

# 心肺复苏中时空转换的意义

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自古以来,“时光一去不复返”是一种对失去而不可复得的感叹。如牛顿在时空的数学模型中将时间作为一条独立而无限的直线,空间却独立存在于宇宙中。爱因斯坦广义相对论认为,时间和空间是不能独立存在的,与空间相伴的时间也并非单一方向的。在病理生理学中寻常可见的可逆变化机制,不难解释通过改善机体某种病理生理状态,可使组织细胞的生命时间发生逆转,换言之,时光倒流。

## 1 心肺复苏(CPR)的时空观

从心搏骤停的瞬间开始标志死亡的倒计时,通常临床将连续 CPR 的时间规定在 30 min 以上,如无自主循环恢复或生命迹象则被认定为临床死亡。而不同的猝死原因所采取的复苏时间不同,如淹溺、药物中毒、低温等需延长 CPR 时间。一般认为,从心搏骤停到 CPR 开始的时间至关重要,时间越短复苏成功率越高,相关 CPR 的质量及心室纤颤早期转复起很大作用。尽管已努力改善这些因素,将复苏最佳时间局限于 4~5 min 的时间范围,但数十年的不懈努力并未使复苏的成功率得到显著提高,复苏的方法也未有卓越进展。除复苏时间和 CPR 质量需要进一步改善外,是否还存在未被关注到的重要因素以不同空间状态存在着?从哲学意义上说,并不存在独立的时间与空间,时空是相互影响、相互转换的。

## 2 何谓 CPR 的空间

空间的多维性决定复苏过程的复杂和不确定性,可涉及到心搏骤停的原因、病理生理机制、维持组织循环和氧合的必需条件、复苏操作方法等。仅通过改善 CPR 时间和手段远不能真正解决复苏的复杂问题。心搏骤停即出现全身缺血、缺氧,而致心室纤颤、无脉电活动,相继出现线粒体能量耗竭,细胞介质信号通路激活,细胞凋亡程序始动;由于肾上腺素可通过增强心肌收缩力,提高大动脉压来增加心、脑血液灌注,却又带来心肌纤维断裂、微循环障碍;高浓度供氧可对组织细胞的氧合作用增强,进而导致细胞肿胀、钙超负荷、组织酸中毒等。在有限的时间范畴内,三维空间中机体物质与能量可能发生更多的变化,而空间要素可能成为影响 CPR 成功与否的决定变数。

## 3 CPR 的时空转换

时间与空间是事物存在的基本形式,二者相互影响,时间与空间构成了四维时空,时间可在三维空间的任何方向增加或减小。曾认为的“时间就是生命”实际上只代表生命过程中的一个方向,存在极大的不确定性,改变 CPR 的时间因素只是复苏中最简单的方法之一,在时间允许的范畴内可能是最有效的。而生命的空间形态则更为复杂,所以由时间单独决定复苏的成败却可能随空间改变而转变其形态。提出一种设想,三维空间具有诸多影响因素,因为生命过程的复杂性,其空间复杂变化最终会影响到生命的时间形态,增加或缩短。通过复苏空间形态变化而使有限的复苏成功时间得以延长,即用充分的空间换取有效的时间。

最后,引用著名物理学家、思想家史蒂芬·霍金解读莎士比亚的一句话来作为本文的支持依据:“哈姆雷特的果壳把在时间中发生的一切作为密码储存之上,这样,我们也许被束缚在果壳之中,而仍然自以为是无限空间之王。”

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## The significance of space-time conversion in cardiopulmonary resuscitation

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Since ancient times, "time gone forever" is a sigh for loss without redemption. In the mathematical model of time and space, Newton had described time like an independent straight line, and independent of the space in the universe. Einstein's general theory of relativity is that time and space are not mutually independent existence, time is not a single direction, its changes accompanied by space. The reversible changes usually could be seen on pathophysiological mechanism. It is not difficult to explain these changes to improve the pathophysiological status, as a vector of cells that survive in time reverse, in other words, the clock back to life.

### 1 Space and time in cardiopulmonary resuscitation (CPR)

Usually cardiac arrest marked the moment the countdown to death, a continuous CPR will be provided in time for more than 30 minutes, without restoration of spontaneous circulation or no sign of life found, death is called clinically. And different reasons for cardiac arrest demand CPR time to be different, such as drowned, drug poisoning, low temperature, and so the need to extend CPR time. The general view that time from cardiac arrest to CPR beginning is essential, the time shorter, the survive rate higher. There are also some major roles related to the quality of CPR and early defibrillation of ventricular fibrillation (VF). Despite these factors were made an effort to improve in past several decades, but also the time frame limited to 4 to 5 minutes. The survive rate has not significantly improved and the distinguished measure of CPR has not developed. If it is still not yet concern that the different form of space for the fatal events, except for early CPR and the quality of CPR need to improve further. In a philosophical sense, the non-independent existence of time and space, that are interrelated effects and conversion.

### 2 What is space of CPR

The multi-dimensional of space that decide the complex and uncertainty process of resuscitation and may relate to the reasons for the cardiac arrest, pathophysiological mechanism, the necessary conditions of circulation and oxygenation in tissue, CPR operation, and so on. It could not really resolve the complex problems in the resuscitation, only by improving CPR time. A systemic hypoxia and ischemia immediately develops as long as cardiac arrest occur, and follows fatal VF or pulseless electrical activity by the anaerobic metabolism, energy depletion in mitochondrial, activation of various signaling pathways and the process of apoptosis. Through epinephrine enhanced myocardial contraction and increased arterial perfusion pressure to heart and brain, it may result in a fracture of myocardial fiber, a further disorders of microcirculation. The role and influence of the high concentration of oxygen supply to the cells which can lead to swelling of cells, calcium overload, aggravated acidosis. In context of limited time, the changes of material and energy may differ widely in three-dimensional space in the body, so that space may be the variable elements of control of the successful resuscitation.

### 3 The space-time conversion of resuscitation

Time and space there is in the form of the substance, which effect each other. A four-dimensional space is composed of time and three-dimensional space. So the time can be longer or shorter in any direction of the space. The improvement of CPR time is a factor in the simplest and the most effective way in the context of CPR time allowed. "Time is life" represents only one aspect of life processes, there is great uncertainty, and life form in space is even more complicated, so time is not alone determine the success or failure of the resuscitation, and it can change time pattern with variety of space. A suppose that there are many influence factors in three-dimensional space, and on behalf of the complexity of life processes, that would ultimately affect the form of lifetime, increase or reduce. Resuscitation related to space through a combination of morphological changes due to success of limited time can be extended, and with adequate space for effective time.

Finally, quoted the words of Shakespeare interpreted by Stephen Hawking, a famous physicist and thinker, as the power sentence to this paper: "All that happened in the real time as a code was deposited in Hamlet's nutshell, so I could be bounded in this a nutshell, and count myself a king of infinite space."

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