Effects of levosimendan on respiratory muscle function in patients weaning from mechanical ventilation

Lisanne Roesthuis[1], Hans van der Hoeven[1], Christer Sinderby[2,3,4], Tim Frenzel[1], Coen Ottenheijm[5,6], Laurent Brochard[2,7], Jonne Doorduin[8], Leo Heunks[9]

Online Supplement

[1] Department of Intensive Care Medicine, Radboud University Medical Center, Nijmegen, The Netherlands; [2] Keenan Research Centre for Biomedical Science, Li Ka Shing Knowledge Institute, St. Michael's Hospital, Toronto, ON, Canada; [3] Institute for Biomedical Engineering and Science Technology (iBEST), Ryerson University and St. Michael's Hospital, Toronto, Canada; [4] Department of Medicine, University of Toronto, Toronto, Canada; [5] Department of Physiology, Amsterdam UMC, location VUmc, The Netherlands; [6] Department of Cellular and Molecular Medicine, University of Arizona, Tucson, Arizona; [7] Interdepartmental Division of Critical Care Medicine, University of Toronto, ON, Canada; [8] Donders Institute for Brain, Cognition and Behaviour, Department of Neurology, Radboud University Medical Center, Nijmegen, The Netherlands; [9] Department of Intensive Care Medicine, Amsterdam UMC, location VUmc, The Netherlands

Correspondence:

Leo Heunks, M.D., Ph.D.

Amsterdam UMC, location VUmc

Postbox 7057

1007 MB, Amsterdam, The Netherlands

Phone +31 20 4443924

l.heunks@amsterdamumc.nl

METHODS

Role of sponsor

The trail was primarily funded by institutional resources (Radboud University Medical Center, Department of Intensive Care). Orion Pharma provided study medication (levosimendan and placebo) and financial compensation for research nurse. Orion Pharma did not have a role in designing the trial, gathering or analyzing data, writing the manuscript, or making a decision to submit the manuscript for publication.

Randomization and blinding

State of the art randomization and blinding was performed. Allocation to placebo or levosimendan occurred by –a 1:1 block design by the research nurses, who also prepared study medication. Placebo and levosimendan were both yellowish and therefore indistinguishable for the researchers and clinicians taking care of the patients. Researchers were blinded when they performed data and statistical analyses.

RESULTS

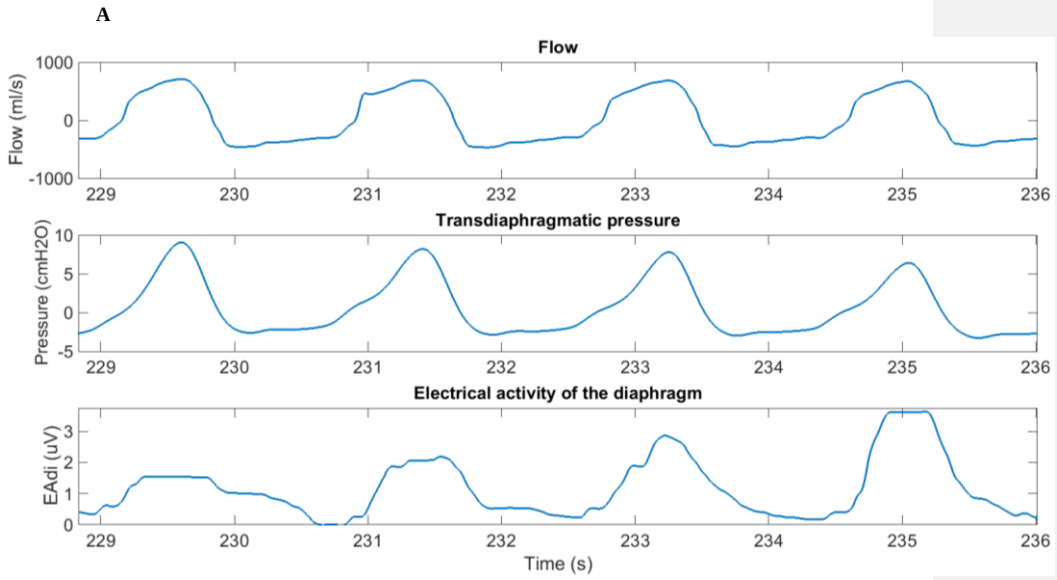
Recruitment of patients

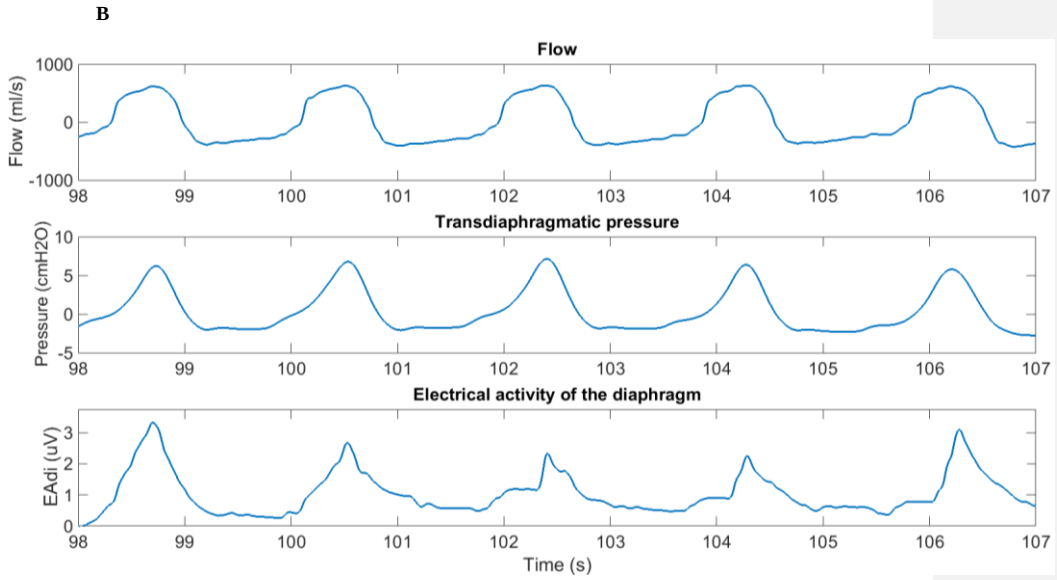
Patients were recruited from September 2012 till February 2017. Patient recruitment and enrollment was based on available researchers, since measurements were highly complex and only performed by LR and JD. Therefore, we did not make a CONSORT diagram, because it does not provide a realistic representation of available and recruited patients.

FIGURE LEGENDS

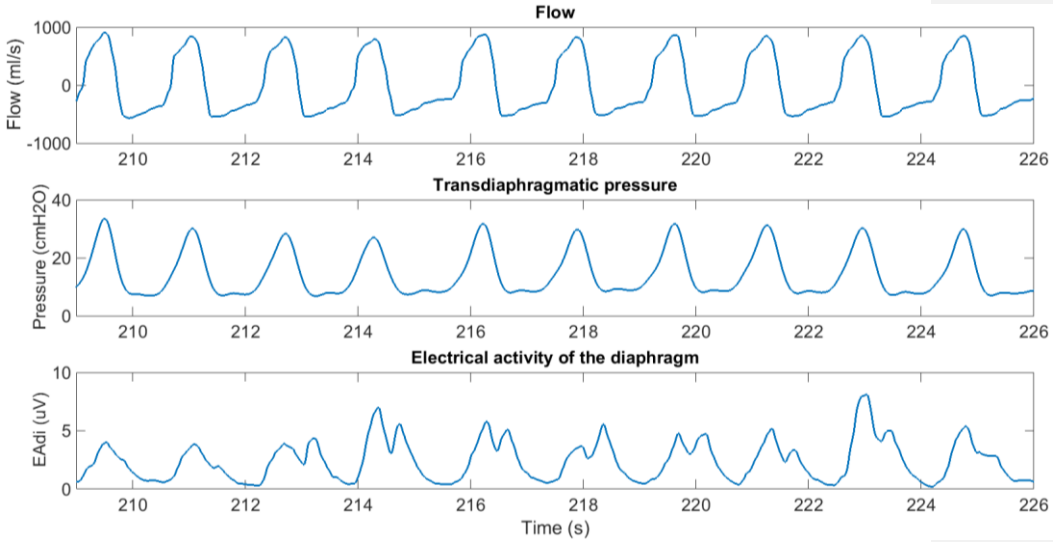
Fig. E1 Examples of non-physiologic electrical activity of the diaphragm (EAdi) signals. The upper curve represents flow, middle curve is transdiaphragmatic pressure (Pdi; i.e. gastric minus esophageal pressure) and the lower curve is the EAdi signal. **A** EAdi peak cut off. **B** The slope of the ascending part of the EAdi curve remains horizontal. **C** Split EAdi peaks. **D** Delay in start of EAdi and EAdi peak cut off.

Fig. E1

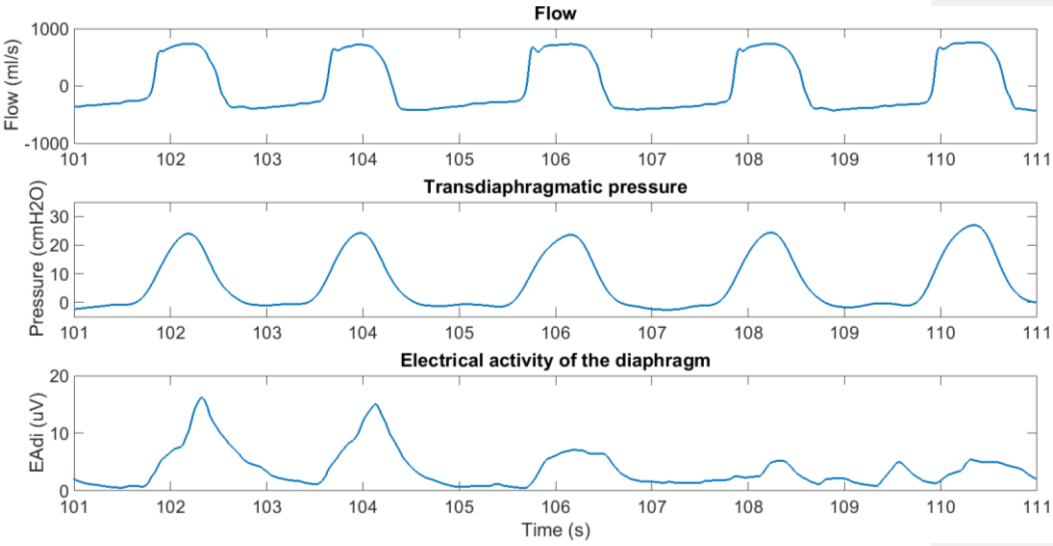

A
Flow
Flow (ml/s)
1000
0
-1000
229
230
231
232
233
234
235
236
Transdiaphragmatic pressure
Pressure (cmH2O)
10
5
0
-5
Electrical activity of the diaphragm
EAdi (uV)
3
2
1
0
Time (s)


B
Flow
Flow (ml/s)
1000
0
-1000
98
99
100
101
102
103
104
105
106
107
Transdiaphragmatic pressure
Pressure (cmH2O)
10
5
0
-5
Electrical activity of the diaphragm
EAdi (uV)
3
2
1
0
Time (s)

C


Flow
Flow (ml/s)
1000
0
-1000
210
212
214
216
218
220
222
224
226
Transdiaphragmatic pressure
Pressure (cmH2O)
40
20
0
Electrical activity of the diaphragm
EAdi (uV)
10
5
0
Time (s)

D


Flow
Flow (ml/s)
1000
0
-1000
101
102
103
104
105
106
107
108
109
110
111
Transdiaphragmatic pressure
Pressure (cmH2O)
30
20
10
0
Electrical activity of the diaphragm
EAdi (uV)
20
10
0
Time (s)