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Original article

Clinical significance of nutritional status in patients with atrial fibrillation: An overview of current evidence

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ABSTRACT

Background: Obesity is a well-known atherosclerosis risk factor; however, its role and the importance of undernutrition in atrial fibrillation (AF) pathogenesis are still not well understood. The aim of this study was to present the current state of knowledge on this issue in different groups of patients.

Methods: Systematic review of papers published between 1980 and 2016.

Results: The literature shows contradicting views regarding the impact of nutritional status on the risk, course, and complications of AF. On the one hand, it has been revealed that overweight, obesity, and high birth mass increase the risk of AF, and that their reduction is linked to an improved course of AF and reduced all-cause and cardiovascular mortality. On the other hand, a so-called obesity paradox has been found, which shows lower all-cause mortality in overweight patients with AF compared to those of normal weight or who are underweight. It has also been shown, although based on a small number of studies, that the relationship between nutritional status and risk of AF and its complication may be U-shaped, which means that not only patients with obesity, but also individuals with underweight, cachexia, and low birth weight may have an increased risk and poor outcome of AF.

Conclusions: The relationship between patients' nutritional status and the course of AF has become clearer but it requires further studies examining the importance of weight reduction on AF course.

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Introduction

Atrial fibrillation (AF) and abnormalities in nutritional status are the most prevalent challenges in current healthcare, both in developed and developing countries. AF concerns approximately 1.5–2% of the general population. This arrhythmia increases the risk of ischemic stroke, congestive heart failure (CHF), hospitalization, and cardiovascular and all-cause mortality [1]. The second problem with contemporary medicine is disturbances in nutritional status resulting in both insufficient and excessive body weight. Undernutrition remains one of the most common causes of death in developing countries. Also in countries with a high income per capita, undernutrition affects 22–34% of patients treated in hospital and, in 70% of these cases, the deterioration in nutritional status occurs during hospitalization [2,3]. An energy deficit in daily diet increases short-term risk of mortality by approximately

two- to threefold. A similar outcome results from excess body weight in the form of overweight and obesity. Throughout a 10-year follow-up of people diagnosed with obesity, who had never smoked, and were aged 50–71 years, there was a two- to threefold increased risk of death [4]. The likelihood of developing complications of obesity increases with its degree. Therefore, class III obesity (body mass index, BMI ≥ 40 kg/m²) is categorized as morbid obesity.

We hypothesize that (a) the conditions of under- and overnutrition are related to the risk of AF, (b) the nutritional status of a patient is closely related to the clinical course of arrhythmia (paroxysmal AF progression to permanent AF) and its complications, and (c) impaired nutritional status of patients with AF affects their mortality and other complications (Fig. 1). The aim of this study was to present contemporary views on the relationship of nutritional status with the three aspects listed above on the clinical course of AF.

Search strategy

A search covering the period from January 1980 to April 2016 was conducted by the two investigators (MA and JB) working

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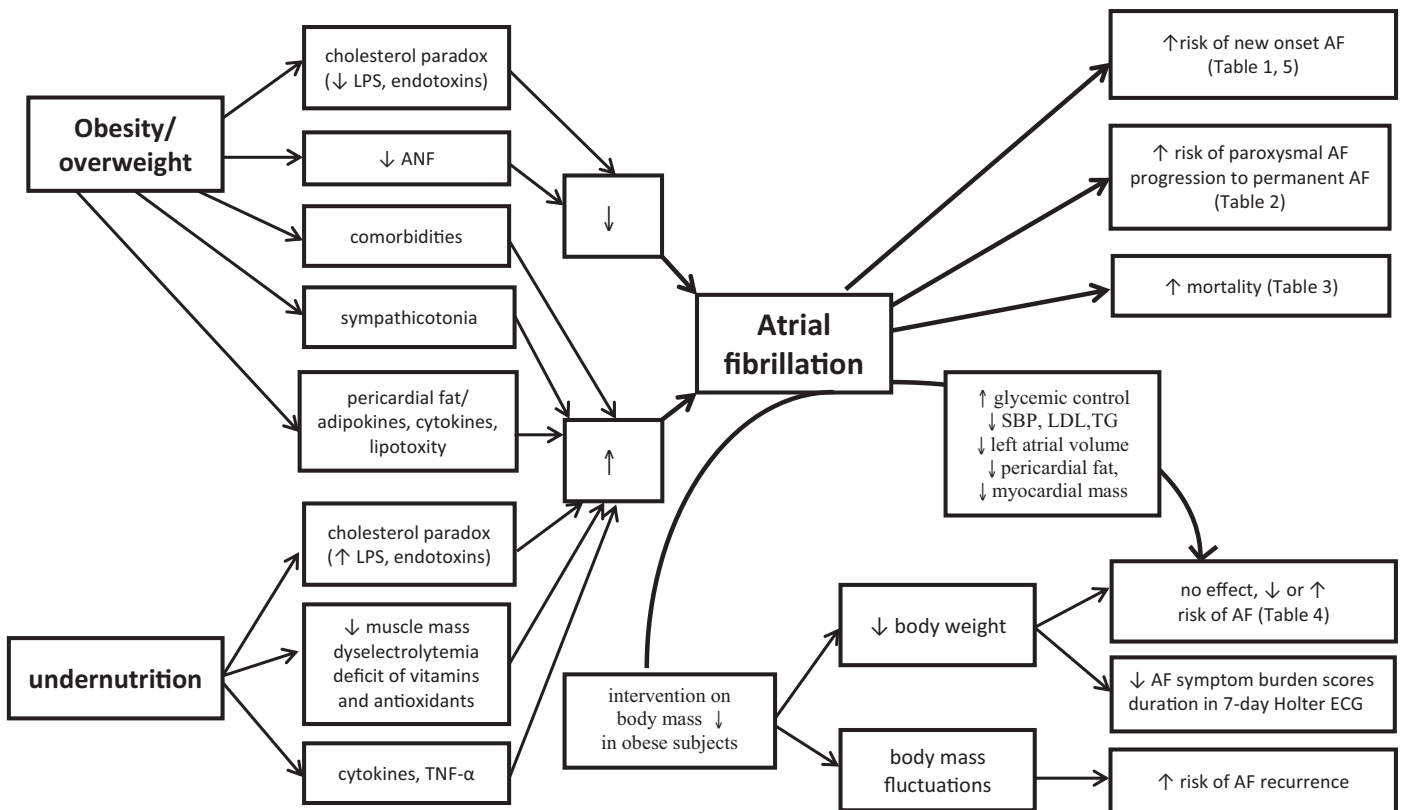


Fig. 1. The role of nutritional status in pathogenesis of atrial fibrillation (AF). Abbreviations: AF, atrial fibrillation; ANS, autonomic nervous system; ANF, atrial natriuretic factor; LPS, bacterial lipopolysaccharides; SBP, systolic blood pressure; LDL, low-density lipoprotein; TG, triglycerides; ↑, unfavorable effect (increase in AF risk); ↓, favorable effect (decrease in risk of AF and its complications).

independently using the PubMed database. The search terms applied were “atrial fibrillation” combined with (body mass OR overweight OR obesity OR adiposity OR underweight OR weight loss OR malnutrition OR undernutrition OR nutritional status) AND (prognosis OR mortality OR progression OR quality of life OR symptom burden) AND (clinical study OR clinical trial OR comparative study OR controlled clinical trial OR meta-analysis OR observational study OR randomized controlled trial OR review OR systematic reviews). References given in the studies retrieved were searched manually for additional studies and reviews. No language restrictions were applied. Finally, 612 publications were found. However, many of them were inconsistent with the manuscript topic, due to e.g. acting AF as a risk factor for postoperative complication, risk factor for heart failure exacerbation, etc. Finally, 61 studies were taken into account and are presented in Tables 1–5.

Excessive nutritional status as a risk factor for AF

The publications on the relationships between overnutrition and risk of AF are presented in Table 1 [5–32]. The majority of them showed a positive association between occurrence of AF and overweight (increased risk by 18–54%) and obesity (increased risk by 1.6–2.4-fold). Sun et al. [14] and Chei et al. [22] showed a U-shaped relationship between risk of AF and body weight, which means that both overweight (BMI ≥ 25 kg/m²) and underweight (BMI < 18.5 kg/m²) were associated with greater arrhythmia event occurrence during follow-up. Only Sun et al. [25] did not find significant relationships between BMI and risk of AF. Increased incidence of AF in obese patients was observed in a retrospective analysis of patients undergoing cardiac surgery [6,8,10,14,15,18]. The Framingham Heart Study found a 4–5% increase in arrhythmia

risk for each additional BMI unit throughout a follow-up period of more than 13 years [5]. This relationship persisted even after the adjustment for myocardial infarction, hypertension, and diabetes. A linear relationship between BMI and the incidence of arrhythmias was also observed in the Women’s Health Study, in which more than 34,000 women with no evidence of cardiovascular diseases reported a 4.7% [95% confidence interval (CI): 3.4–6.1; *p* < 0.0001] increase in AF risk per 1 unit increase in BMI [13]. During the 60-month follow-up period in this study, women with obesity, compared with those who maintained a BMI below 30 kg/m², developed a 41% higher risk of arrhythmia. Correspondingly, in a study by Perez et al. [17], which analyzed the risk factors of AF in a group of more than 80,000 postmenopausal women, it was demonstrated that being overweight was associated with a 12.1% incidence of arrhythmia. In a recent study published in 2015 conducted with more than 7000 patients with newly diagnosed type 2 diabetes, it was found that, during an average 4.6-year follow-up, overweight and obesity were associated with, respectively, a nearly two- to threefold increase in AF risk [24]. Diabetes mellitus with obesity increased the risk of AF in a study by Alves-Cabrata et al. [30], too. These relationships were also confirmed in a meta-analysis of 16 studies involving 123,249 participants, in which obesity was associated with a 49% increased risk of AF [relative risk (RR) 1.49; 95% CI: 1.36–1.64] compared with those who were not obese [33].

Recent attention has also been paid to the relationship between AF and anthropometric indicators of nutritional status other than BMI. In one of these studies, more than 4000 patients aged 60 years were observed for 13 years [26]. It was confirmed that, in addition to BMI, waist circumference [10,11,23,26], sagittal abdominal diameter (SAD) [26], hip circumference [30], and body surface area (BSA) [12] were also independent predictors of AF. The importance

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