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CARDIOPULMONARY RESUSCITATION (CPR) IN MICROGRAVITY: EFFECTIVENESS OF
USING THE MMM VS. THE CMRS – CPR SIMULATION IN NEUTRAL BUOYANCY.

Abstract

Background: Microgravity changes conditions of cardiopulmonary resuscitation (CPR) procedure and other emergency medical procedures (EMP). The main problem for astronauts is to ensure the stable position of rescuers in relation to the patient, appropriate for the microgravity environment and to maintain this position during CPR and EMP for extended time. A new innovative rescuers' restraint system (Atmed Restraint System, ARS), based on the lever mechanism made by lower limbs to stabilize the position, can be applied successfully in microgravity conditions. This solution was used in a new model of the Crew Medical Restraint System (CMRS) called Mobile Medical Module (MMM) and tested in neutral buoyancy.

Aim: The aim of the conducted research in neutral buoyancy was to compare the possibilities of using the CMRS vs. the MMM to conduct CPR by one and two rescuers.

Material and method: The test was carried out in a pool at a depth of 4 m (13 ft). Rescuers (2 teams, 4 persons) were balanced to obtain neutral buoyancy. The CMRS and the MMM were attached to the bottom of the pool. Two tests were performed during the study. No belts were used in the second test with the MMM.

Results: Two tests gave two different results. The application of special handles (ATS) on MMM allowed to reduce the time to adopt the right positions around the patient (60 sec. CMRS vs. 10 sec. MMM), thus obtaining a stable position throughout the entire test period – rescuers' opinion ("yes" – 1pt / "no" – 0pts) (0pts CMRS vs. 4pts MMM), achieving greater ventilation and chest compression efficiency due to the lever mechanism (0pts CMRS vs. 4pts MMM), shortening the time needed to change positions between rescuers (60 sec. CMRS vs. 10 sec. MMM.), increasing confidence in performing CPR (0 pts CMRS vs. 4pts MMM), applying "ground-based" CPR techniques for one minute (4pts CMRS vs. 4pts MMM), greater comfort in performing CPR (0pts CMRS vs. 4pts MMM), maintaining a stable position for three minutes (0pts CMRS vs. 4pts MMM), ability to perform CPR by one rescuer for three minutes (0pts CMRS vs. 4 pts MMM).

Conclusion: The use of lever mechanism in MMM changes the effectiveness of performing CPR and providing medical assistance in neutral buoyancy compared to the traditional method of attaching rescuers to the CMRS.