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CLINICAL RESEARCH

Characteristics and prognosis of patients with acute heart failure without troponin determination: The EAHFE-TROPICA3 study

Caractéristiques et pronostic des patients souffrant d'insuffisance cardiaque aiguë sans détermination de la troponine: étude EAHFE-TROPICA3

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KEYWORDS
Acute heart failure;
Troponin;
Prognosis

Summary
Background. — The absence of cardiac troponin (cTn) determination in an episode of acute heart failure (AHF) is frequent. The characteristics of these patients are not well known; nor is it known whether they have a better prognosis than patients in whom cTn is determined.

Abbreviations: AHF, acute heart failure; CI, confidence interval; cTn, cardiac troponin; ED, emergency department; HR, hazard ratio; nocTn, without cTn determination; wcTn, with cTn determination.

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Aim. — The objective of the EAHFE-TROPICA3 study was to analyse the characteristics of patients consulting for AHF in whom cTn was not determined (nocTn), and to evaluate the relationship of cTn determination (wcTn) with patient outcomes.
Methods. — This was an analysis of the multipurpose prospective EAHFE registry of patients with AHF consulting at the emergency departments of 34 Spanish hospitals.
Results. — Data from 8850 patients with AHF were analysed; cTn was not determined in 4216 of these patients (47.6%), who had a lower prevalence of ischaemic heart disease, more frequent use of loop diuretics at baseline, a greater rate of oedema in the acute episode, more frequent history of heart failure, and less use of angiotensin-converting enzyme inhibitors or aldosterone receptor antagonists and beta-blockers at baseline. Compared with the wcTn group, the nocTn group had the same in-hospital mortality (adjusted odds ratio [OR] 1.21, 95% confidence interval [CI] 0.98—1.50), mortality at 30 days (adjusted OR 1.07, 95% CI 0.90—1.28) and reconsultation at 30 days (adjusted OR 0.90, 95% CI 0.80—1.02).
Conclusions. — Patients presenting with AHF with and without cTn determination have different characteristics. These differences are not related to a better prognosis.

MOTS CLÉS
Insuffisance cardiaque aiguë ;
Troponine cardiaque ;
Pronostic

Résumé
Contexte. — L'absence de détermination de la troponine cardiaque (TnC) lors d'un épisode d'insuffisance cardiaque aiguë (ICA) est fréquente. Les caractéristiques de ces patients ne sont pas bien connues, non plus si leur pronostic est meilleur que celui des patients chez qui le TnC est déterminé.
Objectif. — L'objectif de l'étude EAHFE-TROPICA3 était d'analyser les caractéristiques des patients consultant pour l'AHF chez lesquels cTn n'était pas déterminé (noTnC) et d'évaluer la relation entre la détermination de cTn (dTnC) et les résultats pour le patient.
Méthodes. — Une analyse du registre EAHFE polyvalent et prospectif des patients consultés au service des urgences de 34 hôpitaux espagnols par l'AHF a été réalisée.
Résultats. — Un total de 8850 patients avec ICA a été analysé, dont TnC n'a pas été déterminé chez 4216 (47,6 %). Ces derniers patients présentaient une cardiopathie moins ischémique, utilisaient des diurétiques de l'anse au départ et un œdème lors de l'épisode aigu et étaient plus fréquemment atteints d'insuffisance cardiaque antérieure, utilisaient des inhibiteurs de l'enzyme de conversion de l'angiotensine ou des antagonistes des récepteurs de l'aldostérone et des bêta-bloquants au départ. Les patients noTnC ont présenté les mêmes mortalité hospitalière (OR ajusté 1,21, IC95 % 0,98—1,50) mortalité à 30 jours (OR ajusté 1,07, IC95 % 0,90—1,28) et reconsultation à 30 jours (OR ajusté 0,90, IC95 % 0,80—1,02 respectivement) qui les patients dTnC.
Conclusions. — Les patients présentant une ICA avec et sans dosage de TnC ont des caractéristiques différentes. Ces différences ne sont pas liées à un meilleur pronostic.

Background

Acute heart failure (AHF) is prevalent; it is a frequent reason for emergency department (ED) consultation, and results in a high percentage of hospitalization, generating high healthcare costs [1]. Short- and long-term mortality rates in patients with AHF are elevated, with some series describing an in-hospital mortality rate of 7.6%, a 30-day mortality rate of 9.4% and a 1-year mortality rate of 10% [2,3]. The 30-day rate of revisiting the ED is also high (up to 20%) [3]. Taking this into account, risk scales are needed to stratify the prognosis of patients with AHF who attend in the ED [4—8]. These scales usually include variables that are easy to obtain, although some variables are biomarkers, which must be requested on admission to the ED and this does not always happen.

Two biomarkers have shown an elevated predictive capacity for short- and long-term mortality in patients with AHF: the natriuretic peptides and cardiac troponin (cTn). The natriuretic peptides have been studied widely, and an elevation of their values is related to significantly higher mortality [9,10]. The absence of natriuretic peptide values in cases of AHF is not related to worse outcomes compared with patients for whom these values are available, largely

because they do not modify the therapeutic approach in the ED [11].

Elevated cTn values are also related to worse patient outcomes. Different studies have shown that elevation of any type of cTn is associated with lower survival in various settings, as well as in AHF [12—17]. For this reason, guidelines and expert consensus statements recommend their determination in an episode of AHF, to discount an acute coronary event as the precipitating event for the AHF, and because of their capacity as a marker of poor patient outcome [18,19]. cTn is not determined systematically in routine clinical practice. As only a rise or fall in cTn concentration is usually reported in most registries, it is difficult to know the percentage of patients in whom this value has not been determined. Analysis of the ADHERE registry in 2008 showed that cTn had not been determined during an episode of AHF in 19.5% of patients [16], but the characteristics of this group were not analysed. The EFFECT cohort, which included 3800 episodes of AHF, showed that the cTn value was not analysed in 1674 episodes (44.1%) [17]. The Spanish EAHFE (Epidemiology of Acute Heart Failure in Emergency Departments) registry reported a higher percentage, showing that cTn was not determined in up to 50.9% of AHF episodes, although in recent years there has been a trend towards more frequent determination of these values [3].

In view of the high percentage of patients in whom cTn is not determined, it is remarkable that there is a lack of studies investigating if there are variables related to AHF, and comparing the outcomes of this population with patients in whom cTn was determined, independent of whether the value was elevated or not. The hypothesis of our work is that the physician who does not request cTn in an episode of AHF selects a group of patients with less severity, with better results in terms of mortality and reconsultation. The objective of the EAHFE-TROPICA (TROPonin in acute heart failure) study was to determine characteristics and prognosis in terms of in-hospital mortality and 30-day mortality and reconsultation in patients presenting an episode of AHF in whom cTn values were not determined, and to compare the outcomes of these patients with those of patients with cTn determination.

Methods

The EAHFE-TROPICA3 study was an analysis of the patients included in the EAHFE registry—a multipurpose multicentre cohort of non-interventionist analytical character that consecutively included all patients who attended 34 Spanish EDs for AHF. The patients were initially included by ED physicians according to clinical and radiological criteria. Within a maximum period of 72 hours the principal investigator of each centre verified fulfilment of the diagnostic criteria established in the prevailing clinical guidelines, and was responsible for the final diagnosis and patient inclusion in the EAHFE registry. To do this, the principal investigator verified the clinical criteria and the presence of elevated natriuretic peptide concentrations or echocardiographic signs of cardiac insufficiency. Patients presenting AHF within the context of an acute coronary syndrome were excluded from the analysis.

The EAHFE registry currently includes 9078 patients diagnosed with AHF in 34 Spanish EDs, collected during four inclusion periods. The first period (EAHFE-1) was from 15 April to 15 May 2007 (1 month, 10 EDs, 948 patients); the second (EAHFE-2) was from 1 to 30 June 2009 (1 month, 19 EDs, 1483 patients), the third (EAHFE-3) was from 01 November to 31 December 2011 (2 months, 29 EDs, 3414 patients) and the fourth (EAHFE-4) was from 1 January to 28 February 2014 (2 months, 27 EDs, 3233 patients). The methodology of data collection was the same in all the centres in the four recruitment periods, and has been described elsewhere [3,5]. The study was approved by the ethics committees and Clinical Investigation Units of all the participating hospitals, and conformed to the principles outlined in the Declaration of Helsinki.

Independent variables included data related to the basal characteristics of the patients (age, sex, history of previous disease, baseline treatment, Barthel index and functional class according to the New York Heart Association), as well as clinical data (presence of dyspnoea, oedema, symptoms of low cardiac output, heart rate and blood pressure) relating to the acute episode of AHF and the results of complementary tests (blood analyses, chest X-ray and electrocardiogram) performed in the ED.

The classifying variable was the determination of cTn during ED care, dividing the patients into two groups: one with cTn determination (wcTn) and the other without cTn determination (nocTn). In the wcTn group, cTn was defined as elevated with a value above the reference value according to the immunoassays used in each centre (Appendix A). The outcome variables of the study were in-hospital mortality, and mortality and reconsultation at the ED within 30 days of hospital or ED discharge; this was determined by telephone and by consultation of both the hospital and outpatient clinical history of the patient, following the usual EAHFE registry procedure.

Qualitative variables are expressed using absolute and relative frequencies; quantitative variables are expressed using means and standard deviations. For comparisons, the χ^2 test was used for qualitative variables (or Fisher's exact test in 2×2 tables when the expected values were < 5), and Student's t test for independent measures was used for quantitative variables. The variables with significant differences between groups in the bivariate analysis were introduced into a logistic regression model to adjust for in-hospital mortality and mortality and reconsultation at 30 days. The resulting variables are expressed as odds ratios with 95% confidence intervals (CIs).

The study was completed with a Kaplan—Meier model to analyse 30-day mortality, with the construction of truncated mortality tables (compared with the log-rank test) to compare patients with nocTn, elevated wcTn and non-elevated wcTn, using nocTn as the reference value. A Cox model was performed for the calculation of proportional risks, expressed as hazard ratios (HRs) with 95% CIs. Differences were considered to be statistically significant with a P value < 0.05 or when the 95% CI of the odds ratio or HR excluded the value of 1. SPSS® software, version 19.0 (SPSS Inc., Chicago, IL, USA) was used for the statistical analyses.

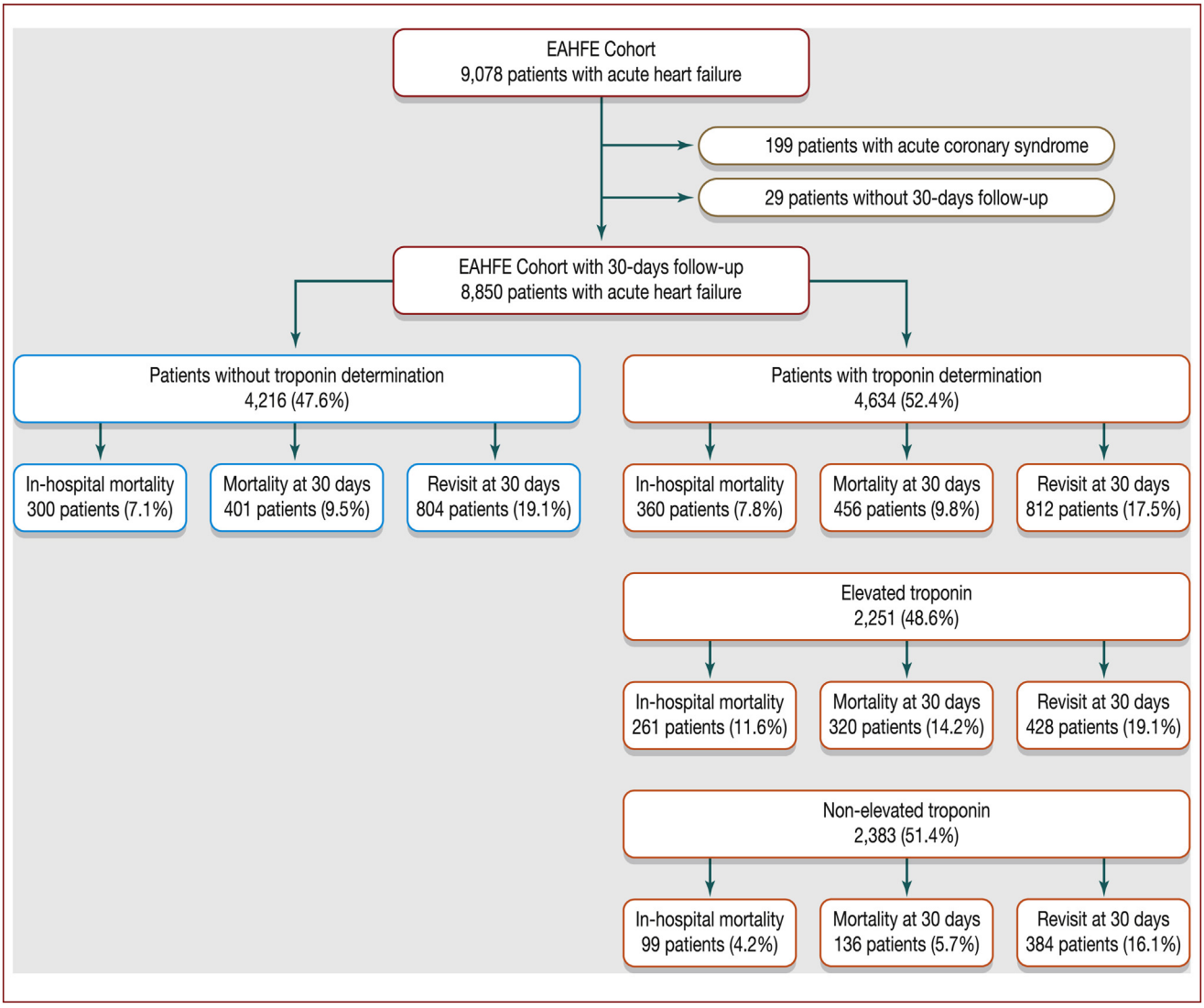

Figure 1. Patients included in the analysis. EAHFE: Epidemiology of Acute Heart Failure in Emergency Departments.

Results

The EAHFE cohort included 9078 patients. Thirty-day follow-up was available in 8850 of these patients; cTn was not determined in 4216 patients (47.6%). In-hospital mortality, and mortality and reconsultation at 30 days were 7.1%, 9.5% and 19.1%, respectively, in the nocTn group, and 7.8%, 9.8% and 17.5%, respectively, in the wcTn group (Fig. 1). Analyses of the basal characteristics and differences between groups are shown in Table 1.

The nocTn group presented a lower prevalence of ischaemic heart disease and peripheral artery disease and a less frequent history of cerebral vascular accidents; fewer received angiotensin-converting enzyme inhibitors or aldosterone receptor antagonists and beta-blockers at baseline; conversely, these patients also presented a higher prevalence of atrial fibrillation, chronic obstructive pulmonary disease and previous heart failure, and were more likely to receive more loop diuretics and digoxin as the basal treatment. In the acute episode they presented a greater frequency of peripheral oedema, with a lower frequency of dyspnoea and hyponatraemia. The management of the acute episode was also different, with a greater proportion in the nocTn group requiring oxygen therapy, fewer inotropic drugs or vasopressors, and a lower proportion requiring morphine and non-invasive ventilation. Table 2 shows the results of the multivariable study, with significant differences in the basal history of ischaemic heart disease and previous heart failure compared with the wcTn group.

Fig. 2 shows the results of the different outcome markers studied. After adjusting the model for the differences in basal characteristics and the acute episode between the two groups, in-hospital mortality, and mortality and reconsultation at 30 days did not differ according to whether or not cTn was determined.

The adjusted analysis of 30-day survival showed differences on analysis of the three groups: nocTn, elevated wcTn and non-elevated wcTn (Fig. 3). Using nocTn as the reference value (HR = 1), the non-elevated wcTn group had an HR of 0.68 (95% CI 0.54—0.86; $P = 0.001$) and the elevated wcTn group had an HR of 1.60 (95% CI 1.33—1.92; $P < 0.001$).

Table 1 Univariate and bivariate study of basal and acute episode characteristics, according to whether or not cardiac troponin was determined in the emergency department, and whether or not the value was elevated.

	Total ($n = 8850$)	nocTn ($n = 4216$)	wcTn ($n = 4634$)	*P*	wcTn; cTn elevated ($n = 2251$)	wcTn; cTn not elevated ($n = 2383$)	*P*
Demographic data							
Age $\geq$ 75 years	6554 $\pm$ 74.3	3115 $\pm$ 74.2	3439 $\pm$ 74.4	0.758	1723 $\pm$ 76.6	1716 $\pm$ 72.4	0.001
Men	3893 (44.1)	1838 (43.7)	2055 (44.5)	0.477	1101 (49.0)	954 (40.1)	< 0.001
Personal history							
Arterial hypertension	7403 (83.8)	3512 (83.5)	3891 (84.1)	0.449	1877 (83.6)	2014 (84.6)	0.345
Diabetes mellitus	3753 (42.5)	1767 (42.0)	1986 (42.9)	0.388	1024 (45.6)	962 (40.4)	< 0.001
Dyslipidaemia	3678 (41.6)	1708 (40.6)	1970 (42.6)	0.059	959 (42.7)	1011 (42.5)	0.870
Ischaemic heart disease	2686 (30.4)	1146 (27.3)	1540 (33.3)	< 0.001	814 (36.3)	726 (30.5)	< 0.001
CRI	2042 (23.1)	964 (22.9)	1078 (23.3)	0.669	622 (27.7)	456 (19.2)	< 0.001
Cerebrovascular accident	1123 (12.7)	497 (11.8)	626 (13.5)	0.016	324 (14.1)	302 (12.7)	0.082
Atrial fibrillation	4217 (47.8)	2057 (48.9)	2160 (46.7)	0.036	959 (42.7)	1201 (50.5)	< 0.001
Peripheral artery disease	750 (8.5)	327 (7.8)	423 (9.1)	0.021	231 (10.3)	192 (8.1)	0.009
Heart valve disease	2396 (27.1)	1116 (26.5)	1280 (27.7)	0.233	599 (26.7)	681 (28.6)	0.140
COPD	2216 (25.1)	1111 (26.4)	1105 (23.9)	0.006	556 (24.8)	549 (23.1)	0.170
Previous heart failure	5353 (61.9)	2683 (64.9)	2670 (59.2)	< 0.001	1274 (58.1)	1396 (60.3)	0.127
Basal situation							
Barthel index < 60 points	1732 (22.8)	869 (23.7)	863 (22.1)	0.091	365 (20.2)	282 (13.4)	< 0.001
Basal NYHA III—IV	2021 (24.7)	985 (25.3)	1036 (24.2)	0.241	510 (24.9)	526 (23.5)	0.92
Baseline treatment							
Loop diuretics	5815 (69.1)	2818 (70.5)	2997 (67.9)	0.012	1459 (69.1)	1538 (66.9)	0.121
ACE inhibitors or ARAs	4698 (55.9)	2179 (54.6)	2519 (57.1)	0.021	1179 (55.8)	1340 (58.3)	0.092
MRBs	1528 (18.2)	713 (17.8)	815 (18.5)	0.461	382 (18.1)	433 (18.8)	0.504
Calcium channel blockers	1959 (23.3)	917 (22.9)	1042 (23.6)	0.468	472 (22.3)	570 (24.8)	0.053
Beta-blockers	3440 (39.4)	1441 (34.6)	1999 (43.7)	< 0.001	958 (43.0)	1041 (44.3)	0.397
Digoxin	1503 (17.9)	784 (19.6)	719 (16.3)	< 0.001	341 (16.1)	378 (16.5)	0.775
Amiodarone	533 (6.3)	245 (6.1)	288 (6.5)	0.451	136 (6.4)	152 (6.6)	0.796
Nitrates	1651 (19.6)	763 (19.1)	888 (20.1)	0.238	505 (23.9)	383 (16.7)	< 0.001
Acute episode data							
Dyspnoea	7684 (87.2)	3573 (85.0)	4111 (89.2)	< 0.001	2029 (89.7)	2138 (88.4)	0.162
Oedema	5497 (67.1)	2495 (69.7)	3002 (65.1)	< 0.001	1457 (64.4)	1593 (65.9)	0.291
Symptoms of low cardiac output[a]	1405 (18.3)	568 (17.8)	837 (186)	0.330	471 (21.2)	380 (16.2)	< 0.001
O_2 saturation $\leq$ 90%	2531 (30.0)	1157 (29.0)	1374 (30.9)	0.057	729 (33.5)	665 (28.6)	< 0.001

Table 1 (*Continued*)

	Total ($n = 8850$)	nocTn ($n = 4216$)	wcTn ($n = 4634$)	*P*	wcTn; cTn elevated ($n = 2251$)	wcTn; cTn not elevated ($n = 2383$)	*P*
SBP $\leq$ 100 mmHg	487 (5.6)	224 (5.4)	263 (5.8)	0.473	157 (7.1)	111 (4.6)	< 0.001
Hyponatraemia[b]	1749 (20.4)	777 (19.4)	972 (21.2)	0.044	554 (24.6)	429 (17.9)	< 0.001
eGFR < 60 mL/min/1.73 m^2	4879 (56.5)	2292 (56.1)	2587 (56.8)	0.554	1417 (63.1)	1214 (51.0)	< 0.001
Management in the ED							
Oxygen therapy	6589 (75.6)	3221 (77.6)	3368 (73.8)	< 0.001	1629 (73.3)	1739 (74.3)	0.455
Diuretics[c]	7659 (87.8)	3649 (87.8)	4010 (87.9)	0.955	1923 (86.5)	2087 (89.1)	0.006
Endovenosos nitrates	1630 (18.7)	781 (18.8)	849 (18.6)	0.820	451 (20.3)	398 (17.0)	0.004
Inotropic drugs or vasopressors	201 (2.5)	70 (2.1)	131 (2.9)	0.029	85 (3.8)	46 (2.0)	< 0.001
Morphine	415 (6.4)	118 (4.3)	297 (7.9)	< 0.001	193 (9.8)	104 (5.8)	< 0.001
NIV in the ED	618 (7.1)	214 (5.2)	404 (8.9)	< 0.001	208 (9.4)	196 (8.4)	0.242
Invasive ventilation	277 (3.5)	121 (3.6)	156 (3.4)	0.616	74 (3.3)	82 (3.5)	0.744

Data are expressed as mean $\pm$ standard deviation or number (%). ACE: angiotensin-converting enzyme; ARA: aldosterone receptor antagonist; COPD: chronic obstructive pulmonary disease; CRI: chronic renal insufficiency defined by a creatinine concentration > 2 mg/dL; cTn: cardiac troponin; ED: emergency department; eGFR: estimated glomerular filtration rate calculated with the MDRD-4 (Modification of Diet in Renal Disease) formula; nocTn: without cTn determination; MRB: mineralocorticoid receptor blocker (eplerenone and spironolactone); NIV: non-invasive ventilation; NYHA: New York Heart Association; SBP: systolic blood pressure; wcTn: with cTn determination.

[a] Symptoms of low cardiac output are defined as the presence of cold extremities, alteration in level of consciousness, bad peripheral perfusion and/or sweating.

[b] Hyponatraemia sodium value < 135 mEq/L.

[c] Use of diuretics in perfusion, bolus or both.

Table 2 Multivariable study of basal and acute episode characteristics in patients in whom cardiac troponin was not determined in the emergency department.

	Crude OR (95% CI)	Adjusted OR (95% CI)
History		
Ischaemic heart disease	0.75 (0.69–0.82)	0.74 (0.67–0.83)
Cerebrovascular accident	0.86 (0.76–0.97)	0.88 (0.77–1.02)
Atrial fibrillation	1.09 (1.01–1.19)	1.07 (0.97–1.18)
Peripheral artery disease	0.84 (0.72–0.97)	0.94 (0.79–1.11)
COPD	1.14 (1.04–1.26)	1.11 (0.99–1.23)
Heart failure	1.27 (1.17–1.39)	1.19 (1.07–1.32)
Baseline treatment		
Loop diuretics	1.13 (1.03–1.24)	1.15 (1.03–1.28)
ACE inhibitors or ARAs	0.90 (0.83–0.99)	0.90 (0.82–0.99)
Beta-blockers	0.68 (0.63–0.75)	0.77 (0.70–0.85)
Digoxin	1.25 (1.12–1.40)	1.07 (0.94–1.21)
Acute episode data		
Dyspnoea	0.69 (0.61–0.78)	0.93 (0.80–1.08)
Oedema	1.23 (1.12–1.35)	1.20 (1.08–1.32)
Hyponatraemia[a]	**0.90 (0.81–1.00)**	**0.92 (0.82–1.03)**

ACE: angiotensin-converting enzyme, ARA: aldosterone receptor antagonist; CI: confidence interval; COPD: chronic obstructive pulmonary disease; OR: odds ratio.
[a] Hyponatraemia sodium value < 135 mEq/L.

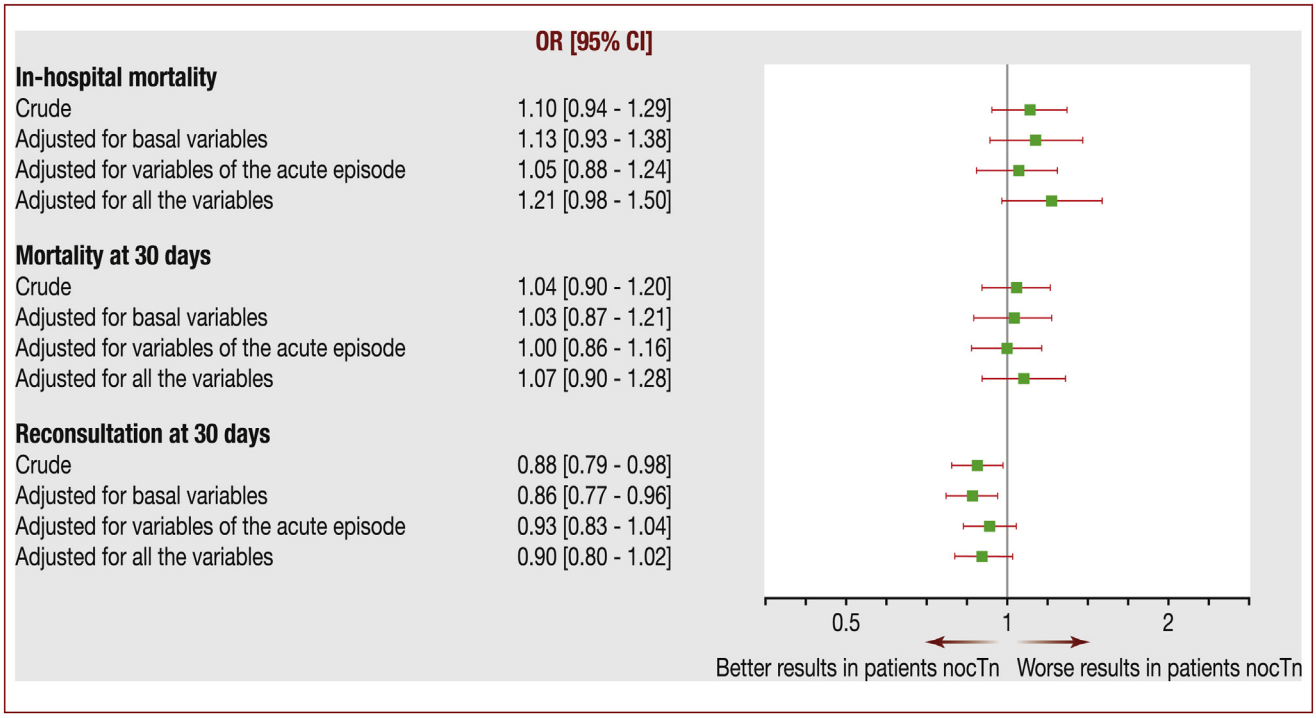

Figure 2. Crude and adjusted odds ratios (ORs) with 95% confidence intervals (CIs) for the different outcome variables in patients with acute heart failure in whom troponin was not determined in the emergency department (nocTn). Values adjusted for basal variables (ischaemic heart disease, previous heart failure, use of angiotensin-converting enzyme inhibitors or aldosterone receptor antagonists, loop diuretics or beta-blockers at home) and the acute episode (oedema of the lower extremities).

Discussion

The results of EAHFE-TROPICA3 study show that there is a high percentage of patients with AHF in whom cTn is not determined, and that these patients have different characteristics. Only the EFFECT study has performed this type of comparative analysis, focusing on evaluating the relationship between an increase in the cTn I concentration and mortality [17]. Among a total of 3800 patients, cTn concentrations were not determined in 1674 patients

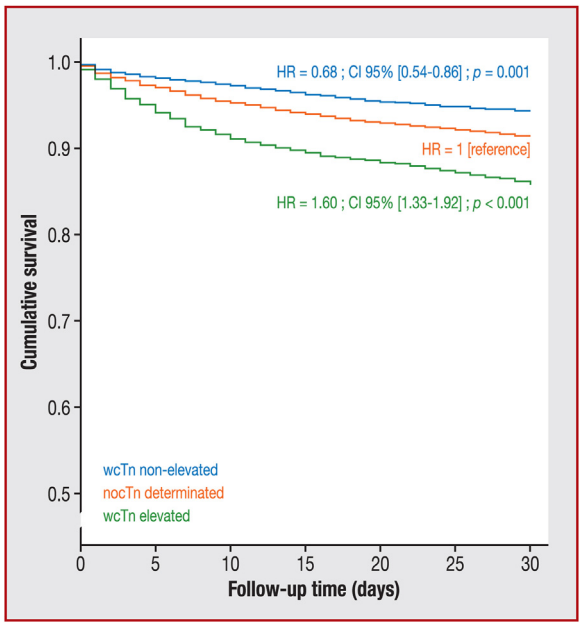

Figure 3. Crude survival curves at 30 days in patients with acute heart failure based on elevated, non-elevated or non-determined troponin concentrations. Log-rank (Mantel—Cox) < 0.001. Values adjusted for basal variables (ischaemic heart disease, previous heart failure, use of angiotensin-converting enzyme inhibitors or aldosterone receptor antagonists, loop diuretics or beta-blockers at home) and the acute episode (oedema of the lower extremities). The reference value was ''without troponin determination'' (nocTn). CI: confidence interval; HR: hazard ratio; wcTn: with troponin determination.

(46.5%)—a similar result to ours. In this study, the authors only described and compared the basal characteristics, and did not find many differences between the two populations studied. As in the present study, the nocTn group had a lower prevalence of ischaemic heart disease, cerebral vascular accidents and peripheral artery disease. However, in the multivariable analysis of our study, only ischaemic heart disease remained significantly different. The explanation for this is that, as recommended in the clinical practice guidelines, cTn determination is usually requested in these patients to rule out an acute coronary syndrome as the trigger for the AHF episode. There is greater use of angiotensin-converting enzyme inhibitors or aldosterone receptor antagonists and beta-blockers, following the recommendations of the guidelines, in this type of patient with an ischaemic substrate. We also found other differences, albeit few, in the acute episode data and in the management of the acute episode, defining the profile of a patient with less severe disease, as less morphine, fewer vasopressors and less non-invasive ventilation were used. This confirms, in part, our hypothesis that the physician does not request cTn in patients with lower severity.

Despite this profile of lower severity, an unexpected and important result of our study was that no significant differences were observed between the nocTn and wcTn groups in terms of in-hospital mortality, and mortality and reconsultation at 30 days. We can say that the nocTn group had a less severe profile, but this was not related to a better prognosis, because mortality and reconsultation were the same as in the wcTn group.

The predictive value of elevated cTn concentrations is well known, being related to a worse outcome [14—16]. For this reason, the determination of cTn is used in AHF predictive scales. There are numerous scales for evaluating the prognosis of AHF, most of which are used in hospitalized patients. The Emergency Heart Failure Mortality Risk Grade (EHMRG) scale [6], the Ottawa Heart Failure Risk Scale (OHFRS) [8] and the Multiple Estimation of risk based on the Emergency department Spanish Score In patients with AHF (MEESSI-AHF) scale [7] are used to assess the outcomes of patients with AHF in the ED setting. The presence of elevated cTn concentrations in the scales is considered to be a bad outcome factor, which is scored as positive. A theoretical limitation of the application of these scales is the absence of cTn determination. This occurs frequently because of the elevated number of patients without cTn determination in the ED. Therefore, in the validation of the EHMRG scale with a Spanish cohort, the main reason for patient exclusion from performing the validation was the absence of cTn determination (in 40.5% of the sample) [20].

The reason why the nocTn group did not present a worse outcome can be explained by the results of the comparative analysis between the elevated and non-elevated wcTn groups. On comparison of these groups, there was a stratification of risk in 30-day mortality. The survival curve for the nocTn group was between the elevated and non-elevated wcTn group curves. This result is logical if we take into account that practically half of the wcTn group had elevated concentrations (48.6%), with the other half having non-elevated concentrations (51.4%); this same pattern would have been assumed in the nocTn group if cTn had been determined, and thus the prognoses are neutralized. Other biomarkers are being investigated, to better assess the prognosis of patients with AHF. Galectin and sST2 are two proposed biomarkers, with good initial results; at present, however, their availability is limited [21—23].

In the ongoing debate about the stratification of risk in patients with AHF [24—27], the implications of our study are clear. There are numerous patients for whom cTn determination is not requested, and the assumption that these patients have a low risk and a better prognosis is not true. We must determine cTn in all patients with AHF, to try to improve the stratification prognosis according to the presence or absence of high cTn concentrations.

Study limitations

This study has several limitations. The design excluded patients presenting an acute coronary syndrome as the trigger for the AHF episode. In this group of patients, cTn is always requested to achieve the diagnosis, which could produce a selection bias. However, it is known that the outcome of these patients does not depend on the episode of AHF itself, but rather on specific measures of the ischaemic event; their inclusion, therefore, would have induced a bias. There may be a bias in the decision to determine or not determine cTn depending on the characteristics of the patient; this makes the characteristics of the two groups different, but we think it is a reflection of usual clinical practice. The determination of cTn was not centralized in

a biobank, so the use of different immunoassays in different centres is a limitation. Nonetheless, this allows a more general application of the conclusions. The comparison with stratified cTn concentrations was not an objective of this study, but might have had an impact on patient outcome with slightly elevated values, especially for highly sensitive cTn T.

Conclusions

The present study identified a large group of patients in whom cTn concentrations were not determined; this was more frequent in patients with chronic heart failure and less ischaemic heart disease. Emergency management suggests a less severe profile, but this was not related to lower in-hospital mortality, and mortality or reconsultation at 30 days.

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Disclosure of interest

The authors declare that they have no competing interest.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.acvd.2019.02.004.

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