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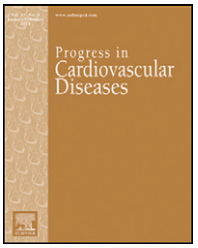

Metabolic Syndrome: An Evolving Clinical Construct

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ABSTRACT

Metabolic syndrome (MetS), a clustering of metabolic risk factors, identifies individuals at increased risk of diabetes and cardiovascular disease (CVD). Measurement of waist circumference, high-density lipoprotein–cholesterol, triglycerides, blood pressure and fasting blood glucose are easily obtained in the clinic. At any level of low-density lipoprotein–cholesterol, presence of MetS increases the risk of adverse CVD outcomes including bothatherosclerotic CVD and atrial fibrillation. The MetS construct should focus the clinician on recommending behavioral lifestyle modification as this improves all of its components. The challenge, however, has been the lack of a standardized approach to achieve effective and sustained lifestyle modification in clinical practice. We briefly review various approaches useful to the clinician in counseling such patients. These include group lifestyle programs and emerging mobile technology. Technology alone may not be sufficient, but as an adjunct has the promise to improve low rates of behavioral change currently seen with traditional programs.

Definition and background

We consider metabolic syndrome (MetS) to be a useful clinical construct of clustered metabolic risk factors. Importantly, MetS is common in the general population.[1] It likely derives from overnutrition, often combined with a sedentary lifestyle.[2] It is prevalent in children and adolescents and in young women with polycystic ovary syndrome.[3,4] The pathophysiology underlying MetS involves insulin resistance, hyperinsulinemia and visceral obesity, which has been difficult to measure in clinical practice.[5]Recognition of MetS acknowledges an inflammatory and prothrombotic milieu that act in concert with atherogenic dyslipidemia to promote increased risk of atherosclerotic cardiovascular disease (CVD; ASCVD).[6] It is not synonymous with obesity. Obese individuals without metabolic clustering have lower risk of ASCVD than obese individuals with MetS.[7,8] Rarely MetS is related to genetic alterations.[9]

The diagnosis of MetS requires 3 of 5 easily measured clinical components: increased abdominal circumference, low high-density lipoprotein cholesterol (HDL-C) levels by gender, elevated triglycerides (TGs), elevated fasting blood glucose (FBG), and elevated blood pressure (BP).[1] MetS identifies individuals at increased risk of diabetes mellitus (DM), ASCVD, atrial fibrillation (AF), nonalcoholic fatty liver disease and all-cause mortality.[1,10–14] Case control data suggest that while it is a strong independent determinant of ASCVD, it is not stronger than the sum of its individual parts.[15] Yet its usefulness as a construct extends beyond indicating increased risk of CVD and DM. The concept of MetS is important because it provides an understanding of the underlying pathophysiology (insulin resistance and hyperinsulinemia, usually a consequence of increased visceral fat) that all of the components have in common. This can lead directly to the prescription of lifestyle therapies that are so effective in improving this condition.

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Abbreviations and Acronyms

AF = Atrial fibrillation

ASCVD = Atherosclerotic cardiovascular disease

CVD = Cardiovascular disease

DM = Diabetes mellitus

HDL-C = High-density lipoprotein cholesterol

MetS = Metabolic syndrome

PA = Physical activity

TG = Triglyceride

Clinicians can inform their patients that all five components of the MetS improve with lifestyle behavioral modification. Recognition should inform the risk discussion to encourage patients to improve behaviors to reduce metabolic risk burden. Identification of MetS in premenopausal women can highlight a group that could derive benefit from a more intensive approach to lifestyle intervention. Patients with MetS should be targeted for more frequent follow up with a greater focus on self-monitoring to aid lifestyle intervention efficacy (Fig 1).

Although lifestyle behavioral modification is the cornerstone of treatment for MetS, implementation of behavioral lifestyle modification in routine clinical practice is difficult, time consuming, and resource intensive. Unlike pharmacologic treatment, a definitive method for achieving sustained lifestyle behavioral change is not available. Wearable monitoring devices offer a novel approach to improve adherence to lifestyle modification, but these devices have limited data on long-term efficacy.[16] The optimal approach to utilize these devices in clinical practice needs more study. Patient motivation is a key factor that determines success in achieving behavioral goals. A team of providers, including those with expertise in cognitive behavioral psychology, is necessary to implement lifestyle behavioral change. More study is needed to develop a practical, affordable, and effective lifestyle program for patients with MetS.

This purpose of this review is to: (1) recognize the clinical impact of MetS, (2) review the literature supporting lifestyle modification for treatment, and finally (3) analyze the effect of technology to shape behavioral change.

The case for MetS: identification is clinically important

Relation to CVD risk

Utilizing data from randomized controlled trials (RCTs), at every low-density lipoprotein cholesterol level, the presence of the MetS increases ASCVD risk such that those with MetS are on a higher ASCVD risk curve than those without MetS.[17] This suggests that knowledge of metabolic risk factor burden is useful in the risk discussion regarding statin therapy. It further highlights the need to pursue lifestyle modification even after statin therapy is initiated as noted below.

Like ASCVD, AF is increased in individuals with metabolic risk factors. In a large prospective, community-based observational cohort study, MetS was associated with increased risk of new onset AF.[12] MetS also predicted elevated risk of post-operative AF in younger patients undergoing isolated coronary bypass surgery.[18] Importantly, lifestyle modification reduces AF burden and improves maintenance of sinus rhythm.[19,20] Similar to ASCVD, pharmacologic and ablation treatments need to be accompanied by healthy behavioral changes to prevent AF and reduce AF burden.

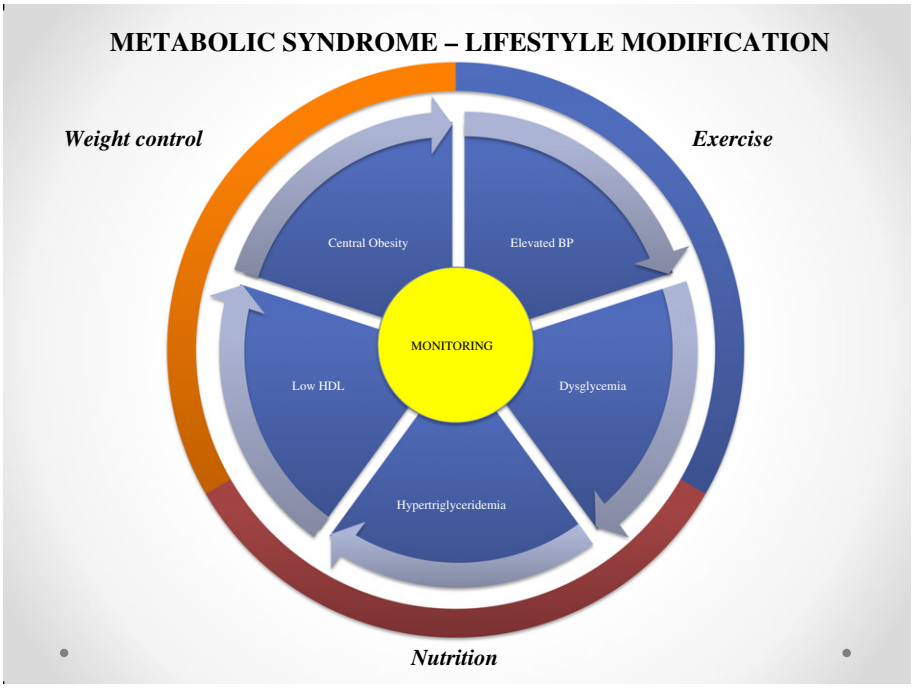

Fig 1 – MetS is a clustering of metabolic risk factors including central obesity, elevated blood pressure, dysglycemia, hypertriglyceridemia and low HDL that predicts increased risk of CVD and diabetes. Lifestyle modification improves all components of MetS. Self-monitoring with the assistance of technology support improves outcomes in MetS.