

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

- Automated analysis of MR imaging that provides precise measurements of body composition through volumetrically measuring individual fat and muscle compartments.

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

- Body Measurement Index (BMI) is an outdated method of quantifying body size and health.
- BMI looks at health trends across large population groups and fails to specify specific fat distribution which is significantly linked to adverse outcomes.
- Among subjects with the same BMI and waist circumference, the volume of visceral adipose tissue can range from 2.4 to 9.3 liters; creating a dramatic difference in health risk between two individuals of the same BMI.

### **What does Body Composition Profiling measure?**

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

### **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. Visceral fat does not include fatty 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.
- The Subcutaneous Fat is measured in liters (L).

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

- Fatty tissue that is deposited in the liver is measured using the proton density fat fraction (PDFF). The PDFF is a standardized MRI biomarker measuring regions of interest in the liver through the analysis of water and fat signals in tissue.
- Liver Fat is measured in percentages (%).

### **What is MFI?**

- Muscle Fat Infiltration measures the fraction of adipose tissue within the muscle.
- 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 percent value indicates there is a higher fraction of fat within the muscles, which indicates a lower muscle quality.
- The infiltration of fat within skeletal muscle happens as we age, as well as due to physical inactivity, obesity, high-fat diet, endocrine disorders, and certain medications.

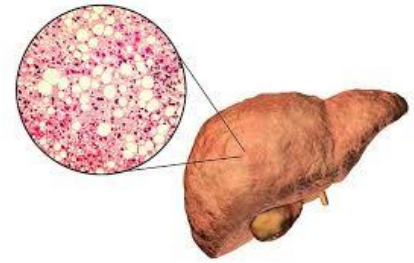
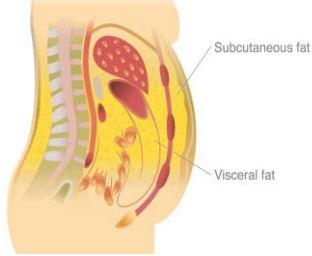
### **What is FFMV?**

- 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 using the fat-free muscle volume of both the anterior and posterior thigh muscle groups. A low value may indicate that there is a low quantity of fat-free muscle tissue.
- Muscle Volume is measured in liters (L).
- 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% of your muscle volume per decade.
- Most men will lose about 30% of their muscle mass during their lifetimes.
- Adverse muscle composition is a low muscle volume with high muscle fat infiltration.
- In addition to aging, several factors lead to reduced muscle volume, such as endocrine dysfunction, neurological dysfunction, disuse and physical inactivity, inflammation, and certain medications.

### **Individual Muscle Measurements:**

- Anterior thigh muscles measured: *quadriceps femoris, sartorius and tensor fascia latae*
- Posterior thigh muscles measured: *gluteus muscles, iliacus, adductor muscles and hamstring muscles*

## ASSOCIATED HEALTH RISKS



- In the presence of visceral obesity, low liver fat was strongly associated with a higher risk for cardiovascular disease.
- High volume of visceral adipose tissue has been linked to increased cardiac risk, type II diabetes, liver inflammation and fibrosis, certain types of cancer, sleep apnea, and stroke.

- High visceral fat and muscle fat infiltration are associated with both type II diabetes and cardiovascular disease.
- Sarcopenic obesity increases the risk of Type 2 Diabetes by 38%.
- Excessive muscle fat has been associated with reduced physical function, disability, frailty, increased fracture risk, increased risk of hospitalization, severe illness outcome, and poor overall survival.
- Low muscle volume has been associated with shorter survival, and higher surgical and post-operative complications.
- Risk for cardiac disease can be reduced by increasing muscle mass.

- High liver fat without visceral obesity is modestly associated with higher risk for type II diabetes.