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Etiology of nontraumatic out-of-hospital cardiac arrest with return of spontaneous circulation and predictive values of computed tomography findings for in-hospital mortality in affected patients

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Abstract

Computed tomography (CT) scans are increasingly requested for nontraumatic out-of-hospital cardiac arrest (OHCA) patients with return of spontaneous circulation (ROSC). CT scan findings contribute to the diagnosis of cardiac arrest and patient management. The primary objective of this study is to determine the causes and frequencies of cardiac arrest in nontraumatic OHCA patients with ROSC, and the secondary objective is to determine the CT preferences of clinicians and the predictive values of CT findings for in-hospital mortality in these patients. The population of this retrospective single-center cohort study consisted of 863 nontraumatic OHCA patients brought to the emergency department of a tertiary hospital between January 1st, 2016, and December 31st, 2020. The study sample consisted of 258 nontraumatic OHCA patients with ROSC aged 18 years and older who underwent radiographic imaging within 24 hours after emergency department admission. Two emergency medicine specialists determined the causes of cardiac arrest based on all available data. Patients' radiological images were re-reported by a radiologist. CT findings associated with in-hospital mortality were determined. The median age of 258 patients included in the sample, 163 (63.2%) of whom were male, was 67 years (interquartile range: 17, min: 18–max: 94). Cardiac arrest occurred primarily due to cardiac causes (35.3%), followed by pulmonary causes (29.1%), while the cause could not be determined in 22.9% of the patients. The radiological imaging method most preferred by clinicians was cranial CT (n = 238, 92.2%), followed by thoracic CT (n = 236, 91.5%) and abdominal CT (n = 141, 54.7%). The in-hospital mortality rate was 88%. Several thoracic CT findings, including infiltration/consolidation (odds ratio: 6.74; 95% confidence interval [CI]: 1.35–33.56, $P = .017$), chronic lung pathologies (OR: 1.39; 95% CI: 0.44–4.8, $P = .026$), and chronic lung pathologies accompanied by pneumothorax (OR: 17.5; 95% CI: 1.7–178.4, $P = .001$) were significantly associated with in-hospital mortality. We found that cardiac causes were the most common causes of cardiac arrest in nontraumatic OHCA patients with ROSC. Additionally, clinicians most frequently requested cranial and thoracic CT for these patients. Of note, thoracic CT findings were significantly associated with in-hospital mortality.

Abbreviations: CI = confidence interval, CPR = cardiopulmonary resuscitation, CT = computed tomography, DW-MRI = diffusion-weighted MRI, ED = emergency department, ICU = intensive care unit, OHCA = out-of-hospital cardiac arrest, PCI = percutaneous coronary intervention, ROSC = return of spontaneous circulation.

Keywords: emergency service, hospital, hospital mortality, out-of-hospital cardiac arrest, return of spontaneous circulation, tomography, X-ray computed

1. Introduction

The incidence of out-of-hospital cardiac arrest (OHCA), a significant public health concern, has been reported as 53 to 55/100,000 person/year.[1,2] The incidence of return of spontaneous circulation (ROSC) in patients with OHCA has been reported as 29.7% (95% confidence interval [CI]: 27.6–31.7%), the rate of survival until hospital admission as 22.0% (95% CI: 20.7–23.4%) and the rate of survival until discharge from hospital as 8.8% (95% CI: 8.2–9.4%).[3] Neurological

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The datasets generated during and/or analyzed during the current study are not publicly available, but are available from the corresponding author on reasonable request.

This study received approval from the University of Health Sciences Tepecik Training and Research Hospital Ethics Committee (Decision No: 2021/07-01, dated July 14, 2021).

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problems occur in 65% of discharged OHCA patients, and irreversible cognitive dysfunction in approximately 35%.[4]

Many studies have found cardiac causes to be the most common cause of OHCA, with rates ranging from 37.5% to 82%.[5–7] While 2.3% to 16% of OHCA cases were reportedly caused by neurological emergencies,[8–10] the cause could not be determined in 17.2% of cases.[11] Clinicians consider cases of OHCA of unknown cause to be "presumed cardiac" per Utstein guidelines.[12] However, the rates of OHCA cases with "cardiac" and "noncardiac" etiologies reported in the literature are inconsistent.[13] In OHCA patients, limited anamnesis and physical examination findings, as well as the limited time, make it difficult to determine the etiology. In this context, computed tomography (CT) stands out as the most effective method in determining the etiology of OHCA.

Nevertheless, requesting a CT scan for OHCA patients is a critical decision, as transferring an unstable patient to a CT unit carries the risk of re-arrest and may also delay time-sensitive procedures such as percutaneous coronary intervention (PCI). The use of antiplatelet agents before PCI may worsen intracerebral hemorrhage. On the other hand, not performing imaging studies to confirm the diagnosis could ultimately worsen the patient's condition. Therefore, despite its disadvantages, the use of CT after arrest is increasing due to easier access to CT and physicians' concerns about overlooking diagnoses. Early whole-body CT is reportedly applicable in nontraumatic OHCA patients with ROSC and provides additional diagnostic value.[14,15] On the other hand, it has been reported that early cranial CT scans performed in nontraumatic OHCA patients with ROSC did not change the early and late post-resuscitation care of the patients.[16] Another study concluded that there is insufficient evidence to establish that performing cranial CT and other CT scans in the emergency department (ED) improved patient management.[17]

In light of this information, the primary objective of this study is to determine the causes of cardiac arrest and the frequencies of these causes in nontraumatic OHCA patients with ROSC, and the secondary objective is to determine the CT preferences of clinicians and the predictive values of CT findings for in-hospital mortality in these patients. It is expected that the findings of this study will provide insight into the usefulness of early imaging studies in managing OHCA patients with ROSC and guide new studies in this field.

2. Materials and methods

2.1. Study design and setting

This study was designed as a retrospective single-center cohort study. It was conducted between January 1st, 2016, and December 31st, 2020, in a tertiary training and research hospital where emergency medicine and cardiology specialists are available 24 hours a day, which provides uninterrupted radiological imaging services, including CT and magnetic resonance imaging (MRI), and handles approximately 200,000 ED admissions annually. The study protocol was approved by the local ethics committee (Decision No: 2021/07-01).

2.2. Population and sample

The study population consisted of 863 nontraumatic OHCA patients brought to the ED of a tertiary hospital during the study period. Cardiopulmonary resuscitation (CPR) of each patient with OHCA brought to the ED was managed by a team that included an emergency medicine specialist. CPR was initiated and managed according to the 2015 and 2020 American Heart Association Advanced Cardiac Life Support Guidelines for nontraumatic OHCA patients brought to ED. Palpation of a detectable pulse from the great arteries for at least 15 minutes was considered to indicate ROSC. ROSC was achieved in 347 (40.2%) of 863 nontraumatic OHCA patients. Radiological imaging was performed in 258 (74.4%) OHCA patients with ROSC within 24 hours after ED admission. In the end, the study sample consisted of 258 nontraumatic OHCA patients with ROSC aged 18 years and older who underwent radiological imaging.

2.3. Data collection

Patients' demographic characteristics, including age, gender, age group (<65 years old, 65–74 years old, 75–84 years old, and >85 years old), the year of ED admission, and the type of ED admission (via 112-emergency helpline or other means), clinical characteristics, including chronic diseases, and radiological imaging methods performed (cranial CT, thoracic CT, abdominal CT, diffusion-weighted MRI (DW-MRI) of the brain, chest X-ray), their findings and timing were obtained from the hospital information system and recorded.

The causes of cardiac arrest were identified based on all available data of the patients, including ED and intensive care unit (ICU) epicrisis reports, laboratory test results, electrocardiography findings, echocardiography findings, PCI, and radiological imaging reports (cranial CT, thoracic CT, abdominal CT, DW-MRI of the brain, chest X-ray), surgical outcomes, medical and/or interventional treatments applied, and consultation notes. Since there was no standard testing protocol for OHCA patients with ROSC, they underwent different tests. Therefore, this study focused only on CT findings associated with in-hospital mortality.

2.4. Key variables and outcomes

Two emergency medicine specialists evaluated all available data of the patients together. They classified the cardiac arrests by mutual decision as cardiac arrest due to cardiac causes, pulmonary causes, intracranial causes, sepsis, toxins, anaphylaxis, metabolic causes, surgical causes, or cardiac arrest of unknown cause.

In cases where there was no apparent cardiac cause, such as typical angina prior to the arrest, ventricular fibrillation on electrocardiography, ST-segment elevation or newly identified left bundle branch block, and critical stenosis on PCI, and in cases where the cause of cardiac arrest could not be determined with other data, the cardiac arrest was defined as "cardiac arrest of unknown cause."

All radiological images obtained (cranial CT, thoracic CT, abdominal CT, DW-MRI of the brain, chest X-ray) were reported by a single radiologist blinded to patient characteristics. CT findings common to patients were grouped and recorded.

The study's outcome was defined as in-hospital mortality. ED outcome (mortality, ICU admission or transfer to ICU) and ICU outcome (mortality or discharge) of the patients were determined by reviewing hospital records and local records and recorded.

2.5. Statistical analysis

SPSS 25.0 (Statistical Product and Service Solutions for Windows, Version 25.0, IBM Corp., Armonk, NY, 2017) and Medcalc 14 (Acacialaan 22, B-8400 Ostend, Belgium) software packages were used in the statistical analyses of the collected data. The normal distribution characteristics of numerical variables were analyzed using Shapiro–Wilk and Shapiro–Francia tests. Probability (P) statistics of $\leq .05$ were deemed to indicate statistical significance. Mann–Whitney U test with Monte Carlo simulation was used to compare the differences in numerical variables between 2 independent groups. Pearson chi-square test, Fisher–Freeman–Halton test, and Fisher exact test with Monte Carlo simulation were used to compare the differences in categorical variables between the groups. Benjamini–Hochberg procedure was used to conduct post hoc analyses. The in-hospital mortality rates of patients with a risk factor compared to those without were expressed using hazard ratios within 95% CIs. Missing data were treated as a potential limitation of the study, and analyses included only patients with complete data. The impact of missing data on potential bias was considered during the interpretation of the results. Lastly, Decision Tree, Random Forests, Ada Boosting, XGBoost, and LightGBM algorithms were used to determine the cause–effect relationship between the hospital outcome dependent variable and explanatory variables. However, the results were not reported because there was such a significant imbalance in the amount of data between different classes of the response variable that most models predicted the class with the most data, and therefore, a reliable model could not be built. As this was a retrospective study based on hospital records, there was no active follow-up of patients beyond their in-hospital care. Loss to follow-up was not applicable, as all included patients had complete in-hospital records for the variables analyzed. Quantitative variables were tabulated as mean ± standard deviation, and median with minimum–maximum values, and categorical variables were tabulated as numbers (n) and percentage (%) values. Variables were analyzed within a 95% CI. Probability (*P*) statistics of < .05 were deemed to indicate statistical significance.

3. Results

Among a total number of 863 OHCA patients on whom CPR was performed in the ED during the study period, 258 patients were included in the data analysis. The patient flow diagram is shown in Figure 1. The median age of 258 patients included in the sample, 163 (63.2%) of whom were male, was 67 (interquartile range [IQR]: 17, min: 18–max: 94) years. One hundred eighty-three patients (70.9%) applied to the ED via the 112-emergency helpline. The most common chronic disease in the sample was hypertension (51.6%), followed by coronary artery disease (44.2%) and diabetes mellitus (28.3%). Ninety-six (37.2%) patients had CT scans within the first hour, 144 (55.8%) between the 1st and 6th hours, and 18 (7%) between the 6th and 24 hours. Cardiac arrest in nontraumatic OHCA patients with ROSC occurred primarily due to cardiac causes (n = 91, 35.3%), followed by pulmonary causes (n = 75, 29.1%), while the cause could not be determined in 59 (22.9%) patients. The most commonly performed cardiac intervention was PCI (n = 24), followed by cardiac pacing (n = 2) and pericardiocentesis (n = 1). No patient underwent neurosurgical intervention. The follow-up period was completed after patients were discharged from the hospital or died in the hospital. 86 (37.9%) of the patients died within the first 24 hours, 81 (35.7%) within 1 to 7 days, 42 (18.5%) within 8 to 30 days and 18 (7.9%) after 30 days. Patients' clinical characteristics are shown in Table 1.

The most frequently preferred radiological imaging method was cranial CT (n = 238, 92.2%), followed by thoracic CT (n = 236, 91.5%) and abdominal CT (n = 141, 54.7%). Additionally, 18 (7%) patients underwent CT angiography of the chest, 16 (6.2%) underwent DW-MRI of the brain, 16 (6.2%) underwent chest X-ray, and 80 (31%) underwent echocardiography. All patients who underwent PCI had undergone cranial CT scans beforehand. One patient with subarachnoid hemorrhage detected on a cranial CT scan became an organ donor and underwent surgery for liver and bilateral kidney explantation. Abdominal CT revealed findings of acute abdomen in 8 patients, including free fluid in the abdomen in 6 patients, mesenteric ischemia in 1 patient, and pneumoperitoneum in 1 patient. The patient diagnosed with mesenteric ischemia was taken into surgery, and the diagnosis was confirmed, but the patient died.

Thirty-one (12%) patients were discharged from the hospital. Of the 347 nontraumatic OHCA patients with ROSC, the in-hospital mortality of 258 (74.4%) patients with radiological imaging was 88% (n = 227), compared to the 100% in-hospital mortality of 89 (25.6%) patients without radiological imaging. No significant relationship was found between the causes of cardiac arrest and in-hospital mortality (*P* = .257). CT findings and their relationship with in-hospital mortality are shown in Table 2.

Missing data were primarily related to variables such as prehospital shockable rhythms and CPR duration due to limitations

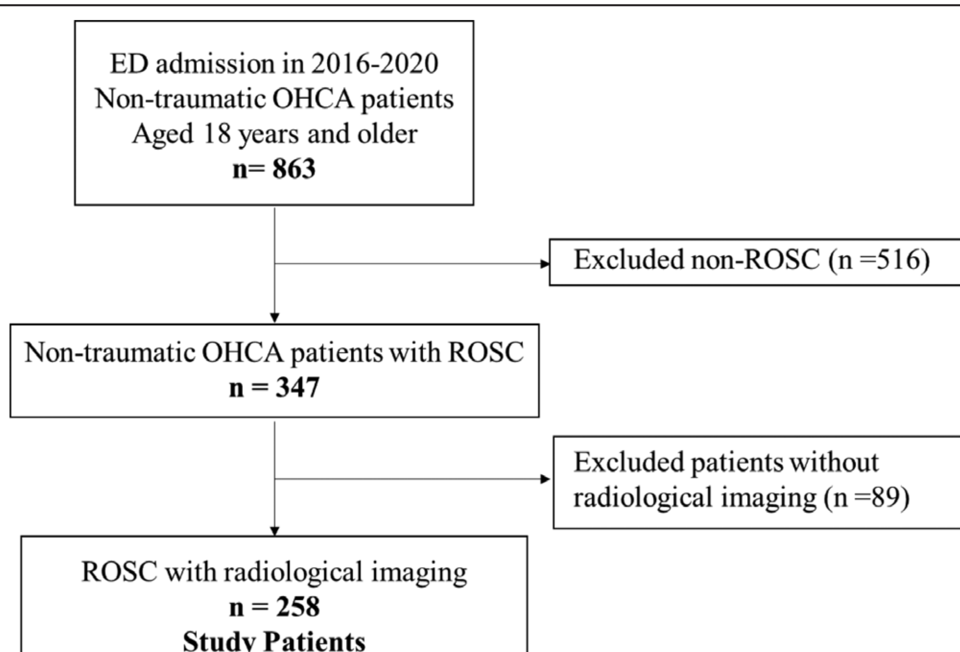

Figure 1. Patients flow diagram. ED = emergency department, OHCA = out-of-hospital cardiac arrest, ROSC = return of spontaneous circulation.

Table 1

Clinical characteristics of patients with nontraumatic out-of-hospital cardiac arrest and return of spontaneous circulation.

Characteristics	n (%)
Chronic diseases	
Hypertension	133 (51.6)
Coronary artery disease	114 (44.2)
Diabetes mellitus	73 (28.3)
Others	73 (28.3)
Congestive heart failure	65 (25.2)
Chronic obstructive pulmonary disease	53 (20.5)
Chronic renal failure	41 (15.9)
Cerebrovascular disease	33 (12.8)
Malignancy	30 (11.6)
Hyperlipidemia	21 (8.1)
Dementia	12 (4.7)
Interventional treatments	31 (12.0)
Cardiac interventions	26 (83.9)
Cardiovascular and thoracic surgery	3 (9.7)
Abdominal surgery	2 (6.5)
Medical treatments	59 (22.9)
Antibiotics	45 (76.3)
Antiedema drugs	9 (15.3)
Thrombolytics	2 (3.4)
Hemodialysis	2 (3.4)
Erythrocyte suspension transfusion	1 (1.7)
Causes of cardiac arrest	
Cardiac causes	91 (35.3)
Pulmonary causes	75 (29.1)
Unknown	59 (22.9)
Intracranial causes	13 (5.0)
Metabolic causes	11 (4.3)
Toxins	4 (1.6)
Sepsis	2 (0.8)
Anaphylaxis	2 (0.8)
Mesenteric ischemia	1 (0.4)

Antiedema drugs include furosemide, mannitol, or dexamethasone.
OHCA = out-of-hospital cardiac arrest, ROSC = return of spontaneous circulation.

in prehospital record availability. However, in-hospital variables had no missing data.

4. Discussion

Cardiac arrest in nontraumatic OHCA patients with ROSC occurred primarily due to cardiac causes (35.3%), followed by pulmonary causes (29.1%), intracranial causes (5%), metabolic causes (4.3%), toxins (1.6%), sepsis (0.8%), anaphylaxis (0.8%), and surgical causes (0.4%), while the cause could not be determined in 59 (22.9%) patients. The radiological imaging method most preferred by clinicians in nontraumatic OHCA patients with ROSC was cranial CT (n = 238, 92.2%), followed by thoracic CT (n = 236, 91.5%). The in-hospital mortality rate of our sample was 88%. Several thoracic CT findings, including infiltration/consolidation (*P* = .017), chronic lung pathologies (*P* = .026), and chronic lung pathologies accompanied by pneumothorax (*P* = .001) were found to be significantly associated with in-hospital mortality in nontraumatic OHCA patients with ROSC.

The characteristics of the sample were consistent with the literature. The male ratio was 63.2% and the median age was 67 (IQR: 17, min: 18–max: 94) years. In a similar study conducted in our country, the mean age of the eligible patients for analysis was 65.2 ± 15.2 years. Majority of these were male (61.7%).[18] The most common chronic disease in the sample was hypertension (51.6%). Hypertension was associated with an increased risk of OHCA (adjusted odds ratio: 1.19 [1.07–1.32]).[19]

The guidelines published in 2021 by the European Resuscitation Council and the European Society of Intensive Care Medicine on post-resuscitation care, it is recommended that the noncardiac etiology of OHCA can be determined through cranial CT and thoracic CT in patients without evidence of cardiac ischemia, but there are no specific recommendations on when and to which patients CT can be performed.[20] In our population, 74.4% of OHCA patients with ROSC had undergone some form of radiological imaging. The in-hospital mortality of OHCA patients with ROSC in our population who did not undergo any radiological imaging was 100%. We believe that clinicians did not request radiologic imaging for these patients because they were unstable. CT was performed in 93% of the patients in our sample within the first 6 hours. Emergency medicine physicians often prefer to perform CT early in OHCA patients in whom ROSC has been achieved.

Thoracic CT revealed the highest number and rate of abnormal findings in our sample among the CT methods. Accordingly, abnormal findings, primarily pulmonary edema/effusion (n = 63) and consolidation/infiltration (n = 61), were detected in 193 of 236 patients who underwent thoracic CT. Additionally, pneumothorax was detected in 36 patients, and rib fracture was detected in 10 patients due to resuscitation. Several thoracic CT findings, including infiltration/consolidation (OR: 6.74; 95% CI: 1.35–33.56, *P* = .017)), chronic lung pathologies (OR: 1.39; 95% CI: 0.44–4.8, *P* = .026), and chronic lung pathologies accompanied by pneumothorax (OR: 17.5; 95% CI: 1.7–178.4, *P* = .001) were significantly associated with in-hospital mortality in nontraumatic OHCA patients with ROSC. Thoracic angiography CT, which was performed on a limited number of selected patients (n = 18), revealed major causes of cardiac arrest, including pulmonary embolism in 9 patients and aortic dissection in 1 patient. A recent study reported that CT revealed abnormal lung parenchymal and pleural findings, primarily aspiration, pulmonary edema, and consolidation/pneumonia, in 78% of OHCA patients, similar to our study.[21] Abdominal CT revealed signs of acute abdomen in 8 of our patients, free fluid in the abdomen in 6, and mesenteric ischemia and pneumoperitoneum in 1 patient each. While mesenteric ischemia was considered the cause of cardiac arrest, other findings were considered resuscitation complications. Abdominal CT findings were not found to be associated with in-hospital mortality. Karasakis et al reported that resuscitation-related injury diagnoses were common (81%), with 14% being critical.[22] It has been reported that head-to-pelvis CT has a diagnostic yield of approximately 30% in determining the cause of cardiac arrest.[23] In comparison, in our study, even though CT imaging identified important causes of cardiac arrest and CPR complications, the causes of cardiac arrest were not determined solely by CT imaging. Yet, considering that CT imaging provides essential diagnostic information in OHCA patients with ROSC, early CT scanning should be considered in selected patients.

Although our study's most frequently preferred radiological imaging method was cranial CT (n = 238, 92.2%), intracranial causes were the 4th most common (5%) cause of cardiac arrest. The prevalence of intracranial hemorrhage in OHCA patients was reported as 4.28% (95% CI: 3.31–5.24) in the literature.[10] Gökdere et al reported the rate of clinically significant abnormalities in the cranial CT scan of nontraumatic OHCA patients with ROSC as 12.2%, and the most common changes in patient management as requesting consultation from the neurology department (n = 9) and adding a new medication to the treatment (n = 6).[16] Nevertheless, they found no significant difference in mortality between the groups with and without changes in patient management. In their study, as in our study, no patient underwent neurosurgical intervention. They concluded that performing an early cranial CT scan in the ED is unnecessary. However, they noted limited sample variation as a limitation of their study. In our opinion, the fact that they did not have any patients requiring neurosurgical intervention as a change in patient management may be considered another limitation of their study. In our study, only 1 patient with ischemic stroke

Table 2

Association between computed tomography findings and in-hospital mortality.

Characteristics	Survived (n = 31)	Deceased (n = 227)	Odds ratio (95% CI)	*P*-value
ED admission via emergency (112), yes	14 (45.2)	61 (26.9)	–	.056§
Age, median (min–max)	60 (29–88)	67 (18–94)	–	**.001**#
Gender, male	20 (64.5)	143 (63.0)	–	.999§
Cranial CT performed, yes	30 (96.8)	208 (91.6)	–	.483¶
Cranial CT findings			–	.642‖
Normal*	20 (66.7)	131 (63.0)	–	–
Acute ischemia and edema	1 (3.3)	9 (4.3)	–	–
Chronic ischemic changes	9 (30.0)	57 (27.4)	–	–
Mass effect/compression	0 (0.0)	4 (1.9)	–	–
Bleeding	0 (0.0)	7 (3.4)	–	–
Thoracic CT performed, yes	27 (87.1)	209 (92.1)	–	.385¶
Thoracic CT Findings			–	**.039**‖
Normal*	8 (29.6)	35 (17.2)	–	–
Infiltration/consolidation (1)	2 (7.4)	**59 (29.1)**	6.74 (1.35–33.56)	**.017**‖
Pulmonary edema/effusion (2)	6 (22.2)	57 (28.1)	–	–
Pneumothorax (3)	0 (0.0)	5 (2.5)	–	–
Rib fracture (4)	1 (3.7)	3 (1.5)	–	–
Chronic changes/masses (5)†	**7 (25.9)**	22 (10.8)	1.39 (0.44-4.8)	**.026**‖
2 + 3	2 (7.4)	18 (8.9)	–	–
3 + 5	1 (3.7)	4 (2.0)	17.5 (1.7–178.4)	**.001**‖
2 + 3 + 4 + 5‡	0 (0.0)	6 (3.0)	–	–
Chest CT angiography performed, yes	–	18 (9.0)	–	–
Normal	–	8 (44.4)	–	–
Pulmonary embolism	–	9 (50.0)	–	–
Aortic dissection	–	1 (5.6)	–	–
Abdominal CT performed, yes	11 (35.5)	130 (57.3)	–	**.033**§
Abdominal CT findings			–	.853‖
Normal	8 (72.7)	95 (73.1)	–	–
Chronic nonspecific	3 (27.3)	27 (20.8)	–	–
Acute surgical diagnoses	0 (0.0)	8 (6.2)	–	–

All tests performed with Monte Carlo simulation. Post hoc analysis performed using Benjamini–Hochberg procedure.

CI = confidence interval, CT = computed tomography, ED = emergency department.

*Reference value for odds ratio.

†Includes bulla, atelectasis, fibrosis, and masses.

‡Excluded from analysis.

§Pearson chi-square test.

‖Fisher–Freeman–Halton test.

¶Fisher exact test.

#Mann–Whitney *U* test.

survived among the patients with blunt pathology detected on cranial CT. Cranial CT findings were not associated with in-hospital mortality. However, all patients had undergone cranial CT before PCI. Additionally, a patient diagnosed with subarachnoid hemorrhage became an organ donor. Although the outcome of OHCA patients is generally poor, clinicians perform CT on these patients for many reasons.

The primary limitation of this study was its retrospective and single-center design. Secondly, not all causes of cardiac arrest could be determined. Thirdly, prehospital data such as the presence of shockable rhythms (ventricular fibrillation, pulseless ventricular tachycardia) and CPR duration, which may have affected mortality, could not be evaluated because they were limited. Whole-body CT was not performed on all patients. There was no standardization in the performed examinations and radiological imaging requested according to the probable causes of cardiac arrest. Finally, the impact of CT findings on patient management has not been examined.

5. Conclusions

In conclusion, we found that cardiac causes were the most common causes of cardiac arrest in nontraumatic OHCA patients with ROSC. Additionally, we determined that clinicians most frequently requested cranial and thoracic CT for these patients. Of note, we found that thoracic CT findings were significantly associated with in-hospital mortality in these patients.

Author contributions

Conceptualization: Yesim Eyler, Turgay Yilmaz Kilic.
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Methodology: Hasan Idil.
Supervision: Ali Er.
Writing – original draft: Yesim Eyler.
Writing – review & editing: Yesim Eyler, Turgay Yilmaz Kilic, Hasan Idil, Ali Er.

References

[1] Berdowski J, Berg RA, Tijssen JG, Koster RW. Global incidences of out-of-hospital cardiac arrest and survival rates: Systematic review of 67 prospective studies. Resuscitation. 2010;81:1479–87.
[2] Hawkes C, Booth S, Ji C, et al. Epidemiology and outcomes from out-of-hospital cardiac arrests in England. Resuscitation. 2017;110:133–40.
[3] Yan S, Gan Y, Jiang N, et al. The global survival rate among adult out-of-hospital cardiac arrest patients who received cardiopulmonary resuscitation: a systematic review and meta-analysis. Crit Care. 2020;24:61.

[4] Mozaffarian D, Benjamin EJ, Go AS, et al. Heart disease and stroke statistics--2015 update: a report from the American Heart Association. Circulation. 2015;131:e29–322.
[5] Moriwaki Y, Tahara Y, Kosuge T, Suzuki N. Etiology of out-of-hospital cardiac arrest diagnosed via detailed examinations including perimortem computed tomography. J Emerg Trauma Shock. 2013;6:87–94.
[6] Myat A, Song KJ, Rea T. Out-of-hospital cardiac arrest: current concepts. Lancet. 2018;391:970–9.
[7] Pell JP, Sirel JM, Marsden AK, Ford I, Walker NL, Cobbe SM. Presentation, management, and outcome of out of hospital cardiopulmonary arrest: comparison by underlying aetiology. Heart. 2003;89:839–42.
[8] Kurkciyan I, Meron G, Sterz F, et al. Spontaneous subarachnoid haemorrhage as a cause of out-of-hospital cardiac arrest. Resuscitation. 2001;51:27–32.
[9] Inamasu J, Miyatake S, Suzuki M, et al. Early CT signs in out-of-hospital cardiac arrest survivors: temporal profile and prognostic significance. Resuscitation. 2010;81:534–8.
[10] Lee KY, So WZ, Ho JSY, et al. Prevalence of intracranial hemorrhage amongst patients presenting with out-of-hospital cardiac arrest: a systematic review and meta-analysis. Resuscitation. 2022;176:136–49.
[11] Gassler H, Fischer M, Wnent J, Seewald S, Helm M. Outcome after pre-hospital cardiac arrest in accordance with underlying cause. Resuscitation. 2019;138:36–41.
[12] Bray JE, Grasner JT, Nolan JP, et al. Cardiac arrest and cardiopulmonary resuscitation outcome reports: 2024 update of the utstein out-of-hospital cardiac arrest registry template. Circulation. 2024;150:e203–23.
[13] Carter RM, Cone DC. When is a cardiac arrest non-cardiac? Prehosp Disaster Med. 2017;32:523–7.
[14] Viniol S, Thomas RP, Konig AM, Betz S, Mahnken AH. Early whole-body CT for treatment guidance in patients with return of spontaneous circulation after cardiac arrest. Emerg Radiol. 2020;27:23–9.
[15] Westafer LM. Whole-Body CT after nontraumatic cardiac arrest? https://www.jwatch.org/na49898/2019/09/13/whole-body-ct-after-nontraumatic-cardiac-arrest. Accessed February 2, 2025.
[16] Cankaya Gokdere D, Emektar E, Corbacioglu SK, Yuzbasioglu Y, Ozturk C, Cevik Y. The role of brain CT in patients with out-of-hospital cardiac arrest with return of spontaneous circulation. Am J Emerg Med. 2022;52:143–7.
[17] Korkmaz T, Sener A, Degerli V. Correlation of prognosis and cost-effectiveness of computed tomography for out-of-hospital cardiac arrest patients with return of spontaneous circulation in the emergency department. J Pak Med Assoc. 2022;72:1507–12.
[18] Avci A, Yolcu S, Simsek Y, et al. Factors affecting the return of spontaneous circulation in cardiac arrest patients. Medicine (Baltim). 2024;103:e40966.
[19] Kim J, Cho SI, Park JH, et al. Risk of hypertension and treatment on out-of-hospital cardiac arrest incidence: a case-control study. Medicine (Baltim). 2022;101:e29161.
[20] Nolan JP, Sandroni C, Bottiger BW, et al. European resuscitation council and European society of intensive care medicine guidelines 2021: post-resuscitation care. Resuscitation. 2021;161:220–69.
[21] Newton M, Hall J, Counts CR, et al. Lung parenchymal and pleural findings on computed tomography after out-of-hospital cardiac arrest. Resuscitation. 2024;205:110446.
[22] Karatasakis A, Sarikaya B, Liu L, et al. Prevalence and patterns of resuscitation-associated injury detected by head-to-pelvis computed tomography after successful out-of-hospital cardiac arrest resuscitation. J Am Heart Assoc. 2022;11:e023949.
[23] Branch KR, Nguyen ML, Kudenchuk PJ, Johnson NJ. Head-to-pelvis CT imaging after sudden cardiac arrest: current status and future directions. Resuscitation. 2023;191:109916.