



### **What is AMRA & Body Composition Profiling?**

- Automated analysis of MRI imaging that provides precise measurements of body composition through volumetrically measuring individual fat and muscle compartments
- 6-10 minute MRI examination

### **Why is this clinically relevant/important?**

- Among subjects with the same BMI and waist circumference, VAT volume can range from 2.4 liters to 9.3 liters
- BMI looks at health trends in large population groups, and fails to specify specific fat distributions which is significantly linked to adverse outcomes.

### **What does it measure?**

- Visceral Adipose Tissue (VAT)
- Liver Fat
- Muscle Fat infiltration (MFI)
- Fat Free Muscle Volume (FFMV)
- Individual muscle measurements
- Abdominal Subcutaneous Adipose Tissue (ASAT)

### **What is VAT?**

- Visceral fat is the intra-abdominal fat stored around and between the abdominal organs and is the most detrimental type of fat.
- Defined as the volume of adipose tissue within the abdominal cavity, excluding adipose tissue outside the abdominal skeletal muscles and posterior of the spine and back muscles.
- Visceral Fat is measured in liters (L).

### **What is ASAT?**

- Subcutaneous fat is the most prominent type of fat and is stored beneath the skin
- Defined as the subcutaneous adipose tissue volume in the abdomen from the top of the femoral heads to the top of the thoracic vertebrae, T9.
- The Subcutaneous Fat is measured in liters (L).

### **What is liver fat?**

- Defined as the average proton density fat fraction in regions of interest in the liver.
- Proton density fat fraction is a standardized MRI biomarker measuring fat through the analysis of water and fat signals in tissue.
- Liver Fat is measured in percentages (%).

### **What is MFI?**

- Muscle Fat = fraction of adipose tissue in the muscle, aka muscle fat infiltration or intramuscular fat.
- Muscle Fat is measured in percentages
- Muscle Fat measurement is calculated as the mean muscle fat infiltration in the anterior thigh muscle groups in both legs. A high value means there is a higher fraction of fat in the muscles, which indicates a lower muscle quality.
- High muscle fat = low quality muscle.
- The fat infiltration of skeletal muscle happens as we age, as well as due to muscle disuse or inactivity, diseases, obesity, high-fat diet, endocrine disorders, and certain medications.
- Women and individuals with African ancestry tend to have higher muscle fat than other population groups

## What is FFMV?

- Muscle volume is the volume of fat-free, active skeletal muscle, and is related to the amount of muscle mass.
- The Muscle Volume measurement is calculated as the thigh fat-free muscle volume of both the anterior and posterior thigh muscle groups. A low value may indicate that there is low quantity of fat-free muscle tissue.
- Muscle Volume is measured in liters (L).
- Age-related muscle loss, called sarcopenia, is a natural part of aging.
- Decline in muscle volume is noticeable after about 45 years of age, with the greatest decrease in the lower body
- After age 30, you begin to lose as much as 3% to 5% per decade.
- Most men will lose about 30% of their muscle mass during their lifetimes.
- After the age of 25, muscle volume reduces progressively
- Adverse muscle composition = Low muscle volume with high muscle fat infiltration.
- In addition to aging, several factors lead to reduced muscle volume, such as certain diseases, endocrine dysfunction, neurological dysfunction, disuse and inactivity, inflammation, and certain medications

## Individual Muscle Measurements:

- Anterior thigh muscle group: quadriceps femoris, sartorius and tensor fascia latae.
- Posterior thigh muscle group: gluteus muscles, iliacus, adductor muscles and hamstring muscles.

## Interpreting reports:

- The patient's measurement (black dot) is compared to the distribution of measurements within a sex specific reference population (white bar).
- The 25th, 50th and 75th percentiles of this reference population are presented as solid lines.
- The distribution within the patient's virtual control group (blue bar) shows the expected range of the measurement, given the patient's sex and body size at time of scan. *\*The patient marker being within the blue field, does not indicate if the patient is healthy or unhealthy.*

## Associations:

- High liver fat without visceral obesity:
  - o Was modestly associated with higher risk for T2D.
  - o Was not significantly associated with a higher risk for CHD.
- In the presence of visceral obesity, low liver fat was strongly associated with
  - o Higher risk for CHD.
- High visceral fat and muscle fat infiltration are associated with both T2D and CHD.
- High VAT has been linked to increased cardiac risk, type 2 diabetes, liver inflammation and fibrosis, certain types of cancer, sleep apnea, and stroke.
- Excessive muscle fat has been associated with reduced physical function, disability, frailty, increased fracture risk, increased risk of hospitalization, severe illness outcome, poor overall survival, among others.
- Low muscle volume has been associated with shorter survival, higher surgical and post-operative complications

## Interventions to recommend:

- A reduction in the amount of calories consumed and an increase in the amount of calories burned are effective strategies to reduce visceral fat.
- Visceral fat can be reduced even without weight loss; however, research has shown that weight loss of 5% resulting from a healthier lifestyle can decrease visceral fat by 15-25%
- The Mediterranean diet has also been proven as an interesting dietary approach to reduce visceral fat and improve overall health / This type of diet contains large amounts of vegetables, fruits, legumes, herbs, nuts, fish and seafood, and olive oil.
- Reduce amount of red meat and dairy
- Plant-based diets were associated with a decrease in visceral fat