SUMMARY

[0005] An aspect of the present disclosure provides a method for evaluating efficacy of a therapeutic intervention. The method comprises obtaining, from each of paired liver biopsy samples of a subject comprising a first sample prior to the therapeutic intervention and a second sample after the therapeutic intervention, a first set of image data indicative of a first histopathological feature and a second set of image data indicative of a second histopathological feature; for each of the first and second samples, quantifying the second histopathological feature, overlapping the first and second sets of image data based on a common image frame, and quantifying the first histopathological feature present in an overlapping area of the first and second sets of image data on the common image frame; and determining the efficacy of the therapeutic intervention based on a comparison of the quantified second histopathological feature between the first and second samples and/or a comparison of the quantified first histopathological feature in the overlapping area between the first and second samples. The first and second pathological features comprise features selected from the group consisting of fibrosis, inflammation, ballooning and steatosis.

[0006] Another aspect of the present disclosure provides a system for evaluating efficacy of a therapeutic intervention. The system comprises a data receiving module configured to receive image data generated by each of paired liver biopsy samples of a subject comprising a first sample prior to the therapeutic intervention and a second sample after the therapeutic intervention, wherein the image data comprises a first set of image data indicative of a first histopathological feature and a second set of image data indicative of a second histopathological feature; at least one processor; and a computer-readable memory coupled to the processor and having instructions stored thereon that are executable by the processor to, for each of the first and second samples, quantify the second histopathological feature, overlap the first and second sets of image data based on a common image frame, and quantify the first histopathological feature present in an overlapping area of the first and second sets of image data on the common image frame; and determine the efficacy of the therapeutic intervention based on a comparison of the quantified second histopathological feature between the first and second samples and/or a comparison of the quantified first histopathological feature in the overlapping area between the first and second samples. The first and second pathological features comprise features selected from the group consisting of fibrosis, inflammation, ballooning and steatosis.

CLAIMS

1. A method for evaluating efficacy of a therapeutic intervention, the method comprising:

obtaining, from each of paired liver biopsy samples of a subject comprising a first sample prior to the therapeutic intervention and a second sample after the therapeutic intervention, a first set of image data indicative of a first histopathological feature and a second set of image data indicative of a second histopathological feature;

for each of the first and second samples:

quantifying the second histopathological feature;

overlapping the first and second sets of image data based on a common image frame; and

quantifying the first histopathological feature present in an overlapping area of the first and second sets of image data on the common image frame; and

determining the efficacy of the therapeutic intervention based on a comparison of the quantified second histopathological feature between the first and second samples and/or a comparison of the quantified first histopathological feature in the overlapping area between the first and second samples,

wherein the first and second pathological features comprise features selected from the group consisting of fibrosis, inflammation, ballooning and steatosis.

2. The method as claimed in claim 1, wherein the first histopathological feature comprises fibrosis and the second histopathological feature comprises steatosis, and wherein quantifying the first histopathological feature present in the overlapping area comprises a concomitant zonal analysis of changes in collagen fibers around fat vacuoles.

3. The method as claimed in claim 2, further comprising identifying in each of the first and second samples a periportal region, a pericentral region, and a transitional region between the periportal and pericentral regions, wherein quantifying the second histopathological feature comprises quantifying steatosis in the whole sample and each of the periportal, pericentral and transitional regions.

4. The method as claimed in claim 3, wherein the therapeutic intervention is determined to be effective if the quantified steatosis in each of the periportal, pericentral and transitional regions is lower in the second sample than in the first sample.

5. The method as claimed in claim 3 or 4, wherein the overlapping area corresponds to the transitional region, and wherein the therapeutic intervention is determined to be effective if the quantified fibrosis in the transitional region is lower in the second sample than in the first sample.

6. The method as claimed in any one of the preceding claims, wherein obtaining the first and second sets of image data comprises using second harmonic generation (SHG) microscopy and/or two photon excitation fluorescence (TPEF) microscopy.

7. The method as claimed in claim 1, wherein the first histopathological feature comprises fibrosis and the second histopathological feature comprises ballooning.

8. A system for evaluating efficacy of a therapeutic intervention, the system comprising:

a data receiving module configured to receive image data generated by each of paired liver biopsy samples of a subject comprising a first sample prior to the therapeutic intervention and a second sample after the therapeutic intervention, wherein the image data comprises a first set of image data indicative of a first histopathological feature and a second set of image data indicative of a second histopathological feature;

at least one processor; and

a computer-readable memory coupled to the processor and having instructions stored thereon that are executable by the processor to:

for each of the first and second samples:

quantify the second histopathological feature;

overlap the first and second sets of image data based on a common image frame; and

quantify the first histopathological feature present in an overlapping area of the first and second sets of image data on the common image frame; and

determine the efficacy of the therapeutic intervention based on a comparison of the quantified second histopathological feature between the first and second samples and/or a comparison of the quantified first histopathological feature in the overlapping area between the first and second samples,

wherein the first and second pathological features comprise features selected from the group consisting of fibrosis, inflammation, ballooning and steatosis.

9. The system as claimed in claim 8, wherein the first histopathological feature comprises fibrosis and the second histopathological feature comprises steatosis, and wherein the instructions are executable by the processor to quantify the first histopathological feature present in the overlapping area based on a concomitant zonal analysis of changes in collagen fibers around fat vacuoles.

10. The system as claimed in claim 9, the instructions are executable by the processor to identify in each of the first and second samples a periportal region, a pericentral region, and a transitional region between the periportal and pericentral regions, and to quantify the second histopathological feature based on a quantified steatosis in the whole sample and each of the periportal, pericentral and transitional regions.

11. The system as claimed in claim 10, wherein the therapeutic intervention is determined to be effective if the quantified steatosis in each of the periportal, pericentral and transitional regions is lower in the second sample than in the first sample.

12. The system as claimed in claim 10 or 11, wherein the overlapping area corresponds to the transitional region, and wherein the therapeutic intervention is determined to be effective if the quantified fibrosis in the transitional region is lower in the second sample than in the first sample.

13. The system as claimed in any one of claims 8 to 12, wherein the image data comprises data from a second harmonic generation (SHG) microscope and/or a two photon excitation fluorescence (TPEF) microscope.

14. The system as claimed in claim 8, wherein the first histopathological feature comprises fibrosis and the second histopathological feature comprises ballooning.