Mediterranean diet in secondary prevention of CHD

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Abstract

Objective: To summarise our present knowledge on the Mediterranean diet in secondary prevention of CHD.

Design: Review of literature.

Setting: Adult coronary patients.

Subjects: CHD patients at high risk of cardiac death.

Results: The two main causes of death in these patients are sudden cardiac death (SCD) and chronic heart failure (CHF). The main mechanism underlying recurrent cardiac events is coronary thrombosis resulting from atherosclerotic plaque erosion or ulceration. The occurrence of thrombosis is usually associated with plaque weakness in relation to high lipid content of the lesion where cholesterol only represents a very small part compared with other lipids (i.e. fatty acids). Thus, the three main aims of the preventive strategy are to prevent coronary thrombosis, malignant ventricular arrhythmia and the development of left ventricular dysfunction (and CHF) and finally to minimise the risk of plaque erosion and ulceration. There is now a consensus about recommending the Mediterranean diet pattern for the secondary prevention of CHD because no other dietary pattern has been successfully tested so far in these patients. The most important aspect, in contrast with the pharmacological prevention of CHD (including cholesterol lowering), is that the Mediterranean diet results in a striking effect on survival.

Conclusions: The traditional Mediterranean diet is effective in reducing both coronary atherosclerosis/thrombosis and the risk of fatal complications such as SCD and heart failure.

The priority of secondary prevention is somewhat different from that of primary prevention. In the context of primary prevention, intervention focuses on traditional risk factors (e.g. lifestyle factors, diabetes, overweight or obesity, high blood pressure) and surrogate endpoints. In secondary prevention, it is critical to reduce the risk of severe and often fatal clinical complications such as sudden cardiac death (SCD) and chronic heart failure (CHF) [1,2]. This does not mean that traditional risk factors of CHD should not be measured and, if necessary, corrected in secondary prevention, because they also play a role in the occurrence of CHD complications. It simply means that because complications such as SCD and associated syndromes are often unpredictable, occur out of hospital and far from any potential therapeutic resources in the majority of cases, and account for approximately 70% of cardiac mortality in secondary prevention, they should be the priority of any secondary prevention programme. For this reason, in the present text, we will focus our recommendations and comments specifically on clinical efficacy and not on surrogate efficacy [1,2].

Whatever the specific clinical aims of the programme, nutritional evaluation and counselling of each individual with CHD must be a key goal of the preventive intervention. Nutrition is, however, only one component of such a programme. Exercise training, behavioural interventions (particularly to help the patient abstain from smoking) and drug therapy – particularly antithrombotic drugs – also have important roles. The dietary prevention programme is commonly initiated during hospitalisation for a first CHD event. With the shortening of stay in the coronary care unit, the dietary intervention is initiated during the following days in hospital, and then continued in secondary prevention centres and included in cardiac rehabilitation programmes. An individualised dietary prevention programme should be developed under the guidance of a specialised dietician and in close collaboration with the patient's cardiologist and primary care physician, so that there is no discontinuity or discrepancy in dietary counselling between the hospitalisation and post-hospitalisation phases of the rehabilitation programme [1,2].

The scientific concept of Mediterranean diet

There is now a consensus about recommending the Mediterranean diet pattern for the secondary prevention

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of CHD because no other dietary pattern has been successfully tested so far in these patients[1,2]. The most important aspect, in contrast with the pharmacological prevention of CHD (including cholesterol lowering), is that the Mediterranean diet results in a striking effect on survival. The main explanation is that the Mediterranean diet is protective not only against CHD and CHD complications, but also against other chronic diseases including cancers[3,4]. Furthermore, the Mediterranean diet appears to be effective in reducing both coronary atherosclerosis/thrombosis and the risk of fatal complications (SCD and CHF) of atherosclerosis and thrombosis.

Finally, no harmful side effects have been reported following the adoption of this dietary pattern, unlike drug therapies[4,5].

Prospective studies of the epidemiology of CHD have shown that mortality from CHD differs greatly among populations and that at least some of the differences are associated with differences in dietary habits[6]. Mediterranean populations have been relatively protected from CHD and certain cancers, and the particular composition of the traditional Mediterranean diet has been put forth to explain this[7,8]. However, epidemiological studies only provide associations between the risk factors and clinical endpoints, not causal relationships. Several confounding factors may play a part in these associations. The economic situation and the presence of extended social support systems, for instance, have been proposed to explain the low prevalence of CHD in some Mediterranean countries. Clearly, randomised trials are the only way to make sure that a given dietary pattern results in a significant protective effect against CHD complications.

Some dietary trials in primary or secondary prevention of CHD have reported an impressive reduction of CHD risk, especially in terms of mortality[9–11].

In contrast, other dietary trials specifically aimed at reducing blood cholesterol failed to significantly improve the prognosis of the dieters[12–14].

The successful trials in general tested dietary patterns characterised by a low intake of total, saturated and n-6 polyunsaturated fats[9–11] and an increased intake of n-3 fatty acids[9–11,15]. Their aim was not to primarily reduce blood cholesterol, but this is a critical issue.

Two of these trials[9,10] also included a high intake of fresh fruits and vegetables, legumes and cereals containing large amounts of fibre, antioxidants, minerals, vegetable proteins and vitamins of the B group. The credibility of these trials was considerably reinforced by a number of studies showing protective effects of most of these foods and nutrients,[16–18] with a particular emphasis on plant and marine n-3 fatty acids[5,10,11,15,19,20].

The 'Lyon Diet Heart Study' was a randomised single-blind secondary prevention trial aimed at testing whether an experimental Mediterranean diet could reduce the risk of recurrence after a first myocardial infarction. A significant reduction of the rates of fatal and non-fatal cardiovascular complications was reported[5,10,21], and no major bias was detected in the trial[5,22]. In addition, the trial suggested for the first time that patients following the Mediterranean diet were also relatively protected from cancer[4]. Although further controlled trials are warranted to confirm the cancer data, those obtained from the 'Lyon Diet Heart Study' are in line with several epidemiological observational studies suggesting that some dietary factors are very important in cancers and cancer prevention[3,23–26].

In the 'Lyon trial', investigators advised patients to use either olive oil or rapeseed oil (or both oils together) because some French patients do not like the taste of olive oil and might have rejected the whole Mediterranean diet pattern. As rapeseed and olive oil have similar fatty acid compositions – very low saturated fatty acids and high oleic acid – the tested diet remains, on average, a very Mediterranean diet[5,10,21].

In a recent and very large observational study about the health effects of the Mediterranean diet[27], the authors concluded that their results provide strong evidence for a beneficial effect of higher conformity with the Mediterranean dietary pattern on risk of death from all causes, including deaths due to CVD and cancer, in a US population. They base their conclusions on previous epidemiological studies conducted in non-US populations and reporting similar data about the effect of the Mediterranean diet on longevity[3,28].

Thus, epidemiological studies[3,27,28] confirmed the results of the 'Lyon Diet Heart Study', now a reference trial in the field[29]. Interestingly, in that trial, there was no difference between groups for the main conventional risk factors, including blood cholesterol and blood pressure. This suggested that protection was largely independent from these traditional (conventional) factors.

In contrast, it is noteworthy that a recent meta-analysis involving 534 906 individuals reported that the Mediterranean diet was associated with a significant reduction of metabolic syndrome, a pre-diabetes state[30].

All these data are of considerable relevance for public health. No other dietary pattern is apparently as effective in reducing the risks of both diabetes and cardiovascular complications. It is therefore surprising that when defining dietary recommendations to prevent chronic diseases, experts forget to mention the Mediterranean diet[31], sometimes distort the published data to discredit the concept, and put forward treatments that increase the risk of diabetes[32,33].

The Mediterranean diet in practical terms

The diet score usually used to assess conformity with the Mediterranean dietary pattern in epidemiological studies[3,27,28,30] is rather simplistic and does not capture the various practical aspects of the real and various traditional Mediterranean diets.

Briefly, what must clinicians (and their patients) know?

The Mediterranean diet[7,8] is characterised by the consumption of:

1. A wide variety of raw, sometimes cooked, seasonal vegetables throughout the year, often large amounts of onions, garlic, parsley, rosemary, oregano, thyme and other aromatic herbs.

2. Fruit throughout the year, both fresh and dried (during the summer, for consumption in winter, e.g. apricots, figs and grapes).

3. Various nuts (almonds, hazelnut), particularly walnuts, which are rich in alpha-linolenic acid (ALA), the main plant n-3 and a major characteristic of traditional Mediterranean diets[8]. There are many other sources of ALA in Mediterranean diets, including salads such as purslane[34] and products from animals fed with ALA-rich feed such as linseed (rabbit, eggs and chicken, dairy products).

4. Grains, preferably whole, especially wheat in the form of bread, fermented with natural leaven and sometimes flavoured with ALA-rich linseed. The wheat used in traditional Mediterranean diets (like the vegetables and fruit) is rustic and does not contain pesticides as it is not a product of industrial agriculture.

5. Fatty fish, including anchovy, sardine, mackerel, sea bream and red tuna, all rich in very-long chain (marine) n-3 fatty acids. Another source of indispensable marine n-3 fatty acids may be the eggs of linseed-fed chicken, as well as the 'fish-like effect of moderate wine drinking'[35].

6. Olive oil, the main edible oil used in the Mediterranean area, low saturated and rich monounsaturated. However, the monounsaturated fat/saturated fat ratio used by epidemiologists does not capture one major lipid characteristic of the Mediterranean diet, which is low in n-6 and rich in n-3 fatty acids. The n-6/n-3 ratio has been proposed as a major component of a healthy diet[36].

7. In contradiction with many experts, Mediterranean populations do traditionally eat dairy products, though made of goat and ewe milk and not cow milk. Importantly, these are consumed in the fermented forms of cheese and yoghurt, and almost never as milk, butter or cream.

8. Mediterranean populations are not vegetarian. They eat ALA-rich eggs and small amounts of meat, mainly lean meat such as rabbit, chicken and duck. Beef and/ or pork are also on the menu in the North of the area, while mutton is the preferred meat for festive meals in the South. It is also important to note that everywhere in the Mediterranean area the diet includes a large number of legumes and is therefore rich in vegetable proteins.

9. Moderate alcohol drinking, essentially during meals, is a major characteristic of the Mediterranean diet. The main alcoholic beverage is wine, particularly red wine, a major source of various polyphenols. Wine is a mix of ethanol and polyphenols. South of the Mediterranean Sea, the main source of healthy polyphenols is not wine but fermented black tea (a mix of water and polyphenols). Thus, most people living in the Mediterranean area are high consumers of various polyphenols whose health effects[37] are still considerably underestimated by scientists and physicians. This is another major item not included in the Mediterranean diet score used by epidemiologists.

The wine drinking issue

The medical and scientific literature shows that moderate drinking (one to two drinks per day for women and two to four drinks per day for men) is usually associated with a better life expectancy in the general population, as well as in patients with established CHD[38–40]. In the absence of a controlled trial, which is neither technically nor ethically feasible, the main question for physicians remains whether the inverse association between moderate drinking and CHD complications is a cause–effect relationship.

Although prospective studies with light drinkers (rather than non-drinkers) as the referent group have shown that the 'sick quitter bias' is not the main explanation for the protective effect of moderate drinking, a recent study, in which former drinkers were examined separately from long-term abstainers, confirmed that protection is still present when only long-term abstainers are included in the referent group[41]. This was an important finding because it strongly supports the cause–effect relationship between moderate drinking and better survival.

In meta-analyses, moderate drinking generally results in approximately 30 % lower cardiac mortality and a 20 % reduction of all-cause mortality,[38] which is considerable when compared with the effect of drug treatment and in terms of public health. In addition to the strong epidemiological evidence (and in the absence of clinical trials), another way of evaluating the relationship between moderate drinking and survival is to examine the biological mechanisms by which moderate drinking may reduce the risk of cardiac death and improve survival. In addition to the well-known effects of alcohol on haemostasis (through reduced platelet function and fibrinogen levels) and insulin resistance, recent data indicate that moderate drinking may have a direct protective effect on the ischaemic myocardium[42], and may positively interact with n-3 fatty acids,[35] known to be highly protective in secondary prevention, especially against SCD[15].

These two mechanisms are important to know because they may partly explain why moderate drinking was shown to reduce the risk of SCD[43], a complication that accounts for 65–75 % of all cardiac deaths in the US population[44]. Thus, epidemiological and biological studies strongly suggest that moderate drinking results in

reduced mortality and better life expectancy in patients with established CHD.

Finally, regarding alcohol consumption in secondary prevention, it is important to:

1. identify those at very high risk of cardiac death, for whom there is a clear indication for an implantable cardiac defibrillator (ICD);

2. identify binge and heavy drinkers and explain to them a better way of drinking to protect their lives;

3. identify non-drinkers (and respect their choice), but also those who abstain because they wrongly believe that even light drinking is bad for their health;

4. explain to all patients (with or without ICD) that moderate drinking, especially (but not only) in the form of wine in the context of the traditional Mediterranean diet, may be the most effective way to prevent both fatal and nonfatal complications of CHD[8,39], even in Northern Europe and in old age[45]. Further studies are needed to fully understand the mechanisms of this protection. Finally, coming back to the Mediterranean diet and to the specific consumption of wine, the next question is whether wine drinking (the preferred beverage of Mediterranean populations) is superior to other alcoholic beverages for the prevention of CHD complications. Recent observational data and meta-analysis suggest that wine is more protective than beer and spirits[46].

Conclusion

The traditional Mediterranean diet is effective in reducing both coronary atherosclerosis/thrombosis and the risk of fatal complications such as SCD and CHF.

Acknowledgements

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