
<td>901.8 ±(737.1)</td>
<td>0.084</td>
</tr>
</tbody>
</table>

Charlson Comorbidity-index 2 (1, 3) 1 (0, 2) <0.001

Use of mobility aid 27.7% (39) 41.1% (23) 0.067

Previous fall 35.6% (22) 34.4% (3) 0.091

Visual impairment 14.2% (20) 12.5% (7) 0.756

Coronary artery disease 34.8% (49) 25.0% (14) 0.186

Hypertension 56.7% (80) 35.4% (31) 0.860

Heart failure 32.6% (46) 17.1% (4) 0.001

Cerebrovascular accident 21.3% (30) 16.1% (9) 0.408

Heart valve disorder 35.5% (50) 15.7% (20) 0.073

Atrial fibrillation 32.6% (46) 14.3% (8) 0.009

Pacemaker/ICD 9.2% (13) 11.1% (4) 0.604

Hemiplegia/paraplegia 7.1% (10) 1.8% (3) 0.185

Parkinsonisms 5.7% (8) 1.8% (3) 0.450

Cognitive impairment 15.6% (22) 1.8% (3) 0.006

Alcohol abuse 4.3% (6) 1.6% (2) 1.000

Diabetes Mellitus 39.9% (29) 29.8% (11) 0.073

COPD 17.3% (25) 5.4% (3) 0.025

**Drug use**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Cases n = 141</th>
<th>Controls n = 56</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Drugs</td>
<td>6.4 ±(±3.2)</td>
<td>5.9 ±(±3.4)</td>
<td>0.119</td>
</tr>
<tr>
<td>Number of FRED</td>
<td>2.6 ±(±1.9)</td>
<td>1.5 ±(±2.1)</td>
<td>0.780</td>
</tr>
<tr>
<td>Number of cardiovascular drugs</td>
<td>2.1 ±(±1.4)</td>
<td>2.3 ±(±1.8)</td>
<td>0.844</td>
</tr>
<tr>
<td>Anti-arrhythmics</td>
<td>34.0% (48)</td>
<td>14.3% (8)</td>
<td>0.006</td>
</tr>
<tr>
<td>Diuretics</td>
<td>52.5% (74)</td>
<td>19.3% (23)</td>
<td>0.093</td>
</tr>
<tr>
<td>Beta-blockers</td>
<td>41.8% (59)</td>
<td>37.1% (32)</td>
<td>0.092</td>
</tr>
<tr>
<td>Calcium channel blockers</td>
<td>24.8% (35)</td>
<td>33.7% (20)</td>
<td>0.124</td>
</tr>
<tr>
<td>RAAS inhibitors</td>
<td>18.3% (26)</td>
<td>37.5% (21)</td>
<td>0.917</td>
</tr>
<tr>
<td>Lipid lowering drugs</td>
<td>31.9% (43)</td>
<td>42.9% (24)</td>
<td>0.146</td>
</tr>
</tbody>
</table>

Echocardiographic findings

**TABLE 2** shows the proportion of echocardiographic findings in cases and controls. Proportion of decreased left and RV systolic function (less than good) was increased in hip-fracture patients compared to controls. Right atrial enlargement was also more prevalent in cases, however not statistically significant (p = 0.068). Presence of (≥ mild) tricuspid regurgitation was more prevalent in hip fracture patients, as was presence of pulmonary hypertension. Proportion of aortic valve stenosis and aortic-, mitral- and pulmonary valve regurgitation was equal in cases and controls.

**TABLE 2. ECHOCARDIOGRAPHIC ABNORMALITIES OF HIP-FRACTURE PATIENTS AND CONTROLS**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Cases n = 141</th>
<th>Controls n = 56</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>LV systolic function &lt; good</td>
<td>35.5% (50)</td>
<td>12.5% (7)</td>
<td>0.001</td>
</tr>
<tr>
<td>RV systolic function &lt; good</td>
<td>18.4% (26)</td>
<td>5.4% (3)</td>
<td>0.019</td>
</tr>
<tr>
<td>Left atrial enlargement</td>
<td>62.2% (84)</td>
<td>50% (28)</td>
<td>0.118</td>
</tr>
<tr>
<td>Right atrial enlargement</td>
<td>36.8% (49)</td>
<td>23.2% (13)</td>
<td>0.068</td>
</tr>
<tr>
<td>Aortic Valve Stenosis ≥ mild</td>
<td>21.3% (30)</td>
<td>17.9% (10)</td>
<td>0.390</td>
</tr>
<tr>
<td>Mitral valve regurgitation ≥ mild</td>
<td>31.2% (44)</td>
<td>23.2% (13)</td>
<td>0.265</td>
</tr>
<tr>
<td>Pulmonary hypertension (PAP ≥ 35 mmHg)</td>
<td>29.8% (42)</td>
<td>14.3% (8)</td>
<td>0.024</td>
</tr>
</tbody>
</table>

LV: left ventricular. RV: right ventricular. Data are % (n).

Baseline characteristics of cases and controls are shown in **TABLE 1**. Cases and controls showed significant differences in age, Charlson comorbidity index, a medical history of heart failure, atrial fibrillation, cognitive impairment, COPD and use of anti-arrhythmic drugs. Time of echocardiogram to surgery was not different between cases and controls.
associations

Table 3 shows OR for risk of echocardiographic abnormalities. The following cofactors were maintained in the final multivariate model (model 2): age, gender, CCI, cognitive impairment and use of mobility aid. After adjustment in the final model, risk of decreased LV function remained increased for hip-fracture patients (OR 3.2 [95%CI 1.1 – 9.1]). After adjusting for confounders, none of the other echocardiographic abnormalities remained associated with hip-fractures.

All echocardiographic abnormalities were tested for interaction with time from echocardiogram to surgery in the multivariate models, but none of the interaction terms were statistically significant and therefore stratification for moment of echocardiogram was not performed.

Table 4 shows a trend analysis for the echocardiographic abnormalities that were associated with hip fractures in the univariate analyses. A statistically significant association between increasing severity of LV systolic dysfunction and hip fracture was observed in the unadjusted model. In the adjusted model, odds ratios for hip fracture did increase with severity of LV systolic dysfunction, however not statistically significant. As none of controls had poor LV function, OR for poor LV systolic function compared to other categories could not be calculated. A statistically significant association between increasing severity of tricuspid valve regurgitation and hip fractures was found in the unadjusted model. However, this trend was no longer observed in the adjusted model.

A linear association between decreased RV function and hip-fracture was found univariately (p = 0.032), but after adjustment in the final model, significance was just lost (p = 0.055). As none of controls had moderate or poor RV function, further trend analysis with categorical variables for decreased RV function could not be performed.

Table 3. OR of echocardiographic abnormalities in hip-fracture patients and controls

<table>
<thead>
<tr>
<th>Abnormality</th>
<th>Unadjusted OR (95% CI)</th>
<th>Final model OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LV systolic function &lt; good</td>
<td>3.8 (1.6 – 9.1)*</td>
<td>3.2 (1.3 – 9.1)*</td>
</tr>
<tr>
<td>RV systolic function &lt; good</td>
<td>4.0 (2.2 – 13.8)*</td>
<td>3.3 (0.8 – 14.3)</td>
</tr>
<tr>
<td>Aortic Valve Stenosis ≥ mild</td>
<td>1.2 (0.6 – 2.3)</td>
<td>0.7 (0.3 – 2.0)</td>
</tr>
<tr>
<td>Aortic Valve Regurgitation ≥ mild</td>
<td>1.5 (0.7 – 3.1)</td>
<td>1.8 (0.7 – 4.4)</td>
</tr>
<tr>
<td>Mitral Valve Regurgitation ≥ mild</td>
<td>1.4 (0.7 – 2.7)</td>
<td>0.8 (0.3 – 1.9)</td>
</tr>
<tr>
<td>Tricuspid valve regurgitation ≥ mild</td>
<td>2.6 (1.4 – 4.9)*</td>
<td>1.5 (0.7 – 3.4)</td>
</tr>
<tr>
<td>Pulmonary valve regurgitation ≥ mild</td>
<td>1.2 (0.2 – 6.1)</td>
<td>1.6 (0.2 – 11.8)</td>
</tr>
<tr>
<td>Pulmonary hypertension PAP &gt;35 mmHg</td>
<td>2.5 (1.3 – 5.6)*</td>
<td>1.7 (0.6 – 4.9)</td>
</tr>
</tbody>
</table>

Final model: adjusted for age, gender, Charlson Comorbidity Index (CCI), impaired cognition and use of mobility aid. * p < 0.05

Table 4. Trend analysis of echocardiographic abnormalities in hip-fracture patients and controls

<table>
<thead>
<tr>
<th>Abnormality</th>
<th>Univariate</th>
<th>Final model</th>
</tr>
</thead>
<tbody>
<tr>
<td>LV systolic function (linear)</td>
<td>3.1 (0.3 – 6.2)</td>
<td>0.002</td>
</tr>
<tr>
<td>Good (reference)</td>
<td>1.0</td>
<td>0.035</td>
</tr>
<tr>
<td>Fair</td>
<td>1.4 (1.3 – 8.2)</td>
<td>0.014</td>
</tr>
<tr>
<td>Moderate</td>
<td>7.2 (3.9 – 17.4)</td>
<td>0.062</td>
</tr>
<tr>
<td>Poor</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Tricuspid valve regurgitation (linear)</td>
<td>1.8 (1.2 – 2.6)</td>
<td>0.002</td>
</tr>
<tr>
<td>None (reference)</td>
<td>1.0</td>
<td>0.023</td>
</tr>
<tr>
<td>Mild</td>
<td>2.2 (1.0 – 4.6)</td>
<td>0.037</td>
</tr>
<tr>
<td>Moderate</td>
<td>2.3 (0.9 – 5.8)</td>
<td>0.027</td>
</tr>
<tr>
<td>Severe</td>
<td>10.2 (3.8 – 29.5)</td>
<td>0.023</td>
</tr>
</tbody>
</table>

Final model: adjusted for age, gender, Charlson Comorbidity Index (CCI), impaired cognition, use of mobility aid. OR: Odds Ratio. 95%CI: 95% confidence interval.
Main findings

The results of our study show that patients with traumatic hip-fracture had greater risk of decreased LV function than patients who underwent planned hip-surgery. Increasing severity of LV dysfunction was also associated with hip-fracture, after adjustment for age, sex and other confounders.

Comparison with literature

To the best of our knowledge, this is the first study that described the association between decreased LV function, objectified by echocardiography, and hip-fractures in a hospitalized population. A study by Loxdale et al. described the prevalence of decreased LV function in hip-fracture patients. Prevalence of decreased LV function in this cohort was 46%, which is a slightly larger proportion than our reported 35%. However, as the study of Loxdale et al. had no control group, no associations were reported. The association between decreased LV function and hip-fractures has earlier been described on a population level. Three large longitudinal cohort studies found that risk of hip-fracture was an independent predictor of falls. Over 90% of hip-fractures are caused by a fall. Therefore, an explanatory hypothesis for the association between decreased LV function and hip-fractures is that a significant pathophysiological overlap exists between falls and syncope. Decreased cardiac output can cause (near-) syncope when circulatory demands outweigh the impaired ability of the heart to increase its output, leading to falls in patients with pre-existing mobility problems and unstable gait. Also, decreased LV function is associated with heart rhythm abnormalities, such as atrial fibrillation, ventricular tachycardia, bradycardia and atrioventricular block. These rhythm- and conduction abnormalities can also cause decreased cardiac output, leading to (near) syncope.

We also found that tricuspid valve regurgitation and pulmonary hypertension were more frequently observed in those with hip-fractures, but this difference was not statistically significant after adjustment for confounders. A previous study found that mitral-, tricuspid-, pulmonary valve regurgitation and pulmonary hypertension were associated with falls in a cohort of geriatric out-patients. It is known that valvular abnormalities can contribute to syncope, in particular aortic valve stenosis and mitral valve prolapse. A few studies have described the occurrence of aortic valve stenosis in patients admitted for hip-fracture, mainly to determine the need for routine pre-operative echocardiography. The study by McBrien et al. reported a prevalence of 23% aortic valve stenosis in a cohort of hip-fracture patients who also had an echocardiography, which is comparable to the prevalence of 21% aortic stenosis that we found. Loxdale et al. reported a prevalence of 38%, which is a larger proportion than we found. We did not find that the occurrence of aortic valve stenosis was different between cases and controls, although the proportion of aortic valve stenosis was substantial in both groups. Because patients in both groups probably had an echocardiography because structural cardiac abnormalities were suspected, potentially this has lead to an overrepresentation of aortic valve stenosis in the control group.

Limitations

A major limitation of this study is the fact that our control group differed significantly in mean age and comorbid diagnoses compared to our study cases. To account for these confounders, we have corrected for age, gender and comorbid conditions in our analyses. Furthermore, we compared patients in an acute setting (traumatic hip-fractures) with study controls in a more stable situation (planned hip surgery). As it is questionable whether hospital populations are fit to serve as controls because controls should preferably resemble the general population, we hypothesized that patients undergoing planned hip-surgery would resemble the general population most. Also, in both groups echocardiograms were made for clinical reasons. The research population therefore represents a selection of patients in whom a cardiac abnormality was expected. Potentially, this resulted in an overrepresentation of cardiac abnormalities. As this accounts for both groups however, we believe this did not influence the direction of the associations. Also, time from echocardiogram to surgery was similar in both groups, and interaction terms for time from echocardiogram to surgery and echocardiographic abnormalities were not significant in the multivariate models. We therefore believe we minimized potential selection bias. Furthermore, we performed a case-control study in which the control group was smaller than the case-group. Preferably, the control group should be at least the same size as the case-group to improve power and precision of results. However, within our cohort of patients undergoing hip-surgery this was the largest control-group available. Nevertheless, using a relatively small control group may have led to underestimation of
the effect. Since the association between decreased LV function and hip-fractures in this cohort was present, increasing the control group would probably only lead to narrowing of the confidence intervals. Although registration of all patients was performed prospectively, detailed data on comorbidity and drug use were collected from available medical records and we can therefore not rule out incomplete data collection during admission. However, there is no reason to assume that missing data are differential for the two groups and therefore our groups were deemed comparable.

Clinical implications
It is important to address that the current study aimed at determining associations between echocardiographic abnormalities and hip-fractures, and not causality. It is known that injurious falls in older persons are often multifactorial, and structural cardiovascular abnormalities most likely contribute to falls in the presence of other fall-risk increasing factors, such as impaired mobility and use of fall-risk increasing medication. However, regardless whether the associations are causal or not, patients with falls and hip-fractures are apparently at increased risk of decreased LV function. Therefore, early recognition of potentially modifiable risk factors with subsequent intervention is warranted in vulnerable patients at risk of (injurious) falls. Potentially, an echocardiogram may detect an important and potentially treatable fall-risk-increasing factor. These findings are in line with the syncope guidelines, in which an echocardiogram is advised in the work-up of cardiac syncope, when structural cardiac abnormalities are suspected.

Conclusion
In conclusion, patients with traumatic hip-fracture have greater risk of decreased LV function than patients who underwent planned hip-surgery. Follow-up studies in a prospective setting are needed to validate our findings. Furthermore, it is necessary to assess the clinical relevance of our findings, e.g. reversibility of this risk factor, by studying the effects of treatment of decreased ventricular function on fall and fracture-incidence rates.

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Conflicts of interest statement
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failing: should one blame the heart?

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