

## CARDIOLOGY PUNCTURE DEVICE

### **Field of the Invention**

The invention relates to the technical field of cardiology, and specifically to a cardiology  
5 puncture device.

### **Background to the Invention**

Radial artery puncture is a common vascular puncture technique used to obtain arterial  
blood samples or to perform interventional procedures. A radial artery puncture device  
10 usually comprises a needle, a catheter and connecting tubes. During radial artery puncture,  
medical staff use such devices to insert the needle into the patient's radial artery, and then  
deliver samples or therapeutic agents to the target site through the catheter. Radial artery  
puncture is a routine and important clinical operation, employed to monitor arterial blood  
gases, blood pressure and other physiological parameters, as well as to carry out  
15 interventional treatment.

For example, publication number CN117582272A discloses a cardiology clinical puncture  
device and method which facilitates adjustment of the puncture angle. In particular, this  
device addresses the shortcomings of prior art in which puncture devices could not be  
supported or adjusted, and in which there was no positioning mechanism for the patient's  
20 palm during puncture, thereby presenting certain safety risks. The device comprises a  
base, with a hand support plate fixedly mounted on one side of the top of the base,  
installation rods fixedly mounted on both sides of the hand support plate, and the ends of  
the two installation rods extending to one side of the hand support plate. When puncturing  
the patient's radial artery, the invention allows the patient's palm to be stably limited  
25 according to actual needs, while also enabling adjustment of the position and angle of the  
puncture needle used for the palm. Thus, during puncture, the accurate puncture angle  
can be maintained without deviation, thereby ensuring good operational safety.

The above cardiology clinical puncture device and method, by limiting the patient's palm,  
ensures that the puncture angle remains precise during actual puncture, reducing the

likelihood of deviation and providing good safety. However, when the patient uses the puncture device in cold weather, placing the hand on the device may easily cause irritation, which is unfavourable for puncture.

For example, publication number CN213346036U discloses a radial artery puncture device comprising a main plate, one end of the main plate being rotatably connected to a forearm support, the other end of the forearm support being connected to a palm support, the forearm support and the palm support forming a certain angle, the opening of the angle facing the main plate. A height adjuster is also provided between the main plate and the palm support, the height adjuster being used to adjust the height of the palm support.

Compared with the prior art, this utility model has a simple structure, facilitates radial artery puncture by the operator, improves puncture success rate, reduces patient discomfort, allows adjustment of the most comfortable puncture height according to different patient postures, provides strong adaptability, and effectively overcomes the increased cleaning difficulty caused by blood flowing towards the palm.

The above radial artery puncture device, by providing a height adjuster between the main plate and the palm support, effectively overcomes the increased cleaning difficulty caused by blood flowing towards the palm. However, before using the puncture device, the puncture needle must be disinfected, which requires manual disinfection by medical staff, making the process cumbersome and unfavourable to the efficiency of medical work.

### **Statement of Invention**

The purpose of the invention is to provide a cardiology puncture device, so as to resolve the problems raised in the background art whereby the patient's hand placed on the device may easily cause irritation, which is unfavourable for puncture, and whereby the puncture needle requires manual disinfection by medical staff, making the process cumbersome and unfavourable to medical work.

To achieve the above purpose, the invention provides the following technical solution: a cardiology puncture device comprising a base, with a driving motor fixedly mounted inside the left side of the base, the output end of the driving motor being fixedly connected to a

transverse screw rod, the transverse screw rod being rotatably mounted within the base; the surface of the transverse screw rod is threadedly provided with a movable block, the upper end of the movable block being fixedly connected to a lifting adjustment chamber, the interior of the lifting adjustment chamber being rotatably provided with a longitudinal screw rod, the surface of the longitudinal screw rod being equipped with an adjustment engagement mechanism, the front end of the adjustment engagement mechanism being provided with a puncture needle; the right-hand surface of the transverse screw rod is penetratively provided with a first water sac, the right side of the first water sac being fixedly mounted inside the base, the upper right side of the base being fixedly provided with a placement chamber, the interior of the placement chamber being equipped with an automatic heating mechanism; the upper left side of the placement chamber is fixedly provided with a pressing chamber, the left side of the pressing chamber being penetratively provided with a water spray port, the water spray port corresponding to the position of the puncture needle, and the right interior side of the water spray port being equipped with an automatic disinfection mechanism.

Further, the adjustment engagement mechanism is provided with a first gear, the first gear being fixedly mounted at the upper end of the longitudinal screw rod, the upper left side of the lifting adjustment chamber being fixedly provided with a perforated plate, the interior of the perforated plate being penetratively provided with a shifting plate, the central rear end of the puncture needle being fixedly provided with an adjustment round rod, the rear surface of the adjustment round rod being formed with a clamping groove, the clamping groove being annularly distributed.

Further, the shifting plate is of "T"-shaped configuration, the upper end of the shifting plate being fixedly provided with a second gear, the second gear being engaged with the first gear, and a limiting spring being fixedly mounted between the shifting plate and the perforated plate.

Further, the front left side of the movable block is penetratively provided with a pull rod, the right side of the pull rod being fixedly provided with a clamping block, the clamping block and the clamping groove being of inclined configuration, the clamping block forming an engagement structure with the adjustment round rod through the clamping groove, the

surface of the pull rod being penetratively provided with a return spring, the left and right sides of the return spring being respectively fixedly mounted between the pull rod and the movable block.

5 Further, the automatic heating mechanism is provided with a clamping pad, the clamping pad being fixedly mounted inside the placement chamber, the interior of the placement chamber being fixedly provided with a heater, the upper end of the base being fixedly provided with a storage battery, the right side of the storage battery being fixedly provided with a waterproof lead, and the right side of the waterproof lead being fixedly provided with a waterproof contact plate.

10 Further, the right side of the first water sac is fixedly provided with a first diversion tube, the upper end of the first diversion tube being penetratively mounted inside the clamping pad.

Further, the upper left side of the heater is fixedly provided with a waterproof starting member, the waterproof starting member corresponding in position to the waterproof contact plate, the upper left side of the waterproof contact plate being fixedly provided with  
15 a pressure spring between the waterproof contact plate and the interior of the clamping pad, and the central lower end of the waterproof contact plate being aligned with the upper end of the first diversion tube.

Further, the automatic disinfection mechanism is provided with a second water sac, the right side of the second water sac being fixedly mounted on the right inner wall of the  
20 pressing chamber, the upper end of the pressing chamber being fixedly provided with a liquid storage chamber, the liquid storage chamber being communicated with the pressing chamber through a one-way diversion pipeline, the one-way diversion pipeline being penetratively mounted at the upper left side of the pressing chamber, the interior of the liquid storage chamber being fixedly provided with an inclined plate, the inclined plate  
25 being aligned with the upper end of the one-way diversion pipeline, and the interior of the one-way diversion pipeline being provided with a one-way valve.

Further, the upper end of the clamping pad is fixedly provided with a second diversion tube, the second diversion tube being penetratively mounted through the pressing chamber, and the upper end of the second diversion tube being fixedly mounted at the lower end of the

second water sac.

Further, the left side of the second water sac is fixedly provided with a piston plate, the piston plate being of "T"-shaped configuration, and the left outer wall of the piston plate being fitted against the inner wall of the pressing chamber.

5 Compared with the prior art, the beneficial effects of the invention are as follows:

1. A screw rod capable of adjusting the puncture needle is provided. By rotation of the transverse screw rod, the movable block threadedly connected to its surface can be driven to move left and right under the limitation of the base, thereby adjusting the lifting  
10 adjustment chamber fixedly mounted at the upper end of the movable block. Inside the lifting adjustment chamber, rotation of the longitudinal screw rod drives the movable block threadedly connected to its surface to move up and down, thus enabling adjustment of the position of the puncture needle at the front end of the movable block, making it suitable for different patients and convenient for medical staff to use.

Further, between the movable block and the puncture needle a clamping block is provided  
15 which allows convenient disassembly and adjustable angle. During use, the adjustment round rod at the central rear end of the puncture needle is inserted into the interior of the movable block, at which point the adjustment round rod contacts the clamping block, the clamping block engages in the clamping groove, and automatic engagement installation is achieved. When disassembly and cleaning are required, the pull rod can be drawn to  
20 directly remove the puncture needle, achieving convenient disassembly and installation. At the same time, when installing the puncture needle, different angles can be adjusted according to the different clamping grooves formed at the rear end surface of the adjustment round rod, thereby enabling adjustment of the puncture needle angle, convenient for medical staff to select a suitable angle for puncture.

2. A first water sac is penetratively mounted on the surface of the transverse screw rod.  
25 When the movable block moves rightwards to perform puncture, it compresses the first water sac, which delivers liquid through the first diversion tube into the interior of the clamping pad within the placement chamber, causing the clamping pad to bulge. The bulging clamping pad can more closely fit the patient's arm, simultaneously limiting the arm,

preventing patient movement from causing puncture deviation, and providing protection.

Further, when the first water sac delivers liquid through the first diversion tube into the clamping pad, since the lower end of the waterproof contact plate is aligned with the outlet of the first diversion tube, as liquid enters, the waterproof contact plate is pressed upwards against the pressure spring under the impact and buoyancy of the water flow, causing the right side of the waterproof contact plate to contact the waterproof starting member. At this point, the storage battery activates the waterproof starting member via the waterproof lead and waterproof contact plate, thereby enabling the heater to start heating, raising the temperature inside the clamping pad, avoiding irritation to the patient when the device is used in cold weather, and further providing protection.

3. When the clamping pad is filled with water to limit the patient's arm, part of the water inside the clamping pad enters the second water sac through the second diversion tube. The second water sac inside the pressing chamber expands with the water and pushes the piston plate leftwards. The piston plate, along the interior of the pressing chamber, compresses the disinfection alcohol inside the pressing chamber. At this time, the disinfection alcohol passes through the water spray port to spray and disinfect the puncture needle, eliminating the need for manual disinfection by medical staff and reducing their workload.

### **Brief Description of the Drawings**

Figure 1 is a front sectional structural schematic diagram of the invention;

Figure 2 is a front sectional structural schematic diagram of the first gear of the invention;

Figure 3 is a side sectional structural schematic diagram of the movable block of the invention;

Figure 4 is a front sectional structural schematic diagram of the movable block of the invention;

Figure 5 is a top sectional structural schematic diagram of the adjustment round rod of the invention;

Figure 6 is a right sectional structural schematic diagram of the movable block of the invention;

Figure 7 is an enlarged structural schematic diagram of part A in Figure 1 of the invention;

Figure 8 is a front sectional structural schematic diagram of the pressing chamber of the invention;

Figure 9 is a side sectional structural schematic diagram of the placement chamber of the invention;

Figure 10 is a top sectional structural schematic diagram of the placement chamber of the invention.

In the drawings: 1, Base; 2, Driving motor; 3, Transverse screw rod; 4, Movable block; 5, Lifting adjustment chamber; 6, Longitudinal screw rod; 7, Moving block; 8, Puncture needle; 9, First gear; 10, Perforated plate; 11, Second gear; 12, Shifting plate; 13, Limiting spring; 14, Pull rod; 15, Clamping block; 16, Return spring; 17, First water sac; 18, First diversion tube; 19, Placement chamber; 20, Clamping pad; 21, Heater; 22, Storage battery; 23, Waterproof lead; 24, Waterproof contact plate; 25, Waterproof starting member; 26, Pressure spring; 27, Second diversion tube; 28, Pressing chamber; 29, Second water sac; 30, Piston plate; 31, Water spray port; 32, Liquid storage chamber; 33, One-way diversion pipeline; 34, Inclined plate; 35, Adjustment round rod; 36, Clamping groove.

## **Detailed Description**

The embodiments of the invention will now be described clearly and completely with reference to the accompanying drawings. It is evident that the described embodiments are merely part of the invention and not all of the embodiments. Based on the embodiments of the invention, all other embodiments obtained by those skilled in the art without creative effort fall within the scope of protection of the invention.

Embodiment 1: As shown in Figures 1–6, in order to solve the problem that medical staff may experience instability when holding a puncture needle to perform puncture, an adjustment engagement mechanism is disclosed. A base (1) is provided, with a driving

motor (2) fixedly mounted inside the left side of the base (1), the output end of the driving motor (2) being fixedly connected to a transverse screw rod (3), the transverse screw rod (3) being rotatably mounted within the base (1). The surface of the transverse screw rod (3) is threadedly provided with a movable block (4), the upper end of the movable block (4) being fixedly connected to a lifting adjustment chamber (5), the interior of the lifting adjustment chamber (5) being rotatably provided with a longitudinal screw rod (6), the surface of the longitudinal screw rod (6) being equipped with an adjustment engagement mechanism, the front end of the adjustment engagement mechanism being provided with a puncture needle (8). The adjustment engagement mechanism is provided with a first gear (9), the first gear (9) being fixedly mounted at the upper end of the longitudinal screw rod (6). The upper left side of the lifting adjustment chamber (5) is fixedly provided with a perforated plate (10), the interior of the perforated plate (10) being penetratively provided with a shifting plate (12). The central rear end of the puncture needle (8) is fixedly provided with an adjustment round rod (35), the rear surface of the adjustment round rod (35) being formed with clamping grooves (36), the clamping grooves (36) being annularly distributed. The shifting plate (12) is of "T"-shaped configuration, the upper end of the shifting plate (12) being fixedly provided with a second gear (11), the second gear (11) being engaged with the first gear (9), and a limiting spring (13) being fixedly mounted between the shifting plate (12) and the perforated plate (10). The front left side of the moving block (7) is penetratively provided with a pull rod (14), the right side of the pull rod (14) being fixedly provided with a clamping block (15), the clamping block (15) and the clamping grooves (36) being of inclined configuration, the clamping block (15) forming an engagement structure with the adjustment round rod (35) through the clamping grooves (36). The surface of the pull rod (14) is penetratively provided with a return spring (16), the left and right sides of the return spring (16) being respectively fixedly mounted between the pull rod (14) and the moving block (7).

In this embodiment, a screw rod capable of adjusting the puncture needle (8) is provided. When puncture is required, the driving motor (2) is started, the driving motor (2) rotates and drives the transverse screw rod (3) at its output end to rotate, thereby driving the movable block (4) threadedly connected to its surface to move left and right under the limitation of the base (1), thus adjusting the lifting adjustment chamber (5) fixedly mounted at the upper

end of the movable block (4). At this time, the puncture needle (8) arranged at the upper end can perform puncture, and inside the lifting adjustment chamber (5), rotation of the longitudinal screw rod (6) drives the moving block (7) threadedly connected to its surface to move up and down, thereby enabling adjustment of the position of the puncture needle (8) at the front end of the moving block (7). Before rotating the longitudinal screw rod (6), the shifting plate (12) must first be pushed downwards, the shifting plate (12) pulling the second gear (11) out of engagement with the first gear (9), at which point the longitudinal screw rod (6) can be rotated. When the shifting plate (12) is released, the limiting spring (13) between the shifting plate (12) and the perforated plate (10) resets, enabling the second gear (11) to engage with the first gear (9), thereby restricting rotation of the longitudinal screw rod (6) and achieving a limiting effect. This is suitable for different patients and convenient for medical staff to use. Between the moving block (7) and the puncture needle (8), a clamping block (15) is provided which allows convenient disassembly and adjustable angle. During use of the puncture needle (8), the adjustment round rod (35) at the central rear end of the puncture needle (8) is inserted into the interior of the moving block (7), at which point the adjustment round rod (35) contacts the clamping block (15). As the clamping block (15) is of inclined configuration, when contacting the adjustment round rod (35) it is pressed leftwards, thereby stretching the return spring (16) until the clamping block (15) corresponds to the position of the clamping groove (36). At this point, under the elastic force of the return spring (16), the clamping block (15) automatically engages in the clamping groove (36), achieving automatic engagement installation. When disassembly and cleaning are required, the pull rod (14) can be drawn, the pull rod (14) stretching the return spring (16), causing the clamping block (15) to disengage from the clamping groove (36), and the puncture needle (8) can be directly removed, thereby achieving convenient disassembly and installation. At the same time, when installing the puncture needle (8), different angles can be adjusted according to the different clamping grooves (36) formed at the rear end surface of the adjustment round rod (35), thereby enabling adjustment of the puncture needle (8) angle, convenient for medical staff to select a suitable angle for puncture.

Embodiment 2: As shown in Figures 1, 6, 7 and 9, in order to solve the problems that patients may easily move and cause deviation during puncture, and that puncture in a cold

environment may produce greater irritation, an automatic heating mechanism is disclosed. The right-hand surface of the transverse screw rod (3) is penetratively provided with a first water sac (17), the right side of the first water sac (17) being fixedly mounted inside the base (1). The upper right side of the base (1) is fixedly provided with a placement chamber (19), the interior of the placement chamber (19) being equipped with an automatic heating mechanism. The automatic heating mechanism is provided with a clamping pad (20), the clamping pad (20) being fixedly mounted inside the placement chamber (19), and the interior of the placement chamber (19) being fixedly provided with a heater (21). The upper end of the base (1) is fixedly provided with a storage battery (22), the right side of the storage battery (22) being fixedly provided with a waterproof lead (23), and the right side of the waterproof lead (23) being fixedly provided with a waterproof contact plate (24). The right side of the first water sac (17) is fixedly provided with a first diversion tube (18), the upper end of the first diversion tube (18) being penetratively mounted inside the clamping pad (20). The upper left side of the heater (21) is fixedly provided with a waterproof starting member (25), the waterproof starting member (25) corresponding in position to the waterproof contact plate (24), and a pressure spring (26) being fixedly mounted between the upper left side of the waterproof contact plate (24) and the interior of the clamping pad (20). The central lower end of the waterproof contact plate (24) is aligned with the upper end of the first diversion tube (18).

In this embodiment, the first water sac (17) is penetratively mounted on the surface of the transverse screw rod (3). When the movable block (4) moves rightwards to perform puncture, it compresses the first water sac (17), which delivers liquid through the first diversion tube (18) into the interior of the clamping pad (20) within the placement chamber (19), causing the clamping pad (20) to bulge. The bulging clamping pad (20) can more closely fit the patient's arm, simultaneously limiting the arm, preventing patient movement from causing puncture deviation, and providing protection. When the first water sac (17) delivers liquid through the first diversion tube (18) into the clamping pad (20), since the lower end of the waterproof contact plate (24) is aligned with the outlet of the first diversion tube (18), as liquid enters, the waterproof contact plate (24) is pressed upwards against the pressure spring (26) under the impact and buoyancy of the water flow, causing the right side of the waterproof contact plate (24) to contact the waterproof starting member (25). At

this point, the storage battery (22) activates the waterproof starting member (25) via the waterproof lead (23) and waterproof contact plate (24), thereby enabling the heater (21) to start heating, raising the temperature inside the clamping pad (20), avoiding irritation to the patient when the device is used in cold weather, and further providing protection.

5 Embodiment 3: As shown in Figures 1, 8, 9 and 10, based on Embodiment 2, in order to solve the problem that medical staff are required to manually disinfect the puncture needle, an automatic disinfection mechanism is disclosed. The upper left side of the placement chamber (19) is fixedly provided with a pressing chamber (28), the left side of the pressing chamber (28) being penetratively provided with a water spray port (31), the water spray  
10 port (31) corresponding to the position of the puncture needle (8), and the right interior side of the water spray port (31) being equipped with an automatic disinfection mechanism. The automatic disinfection mechanism is provided with a second water sac (29), the right side of the second water sac (29) being fixedly mounted on the right inner wall of the pressing chamber (28). The upper end of the pressing chamber (28) is fixedly provided with a liquid storage chamber (32), the liquid storage chamber (32) being communicated with the  
15 pressing chamber (28) through a one-way diversion pipeline (33), the one-way diversion pipeline (33) being penetratively mounted at the upper left side of the pressing chamber (28). The interior of the liquid storage chamber (32) is fixedly provided with an inclined plate (34), the inclined plate (34) being aligned with the upper end of the one-way diversion  
20 pipeline (33), and the interior of the one-way diversion pipeline (33) being provided with a one-way valve. The upper end of the clamping pad (20) is fixedly provided with a second diversion tube (27), the second diversion tube (27) being penetratively mounted through the pressing chamber (28), and the upper end of the second diversion tube (27) being fixedly mounted at the lower end of the second water sac (29). The left side of the second  
25 water sac (29) is fixedly provided with a piston plate (30), the piston plate (30) being of "T"-shaped configuration, and the left outer wall of the piston plate (30) being fitted against the inner wall of the pressing chamber (28).

In this embodiment, disinfectant alcohol is added into the interior of the liquid storage chamber (32). The disinfectant alcohol flows along the inclined plate (34) inside the liquid  
30 storage chamber (32) into the upper end of the one-way diversion pipeline (33). The

one-way diversion pipeline (33) is provided with a one-way valve, enabling the disinfectant alcohol inside the liquid storage chamber (32) to flow into the pressing chamber (28) through the one-way diversion pipeline (33), while preventing backflow of disinfectant alcohol from the pressing chamber (28). When the clamping pad (20) is filled with water to limit the patient's arm, part of the water inside the clamping pad (20) enters the second water sac (29) through the second diversion tube (27). The second water sac (29) inside the pressing chamber (28) expands with the water and pushes the piston plate (30) leftwards. The piston plate (30), along the interior of the pressing chamber (28), compresses the disinfectant alcohol inside the pressing chamber (28). At this time, the disinfectant alcohol passes through the water spray port (31) to spray and disinfect the puncture needle (8), eliminating the need for manual disinfection by medical staff and reducing their workload.

Although embodiments of the invention have been shown and described, it will be understood by those skilled in the art that various changes, modifications, substitutions and variations can be made to these embodiments without departing from the principles and spirit of the invention. The scope of the invention is defined by the appended claims and their equivalents.