Abstract: Bone consists of the mineralized component (i.e., cortex and trabeculae) and the non-mineralized component (i.e., bone marrow). Most of the routine clinical bone imaging uses X-ray-based techniques and focuses on the mineralized component. However, bone marrow adiposity has been also shown to have a strong linkage with bone health. Specifically, multiple previous studies have demonstrated a negative association between bone marrow fat fraction (BMFF) and bone mineral density. Magnetic resonance imaging (MRI) and magnetic resonance spectroscopy (MRS) are ideal imaging techniques for non-invasively investigating the properties of bone marrow fat. In the present work, we first review the most important MRI and MRS methods for assessing properties of bone marrow fat, including methodologies for measuring BMFF and bone marrow fatty acid composition parameters. Previous MRI and MRS studies measuring BMFF and fat unsaturation in the context of osteoporosis are then reviewed. Finally, previous studies investigating the relationship between bone marrow fat, other fat depots, and bone health in patients with obesity and type 2 diabetes are presented. In summary, MRI and MRS are powerful non-invasive techniques for measuring properties of bone marrow fat in osteoporosis, obesity, and type 2 diabetes.
diabetes and can assist in future studies investigating the pathophysiology of bone changes in the
above clinical scenarios.