

Summary

Introduction: The physiological processes associated with dying are well known, nevertheless there is very little scientific data describing these events in greater depth during the perimortal period. However, the data taken from this period may be important for a better understanding of post-mortem organ donation and for establishing a safe interval between circulatory arrest and initiation of organ delivery of DCD donors. The definition of death is based on its irreversibility. When death occurs, it is determined by proof of circulatory arrest. This means the exclusion of any possible spontaneous resumption of circulation (so-called autoresuscitation). This phenomenon has been reported in individual cases but has not yet been the subject any extensive scientific research. The scientific goal of this work was to describe the physiological processes during dying. It focuses on two main areas: firstly, circulatory death (including the phenomenon of autoresuscitation) and secondly, the metabolic change of ions and the acid-base balance during the perimortal period. **Methodology:** The research was conducted as part of an international academic prospective multicentre study (conducted in Canada, the Czech Republic, and the Netherlands). The subjects were ICU patients for whom life-sustaining therapy had been withdrawn in place of compassionate (palliative) care due to their poor and deteriorating state of health. The vital signs of these patients were monitored and recorded between the end of life-sustaining therapy and for 30 minutes after death. **Results:** Between 2014 and 2018, 631 patients were involved in the study. The data from 480 of these patients was then included in the final analysis. Autoresuscitation was detected in 67 patients (14 %; 95 % CI, 11-17), with the longest interval from cardiac arrest to circulatory resumption being 4 minutes 20 seconds. Furthermore, it was found that mechanical cardiac arrest preceded the disappearance of electrical activity in 81% of patients. In 7% of cases the elapsed time between these two events was more than 30 minutes. An analysis of ion levels and acid-base balance was also performed on a subset of 23 patients, where it was found that potassium levels increased by an average of 1.28 mmol/L /hour in the first 30 minutes after death. After correcting for pH there was no increase in K⁺ level. **Conclusion:** It has been shown that the phenomenon of autoresuscitation exists and that the recommended interval of 5 minutes between the determination of circulatory arrest and the start of DCD organ delivery is sufficient. Furthermore, it was found that the increase in potassium levels in early post-mortem can be fully explained by a decrease in pH.

