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Short Communication
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The Liver: Mirror of Health

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Short Communication

Cardio-vascular, degenerative, metabolic and neoplastic diseases are major causes of death and familiarity and early signs of disease guide their specific personalized programs of prevention and care. In the last decades epidemiologic studies report a progressive worldwide epidemic of fatty liver (steatosis): it prevails in 20% to 30% of the overall population with a prevalence increasing up to 60% after 40 years of age and in the elderly [1-3]. Fatty liver (>5% of the overall liver weight) is associated with multiple clinic pathologic conditions: overweight/obesity, excessive intake of alcoholic or sweet beverages, prolonged treatment with hepatotoxic drugs, obstructive sleep apnea syndrome, metabolic syndrome (MetS) and associated diseases (diabetes, lipid dis-metabolisms, cardiovascular, degenerative and neoplastic diseases [1-3]. Steatosis (diagnosed with a simple non-invasive abdominal ultrasound examination) associates with a significant increment (25%) of the overall individual health care costs, determined mostly by cardiovascular and metabolic diseases [4]. Non-alcoholic fatty liver disease (NAFLD) is an indolent pathology unless it is complicated by inflammation, steato-hepatitis (NASH) which may progress rapidly to cirrhosis and hepatocellular carcinoma [1-3]. Finally, steatosis represents a factor of increased severity of non-hepatic chronic diseases and a co-factor of rapid evolution of the liver diseases of different etiology [3]. A great deal of new knowledge in the physiopathology of fatty liver have accumulated in recent years revealing the complexity of the mechanisms involved in NAFLD and NASH [1-3]. Fatty liver may have different aetiologies and patients have to be stratified accordingly; to consider all subjects as affected by the same disease is very naive and introduces a major bias in both research and clinical practice. The most recent guidelines and expert opinions for the management of NAFLD patients prompt a new systems medicine approach for the study of the interplays between major physiology systems which control our vital relations with the environment, brain and nervous system, endocrine system, digestive system (gut, liver and microbiota) and immune system [1-3]. New concepts for patient stratification are needed to identify different clinical prototypes within the general metabolic-syndrome and to do that we need to measure intrahepatic fat (IHF, 1). The gold standard method for measuring liver fat is magnetic resonance (MR) spectrometry [1,5]. Liver biopsy is an invasive procedure unsuitable for monitoring and repeated measures and in addition is hampered by a significant sampling error since it represents only 1/50,000 of the liver and in about one third of cases the intrahepatic fat distribution is dis-homogenous. Nowadays, it is possible to quantify IHF using new non-invasive methods based on software which use algorithms of multiple imaging standardized parameters applied to MR or ultrasound instruments [5,6]. They provide reproducible and precise measures mainly in mild and intermediate forms of steatosis, which are the most important to be diagnosed and monitored for an accurate and timely preventive care before development of the irreversible complications of fatty liver associated diseases.

Using the new non-invasive technologies for IHF quantification it is possible to evaluate in clinical trials as well as in the single subject in clinical practice whether drugs and/or changes of life style or alimentary habit determine an effective reduction of IHF.

Furthermore, the emerging and rapidly growing field of molecular imaging is providing new opportunities for non-invasive studies of *in vivo* physiopathology of fatty liver overcoming the limits of liver biopsy: invasiveness, unsuitability for tight monitoring, sampling error and dead liver specimens where fat is melted in arte fact ghost droplets [7]. Finally the widespread use of IHF measurements provides new research perspectives favouring the studies of the interplay between imaging biomarkers, blood metabolomics, genetic and epigenetic factors for a better understanding of their dynamics during the pathogenic processes involved in NAFLD/NASH. Hopefully the results of these new studies will identify different aetiologies, new diagnostic and prognostic biomarkers and therapy targets for a better stratification of the patients for both prevention and outcome prediction and personalized treatment of fatty liver.

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