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Cardiac arrhythmias in geriatric patients receiving palliative care support

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Abstract

Introduction: Although palliative care patients often undergo electrocardiography (ECG), a detailed cardiac examination is often skipped. The aim of this study was to determine the incidence of arrhythmia in older patients in need of palliative care and to evaluate risk factors for asymptomatic arrhythmias.

Material and methods: This prospective observational study was conducted between 1 March and 1 September 2022 among inpatients in the palliative care unit of Atatürk University Faculty of Medicine Hospital. Malnutrition status was assessed using the full Mini Nutritional Assessment. Delirium was assessed at hospitalization using the confusion assessment method. Electrocardiography was performed in all patients at admission to the palliative care unit. This was followed by 12-lead, 24-hour ambulatory ECG to detect arrythmias. Electrocardiography recordings were evaluated.

Results: The 100 patients included in the study had a median age of 78 years, and 63.0% were women. Arrythmias were detected on Holter ECG in 70 patients (70.0%). The most common were premature ventricular contraction (PVC) (56.5%) and atrial fibrillation (AF) (30.4%). There was a statistically significant negative moderate correlation between PVC load and left ventricular ejection fraction ($r = –0.308$; $p = 0.002$). Premature ventricular contraction load was significantly higher in men than in women ($p = 0.018$). Of the patients with AF, 17 (17.0%) were under anticoagulant therapy. Left ventricular ejection fraction differed significantly according to the presence of AF and anticoagulant use. Left ventricular ejection fraction was lower in patients with AF and anticoagulant use compared to those without AF ($p = 0.001$).

Conclusions: The prevalence of arrhythmias in palliative care patients is considerable. The treatment of arrhythmias in this patient population is complicated by polypharmacy, comorbidities, and frailty.

Key words: palliative care, older adults, arrhythmia.

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INTRODUCTION

Palliative care is a medical specialty in which a multidisciplinary team works in concert to provide individuals with life-threatening illness the best possible quality of life, primarily by preventing or reducing pain. Through the comprehensive assessment and management of pain and other physical and psychosocial problems, palliative care aims to meet patients' spiritual needs [1].

Over the last 20 years, progress has been made worldwide in the field of palliative care, with most large hospitals now offering palliative care. It is possible to receive palliative care support in 67% of hospitals with a bed capacity over 50 and 90% of hospitals with a bed capacity over 300 [2]. Recent increases in life expectancy, cancer incidences, and life expectancy and comorbidities among patients with cancer have also led to an increase in the average age of individuals in palliative care centres. Studies conduct-

ed in the USA have shown that older adults account for most people receiving palliative care support [3].

Although people of all ages receive palliative care [4], the problems experienced by patients receiving geriatric palliative care differ from those in the younger population. The prevalence of neurodegenerative diseases such as dementia increases with aging [5]. These patients are more likely to experience symptoms such as anorexia, anxiety, and nausea than younger people [3]. They also describe symptoms such as pain differently [6]. In addition, patients receiving geriatric palliative care have lower discharge rates compared to younger people [7].

Aging is associated with a progressive loss of myocytes in the heart, while the remaining cells exhibit hypertrophy and connective tissue increases. At more advanced ages, changes such as amyloid accumulation occur. These age-related physiological changes increase the incidence of cardiac arrhythmias, which are associated with higher mortality and morbidity in older patients [8]. Although palliative care patients often undergo electrocardiography (ECG), a detailed cardiac examination is often skipped. The aim of this study was to determine the incidence of arrhythmia in older patients in need of palliative care and to evaluate risk factors for asymptomatic arrhythmias.

MATERIAL AND METHODS

This prospective observational study was conducted between 1 March and 1 September 2022 among inpatients in the palliative care unit of Atatürk University Faculty of Medicine Hospital.

Inclusion criteria were being aged 60 years or older, length of stay in the palliative care unit of at least 24 hours, and signing an informed consent form to participate in the study. Exclusion criteria were repeated admissions to the palliative care unit and inability to provide written informed consent.

Patients' demographic characteristics, reasons for admission to palliative care, from where they were admitted to palliative care, their height, weight, and body mass index (BMI) at admission to palliative care, vital signs such as fever, blood pressure, heart rate, and oxygen saturation at admission, discharge status, survival, and presence and site of infection at admission and during follow-up were recorded. Nutrition status was assessed using the full Mini Nutritional Assessment (MNA). The full MNA consists of 18 items questioning the patient's health and nutritional status, anthropometric measurements (BMI, upper arm and calf circumferences), global evaluation (lifestyle, drugs, mobility, acute stress/dementia/depression), patient self-evaluation (their opinion of their health and nutrition), and oral intake (fluid and food intake and whether they feed themself). Patients with a total score of more than 23.5 in the full MNA were classified as having normal nutritional status, those with scores of 17–23.5 were classified as at risk of malnutrition, and those with scores below 17 were classified as malnourished [9].

On the day of admission to the palliative care unit the confusion assessment method (CAM) was used to evaluate delirium severity. The confusion assessment method tool evaluates the 4 essential distinguishing features of delirium. The first item assesses sudden change or fluctuations in mental status, the second item assesses distraction, the third item assesses disorganized thinking, and the fourth item assesses changes in the level of consciousness. A diagnosis of delirium according to this scale requires positivity of the first 2 items and one of the third or fourth items [10]. Various studies have indicated the validity and reliability of the CAM and demonstrated high sensitivity (94–100%) and specificity (90–95%) [11].

The following laboratory parameters were evaluated at admission to palliative care: white blood cell, neutrophil, lymphocyte, and platelet counts, mean platelet volume, haemoglobin, haematocrit, erythrocyte sedimentation rate, procalcitonin, C-reactive protein, sodium, chlorine, potassium, magnesium, calcium, phosphorus, albumin, creatinine, blood urea nitrogen, aspartate aminotransferase, alanine aminotransferase, gamma-glutamyl transferase, alkaline phosphatase, thyroid-stimulating hormone, and basal cortisol.

All patients in the study underwent ECG upon ward admission to the palliative care unit. This was followed by 12-lead, 24-hour ambulatory ECG (iTengo Holter ECG Workstation, BORSAM, Shenzhen, China) to detect arrythmias. Simultaneous 3-channel, 24-hour Holter recordings were obtained from all patients and transferred to a computer for analysis. A digitized Holter program was used to identify arrhythmias, then the traces were visually reviewed and areas where the traces were unclear were excluded from evaluation. The QRS morphology classification was also performed automatically by the Holter program and obtained after review and manual editing by an experienced technician. Two cardiologists then manually reviewed the entire automated interpretation of the recording for all arrhythmic episodes and all unknown traces. The daily number of premature ventricular contractions (PVC) was recorded for each patient. The daily number of QRS complexes was also recorded. Premature ventricular contraction load was defined as the ratio of PVCs to the total number of QRS complexes in the 24-hour recording.

While performing ECG (Vivid T8®GE Medical System, Horten, Norway), left ventricular end-

diastolic and end-systolic volumes were measured in apical 2- and 4-chamber images, and left ventricular ejection fraction (LVEF) was determined using the modified Simpson rule. All ECG measurements were made from sinus beats, avoiding post-extra systolic beats if possible. Heart failure (HF) was classified according to the 2021 European Society of Cardiology guideline as HF with mildly reduced ejection fraction (LVEF 41–49%) or reduced ejection fraction (LVEF ≤ 40) [12].

Statistical analysis

All analyses were performed using SPSS Statistics version 20.0 (IBM Corp, http://www.spss.com). The Kolmogorov-Smirnov test was used to test continuous variables for normal distribution. The continuous data showed non-normal distribution and were expressed as median and range. The categorical data were presented as frequency distribution and percentages. Categorical data were compared between groups using χ^2 tests or Fisher's exact test if any cell had a value less than 5. Continuous data were compared between groups using the nonparametric Kruskal-Wallis and Mann-Whitney *U* tests. $P < 0.05$ was accepted as statistically significant. Relationships between continuous variables were examined using Spearman's correlation analysis. The strength of correlations was evaluated as weak at *r* values of 0.01–0.029, moderate at 0.30–0.70, strong at 0.71–0.99, and perfect at 1.0. $P < 0.05$ was accepted as statistically significant.

Permission to conduct the study was obtained from the Atatürk University Faculty of Medicine Clinical Research Ethics Committee (dated 27 January 2022, meeting no. 1, decision no. 67). The study was supported by the Atatürk University Research Fund (project number 10474).

RESULTS

The median age of the patients included in the study was 78 (range 64–96), and 63 (63.0%) were women. The most common indications for hospitalization were malnutrition (n = 47, 23.0%), urinary tract infection (n = 19, 9.3%), and pneumonia (n = 16, 7.8%). Arrythmias were detected on Holter ECG in 70 patients (70.0%). The distribution of the arrhythmias detected by 24-hour Holter ECG is shown in Figure 1. The most common findings were PVC (n = 52, 56.5%) and atrial fibrillation (AF) (n = 28, 30.4%).

The basic characteristics of the patients without PVC and those with PVC (grouped as those using and not using antiarrhythmic drugs) are compared in Table 1. There were statistically significant differences between the groups in terms of HF, coronary artery disease (CAD), and malignancy. Heart failure and CAD were more common in patients with PVC and antiarrhythmic use than in those without PVC and with PVC but without antiarrhythmic use. Malignancy was found to be more common in patients with PVC but not using an antiarrhythmic compared to the other groups.

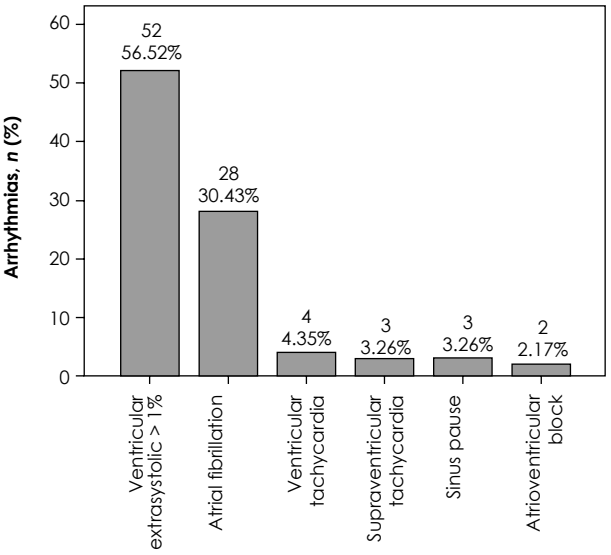

Fig. 1. Distribution of arrhythmias detected on Holter electrocardiography

The patients' vital signs, laboratory findings, and transthoracic echocardiography (TTE) and ECG results according to the presence of PVC and antiarrhythmic use are evaluated in Table 2. Left ventricular ejection fraction, left ventricular end-diastolic diameter (LVEDD), and left ventricular mass index differed significantly according to the presence of PVC and antiarrhythmic use. Left ventricular ejection fraction was higher in patients without PVC compared to those with PVC and antiarrhythmic use (p = 0.007) and PVC without antiarrhythmic use ($p < 0.001$). Left ventricular mass index and LVEDD were both lower in patients without PVC compared to those with PVC and antiarrhythmic use (p = 0.001 and p = 0.046, respectively) and PVC without antiarrhythmic use (p = 0.003 and p = 0.006, respectively).

Analysis of the relationships between PVC load and vital signs, laboratory findings, and TTE and ECG results revealed a moderate negative correlation between PVC load and LVEF (r = –0.308; p = 0.002). There was also a weak positive correlation between PVC load and LVEDD (r = 0.255; p = 0.010). These correlations are shown in Figure 2.

Differences in PVC load were evaluated according the patients' demographic characteristics, comorbidities, habits, and malnutrition and delirium status. There was a statistically significant relationship between PVC burden and gender, with higher PVC load in men than in women (p = 0.018). The re-

Table 1. Basic characteristics of patients based on the presence of premature ventricular contraction and antiarrhythmic use

Parameters	PVC, no antiarrhythmic use (*n* = 34)[1]	PVC, antiarrhythmic use (*n* = 18)[2]	No PVC (*n* = 48)[3]	*p*-value
Age (years), median (range)	77 (66–92)	77 (66–94)	80 (65–96)	0.221
Gender, male, *n* (%)	17 (50.0)	6 (33.3)	14 (29.2)	0.060
BMI, median (range)	24 (17–37.4)	23.5 (21–28.7)	25 (18–34)	0.496
Habits, *n* (%)				
Smoking				0.991
Never-smoker	25 (73.5)	13 (72.2)	34 (70.8)	
Ex-smoker	8 (23.5)	4 (22.2)	12 (25.0)	
Current smoker	1 (2.9)	1 (5.6)	2 (4.2)	
Comorbidities, *n* (%)				
HT	21 (61.8)	12 (66.7)	27 (56.3)	0.719
DM	11 (32.4)	8 (44.4)	16 (33.3)	0.648
CAD	4 (11.8)	9 (50.0)	7 (14.6)	0.002
CKD	7 (20.6)	2 (11.1)	9 (18.8)	0.687
HF	2 (5.9)	9 (50.0)	10 (20.8)	0.001
COPD	7 (20.6)	5 (27.8)	9 (18.8)	0.723
Dementia	6 (17.6)	1 (5.6)	8 (16.7)	0.461
Parkinson's disease	2 (5.9)	0	2 (4.2)	0.586
CVD	9 (26.5)	3 (16.7)	5 (12.5)	0.265
Malignancy	11 (32.4)	0	4 (8.3)	0.002
PVD	2 (5.9)	0	1 (2.1)	0.435
Hyperthyroidism	4 (11.8)	1 (5.6)	5 (10.4)	0.710
Hypothyroidism	2 (5.9)	1 (5.6)	1 (2.1)	0.642
Hyperlipidaemia	0	1 (5.6)	2 (4.2)	0.432
Infectious disease at admission, *n* (%)	24 (70.6)	11 (61.1)	28 (79.2)	0.314
Infectious disease in hospital, *n* (%)	12 (35.3)	5 (27.8)	12 (25.0)	0.594
Delirium according to CAM, *n* (%)	9 (25.5)	5 (27.8)	18 (37.5)	0.524
Malnutrition according to MNA, *n* (%)	16 (47.1)	5 (27.8)	23 (47.9)	0.164
Number of diseases, median (range)	3 (0–6)	4 (0–5)	3 (0–5)	0.062
Outcome, *n* (%)				0.541
Mortality	3 (8.8)	0	6 (12.5)	
Intensive care transfer	6 (17.6)	2 (11.1)	7 (14.6)	
Discharge	25 (73.5)	16 (88.9)	35 (72.9)	

BMI – body mass index, CAD – coronary artery disease, CAM – confusion assessment method, CKD – chronic kidney disease, COPD – chronic obstructive pulmonary disease, CVD – cerebrovascular disease, DM – diabetes mellitus, HF – heart failure, HT – hypertension, MNA – Mini Nutritional Assessment, PVC – premature ventricular contractions, PVD – peripheral vascular disease
HF: 1 vs. 2, p < 0.001, 2 vs. 3, p = 0.023; CAD: 1 vs. 2, p = 0.002, 2 vs. 3, p = 0.005; malignancy: 1 vs. 2, p = 0.005, 1 vs. 3, p = 0.007

lationship between gender and PVC load is presented in Figure 3.

Atrial fibrillation was detected in 34 patients (34.0%). Paroxysmal AF was detected in 6 patients (6.0%). Of the patients with AF, 17 (17.0%) were under anticoagulant therapy. The basic characteristics of the patients according to the presence of AF and anticoagulant use are presented and compared in Table 3.

The distribution of vital signs, laboratory findings, and TTE and ECG results according to the presence of AF and anticoagulant use is evaluated in Table 4. Left ventricular ejection fraction differed significantly according to the presence of AF and anticoagulant use. Left ventricular ejection fraction was lower in patients with AF and anticoagulant use compared to those without AF ($p = 0.001$).

DISCUSSION

In our study, the most common arrhythmias in 100 patients receiving geriatric palliative care sup-

Table 2. Distribution of vital signs, laboratory findings, and transthoracic echocardiography and electrocardiography results according to the presence of premature ventricular contraction and antiarrhythmic use

Parameters	PVC, no antiarrhythmic use (*n* = 34)[1]	PVC, antiarrhythmic use (*n* = 18)[2]	No PVC (*n* = 48)[3]	*p*-value
Vital signs, mean ± SD				
Body temperature (°C)	36.7 ±0.63	36.7 ±0.44	36.6 ±0.40	0.608
Systolic BP [mm Hg]	113 ±15.33	114 ±0.03	113 ±19.53	0.913
Diastolic BP [mm Hg]	71 ±9.24	70 ±0.31	71 ±11.87	0.997
RR (breaths/min)	14 ±2.58	14 ±0.80	14 ±2.51	0.982
HR (beats/min)	85 ±15.03	88 ±0.08	80 ±17.84	0.121
TTE findings, mean ± SD				
LVEF	50.70 ±8.75	45.94 ±9.78	54.37 ±6.20	< 0.001
LVMI	178.88 ±39.81	174.94 ±23.22	153.72 ±31.65	0.001
LVEDD	50.35 ±7.38	53.38 ±7.27	47.66 ±5.15	0.010
IVS	13.73 ±2.55	13.50 ±1.15	14.37 ±1.45	0.057
TAPSE	22.82 ±3.08	22.61 ±2.83	22.77 ±3.64	0.845
ECG findings, mean ± SD				
QT interval	408.52 ±44.58	422.94 ±21.36	415.68 ±39.21	0.221
PR interval	174.48 ±27.08	175.85 ±15.69	168.64 ±49.24	0.291
Laboratory findings, median (range)				
WBC count	8.88 (2.55–114.80)	7.87 (4.96–24.04)	8.47 (3.12–24.00)	0.913
Neutrophil count	6.32 (1.03–15.97)	5.60 (2.11–21.29)	6.28 (2.51–22.64)	0.470
Lymphocyte count	1.16 (0.13–3.48)	1.63 (0.70–2.84)	1.20 (0.32–3.51)	0.070
Hgb	11.7 (4.0–16.3)	11.0 (6.3–12.6)	11.15 (7.2–19.3)	0.548
Platelet count	243 (73–538)	231 (103–521)	249 (89–779)	0.281
MPV	10.0 (8.5–11.9)	10.9 (9.0–11.9)	10.4 (8.8–12.9)	0.051
Glucose	114 (36–572)	126 (79–439)	100 (57–506)	0.372
Na	136 (116–158)	139 (127–147)	138 (124–180)	0.299
K	4.10 (2.88–5.77)	4.09 (2.46–6.00)	4.39 (2.90–6.43)	0.414
Mg	1.8 (1.0–2.7)	1.7 (0.9–2.9)	1.9 (1.3–4.2)	0.139
Ca	8.27 (6.67–11.56)	8.82 (6.80–11.41)	8.55 (6.60–10.60)	0.352
P	3.1 (0.9–8.0)	3.1 (2.0–6.7)	3.3 (1.1–6.3)	0.579
TSH	2.00 (0.01–28.20)	1.39 (0.01–13.00)	1.20 (0.01–13.30)	0.013
T4	0.99 (0.15–1.69)	1.47 (0.80–5.50)	1.19 (0.50–1.90)	0.002
BUN	28 (9–96)	22 (6–197)	25 (6–93)	0.745
Creatinine	1.00 (0.21–5.20)	0.92 (0.40–3.80)	1.03 (0.20–5.00)	0.736
AST	20 (8–119)	18 (13–85)	21 (7–162)	0.896
ALT	14 (1–101)	15 (7–63)	14 (1–74)	0.741
ALP	87 (42–343)	87 (42–239)	98 (44–729)	0.690
LDH	266 (126–2197)	233 (181–590)	294 (44–616)	0.307
CRP	38.5 (0.6–197.0)	21.0 (1.1–328.0)	39.5 (1.0–258.0)	0.788
Procalcitonin	0.24 (0.01–46.00)	0.13 (0.01–1.00)	0.14 (0.01–10.80)	0.397

ALP – alkaline phosphatase, ALT – alanine aminotransferase, AST – aspartate aminotransferase, BP – blood pressure, BUN – blood urea nitrogen, Ca – calcium, CRP – C-reactive protein, ECG – electrocardiography, Hgb – haemoglobin, HR – heart rate, IVS – interventricular septal thickness, K – potassium, LDH – lactate dehydrogenase, LVEF – left ventricular ejection fraction, LVEDD – left ventricle end diastolic diameter, LVMI – left ventricle mass index, Mg – magnesium, MPV – mean platelet volume, Na – sodium, P – phosphorus, PLT – platelet count, PVC – premature ventricular contractions, RR – respiratory rate, TAPSE – tricuspid annular plane systolic excursion, TSH – thyroid-stimulating hormone, TTE – transthoracic echocardiography, T4 – free thyroxine, WBC – white blood cell
LVEF: 1 vs. 3, p = 0.007, 2 vs. 3, p < 0.001; LVMI: 1 vs. 3, p = 0.001, 2 vs. 3, p = 0.003; LVEDD: 1 vs. 3, p = 0.046, 2 vs. 3, p = 0.006; TSH: 1 vs. 3, p = 0.020; T4: 1 vs. 2, p = 0.002, 1 vs. 3, p = 0.020

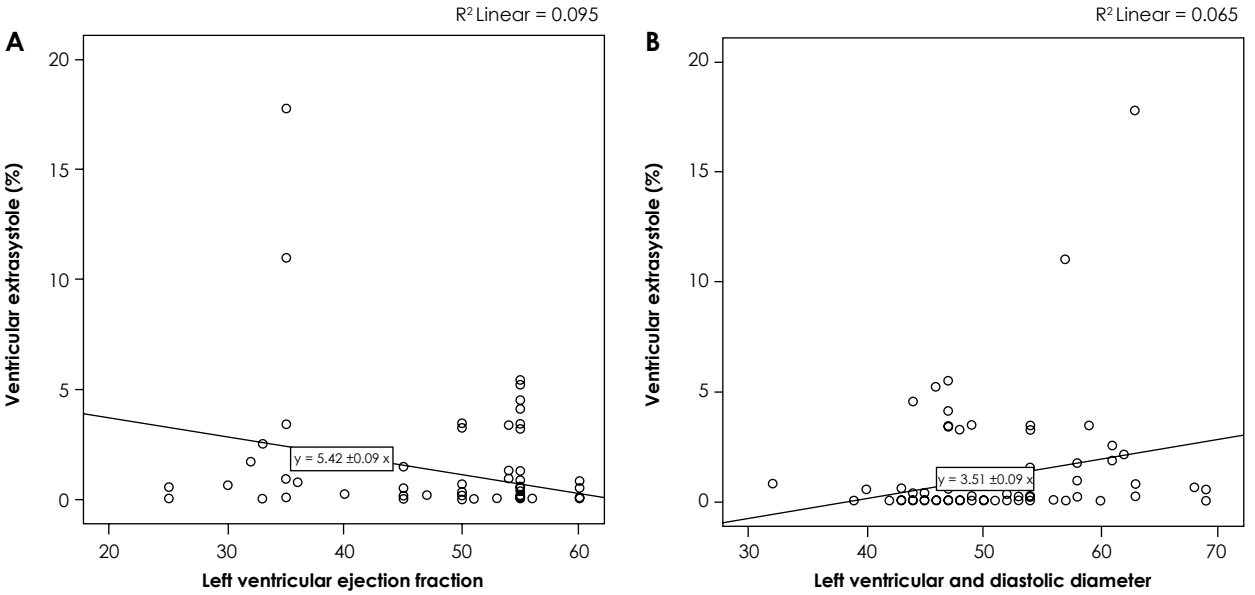

Fig. 2. Correlation between premature ventricular contract load and left ventricular ejection fraction, and left ventricular end-diastolic diameter

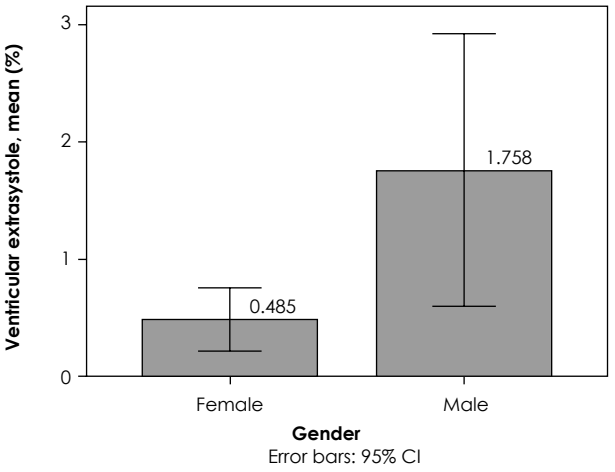

Fig. 3. Relationship between sex and premature ventricular contract load

port were PVC and AF. The prevalence of PVC was higher among patients diagnosed with malignancy, CAD, and HF and those using antiarrhythmic drugs.

It is clear that the incidence of arrhythmia has increased in the older population as a result of longer life expectancy. Aging causes declines in cardiac sinus node signal output and conduction system function, making the heart prone to various arrhythmias [13]. The frailty of geriatric patients and the presence of comorbid cardiovascular diseases often increase the importance of undiagnosed arrhythmias because of impairments in physical and cognitive function. However, the frequency of arrhythmias is not known exactly in this population because older patients have generally not been adequately represented in clinical trials.

The prevalence of PVC in the general population ranges from 4 to 20% and increases with age [14, 15]. Studies conducted among active older people have shown that the prevalence of PVC varies 69–100% [16, 17]. Fleg *et al*. [18] reported a PVC prevalence of 78% among 98 healthy people aged 60–85 years. Higher rates were reported in older groups, reaching 89.4% in a study by Garcia *et al*. [19] including 94 healthy subjects aged 70 years and older, 96% in a study by Kantelip *et al*. [20] in 50 people aged 80 years and older, and 100% in a study by Rossi *et al*. [17] including 18 active subjects aged 90 years and older.

High PVC load is associated with reduced LVEF [16]. Our study also showed that the prevalence of PVC was higher in patients with reduced ejection fraction, consistent with the literature data. In addition, the presence of ventricular arrhythmias in patients with low ejection fraction is associated with high cardiac mortality [17]. Increased LVEDD is an indicator of left ventricular dilation, which leads to arrhythmias via various mechanisms. Left ventricular dilation, myocardial fibrosis, and changes in the distribution of connexin proteins are proarrhythmic [18]. The most common arrhythmia in our study was PVC, at a rate of 56.5%. It is important to detect and treat PVCs, especially in older patients with low ejection fraction, because they disrupt ventricular contraction and lead to diastolic dysfunction. Our findings are also consistent with a previous report that male gender poses a risk for ventricular arrhythmias [19].

Atrial fibrillation screening is important in the older population. The European Society of Cardiology recommends opportunistic screening for AF in patients aged 65 years and older [20]. Lindberg *et al*. [21] showed that many older patients had undiagnosed and therefore untreated AF. In a study including 1454 community-dwelling older adults aged

Table 3. The basic characteristics of the patients according to the presence of atrial fibrillation and anticoagulant use

Parameters	AF, no anticoagulant use (*n* = 17)[1]	AF, anticoagulant use (*n*=17)[2]	No AF (*n* = 66)[4]	*p*-value
Vital signs, mean ± SD				
Age (years), median (range)	82 (69–94)	80 (67–95)	78 (65–96)	0.244
Gender, male, *n* (%)	4 (23.5)	9 (52.9)	24 (36.4)	0.203
BMI, median (range)	25 (21–34)	25 (21–29)	24 (17–34)	0.086
Habits, *n* (%)				
Smoking				0.860
Never-smoker	13 (76.5)	11 (64.7)	48 (72.7)	
Ex-smoker	4 (23.5)	5 (29.4)	15 (22.7)	
Current smoker	0	1 (5.9)	3 (4.5)	
Comorbidities, *n* (%)				
HT	10 (58.8)	11 (64.7)	39 (59.1)	0.910
DM	6 (35.3)	6 (35.3)	23 (34.8)	0.999
CAD	2 (11.8)	6 (35.3)	12 (18.2)	0.118
CKD	5 (29.4)	0	13 (19.7)	0.069
HF	3 (17.6)	7 (41.2)	11 (16.7)	0.081
COPD	1 (5.9)	5 (23.5)	16 (24.2)	0.243
Dementia	2 (11.8)	1 (9.1)	12 (18.2)	0.412
Parkinson's disease	1 (5.9)	1 (5.9)	2 (3.0)	0.788
CVD	3 (17.6)	5 (29.4)	10 (15.2)	0.394
Malignancy	2 (11.8)	2 (11.8)	11 (16.7)	0.809
PVD	0	0	3 (4.5)	0.451
Hyperthyroidism	4 (23.5)	2 (11.8)	4 (6.1)	0.098
Hypothyroidism	1 (5.9)	1 (9.1)	2 (3.0)	0.788
Hyperlipidaemia	0	1 (9.1)	2 (3.0)	0.603
Infectious disease at admission, *n* (%)	12 (70.6)	10 (58.)	51 (77.3)	0.302
Infectious disease in hospital, *n* (%)	4 (23.5)	7 (41.2)	18 (27.3)	0.457
Delirium according to CAM, *n* (%)	6 (35.3)	4 (23.5)	22 (33.3)	0.705
Malnutrition according to MNA, *n* (%)	5 (29.4)	9 (52.9)	30 (45.5)	0.613
Number of diseases, median (range)	3 (0–5)	4 (2–5)	3 (0–6)	0.103
Outcome, *n* (%)				0.784
Mortality	2 (11.8)	2 (11.8)	5 (7.6)	
Intensive care transfer	3 (17.6)	1 (5.9)	11 (16.7)	
Discharge	12 (70.6)	14 (82.4)	50 (75.8)	

AF – atrial fibrillation, BMI – body mass index, CAD – coronary artery disease, CAM – confusion assessment method, CKD – chronic kidney disease, COPD – chronic obstructive pulmonary disease, CVD – cerebrovascular disease, DM – diabetes mellitus, HF – heart failure, HT – hypertension, MNA – mini nutritional assessment, PVD – peripheral vascular disease

60–94 years, AF was found to be the most common sustained arrhythmia, with a prevalence of 1.3% [27]. In other studies, the prevalence of chronic AF has been shown to vary 1.5–3.0% in the general population [23, 24] and increase to 20% with advanced age [25, 26]. In a study by Rich *et al*. [27], approximately half of people diagnosed with chronic AF were aged 75 years old or above. In the older population, repeated ECG screening was shown to have 5-fold greater diagnostic power than normal follow-up [28].

In the literature, the rate of newly diagnosed AF varies 0.7–9.5% [29]. It was detected in 6.2% of patients presenting to primary health care facilities in Canada in a study by Godin *et al*. [30] and 5.5% of older Dutch people in a study by Zwart *et al*. [28]. In contrast, a recent meta-analysis showed that the detection rate of new AF was 1.7% using single-lead ECG [31]. The second most common type of arrhythmia in the patients in our study was AF, at a rate of 30.4%. The differences in AF rates between studies may be related to the higher comorbidities,

Table 4. Distribution of vital signs, laboratory findings, and transthoracic echocardiography and electrocardiography results according to the presence of atrial fibrillation and anticoagulant use

Parameters	AF, no anticoagulant use (*n* = 17)[1]	AF, anticoagulant use (*n* = 17)[2]	No AF (*n* = 66)[3]	*p*-value
Vital signs, mean ± SD				
Body temperature (°C)	36.7 ±0.53	36.7 ±0.50	36.7 ±0.50	0.989
Systolic BP [mm Hg]	108 ±14.37	111 ±20.73	115 ±17.65	0.243
Diastolic BP [mm Hg]	69 ±8.99	70 ±13.08	72 ±10.76	0.827
RR (breaths/min)	15 ±1.94	15 ±1.97	14 ±2.62	0.297
HR (beats/min)	82 ±20.29	82.35 ±14.73	83 ±15.87	0.994
TTE findings, mean ± SD				
LVEF	51 ±7.35	46 ±11.11	53 ±7.23	0.011
LVMI	168 ±30.44	176 ±28.45	163 ±37.83	0.210
LVEDD	49 ±6.25	53 ±8.06	49 ±6.16	0.128
IVS	14 ±1.81	14 ±1.56	14 ±1.99	0.638
TAPSE	21 ±3.08	22 ±2.92	23 ±3.38	0.051
ECG findings, mean ± SD				
QT interval	416 ±24.26	423 ±20.51	412 ±44.79	0.567
PR interval	150 ±62.88	177 ±14.54	174 ±36.73	0.454
Laboratory findings, median (range)				
WBC count	7.08 (2.61–22.72)	9.71 (5.45–114.80)	8.47 (2.55–24.00)	0.464
Neutrophil count	5.13 (1.28–19.39)	8.32 (2.52–21.29)	6.02 (1.03–22.64)	0.697
Lymphocyte count	0.96 (0.41–2.23)	0.80 (0.14–2.84)	1.43 (0.13–3.51)	0.088
Haemoglobin	11.2 (7.9–16.0)	10.8 (5.6–16.0)	11.4 (4.0–19.3)	0.920
Platelet count	209 (101–779)	230 (95–479)	251 (73–538)	0.202
MPV	10.4 (9.1–11.8)	10.4 (8.8–11.5)	10.3 (8.5–12.9)	0.915
Glucose	100 (36–268)	107 (73–300)	110 (39–572)	0.624
Na	137 (116–145)	139 (127–153)	136 (121–180)	0.314
K	4.0 (3.4–5.2)	4.2 (2.5–6.0)	4.3 (2.8–6.4)	0.604
Mg	1.8 (1.3–2.9)	1.8 (1.1–2.9)	1.8 (0.9–4.2)	0.769
Ca	8.4 (7.2–9.4)	8.5 (7.1–11.4)	8.5 (6.6–11.6)	0.423
P	3.0 (0.9–6.3)	3.0 (1.3–6.7)	3.3 (1.1–8.0)	0.152
TSH	1.53 (0.01–13.30)	1.20 (0.01–12.40)	1.57 (0.01–28.20)	0.381
T4	1.13 (0.29–1.50)	1.27 (0.45–5.50)	1.13 (0.15–1.90)	0.643
BUN	23 (9–96)	27 (15–197)	25 (6–91)	0.768
Creatinine	1.02 (0.20–3.87)	0.90 (0.41–5.20)	0.97 (0.20–5.00)	0.938
AST	18 (14–119)	24 (12–85)	20 (7–162)	0.854
ALT	10 (6–101)	15 (3–63)	14 (1–82)	0.502
ALP	74 (42–719)	96 (53–239)	93 (42–729)	0.152
LDH	267 (182–481)	235 (126–590)	265 (44–2197)	0.963
CRP	25 (2–258)	31 (3–163)	39 (1–328)	0.804
Procalcitonin	0.17 (0.01–16.00)	0.30 (0.02–46.00)	0.14 (0.01–16.80)	0.080

AF – atrial fibrillation, ALP – alkaline phosphatase, ALT – alanine aminotransferase, AST – aspartate aminotransferase, BP – blood pressure, BUN – blood urea nitrogen, Ca – calcium, CRP – C-reactive protein, ECG – electrocardiography, Hgb – haemoglobin, HR – heart rate, IVS – interventricular septal thickness, K – potassium, LDH – lactate dehydrogenase, LVEDD – left ventricle end diastolic diameter, LVEF – left ventricular ejection fraction, LVMI – left ventricle mass index, Mg – magnesium, MPV – mean platelet volume, Na – sodium, P – phosphorus, PLT – platelet count, RR – respiratory rate, TAPSE – tricuspid annular plane systolic excursion, TSH – thyroid-stimulating hormone, TTE – transthoracic echocardiography, T4 – free thyroxine, WBC – white blood cell
LVEF: 2 vs. 3, p = 0.001

infection rates, and hypoxia in the patients in our study.

There are several methods of ECG monitoring: resting ECG, recording ECG during symptoms, and Holter ECG. All of these have been previously tested and used in clinical trials [32]. Holter monitors are often used as a standard method [33, 34]. However, Tieleman *et al*. [35] showed that a hand-held, single-lead ECG had 100% sensitivity (95% CI: 93–100) and 95.9% specificity (95% CI: 91.3–98.1) in detecting AF. In false-positive cases, 12-lead ECG rhythm analysis revealed frequent premature atrial or ventricular complexes with irregular coupling intervals, sinus arrhythmia, or atrial flutter with irregular ventricular response. In another study, the positive predictive value was found to be 70.6%, while the false-positive rate was attributed mostly to premature atrial or ventricular complexes [21]. The ease of use of Holter ECG devices not only makes it easier to screen for arrhythmia but may also help improve the quality of care for the older population. It will also facilitate admission to cardiology units by revealing clinically significant arrhythmias.

Oral anticoagulant (OAC) therapy should be planned according to CHA2DS2-VASc score in patients with AF who do not have a mechanical prosthetic valve or significant mitral stenosis. The European Society of Cardiology AF guideline recommends the administration of OAC with a class I indication at CHA2DS2-VASc scores of ≥ 2 in males and ≥ 3 in females, and with a class IIa indication at scores of ≥ 1 in males and ≥ 2 in females [36]. A study showed that 45% of patients received anticoagulant therapy for persistent AF [21]. In a study conducted by Tulner *et al*. [37], this rate was reported to be 58%. Although frailty was not associated with the use of OAC in the present study, the opposite was found in the FRAIL AF study [38]. A higher risk of stroke in patients with severe frailty due to expected bleeding during anticoagulant use was suggested as a possible mechanism. However, the reason for increased bleeding risk with frailty has not yet been elucidated. Contrary to the literature, only 17.0% of the palliative care patients in our study had AF and were not using an anticoagulant. Delaying anticoagulant therapy in older patients can result in potentially significant morbidity and mortality. Atrial fibrillation is usually asymptomatic in older patients, who may present with HF or thromboembolic complications. Older patients who need anticoagulation for AF are at higher risk of bleeding, and they benefit more from OAC therapy [39]. It is important to implement strategies such as routine AF screening with ECG in older adults to improve outcomes and reduce health care costs. In our study, LVEF was found to be significantly lower in patients with AF and anticoagulant use. This suggests that patients under anticoagulation therapy probably had AF for a long time, resulting in low LVEF.

The risk of AF is higher in patients diagnosed with HF. If accompanied by scoliosis, pulmonary hypertension, HT, and cyanosis, this rate will increase secondary to subendocardial ischaemia [40]. Similarly to the literature, the prevalence of AF was high among patients in our study who were diagnosed with HF.

A limitation of our study is that patients were not asked about symptoms of arrhythmia such as palpitations, dizziness, chest pain, and fatigue. Secondly, the sample size was relatively small, so the results should be evaluated with caution. However, the strength of our study is that it was prospective, and it is the first study in our country to examine the incidence of arrhythmia among older patients receiving palliative care support.

CONCLUSIONS

The prevalence of arrhythmia among palliative care patients is not underestimated. Detecting these arrhythmias is important in terms of reducing the risk of developing HF and embolic events that may occur because of AF. Untreated arrhythmias in the palliative care patient population constitute both an economic and medical burden for health care services. The treatment of arrhythmias in this patient population is complicated by polypharmacy, comorbidities, and frailty.

The authors declare no conflict of interest.

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