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Preoperative cardiac evaluation of geriatric patients with hip fracture

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ABSTRACT

Background: The American College of Cardiology (ACC) and the American Heart Association (AHA) have developed guidelines for perioperative assessment of patients in case of non-cardiac surgery. The aim of this study was to investigate if the preoperative cardiac evaluation of geriatric patients with hip fracture was in accordance with these guidelines and what the effects were on outcome.
Methods: In a retrospective study 388 patients with hip fracture treated in the department of Trauma surgery of the Maastricht University Medical Centre in the Netherlands were included. All patients were treated between 2003 and 2006 and had at least two year follow-up. The preoperative cardiac screening was analysed with respect to content and to which level this followed the ACC/AHA guidelines. These guidelines were used to classify cardiac risk into low, intermediate and high risk. This was related to the outcome measurements delay to surgery, perioperative complications and mortality.
Results: According to the ACC/AHA guidelines 82% of patients received correct preoperative cardiac screening in the low vs. 46% in the intermediate and 86% in the high risk group. The most frequent reason for incorrect preoperative cardiac screening was overscreening (>95%). The delay to surgery increased by 9.9 h in the case of overscreening ($p = 0.03$). A previous cardiac history was a significant risk factor for early mortality. Delay of >48 h was associated with more cardiovascular complications and mortality both on univariate and multivariate analysis.
Conclusion: Preoperative cardiac screening is frequently unnecessary after hip fracture, especially in patients with intermediate risk predictors and increases the delay to surgery. Delay of >48 h was associated with more cardiovascular complications and mortality postoperatively. The implementation of the ACC/AHA guidelines may prevent unnecessary cardiac consultations which reduces preoperative resources, delay to surgery and possibly decreases postoperative complications.

Introduction

Hip fractures are one of the most common orthopaedic trauma causes leading to hospital admission in the elderly population and are associated with high morbidity and mortality rates. Treatment can sometimes be chosen conservatively but the majority of patients with hip fracture will undergo surgery. Because of advanced age and comorbidities, the surgical risk is increased.

Cardiac events are responsible for 30–60% perioperative complications in non-cardiac surgery and are the cause of postoperative mortality following non-cardiac surgery in more than 50% of patients.[1,2] The overall incidence of perioperative myocardial ischaemia in elderly patients undergoing hip fracture surgery has been reported to be 35–42%.[3–6] Previous studies indicated that the principal causes of in-hospital death after hip fracture were cardiac failure and myocardial infarction, which occurred early after the fracture.[7–13]

To evaluate preoperatively the risk of cardiac disease in non-cardiac surgery the American College of Cardiology (ACC) and the American Heart Association (AHA) have developed guidelines. According to the ACC/AHA guidelines hip surgery is considered as intermediate risk surgery.[14] The keypoint of these guidelines are summarised in an algorithm indicating the stepwise approach of patients using clinical predictors to identify their risk category. The purpose of preoperative evaluation (including both screening and cardiac consultation) by this approach is not to give medical clearance but rather to perform an evaluation of the patient's current medical status and make recommendations concerning the risk assessment and management of cardiac problems over the entire perioperative period.[14] However, preoperative assessment may be time consuming and lead to unnecessary delay and should therefore be restricted to those with the potential to change patient management.

In order to investigate the application of these guidelines and its impact on the current daily practice of the management of patients

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with hip fractures this study was undertaken. Our hypothesis was that preoperative cardiac evaluation, when not recommended by the ACC/AHA guidelines (overscreening), lead to increased delay to surgery with an increased rate of complicated outcome.

Materials and methods

Study population

This retrospective study was conducted in the department of Trauma surgery of the Maastricht University Medical Centre in the Netherlands, a level 1 trauma centre. From 1st January 2003 till 31st December 2006 all patients treated for hip fracture with a two year follow-up were included. We selected all patients aged 65 and above. Polytrauma patients, patients with pathological hip fractures and patients treated with a total hip arthroplasty were excluded. Patients with a malignancy in their history were not excluded. All patients were operated by the department of trauma surgery using a protocolised treatment algorithm regarding hip replacement or internal fixation. All medical records were evaluated for the following content: patient characteristics, fracture type, type of arthroplasty or fracture fixation, delay to surgery, cardiac risk factors, preoperative assessment, cardiac consultations and their content, postoperative complications, mortality and the use of blood transfusions. Death certificates were obtained from the National population register.

Preoperative cardiac evaluation

Standard work-up after admission to the emergency department consisted of a detailed history, a complete physical examination, an electrocardiography and standard biochemical and haematologic tests. The anaesthesiologist conducted a preoperative consultation and decided whether a cardiac consultation was necessary. This decision was not protocolised or following ACC/AHA guidelines and depended on the attending physician. Our main goal was to evaluate the preoperative cardiac evaluation, using the algorithm proposed in the ACC/AHA guidelines. All patients were retrospectively screened according to these guidelines. The preoperative assessment was compared with the advised preoperative treatment according to the guidelines. In this study there is a difference between the terms 'cardiac screening' and 'cardiac consultation'. Screening accounts for the risk assessment of all patients divided into three different risk categories (Table 1). 'Correctly screened' accounts for those patients who were operated without cardiac consultation with a stable cardiac situation or in the absence of a cardiac history, or patients who received a cardiac consultation when necessary according to the guidelines. We distinguished two possibilities for preoperative cardiac screening that was not in line with the guidelines: under- and overscreening. Cardiac consultation accounts only for the patients who were evaluated by a cardiologist after screening. We analysed the preoperative cardiac consultations and their content. Correct cardiac consultations were executed in accordance with the guidelines and the content was sufficient in relation with the patient's medical condition. For example when non-invasive testing was advised but not performed this was scored as 'not correct'.

Secondary outcome measurements were delay to surgery and overscreening as a risk factor for delay to surgery. Furthermore we scored perioperative complications and death. We analysed the complication rates in relation with delay to surgery. The mortality rates were determined as in-hospital and after 1-month, 1-year and 2-years.

Statistical analysis

All analyses were performed with SPSS 16.0 statistical software for windows (SPSS Inc., Chicago, IL, USA). $p < 0.05$ was considered to be statistically significant. Data were presented as mean for normally distributed or median when non-normally distributed variables. Percentages were used when appropriate. One-way ANOVA was used to compare normally distributed and the Mann–Whitney *U*-test for non-normally distributed continuous variables with Bonferroni correction for multiple testing. A Pearsons chi-square (χ^2) test was used to investigate whether distributions of categorical variables differed from one another. We used a Kaplan–Meier survival curve to investigate the mortality rates for each of the cardiac risk groups, comparing outcome using log rank analysis. Univariate analysis of the postoperative complications was performed to identify predictors for mortality. All important variables for mortality were entered in a multivariate logistic regression analysis.

Results

388 patients were eligible for inclusion and analysed. Of 9 patients time to surgery could not be calculated accurately. In 1% (4/388) of patients follow-up after discharge could not be obtained because they lived abroad. These data were regarded as missing data, were other available data of these patients were still used in other analysis. Table 2 shows the patient and operation characteristics. 46% (178/388) of the patients had a cardiac history, which did not necessarily mean active cardiac conditions. In total 10% (37/388) of patients were predicted to have a high perioperative complication risk (high risk group), 29% (113/388) an intermediate risk and 61% (238/388) a low risk using the ACC/AHA clinical predictors (Table 1).

Preoperative cardiac evaluation

According to the guidelines 82% (195/238) in the low risk group and 86% (32/37) in the high risk group received correct preoperative cardiac screening in comparison with 46% (52/113) in the intermediate risk group ($p < 0.001$, low and high risk in comparison with intermediate risk). Of all patients 28% (109/388) did not receive the correct preoperative screening. The main reason was overscreening in 95% of the cases (104/109) and underscreening in 5% of the cases (5/109).

In total 38% (147/388) of patients received a cardiac consultation after screening of which 2% (1/44) in the low risk group, 12%

Table 1
The American College of Cardiology/American Heart Association clinical predictors for each risk group.[14]

Low risk	Intermediate risk	High risk
Advanced age	Mild angina pectoris	Unstable coronary syndromes
Abnormal ECG	Prior myocardial infarction	Decompensated cardiac heart failure
Rhythm other than sinus	Compensated or prior cardiac heart failure	Significant arrhythmias
Low functional capacity	Diabetes Mellitus	Severe valvular disease
History of stroke		
Uncontrolled hypertension		