**NIPSV for acute cardiogenic pulmonary oedema does not increase the risk of myocardial infarction compared to CPAP**

**Synopsis**


**Question:** Acute cardiogenic pulmonary oedema (ACPO) can be managed with either non-invasive pressure support ventilation (NIPSV) or non-invasive continuous positive airway pressure (CPAP). Does management with NIPSV increase the risk of myocardial infarction compared to management with CPAP?  **Design:** Randomised controlled trial with concealed allocation.  **Setting:** High-dependency unit of a hospital emergency department in Turin, Italy.  **Patients:** 52 adults with severe ACPO, defined as acute dyspnoea, > 30 breaths per minute, use of accessory respiratory muscles, oxygen saturation (SpO₂) < 90% with FIO₂ 60%, and radiological signs of ACPO. Patients with signs of acute coronary syndrome (ACS) on hospital admission were excluded from the study.  **Interventions:** All patients received standard medications (diuretic, nitroglycerin, morphine) and oxygen. NIPSV was applied by a Pulmonetics Systems LTV 1000 ventilator. CPAP was administered by means of a flow generator (Whisper-Flow) with an expiratory (PEEP) valve. Patients randomised to NIPSV (n = 25) received sufficient inspiratory pressure (IPAP) to generate a tidal volume of ~7 mL/kg, and oxygen to maintain SpO₂ at ~93%, via an oronasal mask. Expiratory pressure (EPAP) was gradually increased until SpO₂ ≥ 96% (maximum of 12 cmH₂O). Those randomised to CPAP (n = 27) commenced at 5 cmH₂O via an oronasal mask with oxygen to maintain SpO₂ at ~93%. The CPAP was gradually increased until SpO₂ ≥ 96% (maximum of 12 cmH₂O). Treatment failure was defined as cardiac arrest, respiratory distress and arterial blood gas deterioration for > 60 min, PaO₂/FiO₂ < 100 mmHg, coma or psychomotor agitation, haemodynamic instability, or life-threatening arrhythmias. Otherwise, treatment continued until the participant met objective criteria of recovery.  **Outcomes:** The primary outcome was the rate of acute myocardial infarction (AMI). Secondary outcomes included rate of endotracheal intubation, death, duration of ventilatory assistance, and lengths of stay in the hospital and high-dependency unit.  **Results:** In the NIPSV group, the average EPAP and IPAP applied were 7 ± 1 and 15 ± 3 cm H₂O, respectively. In the CPAP group, the mean pressure applied was 9 ± 2 cm H₂O. AMI occurred in four patients on NIPSV and eight patients on CPAP, which was not significantly different, absolute risk reduction (ARR) 0.14, 95% CI –0.10 to 0.34. Also not significantly different were the number of intubations with only one in the NIPSV group, ARR –0.04, 95% CI –0.20 to 0.09, and the number of deaths with three in the NIPSV group and two in the CPAP group, ARR –0.05, 95% CI –0.23 to 0.13. The lengths of stay in hospital and in the high-dependency unit also did not significantly differ between the groups.  **Conclusion:** This study demonstrated no significant difference in AMI among patients with ACPO managed with NIPSV versus CPAP.  

[ARRs and CIs calculated by the CAP Co-ordinator.]

**Commentary**

ACPO is a vital emergency that usually occurs in the elderly population with a high prevalence of coronary artery disease. The most frequent precipitant cause has been reported to be ACS, especially AMI. Typically, this is a non-extensive non-Q wave AMI that occurs in a patient with previous infarction, diabetes, and hypertension. On other occasions, however, myocardial necrosis is due to either coronary flow imbalance or cardiac overload, secondary to the stress of ACPO. This secondary mechanism is silent, usually generates lower increases in cardiac biomarkers than primary ACS, and has been described in patients with normal coronary arteries.

In patients with ACPO, non-invasive ventilation has been shown to produce a rapid improvement in physiologic parameters and a reduction in the intubation rate and mortality (Masip 2005). Most of the series analysing this technique have reported the overall incidence of AMI considering both primary and secondary mechanisms.

The study by Ferrari et al excluded patients with ACS and therefore it should be inferred that all new cases of AMI were secondary. The trial was specifically designed to clarify the confusion introduced by some previous biased trials that described a higher AMI rate with the use of NIPSV compared to CPAP (Mheta 1997). Conversely, the authors found a nearly double AMI rate in the CPAP group, but the difference was not significant. The study does not provide extensive information about ACS exclusions or new cases of AMI and it is not conclusive because of the small sample size, but provides, like previous trials (Bellone 2004) and meta-analyses, greater evidence about the neutral effect of NIPSV on the incidence of AMI.

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**References**