

# Changes in respiratory muscle function and central drive of gasping in a porcine model of cardiac arrest

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## Background

Gasping, also called agonal respiration, is frequent after cardiac arrest (CA) and is associated with successful resuscitation. Though the benefit of gasping with resuscitation has been well documented, the changes in its respiratory mechanics are still unknown. In the present study, we observed changes in frequency, respiratory muscles motion and central respiratory drive of gasping during prolonged CA in a porcine model.

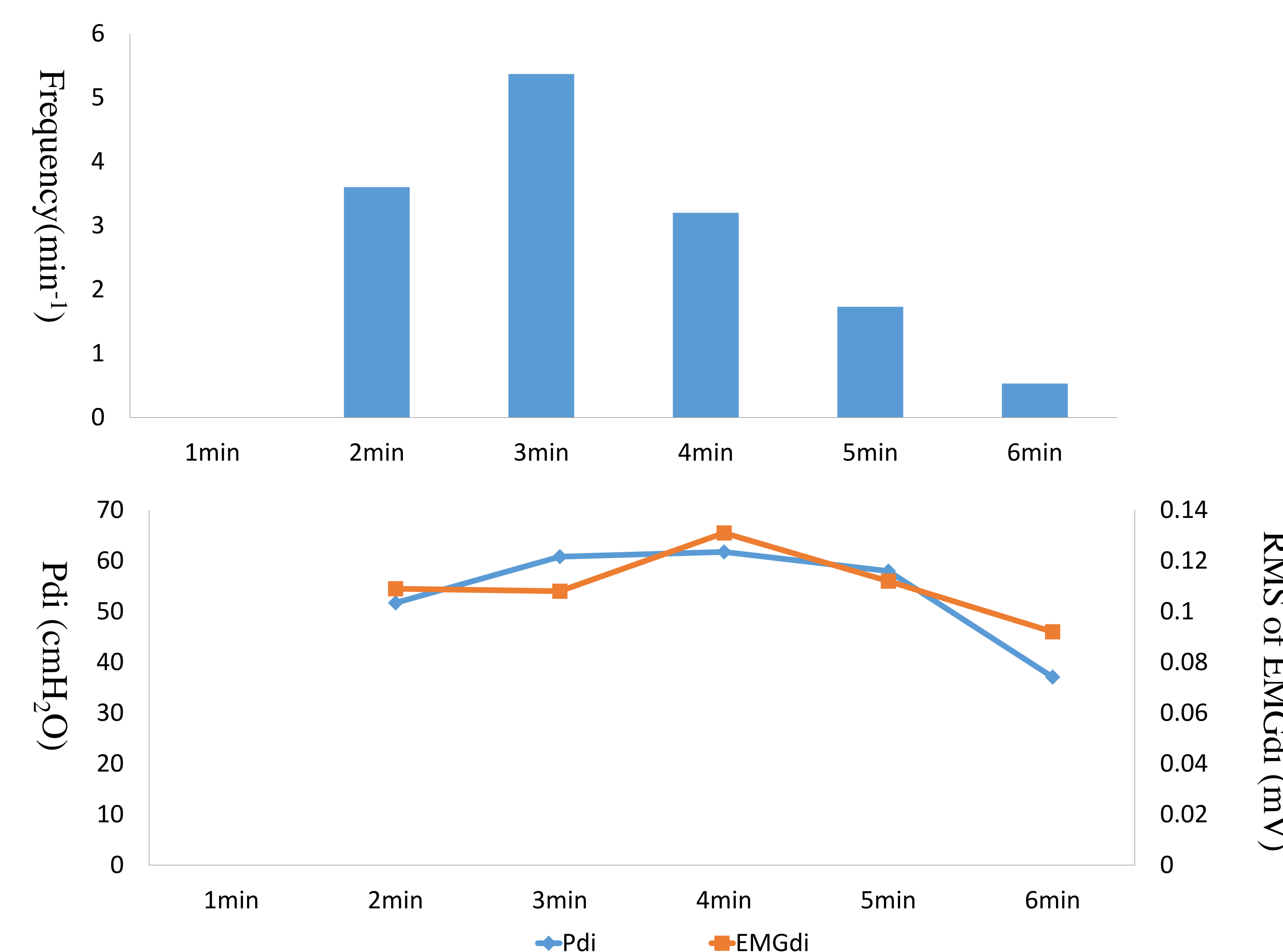
## Methods

Sixteen male domestic pigs weighing  $39 \pm 3$  kg were utilized. Ventricular fibrillation was electrically induced and untreated for 10 min. Transdiaphragmatic pressure (Pdi) and diaphragm electromyogram (EMGdi) of gasping were recorded. The variation of Pdi during the inspiratory phase, defined as the difference of its maximum and base value, was used to evaluate the depth of diaphragmatic motion, while the root mean square (RMS) of EMGdi was calculated to represent the central respiratory drive.

## Results

Gasping began from the second minute and continued until the sixth minute, as its frequency reached a peak in the third minute and then gradually decreased [2min:  $3.60 \pm 1.68$ , 3min:  $5.47 \pm 2.10$ , 4min:  $3.20 \pm 2.93$ , 5min:  $1.73 \pm 2.71$ , 6min:  $0.53 \pm 1.36$ ; 2min vs 3min,  $p < 0.05$ ; 3min vs 4min,  $p < 0.01$ ]. The variation of Pdi demonstrated a similar tendency [2min:  $51.72 \pm 17.38$  cmH<sub>2</sub>O, 3min:  $60.81 \pm 16.61$  cmH<sub>2</sub>O, 4min:  $61.75 \pm 14.10$  cmH<sub>2</sub>O, 5min:  $57.98 \pm 6.18$  cmH<sub>2</sub>O, 6min:  $37.09 \pm 11.86$  cmH<sub>2</sub>O; 2min vs 3min,  $p < 0.05$ ; 3min vs 4min,  $p < 0.01$ ].

Figure. Parameters of gasping during cardiac arrest.



Pdi, trans-diaphragmatic pressure; RMS, root mean square; EMGdi, diaphragm electromyogram.

## Results

However, RMS of EMGdi increased over time and the decreasing trend was absent until the last minute of gasping [2min: 0.109 (0.069, 0.125), 3min: 0.108 (0.094, 0.159), 4min: 0.131 (0.108, 0.161), 5min: 0.112 (0.112, 0.156), 6min: 0.092 (0.082, 0.108); 2min vs 3min,  $p < 0.05$ ; 3min vs 4min,  $p < 0.05$ ; 4min vs 5min,  $p = 0.38$ ; 5min vs 6min,  $p < 0.05$ ].

## Conclusions

During a decrease in respiratory muscle motion, central respiratory drive is still enhanced during gasping in a prolonged CA porcine model.

## References

1. Manole M.D, R.W. Hickey et al. Crit Care Med. 2006. 34(12 Suppl): p. S438-41.
2. Luo YM, Moxham J et al. Respir Physiol Neurobiol. 2005; 146 (2-3); 165-74