CLAIMS

1. A puncture device comprising:

a puncture needle configured to puncture a puncture site of a living body and supply thermal energy to the puncture site;

a holder configured to hold the puncture needle;

a main body to which the holder is slidably attached;

a contacting unit having a through hole through which the puncture needle is projected to the puncture site of the living body and having a cooling member that is able to come into contact with the puncture site;

a sensor needle in which a temperature sensor is arranged;

a surface temperature sensor; and

a control unit, wherein

the sensor needle is installed in parallel with the puncture needle and is held by the holder so as to project to the puncture site of the living body via a through hole formed in the contacting unit, and

the control unit controls electrical energy supplied to the puncture needle and/or the temperature of the cooling member, in accordance with output of the temperature sensor and the surface temperature sensor.

2. A puncture device comprising:

a puncture needle configured to puncture a puncture site of a living body and supply thermal energy to the puncture site;

a holder configured to hold the puncture needle;

a main body to which the holder is slidably attached;

a contacting unit having a through hole through which the puncture needle is projected to the puncture site of the living body and having a cooling member that is able to

come into contact with the puncture site;

a sensor needle in which a temperature sensor is arranged;

a control unit, wherein

the sensor needle is installed in parallel with the puncture needle and is held by the holder so as to project to the puncture site of the living body via a through hole formed in the contacting unit,

the sensor needle is able to measure temperatures at multiple depths at the same time, and

the control unit controls electrical energy supplied to the puncture needle, in accordance with output of the temperature sensor.

3. A puncture device comprising:

a puncture needle configured to puncture a puncture site of a living body and supply thermal energy to the puncture site;

a holder configured to hold the puncture needle;

a main body to which the holder is slidably attached;

a contacting unit having a through hole through which the puncture needle is projected to the puncture site of the living body and having a cooling member that is able to come into contact with the puncture site;

a sensor needle in which a temperature sensor is arranged;

a control unit, wherein

the sensor needle is installed in parallel with the puncture needle and is held by the holder so as to project to the puncture site of the living body via a through hole formed in the contacting unit,

the control unit controls electrical energy supplied to the puncture needle, in accordance with output of the

temperature sensor, and

the cooling member has an area capable of cooling the punctured site before and/or after puncturing.

4. A puncture device comprising:

a puncture needle configured to puncture a puncture site of a living body and supply thermal energy to the puncture site;

a holder configured to hold the puncture needle;

a main body to which the holder is slidably attached;

a contacting unit having a through hole through which the puncture needle is projected to the puncture site of the living body and having a cooling member that is able to come into contact with the puncture site;

a sensor needle in which a temperature sensor is arranged;

a control unit, wherein

the sensor needle is installed in parallel with the puncture needle and is held by the holder so as to project to the puncture site of the living body via a through hole formed in the contacting unit,

the sensor needle is able to measure temperatures at multiple depths at the same time,

the control unit controls electrical energy supplied to the puncture needle, in accordance with output of the temperature sensor, and

the control unit is able to continuously control the temperature in the depth direction.

5. A puncture device comprising:

a puncture needle configured to puncture a puncture site of a living body and supply thermal energy to the puncture site;

a holder configured to hold the puncture needle;

a main body to which the holder is slidably attached;

a contacting unit having a through hole through which the puncture needle is projected to the puncture site of the living body and having a cooling member that is able to come into contact with the puncture site;

a sensor needle in which a temperature sensor is arranged;

a control unit, wherein

the sensor needle is installed in parallel with the puncture needle and is held by the holder so as to project to the puncture site of the living body via a through hole formed in the contacting unit,

the sensor needle is able to measure temperatures at multiple depths at the same time,

the control unit controls electrical energy supplied to the puncture needle, in accordance with output of the temperature sensor, and

the puncture needle is configured to have a tip shape that does not penetrate the membrane existing between the subcutaneous tissue and the muscular layer.

6. The puncture device according to any one of claims 1 to 5, wherein

the puncture device has a cartridge in which the holder is slidably stored,

the cartridge has an opening for projecting the puncture needle, and

the cartridge is detachably attached to the main body.

7. The puncture device according to any one of claims 1 to 6, wherein the control unit supplies the electrical energy to the puncture needle such that an output

temperature of the temperature sensor is 50°C or more and 150°C or less.

8. The puncture device according to any one of claims 1 to 7, wherein the control unit supplies an alternating current to the puncture needle.

9. The puncture device according to any one of claims 1 to 8, wherein the control unit is configured to be able to supply an alternating current to the puncture needle for a prescribed time.

10. The puncture device according to any one of claims 1 to 9, wherein the prescribed time is a time between one second and 20 seconds.

11. The puncture device according to any one of claims 1 to 10, wherein a surface of the puncture needle is coated with an electrically insulating material in a state in which a tip side of the puncture needle is exposed.

12. The puncture device according to claim 11, wherein an exposure length of the tip side of the puncture needle is 0.1 to 2.0 mm.

13. The puncture device according to claim 11 or 12, wherein the electrically insulating material is made by glass coating or resin coating.

14. A cartridge for a puncture device, the cartridge comprising:

a puncture needle configured to puncture a puncture site of a living body and supply thermal energy to the

puncture site;

a holder configured to hold the puncture needle;

the cartridge configured to receive the holder so as to be slidable and having an opening through which the puncture needle is projected; and

a sensor needle in which a temperature sensor is arranged, wherein

the temperature sensor is able to measure temperatures at multiple depths at the same time,

the sensor needle is installed in parallel with the puncture needle and is held by the holder so as to project via the opening formed in the cartridge.

15. A cartridge for a puncture device, the cartridge comprising:

a puncture needle configured to puncture a puncture site of a living body and supply thermal energy to the puncture site;

a holder configured to hold the puncture needle;

the cartridge configured to receive the holder so as to be slidable and having an opening through which the puncture needle is projected; and

a sensor needle in which a temperature sensor is arranged, wherein

the sensor needle is installed in parallel with the puncture needle and is held by the holder so as to project via the opening formed in the cartridge, and

the temperature sensor, along with the surface temperature sensor, is used to control the temperature of the cooling member in contact with the puncture site and / or electrical energy supplied to the puncture needle.

16. A cartridge for a puncture device, the cartridge

comprising:

a puncture needle configured to puncture a puncture site of a living body and supply thermal energy to the puncture site;

a holder configured to hold the puncture needle;

the cartridge configured to receive the holder so as to be slidable and having an opening through which the puncture needle is projected; and

a sensor needle in which a temperature sensor is arranged, wherein

the temperature sensor is used to continuously control the temperature in the depth direction, and

the sensor needle is installed in parallel with the puncture needle and is held by the holder so as to project via the opening formed in the cartridge.

17. A cartridge for a puncture device, the cartridge comprising:

a puncture needle configured to puncture a puncture site of a living body and supply thermal energy to the puncture site;

a holder configured to hold the puncture needle;

the cartridge configured to receive the holder so as to be slidable and having an opening through which the puncture needle is projected; and

a sensor needle in which a temperature sensor is arranged, wherein

the sensor needle is installed in parallel with the puncture needle and is held by the holder so as to project via the opening formed in the cartridge, and

the puncture needle is configured to have a tip shape that does not penetrate the membrane existing between the

subcutaneous tissue and the muscular layer.

18. The cartridge for a puncture device according to any one of claims 14 to 17, wherein a surface of the puncture needle is coated with an electrically insulating material in a state in which a tip side of the puncture needle is exposed.

19. The cartridge for a puncture device according to claim 18, wherein an exposure length of the tip side of the puncture needle is 0.1 to 2.0 mm.

20. The cartridge for a puncture device according to claim 18 or 19, wherein the insulating material is made by glass coating or resin coating.