Factors influencing frequency of resuscitation-related injuries in the Emergency care service of Ljubljana during implementation of the ERC resuscitation Guidelines 2015

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Purpose of the study: General opinion that at least 1/3 of resuscitated patients sustain rib fractures and at least 1/5 sternum fractures was mainly based on autopsy studies conducted in the twentieth century, when lower chest compression depths and rates were recommended and mainly manual chest compressions performed. However, recent autopsy and radiological studies report on much higher frequencies of such injuries. Increasing use of the LUCASTM device (mechanical CPR) raises a question whether it has adverse effects. Therefore, we analysed the influence of age, gender, resuscitation time and mode of CPR (manual vs. mechanical) on the incidence and number of rib and sternum fractures.

Materials and methods: This retrospective autopsy study included 200 patients unsuccessfully resuscitated (150 manually and 50 mechanically) in Ljubljana in the period 2016–2018, following Guidelines 2015.

Results: At least one rib fracture was found in 96% of the manually and in 94% of the mechanically resuscitated ($p=0.555$) while sternum fractures in 79% of the manually and in 72% of the mechanically resuscitated patients ($p=0.332$). Either rib or sternum fractures or both were found in 97.3% in the manual CPR group and in 96% in the mechanical CPR group ($p=0.775$). The average number of those injuries per injured patient was 11.65 in manual CPR group and 11.40 in the mechanical CPR group. Resuscitation mode, resuscitation time and gender of the patients had no influence on CPR-related fractures. The only influencing factor was the age ($p<0.001$).

Conclusion: In cases of cardiac arrest, high quality CPR is essential for patient survival. Mechanical CPR devices deliver high-quality chest compressions, while manual CPR is often inconsistent due to fatigue and other factors. Therefore, in situations where high-quality manual chest compressions cannot be safely delivered, it is reasonable to use a mechanical device. Data on CPR-related injuries in survivors are not reliable, so our assumption about their frequency and severity has to be based on data from autopsy studies. In the studied population, mechanical CPR caused skeletal chest injuries in 1.3% fewer patients than manual CPR.

References:

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CPR-related rib & sternum fractures, Ljubljana 2016-18
manual CPR (n=150) vs. mechanical CPR (n=50)

Comparison of reported rates of rib and sternum fractures and reported rates of severe visceral injuries (%)

Survival-to-discharge rate in the studied population (10.) in comparison to previous rates in Slovenia and abroad (%)