

MANAGING OBESITY FOLLOWING THE MENOPAUSE THE IMPORTANCE OF PHYSICAL ACTIVITY

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Introduction

Obesity is a “communicable” disease, slowly expanding around the western countries of the world. Even though it has a genetic basis, the environment ‘feeds’ it by offering energy-dense foods and a sedentary lifestyle. At the time of menopause women are additionally affected by the withdrawal of endogenous estrogens, which are cardioprotective and affect body composition. These changes put women at a higher risk for obesity and its metabolic consequences: *increased* rates of all cause mortality, hypertension, diabetes mellitus and coronary artery disease. Additional consequences may include cancer, gallstones, kidney stones and osteoarthritis. Although, for osteoporosis and its accompanying fractures there is a *decreased* risk among the overweight, the much more serious consequences of obesity makes weight control a major public health problem. Weight loss can reverse most of the above complications and reduce the number and dosages of medications used. In order to accomplish this, lifestyle modification is essential. The three parts of a successful weight-loss program are a proper diet, behavioral changes and physical activity. Physical activity (PA) has additional benefits such as decreasing all-cause mortality rates, lowering risk factors for atherosclerosis and improving mood and body image. The amount of PA recommended in order to reap its benefits is about 30 minutes of moderate-intensity exercise on most days of the week. We will review these issues in detail, with special emphasis on the problems of postmenopausal women.

Obesity and its Complications

The prevalence of obesity in our time is steadily increasing. An overweight individual is defined as one whose body mass index (BMI; the weight in kg divided by the square of height in meters) is above 25 kg/m². The definition of obesity requires a BMI of over 30 kg/m². It appears that more than one third of Americans have a BMI over 27.8 kg/m² for men and 27.3 kg/m² for women¹. Among the women in this study aged 50-59, 52% were overweight (here defined as BMI > 27.3 kg/m²); while in the 60-69 age group, 42.5% were overweight. Lowering the threshold to include BMI > 25 kg/m² as being overweight will naturally increase these percentages. One of the reports from the Nurses’ Health Study showed that overweight women comprised 50% of the group². In Israel also, about 50% of

women were defined as overweight in the year 2000 (unpublished data from the Ministry of Health, State of Israel). Almost 18% of the American population were considered obese in 1998³, with some ethnic groups and states 'growing' more. A follow-up on this research by Mokdad et al., showed that the prevalence of obesity in the United States increased by 5.6% in just one year – from 17.9% in 1998, to 18.9% in 1999, giving a total growth of 56% from 1991⁴. The most obese age group was the 50-59 year olds, with a prevalence of 24.2%. In Britain, 17% were defined as obese in 1996⁵. Other European countries report similar figures. Hence, we are facing a plague covering most of the western world, growing by a few percent each year.

The Causes of Obesity – Inherited but not Necessarily Inevitable

The causes of this epidemic can be divided into two major factors – genetic and environmental. The genetic part accounts for between 40% to 70% of the risk of becoming obese, and involves over 200 genes and chromosome loci which may contribute to an obese phenotype⁶. For example, 36% of the waist-hip ratio, which when high is a risk factor for obesity-related metabolic diseases (see below), seems to 'run in the family'⁷. Still, an annual increase of over 5% in obesity prevalence cannot be totally blamed upon genes, which cannot possibly mutate at such a pace.

The environmental basis for the growing number of obese individuals is of great importance⁸. We no longer need to chase wildlife or climb trees for food - we just open the refrigerator door. The abundance of large food chains offering "supersize deals" or "all you can eat", in the competition for the consumers' money, obviously plays a role in the increased food intake. Larger portion sizes of high-energy foods are offered - and accepted. Lately, the American Institute for Cancer Research has railed against the meal composition of Americans, encouraging a higher portion of grains and vegetables in meals in the "New American Plate" project (<http://www.aicr.org>). It suggests that vegetables and grains should cover two thirds of the plate. This is based on a large review of nutritional effects on the development of cancer, and as a result it recommends: eat plenty of fruits, vegetables and grains while limiting intake of red meat, alcohol, fat and salt⁹. The American Heart Association has similar recommendations for prevention of heart disease, elaborating on limiting fat content¹⁰. Both organizations advocate engagement in physical activity (PA), avoidance of weight gain and cessation of smoking. Adhering to these guidelines, designed to reduce the incidence of cancer and coronary artery disease, could minimize the environmental effects on the growing prevalence of obesity.

On the other side of the energy balance equation - that of expenditure - the use of motorized vehicles, escalators and lifts greatly decreases the amount of energy

spent throughout the day. An example of the environmental effects on obesity were seen in a study by Luke et al., in which the authors compared black adults from Nigeria and from the United States – from two totally different environments, but with a similar genetic background¹¹. The amount of body fat in black US women was twice as that in the Nigerians. The prevalence of obesity among these women was 50%, compared with only 5% in the Nigerians. These striking differences were not attributed to differences in resting energy expenditure, but to the environmental influences. In a study comparing middle aged female twins, it was found that among environmental factors influencing total and abdominal fat mass, PA had the strongest effect¹².

Environmental effects are not exclusive to adults. Children are also gaining weight at an increasing rate, and sadly, an obese child has an excellent chance of becoming an obese adult. The number one enemy here is the television set, which largely contributes to physical inactivity¹³. A randomized trial in which children decreased the amount of time spent in front of the television and video games for 6 months led to a corresponding relative decrease in body fat and BMI¹⁴. Lowering the prevalence of obesity can therefore begin at this age, where lifestyle may still be easily modified. The education of children also comes from parents and grandparents. After all, what can be more joyful than riding a bicycle or jogging along with your grandchild?

Weight Gain Around the Menopause – Is Estrogen Replacement a Factor?

Additional factors may influence weight in menopausal women. These include the aging process itself and the use of hormone replacement therapy (HRT). Concerning aging, it is known that weight is gained throughout adulthood. For women, the rate seems to approximate 250 grams every year, while the waist circumference grows by about 0.28 cm per year¹⁵ regardless of menopausal status. Physical inactivity seemed to play a major role in the results of this study, and control for this factor greatly attenuated the increase in these parameters. Menopause has been associated with a lower energy expenditure and lower levels of physical activity – leading to greater abdominal adiposity¹⁶, the consequence of which will be discussed below. Estrogen has many mechanisms by which it is believed to protect the fertile female from cardiovascular diseases, including a better lipid profile, decreased coagulation and direct vascular effects¹⁷. The use of HRT also improves the plasma lipid profile, and is therefore expected to offer some protection from the atherosclerotic process and coronary artery disease. Additionally, use of HRT has been shown to decrease the shift from gynoid (buttocks) to android (abdominal) fat deposition¹⁸. Since abdominal adiposity is a major cause of obesity-related metabolic complications, this effect could be a desired one. Observational studies have concluded that HRT is beneficial for

decreasing the risk of cardiovascular disease and mortality^{19,20}, but the Framingham study could not support these results²¹. The HERS study, a randomized trial of secondary prevention with 4 years of HRT use, also could not find a beneficial effect²². A recent review of this study suggests that HRT could even *cause harm* due to more coronary events in the treatment group during the beginning of the study²³. Another randomized study assessing this issue showed that 3 years of HRT did indeed improve the lipid profile by lowering LDL levels and raising HDL levels. However, the treatment did not delay the progression of coronary atherosclerotic plaques, as assessed by angiography²⁴. The actual clinical relevance of this data is unclear – does it ultimately affect mortality? As mentioned above, the hormones have additional effects. Still, the possible difference between observational studies and randomized ones on whether HRT actually protects women could be attributed to failure of the former ones to adjust for additional lifestyle habits. Women voluntarily using HRT are usually more ‘health aware’ and are engaged in a healthier lifestyle. For example, the most physically active participants in the Nurses’ Health Study were also found to be leaner, had a decreased chance of smoking and developing hypertension, diabetes and hypercholesterolemia and had an increased chance of using HRT and vitamin supplements²⁵. Even though the observational studies try to adjust for these factors, some factors such as other nutritional habits or intensity of physical activity may be ignored. On the other hand, the relatively short duration of interventions (3-4 years) and advanced age of participants (65- 67 years) in the randomized trials could limit assessing regression of atherosclerotic plaques and their consequences. This issue is further debated in other parts of this book.

Obesity-related Illnesses

Before discussing the connection between obesity and sickness, it is important to appreciate the average daily activities of obese women. A study looking at these issues showed obese women to exhibit more overall pain, less ability in physical functioning and lower self-esteem². The obese had difficulties in lifting and carrying heavy loads, climbing stairs, bending and vacuuming. The pain from being at a BMI of over 29 kg/m² was calculated to be similar to that of having arthritis. This is the starting point for an otherwise “healthy” obese woman without any complications.

The health problems associated with obesity are numerous, often hazardous, interfering with the quality of life and sometimes fatal. In plain words – obesity kills – or, as has been said, “the obese dig their graves with their teeth”. It has been estimated that 280,000 annual deaths in the United States are attributed to being overweight and obese²⁶. Eighty percent of these occurred in people with a BMI over 30 kg/m², emphasizing the importance of this cutoff point. After 16 years of

follow-up in the Nurses' Health Study,²⁷ it was found that women with a BMI greater than 29 kg/m² had four times the risk of death from cardiovascular disease when compared with those of a BMI less than 19 kg/m. The women with the highest waist-hip ratios had a relative risk of 8.7 for death from coronary artery disease, compared to the leanest. Age seemed to have no effect on the relationship in this study. Even a BMI within the recommended range may pose a threat²⁸: women with BMIs of 23-24.9 kg/m² already had an increased risk of 43% for myocardial infarctions or cardiac death, when compared with fellow nurses with BMIs less than 21 kg/m². Another large prospective study of over 1 million US adults (more than half women) related mortality to high BMIs²⁹. For healthy non-smoking women aged 65-74, this study identified the 'safest' BMI to be less than 27.9 kg/m². A BMI of 28-29.9 kg/m² was associated with a relative risk of 1.28 for death from all causes; women with a BMI over 35 kg/m² had twice the risk of death, when compared with the reference category (women in same age group with BMI of 23.5-24.9 kg/m²). It is interesting, that the very lean women in this age group did not have increased mortality rates, as did the leanest in other age groups. These two studies differ in their identification of 'the safe zone' for body mass; still, the current recommended BMI is lower than 25 kg/m².

The major illnesses that accompany obesity contribute notably to the morbidity and mortality associated with it. Firstly, cardiovascular mortality is a leading cause of mortality among the obese^{28,29}. A report on the trends of coronary artery disease and lifestyle changes among nurses reveals that the incidence of CAD has dropped by 30% between 1980 and 1994³⁰. Two thirds of this decline is attributed by the authors to better food selection, cessation of smoking, and use of HRT. However, the study reveals an increasing degree of obesity with age, which has attenuated this decline. Natural menopause itself did not put a woman into an increased risk for coronary artery disease, regardless of HRT use³¹. Yet women who had a bilateral oophorectomy had more than twice the risk for this disease than age-matched premenopausal women.

Regarding atherosclerosis-promoting illnesses, even a weight gain of a few kilograms may increase the risk of non-insulin dependant diabetes mellitus (NIDDM) two-fold³². Gaining over 8 kg increased the risk almost three-fold, and women who gained over 20 kg had a relative risk of over 12 for developing NIDDM. These correlations were also true for women who were not overweight and were within the recommended values of BMI (less than 25 kg/m²). Older women were at an increased risk when compared with BMI- matched younger women. The insulin resistance associated with aging may be due to the increasing central (abdominal) adiposity, and not to aging itself³³. A possible mechanism by which abdominal fat contributes to insulin resistance has been recently reviewed by

Bergman³⁴. The greater influx of free fatty acids from abdominal fat into the liver could act as a regulator of insulin levels, decreasing its breakdown and allowing for higher systemic levels. Eventually, insulin resistance develops. Indeed, in a study of postmenopausal women the amount of abdominal, but not total or subcutaneous fat, correlated with glucose resistance³⁵. Hence, diabetogenic abdominal adiposity should be avoided. Still, total and subcutaneous fat are not entirely “safe” in terms of health hazards, and may promote the development of estrogen-related cancers. The risk for developing hypertension also grows with increasing body mass^{36,37}. Women older than 55 years who had gained more than 25 kg over 16 years had 4 times the risk for hypertension, compared to weight maintainers³⁶.

Each of these two conditions is a “killer” on its own, but can combine to promote the development of atherosclerosis – the basis for coronary artery disease and stroke. The presence of NIDDM greatly raises the risk for coronary events, stroke and all-cause-mortality, both independently and further in conjunction with hypertension, smoking or obesity³⁸. The relative risk for ischemic stroke among women with BMI of 27-28.9 kg/m² was 75% higher when compared with the leanest³⁹. Higher BMI values yielded correspondingly higher risks.

Other illnesses beget additional risks and suffering to the obese. Women with higher BMIs have a greater prevalence of kidney stones⁴⁰. Gall bladder disease also occurs more in women with higher BMIs^{41,42}. For example, women with a BMI of 32 kg/m² have 6 times the risk for developing gall stone disease when compared with the leanest. Osteoarthritis is another condition brought about by the increased weight. The difficulty with this illness is that the accompanying pain may prevent weight-bearing physical activity, which is needed for weight reduction. Pulmonary emboli (PE) were also found with increased incidence among the overweight and obese⁴³. Women with a BMI over 29 kg/m² had three times the chance of suffering from PE during 16 years of follow up.

Of extreme importance is the relationship between obesity and malignancies. The incidence of breast cancer varies according to weight⁴⁴ and weight gain⁴⁵. Even though a high BMI at the age of 18 carried a decreased risk of breast cancer (perhaps due to associated anovulation and lower endogenous estrogen levels), weight gain carried an elevated risk. Non-users of hormonal replacement therapy who gained over 20 kg in 16 years had twice the risk of breast cancer after menopause when compared to those with unchanged weight. Women who gained between 10-20 kg had a 60% higher risk. Unfortunately, overweight and obese women are less likely to be screened for breast and cervical cancers, even given their increased risk⁴⁶. This could possibly be due to a lower ‘health awareness’ which causes both the increased weight and the screening negligence. Endometrial

cancer was also found to be more prevalent among the obese^{47,48}. The explanation could be a higher level of estrogens originating from subcutaneous, not visceral, fat tissue; meaning that reducing the amount of this tissue should also be targeted during weight loss. The incidence of colon adenomas, which are pre-cancerous lesions, was higher among women with higher BMIs⁴⁹. Women whose high BMI was due to central obesity had a higher risk than those with same BMI but less abdominal obesity. Adenocarcinoma of the esophagus and gastric cardia is also associated with increasing BMI in a dose-dependent manner and the effect is stronger in women than in men⁵⁰. Kidney cancer also has a greater prevalence among the obese⁵¹. Additional relevant risk factors for this tumor are hypertension and smoking. Lung cancer was also found with increased frequency among the obese, while examining non and former smokers⁵². Subjects with a BMI over 30 kg/m² had twice the odds of developing lung cancer than the leanest.

Despite this long list of complications, postmenopausal woman may find some advantages in obesity, especially regarding osteoporosis. The reasons for this could be either a direct effect of weight on weight-bearing bones, a hormonal effect from estrogen production in fat tissue which supports bone mass or a combination of the two. In the Framingham Osteoporosis Study, bone mineral density was indeed higher among heavier menopausal women⁵³. Weight loss was associated with a concomitant decrease in bone mineral density, which eventually led to a greater risk for osteoporotic fractures. In a study of 8059 women aged over 65 years, the leanest had a risk of twice or more for fractures of the pelvis, hip and ribs⁵⁴. No elevated risk was found for fractures in other sites, such as humerus or elbow; so the mechanical factor of body weight seems to play the major role.

Weight Loss Reverses the Complications of Obesity

In the face of the various complications of obesity, a question arises: can the increased morbidity and mortality associated with obesity be reversed with weight loss? The data frequently supports a positive answer. In a few cases where it does not, authors explain that the obesity-related disorder was already well established.

Even a modest weight loss, that of a 5-10 percent of initial weight, can lower or abolish the need for antihypertensive medications⁵⁵. In the Nurses' Health Study, women over 55 years of age who had lost over 10 kg over 16 years had a 15% less chance of developing hypertension³⁶. Insulin sensitivity is also improved by reduction of abdominal adiposity, together with an improvement in blood lipid profile⁵⁶. Gallstone disease is less prevalent among the leaner, but obese individuals beginning weight loss can cause asymptomatic stones to become evident⁴², so caution must be taken. Weight loss also eases the physical burden on the joints; thus the chance of developing osteoarthritis is attenuated. For

overweight women, every 2 units of BMI reduced yield a 60% reduction in the risk for symptomatic osteoarthritis⁵⁷.

Methods of Weight Reduction

Several methods are available for weight reduction: lifestyle modifications, medications or surgery. 'Magic diets' and special food additives are not an option, as most have not been properly proved as beneficial over the long-term. Guidelines of the International Association for the Study of Obesity only assess treatments with a minimum of at least a one-year follow-up.

The medications currently used for weight loss act to reduce energy intake, either by reducing appetite or inhibiting fat absorption⁵⁸. Drugs are modestly effective in reducing weight, by an average addition of 2-10 kg to a weight loss program. They are usually prescribed to those with BMIs over 27 kg/m², or with over 30% body fat for women. Patients with lower BMIs but with obesity related conditions can also be treated pharmacologically. Currently, antiobesity drugs are not recommended for routine use, and if initiated should be combined with the lifestyle changes described below⁵⁸. It is doubtful whether drug treatment should be used for long-term management, although the drug industry would like obesity to be considered in the same way as diabetes or hypertension. Rather, medications should be likened to crutches for a person with a broken leg – temporary help until he/she can manage on his own, and probably for not more than 3–6 months.

Gastric surgery is a very efficient method for weight reduction⁵⁹. It is currently reserved for patients with a BMI of over 40 kg/m² who clearly understand the need for strict follow up. Patients with a BMI over 35 kg/m² may also be candidates for surgery if they have life threatening co-morbid conditions or a severe impairment in everyday living. Though effective, weight loss through surgery may not provide the additional benefits of lifestyle modification, such as proper food selection and engagement in PA. A study comparing weight loss through these two different methods showed that the surgical patients had higher amounts of fat in their food, and lower levels of PA⁶⁰, suggesting that a healthy lifestyle may not have been fully implemented.

The advantages of lifestyle modification are that it is simple, has no side effects, is possible to engage in over many years and puts weight reduction under the control of the patient. Hence one can aim for a reasonable target weight, so osteoporosis may be avoided. Even a modest weight loss is beneficial⁶⁴. Additional benefits are the enhancement of mood⁶¹ and a better chance for cessation of smoking. The nutritional plan for weight loss, which is rich in grains, fruits and vegetables, may have additional effects such as decreased incidence of coronary artery disease^{62,63}, stroke⁶⁴ or cancer⁹. Increasing health awareness can possibly reverse the lower

rates of screening for cancer observed among the obese⁴⁶. The combined lifestyle measures can offer greater protection from coronary events, adding to the effects of weight loss. In the Nurses' Health Study those who kept a healthy diet, abstained from smoking and exercised regularly had a reduction of 57% in coronary events compared to those who did not, for the same body mass⁶⁵. Adding the recommended BMI (< 25 kg/m²) to the equation further lowered this risk.

As with all weight reduction methods, compliance to method specific rules is crucial for the maintenance of the new weight. Overeating after surgery or cessation of drug use or PA will eventually lead to a return to the initial weight. Perhaps the term 'lifestyle' should be changed to 'lifetime'.

Lifestyle Modification for Treatment of Obesity

The safest and most rewarding method of reducing excess weight is through a combination of three arms: proper diet, proper behavioral changes, and adequate PA. Some general strategies exist which may help patients comply with their treatment^{66,67}. The treatment setting should promote the patient to take an active role in her/his treatment, both in the doctor's office and in program groups. Patient education should include brief explanations of regulation of body weight, causes and complications of obesity, and the rate of expected weight loss (about 0.5kg/week). Guidelines for proper diet and/or referral to a dietician, along with exercise prescription and/or referral to exercise groups, should also be included. Certain aspects of behavior should be modified. These three components of a weight loss regimen will be portrayed below.

Diet – Dieting only is an effective way to lose weight, but not to maintain it very well⁶⁸. The parallel reduction of muscle mass might lower the metabolic rate and reduce energy expenditure, resulting in lower energy needs. PA can help to restore the amount of this energy-utilizing tissue. Studies comparing diet only and diet plus exercise will be described in the part regarding PA. The current nutritional recommendations for weight loss are simply adherence to the established guidelines for all adults with a few additional points⁶³. The amount of energy in the diet should be monitored periodically, to ensure the recommended rate of weight loss – 0.5 kg per week. A minimal intake of 1200 kcal per day should be provided for women. It is probably advisable for subjects on a diet for longer than a couple of months to take a regular multivitamin supplement with extra calcium for women. Compliance to the nutritional program can be boosted by allowing at least one free day per week, when three "normal" meals may be consumed without any feelings of guilt.

Behavioral changes – As obesity cannot be cured, but only managed, there is a need for life-long changes in certain habits. While transient reduction of weight can quite easily be accomplished, behavior has a major role in the maintenance of the newly reduced body weight⁶⁹. The goal of changing everyday behavior is, in fact, to reduce food intake and increase energy loss through PA, thereby assisting the two other arms of lifestyle modification. When observing the behavioral patterns of reduced weight maintainers, factors such as regular PA, spouse and social support, feeling in control of eating and avoiding eating during emotional stress seem to play important roles^{70,71}. Even though the need to combat obesity is lifelong, this may not be a lifelong struggle: duration of weight maintenance is inversely related to effort involved⁷². As this was a cross-sectional study, one cannot rule out the possibility, that those who needed less effort in maintaining weight – could actually do it. Still, it provides hope.

Another behavioral issue is smoking. It is not recommended to stop smoking along with decreasing food intake⁶⁶. Higgins et al. found that more weight losers in Framingham started smoking compared to weight maintainers⁷³. Twenty three percent of weight maintainers quit this habit, compared to only 13% of weight losers. Conversely, an increase in BMI elevated the chance of smoking cessation twofold. In summary, the importance of behavioral changes is to assist in reducing food intake and increase daily energy output through activity.

Physical activity – this is the focus of the rest of the article.

The Importance of Physical Activity in Weight Loss and Maintenance

Despite the numerous advantages to be described below, less than half of women aged 50- 64 report doing any regular physical activity, and only about one quarter report high intensity exercise⁷⁴. Physician recommendation to engage in PA seems to be low, averaging one third of all visits⁷⁵. Slightly higher percentages were seen for the obese or those with additional diseases, suggesting that physicians tend to recommend PA as a form of secondary prevention. The ‘at risk’ population will therefore remain at risk.

PA Lowers Mortality Rates

PA decreases mortality rates and this effect is also true for postmenopausal women. Two measures of PA are usually used: quantity and ‘quality’, measured as cardiorespiratory fitness. The difference between the two estimates in adult women was presented by Blair et al.⁷⁶. In this study, physical fitness, but not amount of activity, correlated with reduced mortality. This was surprising, as in men these two measures of PA correlate strongly. The difference in these results was attributed to lack of methodological power, and the authors believe that both

measures should indeed parallel each other. This difference raises issues as to the usefulness of various measures of PA. Still, a low level of fitness was associated with increased mortality risk⁷⁷. In women, the moderately fit had a 55% reduction in mortality rates when compared with the least fit. In another study it appeared that obese but fit men were better off than their lean and unfit counterparts⁷⁸. The unfit lean men had twice the chance of cardiovascular and all-cause mortality than the fit obese or lean men. On the matter of quantity, results from the Framingham Study show that women over the age of 75 who are more active, may show a 75% reduction in mortality compared to the least active⁷⁹. This advocates mild to moderate activity even in this age group.

Timing of PA is also of value: current, but not past (!) PA, was associated with 40% less mortality in women in the Framingham Study⁸⁰. Hence, distant PA (10-15 years ago) provided no current protection, and one may have to continue an active lifestyle in order to enjoy its benefits. Still, one may also 'join the party' anytime and regain some protection, as compared to her/ his sedentary friends.

The reasons for the decreased mortality rates among active men and women could easily be credited to fewer cardiovascular events. However, among 1400 women aged 50-74 years this did not seem to be the case⁸¹. The mortality rates associated with the highest and second highest levels of activity were approximately one third lower than those of the least active, but with no relation to cardiovascular death. This could be explained by the small number of events observed or less possibly, by a true lack of connection. Still, a reduction in cardiovascular risk factors by PA seems to play a major role in its health protective nature.

PA Lowers Risk for Atherosclerosis its Risk Factors and its Complications

The concomitant reduction of traditional cardiovascular risk factors by PA in women could also contribute to decreased morbidity and mortality⁸². The more fit had a lower chance of smoking, having high blood pressure or having high cholesterol. PA has been shown to decrease the amount of abdominal obesity in older women⁸³. Additionally, it may also prevent the accumulation of such fat during aging⁸⁴ and prevent weight gain: Low levels of reported PA were associated with higher weight gain in a ten year follow up of >5000 middle aged women⁸⁵. As central obesity is a contributor to insulin resistance and hypertension, reduction in these factors also follows. For NIDDM, evidence from the Nurses' Health Study suggests that in both the obese and the non-obese, regular PA reduces the risk for developing NIDDM along the years⁸⁶. PA has been shown to reduce hyperinsulinemia and improve insulin peripheral activity in 65 year old subjects⁸⁷. Regarding hypertension, physical fitness in women seemed to protect against development of hypertension, but no data exists on possible weight change during

the study⁸⁸. In overweight subjects, exercise alone or combined with diet as a weight loss regimen decreased blood pressure effectively by over 4 mmHg⁸⁹. Still, the exercise group did lose almost 2 kg of body weight, which could have produced the blood pressure reduction. The blood lipid profile also improves with PA. In 180 postmenopausal women with a low level of HDL and a high level of LDL, PA along with a low cholesterol diet improved the levels of these lipoproteins (elevated HDL, lowered LDL)⁹⁰. This trend was also seen for exercise alone, but did not reach statistical significance. Among postmenopausal women, physical fitness was also associated with an improved lipid profile⁹¹.

Stroke is another obesity-related complication. Among the middle-aged participants of the Nurses' Health Study, PA was related to a lower incidence of total and ischemic stroke⁹². After adjustment for improvements in risk factors, such as hypertension and atherosclerosis, PA could not further reduce the incidence among almost 2000 older women in Framingham⁹³. The suggested mechanism for stroke prevention is, therefore, slowing of the atherosclerotic process.

PA Lowers Cancer Incidence

PA can also combat additional obesity-related illnesses. Importantly, PA lowers the risk for several types of cancer^{81,94}. This could again be due to a 'health conscience' lifestyle or due to hormonal and metabolic effects. However, Kampert et al. could find only a trend in association between self-reported PA or fitness and cancer deaths, which almost reached statistical significance⁹⁵. This could be related to a small number of cases. Among Norwegian women leisure or work time PA did lower the risk for breast cancer⁹⁶. In analysis of only the postmenopausal women, this association did not reach statistical significance. Hence, for PA to be protective, it should be initiated earlier. Conversely, data from the Framingham study suggest that PA does not protect against breast cancer⁹⁷. However, levels of PA seemed to correlate with a reduction in the risk of endometrial cancer, regardless of body mass⁴⁸.

Incidence of colon cancer has also been coupled with PA levels⁹⁴, and active men and women experience less occurrence of this tumor. Again, the Framingham population does not agree with this opinion: among 2308 women in this study, no association was found between PA and colon cancer⁹⁸. However, household activity was not measured. The risk for colon adenomas was found to be lower among middle-aged women with higher levels of PA⁴⁹. The incidence of lung cancer was lower among active men, but not women⁹⁹. This is probably due to the small number of cases among women, but the authors state that a protective pattern was still feasible. Renal cell carcinoma was found to be less prevalent among men with higher occupational PA, but again not in women¹⁰⁰.

Concerning PA and cancer protection, it seems that some connection exists, but different questionnaires and other methodological differences among the studies prevent a clear conclusion at this time.

PA Combats Gallbladder Disease and Osteoarthritis

On average, the risk for cholecystectomy was 30% lower among the most active women when compared to their sedentary counterparts¹⁰¹. 2-3 hours a week of various types of PA, including brisk walking, resulted in a 20% decrease in the need for this procedure. A protective effect with increasing levels of activity was not seen for obese women, only in those with BMIs below 29 kg/m² (which includes the overweight group). Osteoarthritis can also be treated through a carefully planned exercise program¹⁰². Given the 'wear and tear' pathogenesis of this condition, one might fear that heavy PA can actually cause it. In men, this was shown to be the case in one study¹⁰³, but not in an earlier report on this matter from Framingham¹⁰⁴. Neither study showed increased prevalence of osteoarthritis among women. However, a follow-up on the Framingham population did identify increased risks for osteoarthritis in subjects exercising heavily¹⁰⁵. The elevated risk was apparent among those who engaged in more than 3 hours of carrying heavy objects, chopping wood, or strenuous sports. This is far beyond the recommendations for PA to the general public (see below).

PA is for Every Adult

The amount of PA required for achieving its associated health benefits has been delineated in recommendations from the American College of Sports Medicine alone¹⁰⁶ or in a joined statement with the Centers for Disease Control and Prevention¹⁰⁷ and from the National Institutes of Health¹⁰⁸. It is recommended for every adult to engage in 30 minutes of moderate-intensity PA on most, preferably all, days of the week. For example, a brisk walk of 3.5 km (2 miles) a day is enough to exert most of the health benefits. These 30 minutes can be divided into shorter bouts of gardening, playing with the grandchildren or climbing stairs to work along the day. Data from the Nurses' Health Study suggest that 40-65 year old women, whose PA was only walking or more vigorous exercises (jogging, running, tennis, aerobics, etc) had fewer coronary events with rising volumes²⁵. When total energy expenditures were the same, walking was as good a prevention as vigorous activities. An average walking pace (2.1-2.9 mph) offered a 25% reduction in the risk for coronary events when compared with a casual pace (less than 2 mph), while a brisk pace (over 3 mph) awarded 36% protection.

PA for Weight Reduction

Engaging in PA is important for the obese because of its associated health benefits, and also because of its part in weight reduction programs. In a meta-analysis

assessing weight loss programs, the role of exercise was shown to be more important in the long rather than in the short term⁶⁸. When comparing diet only with diet plus exercise programs, on average both yielded the same weight loss at the end of the program – about 11 kg in 15 weeks. Both also showed similar reductions in fat and total body mass. Exercise only resulted in loss of about 3 kg, so compared with the alternatives it was not an effective way to lose weight. This lack of weight loss could be explained in part by concomitant increases in fat-free mass or in appetite. Another meta-analysis revealed that for women using a diet-only weight loss program, 24% of the reduction in weight resulted from loss of fat free mass; while for those on diet plus PA, only 11% of weight reduced was attributed to this tissue¹⁰⁹. For that reason adding PA to the diet regimen is recommended, so that more fat can be shed while conserving the energy-utilizing muscle tissue, thus attenuating the inevitable decrease in basal metabolic expenditure following weight loss.

The advantage of PA emerged in programs which reported percent of weight gain after 1 year: while diet-only participants maintained 56% of their initial weight loss, the members of diet plus PA programs maintained 77% of it. Observing subjects who maintained their weight loss, it appears that most had integrated PA into their lifestyle¹¹⁰. This seems to be independent of the method by which weight had been lost. Among various strategies used by reduced-weight maintainers, PA is a major contributor^{69-71,111}. In women, 90% of weight maintainers used PA as an aid, compared to only 34% of weight regainers⁷⁰.

The type of exercise recommended for weight loss is of the aerobic type, such as walking, jogging, swimming, cycling and aerobic dancing. Resistance exercises did not affect weight loss in programs which incorporated this type of PA¹¹⁰, although fat free mass was added. When BMI is calculated as a measure of progress, it is affected by the increased muscle mass, and higher values are “spuriously” recorded.

There are gender and age differences in the ability of PA to affect weight loss¹¹². Female rats tend to increase food consumption following initiation of PA, perhaps in order to preserve body weight and fat stores needed for reproduction. Still, female rats have been shown to reduce their fat intake autonomously in response to PA, without altering total energy consumed¹¹³. The male rats decrease their food consumption and lose weight. Somewhat similarly, women seem to lose less weight than men following exercise programs¹¹². For example, 3 months of alternate day PA resulted in loss of 2 kg in men, but only 0.5 kg in women. Additional subgroups are the heavier and the older: the more obese lose weight at a higher rate per given amount of PA, probably due to the increased workload

against body mass. The older women seem to lose weight more easily than the younger.

In conclusion, PA has a major role in weight loss maintenance, perhaps due to its fat free mass conservation. Women seem to need to work harder than men for the same weight loss – but on the bright side, they will enjoy more hours of jogging in the outdoors.

PA Prescription

PA is a general recommendation for all adults, as anything is better than none (“never do nothing when you can only do a little”). Still, a more precise prescription may be needed for those who aim at weight reduction through fat loss. The rate of weight reduction should approximate 0.5 kg per week, by a combination of a reduced energy diet and PA. As loss of 1 kg of body weight utilizes about 7000 kcal, the total energy deficit should therefore be about 500 kcal per day, resulting in a total of 3500 kcal per week. It should be stated that reduction of 500 kcal per day is much easier than increasing the expense of the same magnitude (for example, one hour of playing basketball). Shepard and Balady have published a recommendation regarding exercise prescription for cardiovascular risk reduction¹⁴. The type of PA should include both aerobic and resistance training, for the health benefits described above. The intensity can be as low as 40% of maximal heart rate ($=220$ minus the age in years) for older beginners, which can be translated into brisk walking. Minimal frequency of PA is 3 times a week, while it is preferable to do so more often. The duration of exercise should be at least 30 minutes, which can be split into 2 or three bouts. PA is also prescribed in the same manner for patients with symptomatic coronary artery disease, provided they undergo an initial evaluation¹⁵. Naturally, individual modifications may be introduced as needed according to the clinical state of the patient. In addition, simple modifications to lifestyle will help to increase daily PA. Such measures include getting out of the elevator 3 floors below destination, parking farther away and looking after a dog.

Summary

Obesity is a 'growing' problem in many industrialized countries. Postmenopausal women have additional reasons for weight gain, such as hormonal changes affecting fat and fat-free mass. A diminished amount of PA seems to be another cause, and these reasons contribute to a shift from gynoid to abdominal fat accumulation. The costs of this may be obesity, insulin resistance, hypertension, atherosclerosis and coronary events or stroke. Several types of cancer, mainly tumors of the breast, endometrium and colon are also more prevalent among the overweight postmenopausal woman. For this problem, a very simple cure exists –

eat more grains and vegetables, limit fat in the diet and engage in the mood-elevating physical activity of your choice. Park afar, use the stairs, decrease television and computer game time. Sounds easy, but not even 50% of adults are listening; less than half of women aged 50- 64 report doing any regular physical activity. Changing exercise behavior is difficult, and it is no wonder that a large number of physicians still do not recommend moderate regular PA for all adults, irrespective of weight. PA is cheap, safe and devoid of adverse effects, while the health benefits it brings are abundant.

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