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"Resuscitator": Golden medtech proposal introducing a new era for CPR

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ABSTRACT

The author has performed several rescues in both basic and advanced CPR failure. Such practice consists in stimulating an acupuncture point called KI-1 Yongquan, where terrestrial Yin energy enters into our bodies to nourish heart and lungs to maintain vital functions. Said stimulus follows the same ascending path of a lightning bolt. This integration between heart and kidneys makes up the deepest energetic level in acupuncture: the Shao Yin. Such level not only proceeds over cardiovascular physiology but also influences the central nervous system. This helps us to better understand the outstanding response when applied in cardiac arrest and stroke (84.51% survival rate in last 30 years). Such benefit in patients with bilateral amputation lead the discovery of a new energetic path called “reconciliation vessel”, presented before the Chinese National Academy of Medical Science in 2014 and 2016. The “resuscitator” can be used when physical barriers hamper the precordial massage: crashed or overturned vehicles, building collapses, landslides, and other catastrophes with a large number of victims. This prototype was developed under safety measures to avoid any collateral damage in patients or rescuers. By 2020, the global number of victims of cardiovascular diseases will involve 30 million people. Adding the 7% of brain-vascular victims will reach over 30% of all causes of death. Advanced technology may provide the “resuscitator” with global positioning systems to notify the emergency network to send the closest rescue unit to the victim. The present invention has been developed to assist resuscitation maneuvers in humans as well for veterinary use.

KEYWORDS: Resuscitation maneuvers; KI-1 Yongquan; Traditional Chinese Medicine; Acupuncture

1. Introduction

The KI-1 Yongquan resuscitation maneuver has been systematized since 1987 to be proposed as the acupuncture’s main revival point, which means this body place can be used as a complementary resuscitation practice when facing such conditions as sudden death or cardiac arrest, eventually becoming the final resource when facing to basic and advanced cardiopulmonary resuscitation (CPR) failure. Quoted praxis would result in adding up survivors to such critical and life impending situation. Since 2010, this innovative rescue technique and its statistical tendencies have been published sequentially in several oriental and occidental international medical journals[1-12].

Ancient Chinese considered kidneys as the repositories of life energy. Thus, it could be read: “Shen (kidney) is the repository of the ancestral power ... and save the essence of life”[13].

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In that way, Chinese sages claimed KI-1 Yongquan as the “root” point of the Shao Yin energy level, composed by the kidneys and the heart. Moreover, KI-1 Yongquan is the principal place for the ascending Yin Qi (energy from the earth) into our bodies. The interaction between the terrestrial Yin Qi and the heavenly Yang Qi (energy from heaven) will essentially nurture those organs in the most higher (Yang) part of the torso, like the heart and lungs that develop a non-interruptible function to maintain life^[3,11].

2. Justifying the electric negative pulse according to traditional Chinese medicine

Interestingly, nature’s lightning and Shao Yin can share the similar origin, because they are powered by the same energy sources—heaven and earth, thus being able to explain its developments and consequences in our bodies^[14]. Based upon the underlying holistic principles of traditional Chinese medicine, the phenomenon called “Lazarus Effect”^[1] could be scientifically justified when it is compared with the electrophysiology and physiopathology produced by an electrostatic discharge that occurs during the appearance of lightning: a natural interaction between heaven and earth^[6].

For this reason, the ancient Chinese sages understood that “Life is only possible when the pure energy of heaven and the pure energy of the earth are in close interaction”^[15].

In this way, the Chinese already enunciated that the first point of the kidney meridian, as an “alternative physiological pacemaker” and, for this reason, involved as the “key switch” in this complementary resuscitation maneuver (84.55% of success)^[15]. It acts as a

conscience restorer and a cardiac pacemaker. By stimulating KI-1 Yongquan, life survival rates would be considerably increased when basic and advanced CPR protocols have failed^[1-12].

3. Technical specifications: Details of the mechanical system

The information herein provided has been analyzed by Mr. Daniel Oscar Tachini, who adapted the adopted requirements to the technical specifications of the device. Following is the report of electro-technical advisor Mr. Daniel Oscar Tachini:

The main characteristic of this point is to respond to two different local stimuli—mechanic pressure and electric pulse in order to activate the sole of the foot where such point lies, resulting in the recovery of heartbeat and vital functions. According to the clinical parameters discovered by M.D. Adrián Inchauspe, we decided to create a device with two systems that could give these two different stimuli to be applied along with resuscitation maneuvers.

For the first stimulus, a piston whose rod ends in a 1-centimeter diameter sphere is used. Said piston is in the center of spring especially adapted for the pressure above mentioned. The quoted stem will be shifted in a parallel way together with the spring inside a cylinder of certain wall thickness; said cylinder will be part of the casing of the device, and it will be injected in two halves so as to be later assembled by screws thus hosting in its structure, the mechanical and the electronic parts as well (Figure 1).

This mechanical system was created considering the variable pressures for adults and children, using springs with an adapted

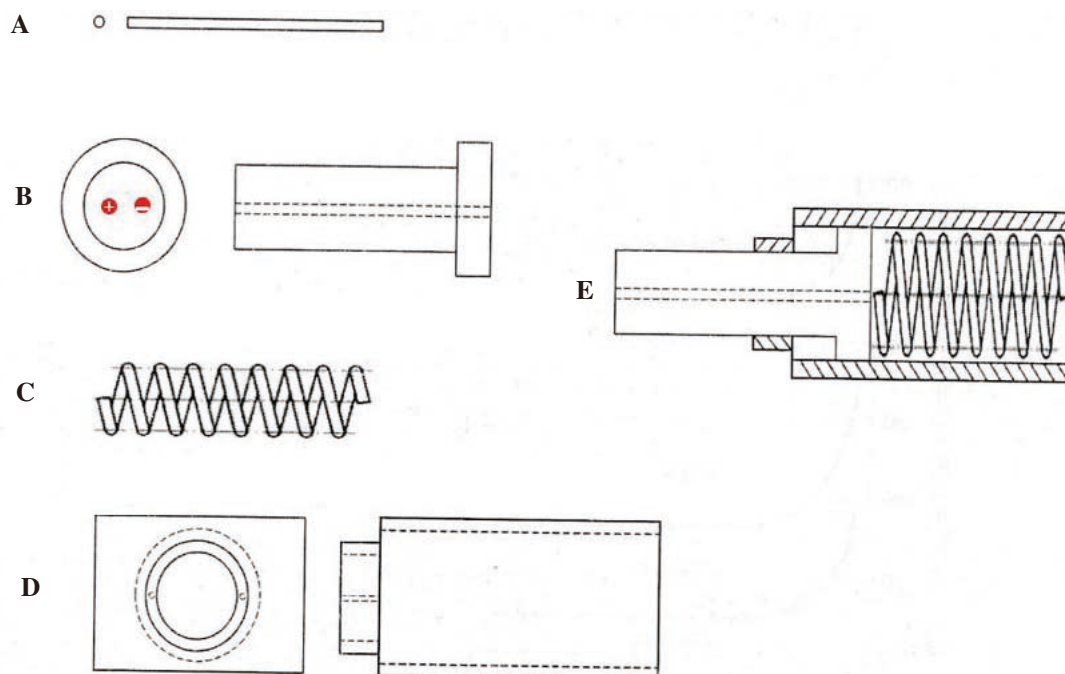


Figure 1. Mechanical system: Assembling of the main parts & detail of the conducting electrodes. A: Copper (front and side view); B: Contact sole of the foot. Plunger with inserts copper \times 2 (front and side view); C: Calibrated spring 10 kg (side view); D: Device casing (front and side view); E: Part assembling of figures A, B, C, D.

resistance up to 15 kg. Inside the device, there runs quoted aluminum stem with a ball-like tip so as not to cause any injury to the skin of the foot. Such stem slides inside a nylon hub to which the spring mentioned before are attached and is in turn connected to an axe, which progressively slides until the required values are reached (Figure 1).

This physical system complies with the requirements to stimulate the point and the consequent physiological changes. In order to support the mechanical system, we have set out a combination of a circuit with an electric pulse added to the previous mechanical system. Such a combination (mechanical-electrical) is produced through the axe that indicates the rank (attached to the piston), with the triggering switch of the electric circuit.

For such purpose, this stem is made of nylon, and it contains two conducting electrodes, which make contact with the skin and which, on the opposing side are connected to the output of the transformer, being the latter the one that sends an electric pulse. In turn, inside it (this means, that part of the stem that does not make contact with the skin and is found inside the cylinder), has a protuberance; once the force was made, such stem shifts towards the interior of the cylinder until the end that makes contact with the switch, closing it so as to activate the electrical circuit and make it shoot the mentioned pulse.

The required pressure is about 10-15 kg for adults and 3-5 kg for children under 8 years old); and a graduated scale (kg) (seen by the user) allows to measure the increasing pressure as the piston runs towards a switch. Then, the electronic device automatically enables the activation of the electric pulse in the next 30 seconds. This means that once the force value has been reached and the stem has been shifted towards the cylinder until its end, it will activate the electrical circuit, shooting the said pulse and stimulating the KI-1 Yongquan point for its consequent physiological changes (Figure 2).

It is important to make it clear that, once the mechanic pressure ceases, as it is equal to the power of the pulse, the intensity of the electricity will decrease until it reaches zero.

The quoted electric circuit works with a 1.5 V tension (fed by a small 1.5 V battery). When the "on-off" key is pressed, the red light emitting diode (LED) indicator is switched which indicates that the device and the opening of the circuit are "on". This feeds and excites a power phase that feeds an inverted transformer, which generates a 37 V tension rectified by rectifier bridge, which produces an electric

negative pulse that is regulated in intensity by P1 and is in turn transmitted to the piston. Tr1 and Tr2 produce a square wave which is amplified by Tr3[16].

This electronic circuit of the "resuscitator" is made up of NE555IC that is wired as a stable multivibrator in order to generate impulses ranging from 60 to 80 Hz (Figure 3).

Using the VR1 potentiometer one can control not only the intensity of the voltage tension at its output but also the duration of the generated pulse that is of about 14 milliseconds.

4. Technical specifications: Details of the electric pulse

(1) Electro-physical characteristics of the electric pulse: Operating voltage: 1.5 V powered circuit and alternating output voltage of 37 V in the transformer; (2) Current intensity of approximation up to 0.015 A in a vacuum (without charge or skin resistance); (3) Pulse form: Mono-stable, with mono-phase square waves; (4) Frequency of oscillation: approximate 60 to 80 Hz; (5) Skin resistance: 2 000-4 000 ohm; (6) Power intensity: 15 mA (0.015 A) at the moment of application, estimated between 60/2 000 ohm. In turn, the circuit is fed by a 1.5 V battery; but in case of increasing its intensity, some changes could be made in order to have a greater electrical charge available[16].

5. Electric current effects on skin and heart electrophysiology

The effects of electric power over the skin can be represented in curves that show the local alterations according to the density of the circulating power (mA/mm²) and according to the exposure time to such power[17].

As it can be observed, the voltage pulse is approximate 15 mA, depending on skin humidity, and as it can be seen in the graphs, the zones in danger would not be reached, since low frequency and voltage are used so the individual is not at risk of burning, swelling, or probability of cardiac fibrillation[17].

To expand the indications to victims who have a high level of humidity and considering the skin resistance (approximate 4000 to

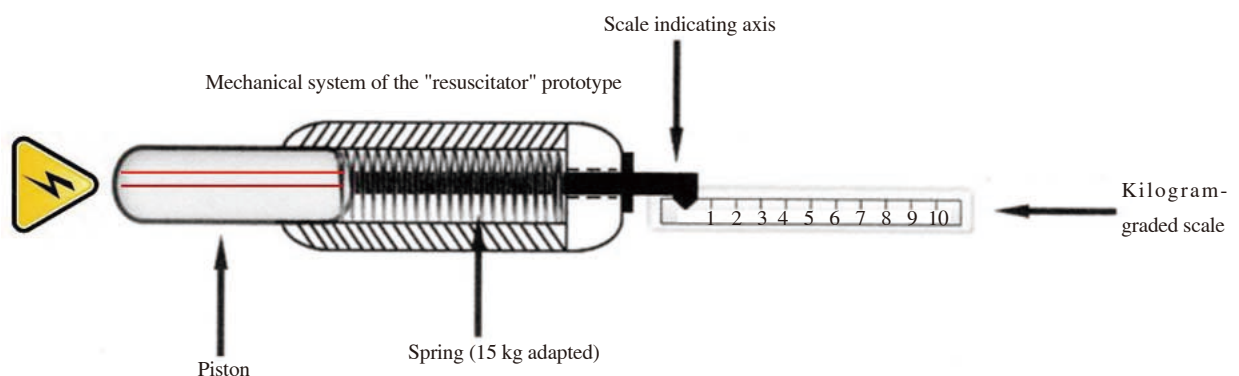


Figure 2. Activation of the electronic circuit to provide the electric discharge.

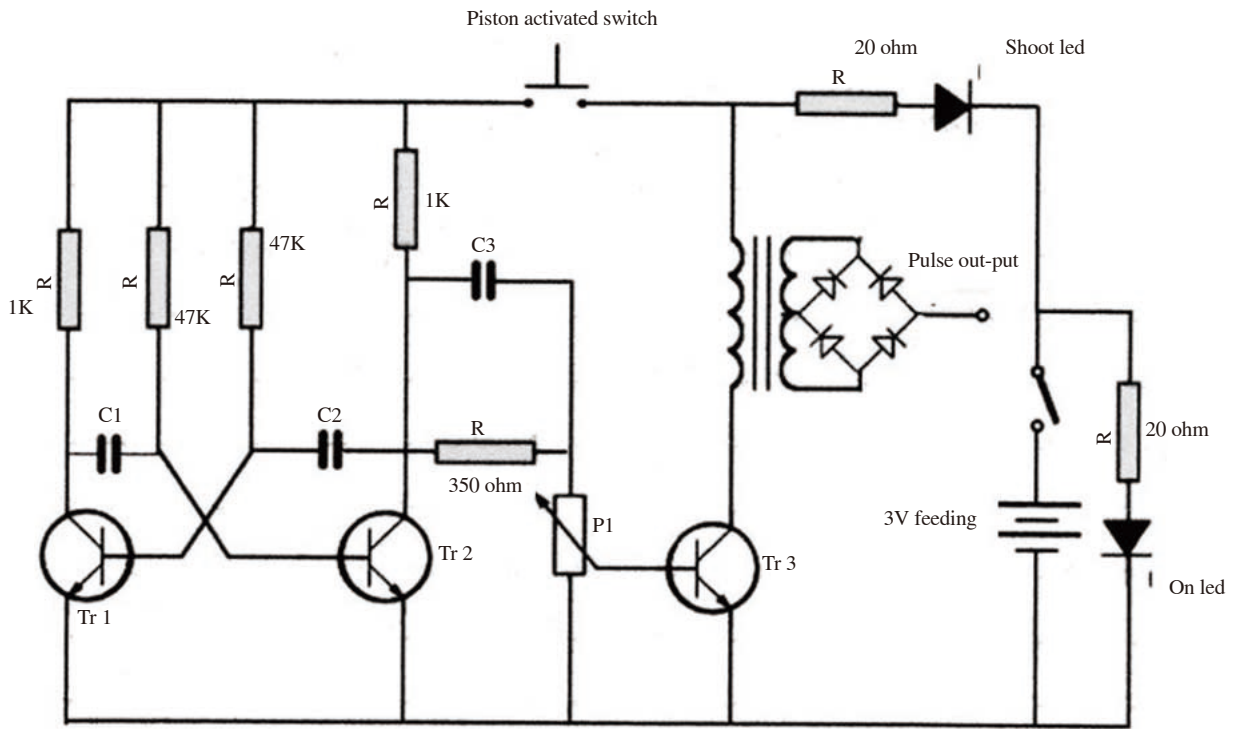


Figure 3. Electric circuit command of the “Resuscitator”.

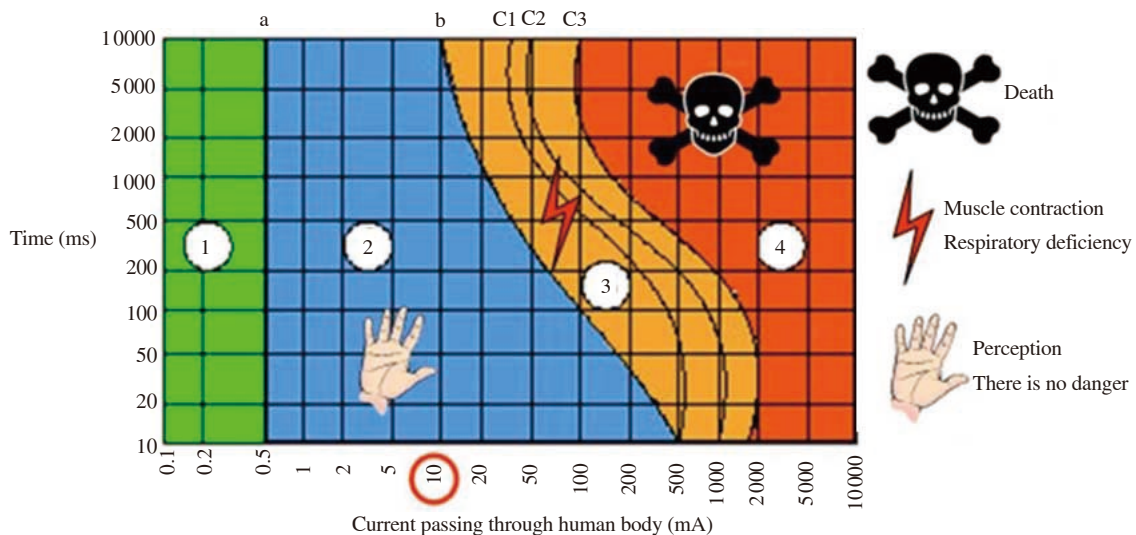


Figure 4. Physiopathological effects of electric current at both superficial (skin-teguments) and deep (cardiac) level[18].

1 000 ohms in a wet patient), we recommend that the user should not exceed the value of 15 milliamperes in case the victim is wet (drowning, rain, etc.) (Figure 4).

Contact with 20 milliamperes can be deadly. As a reference, a house fuse may be 15, 20, or 30 amperes[17]. A more graphical explanation is available in Figure 4[18].

The threshold of perception is the weakest stimulus that a human body can detect. A value of 0.5 mA in alternating current is considered whatever the exposure time is in stage 1. Let-go current is the maximum value of electric current through the body that humans can tolerate (stage 2). In alternating current, it is considered a maximum value that no further to 16 mA, whatever the exposure time. The ventricular fibrillation threshold can be defined as the minimum electrical value able to trigger fibrillation (stage 3).

Ventricular fibrillation is considered the leading cause of death from electric shock (stage 4).

6. Assembling of the “resuscitator” device

Final assembling of the “resuscitator” prototype: This prototype included a potentiometer in order to vary the passage of power through the device, which will have a predetermined power selector that allows a quick selection of power by the rescuer according to the rules suggested for extreme emergency (Figure 5).

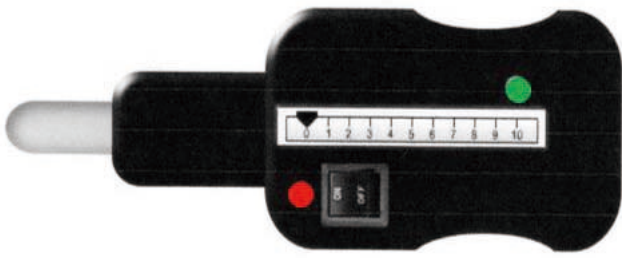


Figure 5. “Resuscitator” (final assembling). Indications: (1) Ignition key; (2) Red LED operating indicator; (3) Graduated scale in kilograms/force; (4) Green LED that indicates estimated operative pressure between 10/15 kg.

By activating the pressure mechanism, the electric pulse is discharged within 30 s, once the compression maneuver has been reached. Then the maneuver must be carried out intermittently at 3-5 min stimuli until it proves positive (evidenced by ECG and pulse).

7. Electro–physiological comparison with lightning physics

When the pressure reaches the set force, the piston makes contact with the switch that activates the discharge of the pulse, and when the green LED shines, the circuit has enabled the passage of the electric pulse. In this way, both stimuli get together in pursuit of a greater efficiency/effectiveness in this resuscitation maneuver.

Regarding this last item, the technical pattern of the said electronic circuit provides an electric pulse of negative polarity in order to activate the first point of the kidney meridian (that conducts an electrical negative polarity too), which has been simplified so as to facilitate and clarify the understanding of its operation, and its beginning is located in K-1 Yongquan. Indeed, this meridian has a centripetal upward course toward the heart, to which is linked by deep collaterals energetic vessels.

Some kind of lightning phenomenon manifests with identical vector polarity to that established by the Chinese in the kidney meridian[12,14]. Thus, the “visible part” of lightning is something that seems to “fall” from the cloud, though in many cases it does just the opposite way. Its “initial return discharge” acts as an “open circuit” between heaven and earth for a short interval of time. Consequently, the negative charges can cross the driver channel to go towards the positive ones seeking to neutralize each other. So by convention, we say that the electric current or main lightning road follows an upward course, established by a path of less resistance to the spread of the electricity, higher from the ground to the cloud than in reverse[12,14]. So when the pressure reaches the set force, the piston makes contact with the switch and activates the discharge of the pulse, the green LED is switched, thus showing that the circuit has enabled the passage of the electric pulse. In this way, both stimuli get together in pursuit of greater efficiency and effectiveness in this resuscitation maneuver. As kidneys belong to a Yin meridian, it has

negative polarity; for that reason, a circuit to obtain a flow of ions with identical electrical value has been adopted.

This is a similar vector to the established Shao Yin circuit: Earth’s Yin energy stimulates KI-1 Yongquan, and starts with an upward discharge, ascending in search of celestial Yang, calling to action to those organs located in the highest part of the body whose vital function cannot be interrupted (heart-lungs)[11,12,19](Figure 6).

Such is the key purpose of “reconciliation vessel”: to reset the cardio-respiratory function from its “root” point, thus restoring the vital signs, both in humans as in veterinary practice (Figure 7).

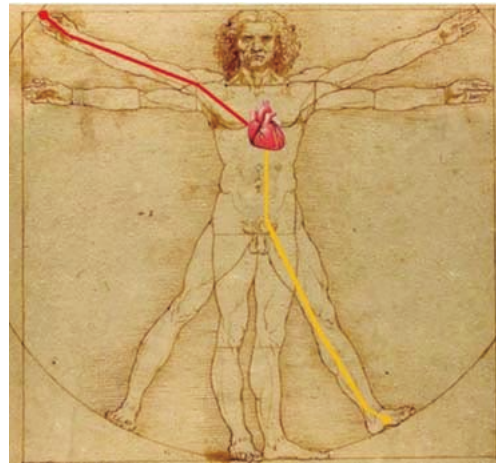


Figure 6. The “reconciliation vessel” in the human body’s topography[11,12].

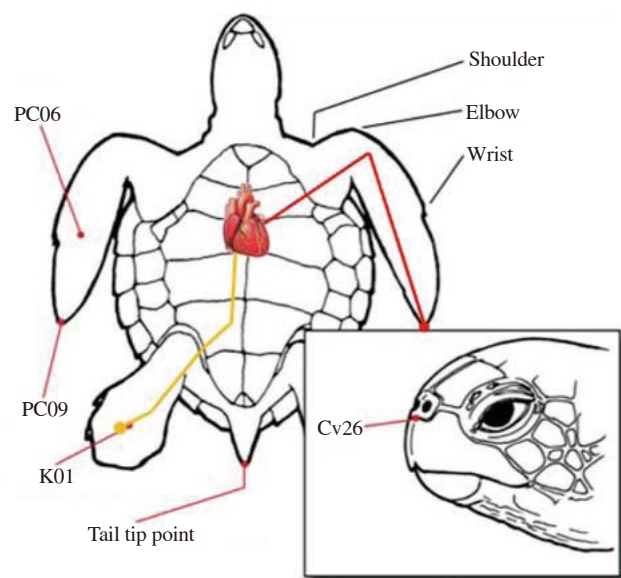


Figure 7. Recommended acupuncture points for sea turtle resuscitation. (All needle insertions are perpendicular to the surface and applied bilaterally). Gv26: Center of the horizontal line joining the lower edge of the nostrils; Tail tip point: Underside of the tip of the tail; PC09: Tip of both front flippers; PC06: Underside of both front flippers 1/6 distance between elbow and wrist (midline between radius and ulna); K01: Middle of the underside of both rear flippers (alternate point for consideration in drowning). See more details from <http://www.seaturtle.org/documents/CTAcupunctureProtocol.pdf> [20].

8. Human application of the KI-1 Yongquan complementary resuscitation maneuver

According to research supplied by traditional Chinese medicine, KI-1 Yongquan, the first kidney meridian, is located in the sole of the foot, in a straight line that goes from the base of the second toe to the heel. If this line is divided into three equal parts, the point is located at the junction between the anterior and middle third, where the plantar flexion is produced. As it belongs to a Yin meridian, it has negative polarity; for that reason, a circuit to obtain a flow of ions with an identical value of electrical discharge has been adopted.

The application of KI-1 maneuver is really simple: in a prone/supine position; Nonspecific position is required; The maneuver consists of holding the foot. Prior to operating the device, the rescuer must follow biosecurity regulations as wearing latex gloves as a basic measure of bio-security (blood contact, secretions, etc.), as well as preventing electricity from dispersing towards the rescuer or health personnel.

9. Discussion

The implementation of the KI-1 Yongquan protocol with the “resuscitator” could allow users to initiate the rescue protocol event chain faster. The activation of the device itself, by involving an electrical impulse, could also generate a GPS-type rescue signal that could be intercepted by emergency centers, so that not only an interactive audio-visual contact can be established, but also the possibility of bringing the sanitary transport closer to the victim in such scenario of the critical situation (Figure 8).

A distinguishing feature of this device lies in its safety as it is not triggered accidentally. Such a mechanism prevents discharges of

this device by an unwanted ignition. This is maintained in such a way that it is not lethal, similar to the electricity cut of a thermal circuit breaker, thus potential risks are avoided. In case of no answer, remember that classical CPR must be continued for two minutes before repeating the maneuver. If the result is positive (*i.e.*, the victim recovers vital signs) CPR must be continued for a two-minute period so as to reach an effective volume of circulation.

According to its statistical results (6.5% manual and 24% extra-hospital survival rescues), this device represents an appropriate alternative to be applied in case basic and advanced CPR protocol fails. The *World Journal of Critical Medicine* has accepted to publish quoted protocol to use said point in case that International Liaison Committee on Resuscitation (ILCOR) and CPR rules cannot be applied in case of landslides, crashed or overturned vehicles; building collapse or other physical barriers that impede rescuers to perform the chest massage; or in catastrophes with a massive number of victims, where there is an insufficient number of rescuers to provide the necessary medical attention[5].

KI-1 Yongquan complementary resuscitation maneuver may be adequately integrated to the current CPR vital support protocols valid worldwide. This inclusion would in no way infringe whatsoever any of the gestures, making up its “action chain” listed in the ILCOR’s CPR Protocol, become a “Golden Standard” when facing both basic and advanced CPR failure[1,11,12].

The aim of this device is not limited to medical professionals or to paramedics, but it is aimed to be used by non-professional people or by people especially trained in basic and advanced CPR courses, so as to significantly increase survival statistics due to cardiac arrest and sudden death[1]. Nowadays, 1.5/1000 individuals die representing a global number of over 20 million cardiovascular deaths in the world per year, being that amount multiplied several times the victims resulting from natural disasters (earthquakes, tsunamis, volcanic



Figure 8. KI-1 Yongquan maneuver & “resuscitator” in CPR emergency rescue scenario.

eruptions)[8]. According to WHO, mortality due to cardiovascular causes ascends to 23%, both in the so-called first world and those of developing countries. If we sum an additional 7% derived from cerebrovascular causes of death (*i.e.* stroke) to this global percentage, it will be reaching almost 30% of the overall causes of death. An ominous situation that will be really catastrophic to 2020, meaning 30000000 victims per year[12].

However, through the “reconciliation vessel” energy bio-circuit, we estimate the possibility of saving approximately 6 to 8 million survivors per year thanks to the application of this simple maneuver. Fortunately, the reason relies on the KI-1 Yongquan maneuver, capable of contributing to both cardiac arrests or sudden deaths and potential brain damage recoveries after a stroke.

10. Conclusions

What interesting are the Chinese Old Classics References on the “energy status” present at the time of syncope. Khi Pa, Yellow Emperor’s personal physician warns:

“In these cases, do not disperse or tone: You must simply direct the energy since there is neither vacuum nor plenitude”[21].

In electrical neutrality that seeks to compensate for the mentioned initial return discharge, the Chinese agreed to establish a similar electrical state during cardiac arrest. The zero point of movement’s cessation, but also inaugurates the beginning of it[12]. This makes it easier to understand the resetting and restoration of the cardiac cycle through the stimulation from its “lead point”.

Regarding quoted description as “Electronic-mechanical device to assist resuscitation applied over K-1 point of acupuncture,” results more appropriate to describe the possibilities of our prototype since it can also be used in the veterinary practice[20].

KI-1 Yongquan complementary resuscitation maneuver may be adequately integrated to current CPR vital support protocols valid worldwide. This inclusion would in no way infringe whatsoever any of the gestures making up its “action chain listed in the ILCOR’s CPR Protocol, and it can become a “Golden Standard” when faced with both basic and advanced CPR failure.

Having described and determined the nature, purpose, scope of the present invention, and how it must be put into practice, we will resume its main characteristics:

- (1) An electro-mechanic device designed to assist the resuscitation maneuvers in order to restore vital signs, which combines a mechanical system with a spring that provides the physical stimulus when the required pressure for the maneuver is exerted, and an electronic circuit to which an electric impulse that reinforces the previous stimulus is added;
- (2) The device will be able to reach a 10-15 kg pressure in the model for adults and a 3-5 kg pressure in the one for children (under 8 years), and an electric pulse of negative ions that is discharged 30 seconds after switch-on which are to activate the physiological reactions of the point proposed in my investigations of traditional Chinese medicine;

- (3) A device in accordance with the previous claims whose parts are powered by an electric source formed by a small ordinary battery (1.5 volts);

- (4) A device according to any of the previous claims, which works within safety parameters that avoids serious physical injuries or lethal discharges, since the voltage of the device does not exceed a maximum intensity of 15 milliamperes, preventing in this way, a fatal accident, if it is incorrectly used;

- (5) A device in accordance with the previous claims, which has been exclusively created to assist in emergencies due to sudden death or cardiac arrest, only when basic and advanced CPR has failed; or in situations in which it makes it impossible to apply the previous ILCOR of CPR protocol (car accidents, overturns, building collapse, landslides, *etc.*); or in case of a catastrophe with a massive number of victims, in which the amount of rescuers is insufficient.

Article 32 of the Declaration of Helsinki VI on Ethical Principles for Medical Research Involving Human Subjects and Human Rights[22] should not be forgotten when it states that: “In the treatment of a patient, where proven prophylactic, diagnostic and therapeutic methods do not exist or have been ineffective, the physician, with informed consent from the patient, must be free to use unproven or new prophylactic, diagnostic and therapeutic measures, if in the physician’s judgment it offers hope of saving a life, re-establishing health or alleviating suffering”[23].

The quoted article, in essence, proposes a “Research Ethics”, one that goes beyond statistics: if a single life out of a million can be saved, then, the maneuver shall find its justification.

Conflict of interest statement

The authors report no conflict of interest.

Authors’ contributions

A.A.I. invented a prototype with key characteristics to improve KI-1 acupuncture rescue maneuver results in patients with both basic or advanced CPR failure. His patient and co-author D.T. designed a device following author’s technical specifications, providing a double electro-mechanical stimuli in victims of sudden death or cardiac arrest refractory to usual vital support protocols. This device can also be used for the same purpose in veterinary practice.

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