The technical problem underlying the present invention can be seen as the provision of means and methods for complying with the aforementioned need.

The technical problem is solved by the embodiments characterized in the claims and herein below.

Accordingly, the present ~~invention~~disclosure provides a method for early differentiating whether a subject suffers from cardioembolic stroke or from non-cardioembolic ischemic stroke, comprising

a) determining the amount of a cardiac Troponin in a sample from a subject suffering from ischemic stroke,

wherein the sample has been obtained immediately after the onset of symptoms of ischemic stroke.

According to a first aspect, there is provided a method for early differentiating whether a subject suffers from cardioembolic ischemic stroke or from non-cardioembolic ischemic stroke, comprising determining the amount of a cardiac Troponin in a sample from a subject suffering from ischemic stroke, wherein the sample has been obtained not more than 6 hours after the onset of symptoms of ischemic stroke.

In a preferred embodiment the method further comprising the step of

b) comparing the amount of said cardiac Troponin as determined in step a to a reference amount, thereby differentiating whether said subject suffers from cardioembolic stroke or from non-cardioembolic ischemic stroke.

Thus, the present ~~invention~~disclosure, in particular, relates to a method for early differentiating whether a subject suffers from cardioembolic stroke or from non-cardioembolic ischemic stroke, comprising

a) determining the amount of a cardiac Troponin in a sample from a subject suffering from ischemic stroke, obtained immediately after the onset of symptoms of ischemic stroke, and

b) comparing the amount of said cardiac Troponin as determined in step a) to a reference amount, whereby it is differentiated whether said subject suffers from cardioembolic ischemic stroke or from non-cardioembolic ischemic stroke.

Preferably, it is differentiated, whether a subject suffers from cardioembolic ischmemic stroke or from non-cardioembolic ischemic stroke by carrying out the further step of c) diagnosing whether a subject suffers from cardioembolic ischemic stroke or from non-cardioembolic ischemic stroke, based on the results of the comparison carried out in step b).

In a preferred embodiment of the method of the present ~~invention~~disclosure, step a) further comprises the determination of the amount of a natriuretic peptide in the sample from the subject obtained immediately after the onset of ischemic stroke. Preferably, the, thus, determined amount of the natriuretic peptide is compared in step b) to a reference amount for a natriuretic peptide.

Thus, the present ~~invention~~disclosure also relates to a method for early differentiating whether a subject suffers from cardioembolic stroke or from non-cardioembolic ischemic stroke, comprising

a) determining the amount of a cardiac Troponin and of natriuretic peptide in a sample from a subject suffering from ischemic stroke, obtained immediately after the onset of symptoms of ischemic stroke, and

b) comparing the amount of said cardiac Troponin as determined in step a) to a reference amount for the cardiac Troponin, and the amount of said natriuretic peptide to a reference amount for the natriuretic peptide, whereby it is differentiated whether said subject suffers from cardioembolic stroke or from non-cardioembolic ischemic stroke.

The method of the present ~~invention~~disclosure, preferably, is an ex vivo method. Morever, it may comprise steps in addition to those explicitly mentioned above. For example, further steps may relate to sample pre-treatments or evaluation of the results obtained by the method. The method may be carried out manually or assisted by automation. Preferably, step (a) and/or (b) may in total or in part be assisted by automation, e.g., by a suitable robotic and sensory equipment for the determination in step (a) or a computer-implemented comparison and/or differentiation based on said comparison in step (b).

According to another aspect, there is provided the use of a cardiac Troponin and/or of a detection agent, which specifically binds thereto in a sample of a subject for early differentiating whether the subject suffers from cardioembolic ischemic stroke or from non-cardioembolic ischemic stroke, wherein the sample has been obtained not later than 6 hours after the onset of symptoms of ischemic stroke.

Accordingly, the present ~~invention~~disclosure also preferably relates to a system for early differentiating whether a subject suffers from cardioembolic ischemic stroke or from non-cardioembolic ischemic stroke, comprising

a) an analyzer unit configured to contact, in vitro, a portion of a sample from a subject who suffers from ischemic stroke with a ligand comprising specific binding affinity for a cardiac Troponin,

b) an analyzer unit configured to detect a signal from the portion of the sample from the subject contacted with the ligand,

c) a computing device having a processor and in operable communication with said analysis units, and

d) a non-transient machine readable media including a plurality of instruction executable by a the processor, the instructions, when executed calculate an amount of the cardiac Troponin, and compare the amount of the marker with a reference amount, thereby differentiating whether a subject suffers from cardioembolic ischemic stroke or from non-cardioembolic ischemic stroke.

According to another aspect, there is provided a device for early differentiating whether a subject suffers from cardioembolic ischemic stroke or from non-cardioembolic ischemic stroke in a subject suffering from ischemic stroke, said device comprising:

a) an analyzing unit comprising a detection agent for a cardiac Troponin which allows for the determination of the amount of said cardiac Troponin (and, optionally, a detection agent for a natriuretic peptide which allows for the determination of the amount of said natriuretic peptide); and

b) an evaluation unit comprising a data processor having implemented an algorithm for comparing the amount(s) determined by the analyzing unit with reference amount(s) stored in a database in order to differentiate whether a subject suffers from cardioembolic ischemic stroke or from non-cardioembolic ischemic stroke, wherein the reference amount is derived from a sample from a subject known to suffer from cardioembolic stroke and/or from a sample from a subject known to suffer from non-cardioembolic ischemic stroke, wherein said sample has been obtained not more than 6 hours after the onset of symptoms of ischemic stroke, and wherein the algorithm is as follows:

i) an identical amount of the cardiac Troponin, or an amount of the cardiac troponin which is increased as compared to the reference amount, is indicative for a subject suffers from cardioembolic stroke, if the reference amount is derived from a subject known to suffer from cardioembolic stroke, and/or

ii) an identical amount of the cardiac Troponin, or an amount of the cardiac troponin which is decreased as compared to the reference amount, is indicative for a subject who suffers from non-cardioembolic ischemic stroke, if the reference amount is derived from a subject known to suffer from non-cardioembolic ischemic stroke.

The term "differentiating" as used herein means to distinguish between cardioembolic stroke and non-cardioembolic stroke in a patient suffering from ischemic stroke. The term as used herein,

Claims

1. A method for early differentiating whether a subject suffers from cardioembolic ischemic stroke or from non-cardioembolic ischemic stroke, comprising determining the amount of a cardiac Troponin in a sample from a subject suffering from ischemic stroke, wherein the sample has been obtained not more than 6 hours after the onset of symptoms of ischemic stroke.

2. The method of claim 1, further comprising the step of comparing the amount of said cardiac Troponin to a reference amount, thereby differentiating whether said subject suffers from cardioembolic stroke or from non-cardioembolic ischemic stroke.

3. The method of claims 1 and 2, wherein the sample been obtained from said subject not more than 3 hours after the onset of symptoms of ischemic stroke.

4. The method of any one of claim 1 to 3, wherein the reference amount is derived from a subject known to suffer from cardioembolic stroke, and wherein an identical amount of the cardiac Troponin, or an amount of the cardiac troponin which is increased as compared to the reference amount, indicates that the subject suffers from cardioembolic stroke,
and/or
wherein the reference amount is derived from a subject known to suffer from non-cardioembolic ischemic stroke, and wherein an identical amount of the cardiac Troponin, or an amount of the cardiac troponin which is decreased as compared to the reference amount, indicates that the subject suffers from non-cardioembolic ischemic stroke.

5. The method of any one of claims 1 to 5, further comprising the determination of the amount of a natriuretic peptide, in particular of a brain natriuretic peptide, in particular of BNP or NT-proBNP.

6. Use of a cardiac Troponin and/or of a detection agent, which specifically binds thereto in a sample of a subject for early differentiating whether the subject suffers from cardioembolic ischemic stroke or from non-cardioembolic ischemic stroke, wherein the sample has been obtained not later than 6 hours after the onset of symptoms of ischemic stroke.

7. A device for early differentiating whether a subject suffers from cardioembolic ischemic stroke or from non-cardioembolic ischemic stroke in a subject suffering from ischemic stroke, said device comprising:

a) an analyzing unit comprising a detection agent for a cardiac Troponin which allows for the determination of the amount of said cardiac Troponin (and, optionally, a detection agent for a natriuretic peptide which allows for the determination of the amount of said natriuretic peptide); and

b) an evaluation unit comprising a data processor having implemented an algorithm for comparing the amount(s) determined by the analyzing unit with reference amount(s) stored in a database in order to differentiate whether a subject suffers from cardioembolic ischemic stroke or from non-cardioembolic ischemic stroke, wherein the reference amount is derived from a sample from a subject known to suffer from cardioembolic stroke and/or from a sample from a subject known to suffer from non-cardioembolic ischemic stroke, wherein said sample has been obtained not more than 6 hours after the onset of symptoms of ischemic stroke, and wherein the algorithm is as follows:

i) an identical amount of the cardiac Troponin, or an amount of the cardiac troponin which is increased as compared to the reference amount, is indicative for a subject suffers from cardioembolic stroke, if the reference amount is derived from a subject known to suffer from cardioembolic stroke, and/or

ii) an identical amount of the cardiac Troponin, or an amount of the cardiac troponin which is decreased as compared to the reference amount, is indicative for a subject who suffers from non-cardioembolic ischemic stroke, if the reference amount is derived from a subject known to suffer from non-cardioembolic ischemic stroke.