

Bedside diaphragmatic ultrasound used to diagnose an unexpected cause of weaning difficulty in a patient with COVID-19 pneumonitis

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INTRODUCTION

Diaphragm dysfunction is responsible for weaning failure with an incidence of 23–80%. It is associated with difficult weaning from mechanical ventilation, prolonged intensive care unit (ICU) stay and increased ICU and hospital mortality.¹ This case report describes the use of bedside ultrasound to diagnose diaphragm dysfunction, assess the severity of dysfunction, refer to specialist care and monitor disease progression in a patient with COVID-19 pneumonitis with difficulty weaning from mechanical ventilation.

CASE REPORT

A 49-year-old male with no known past medical history was admitted to our ICU with respiratory failure due to COVID-19 pneumonitis. He received continuous positive pressure ventilation with oxygen supplementation on the medical high dependency unit for 15 days before deteriorating and requiring invasive ventilation in the ICU.

In ICU, the patient was ventilated using lung-protective ventilation strategies for many weeks before he was switched to pressure support ventilation for attempts to wean him from mechanical ventilation. During the initial phase of his ICU admission, he was severely hypoxaemic and required deep sedation and prolonged muscle relaxation. Prone positioning was needed on four occasions before he was stable in the supine position. Once attempts to liberate him from mechanical ventilation were made, pressure support was gradually reduced along with PEEP and FiO₂. Progress with this reduction in support was slow due to marked tachypnoea and a dyssynchronous respiratory pattern. It was also noted that he had poor air entry in his right lung base with corresponding right lower zone opacities on his chest x-ray.

At this stage, bedside ultrasound was used to investigate the cause of weaning difficulty and consequently, the diagnosis of right diaphragmatic paralysis was made. This was a new finding, as his admission chest x-ray did not show a raised hemidiaphragm. This diagnosis led to an increased focus on physical rehabilitation and mobilisation with a tolerance of his tachypnoea and respiratory pattern, as we now appreciated this didn't represent persistent underlying parenchymal lung disease. We also made a referral to the respiratory team to facilitate longer-term rehabilitation and follow up.

The patient was successfully extubated after intense physical rehabilitation. Post-extubation; he remained tachypnoeic and still required supplemental oxygen at the point of hospital discharge. A follow-up diaphragm ultrasound six months after discharge did not show any improvement in the right diaphragmatic function. He remains dyspnoeic on exertion and still occasionally uses ambulatory supplemental oxygen.

CONCLUSION

Ultrasound assessment revealed an unexpected cause of weaning difficulty in our patient that allowed us to individualise his weaning plan and rehabilitation. This case shows the benefit of bedside ultrasound in evaluating diaphragmatic function in patients who are difficult to wean from mechanical ventilation.

BRIEF DESCRIPTION OF ULTRASOUND IMAGES AND VIDEO

Video: A coronal plane view of the right diaphragm and lung base with no diaphragm movement despite tidal breathing can be seen in the moving liver/abdominal contents on the right of the video.

Images:

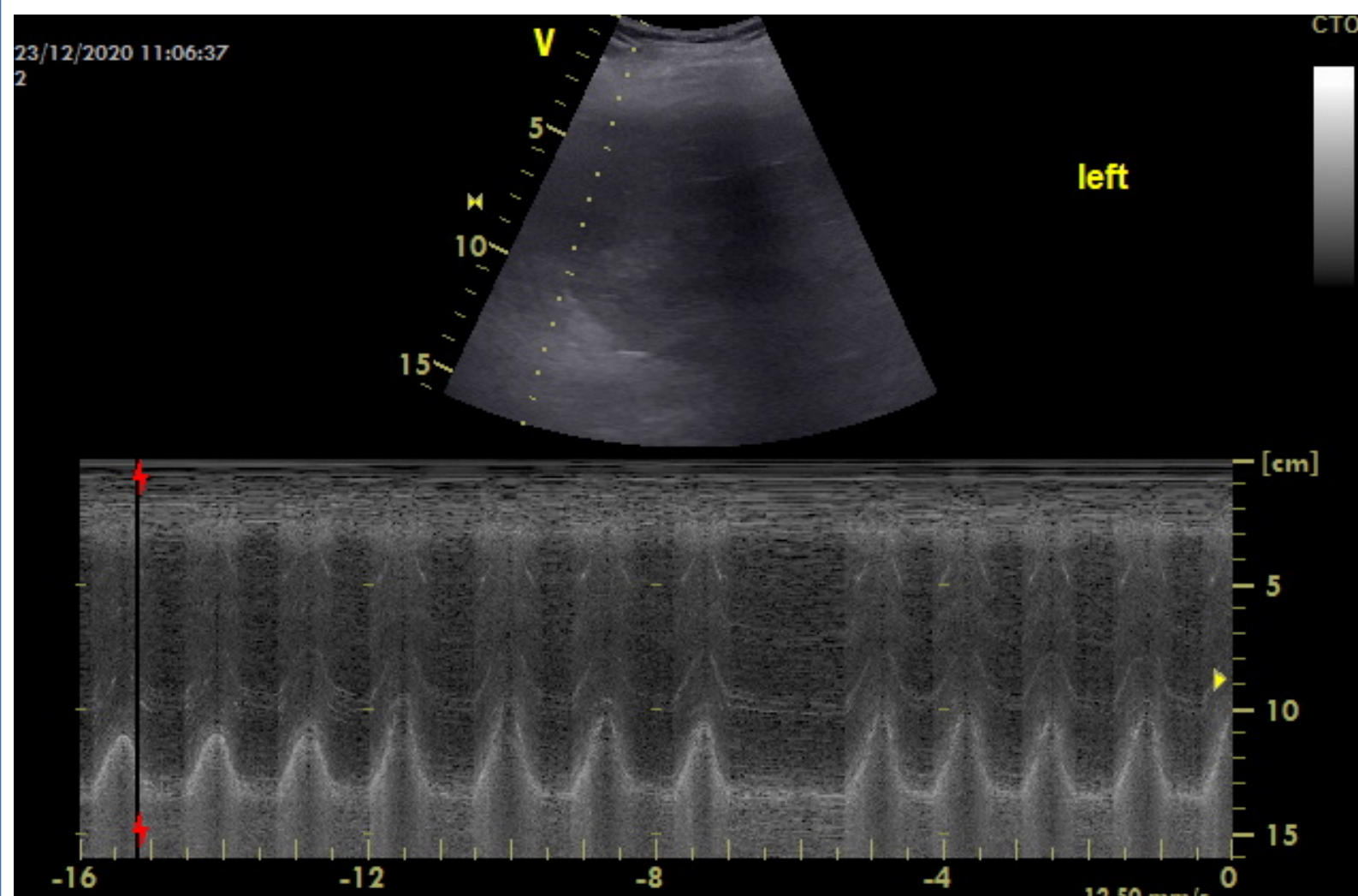


Image 1. M-mode recording of the left diaphragm: The diaphragmatic excursion is present.

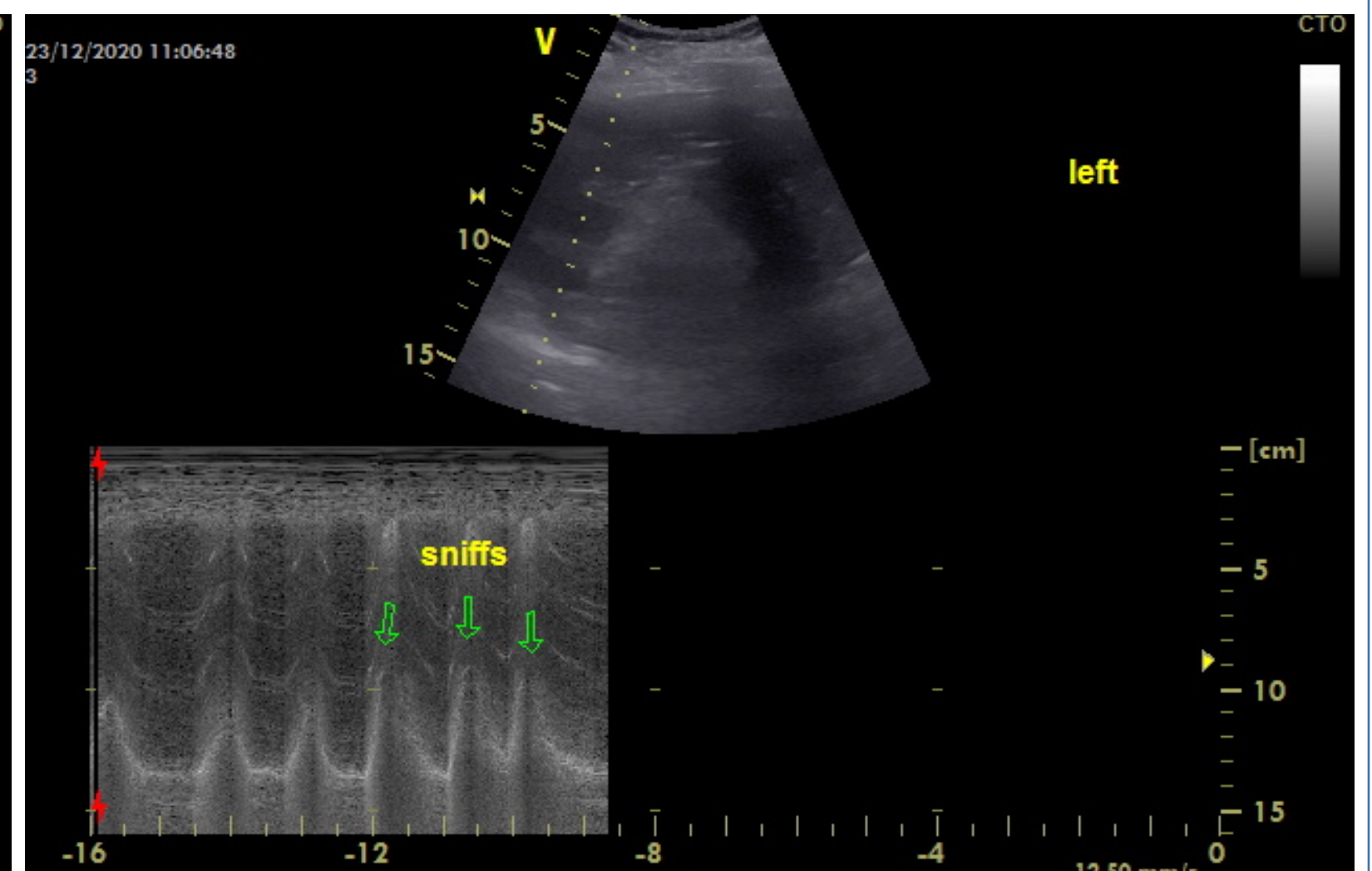


Image 2. M-mode recording of the left diaphragm: The diaphragmatic excursion is present with a positive sniff test.

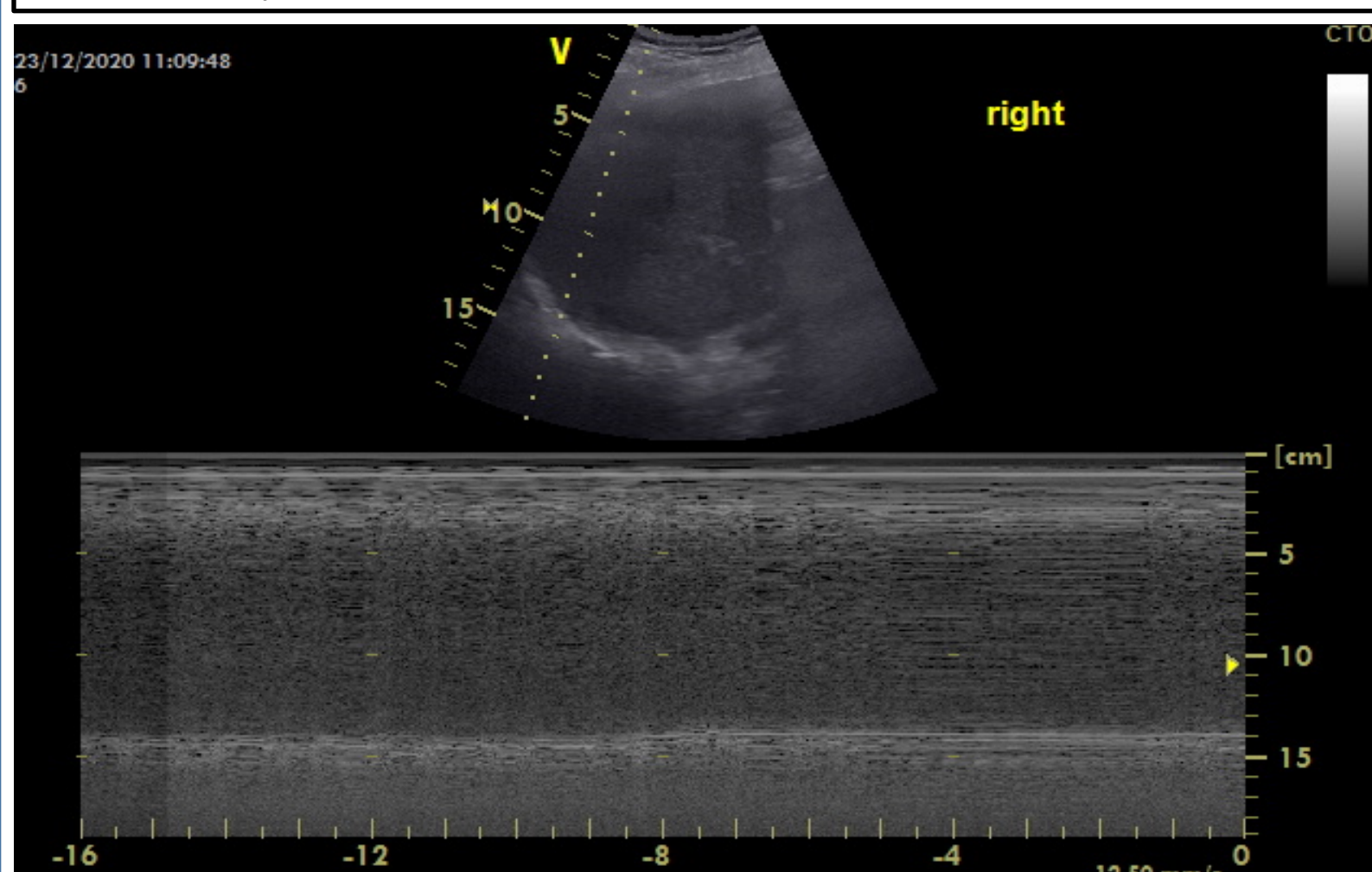


Image 3. M-mode recording of the right diaphragm: There is an absence of diaphragmatic excursion.

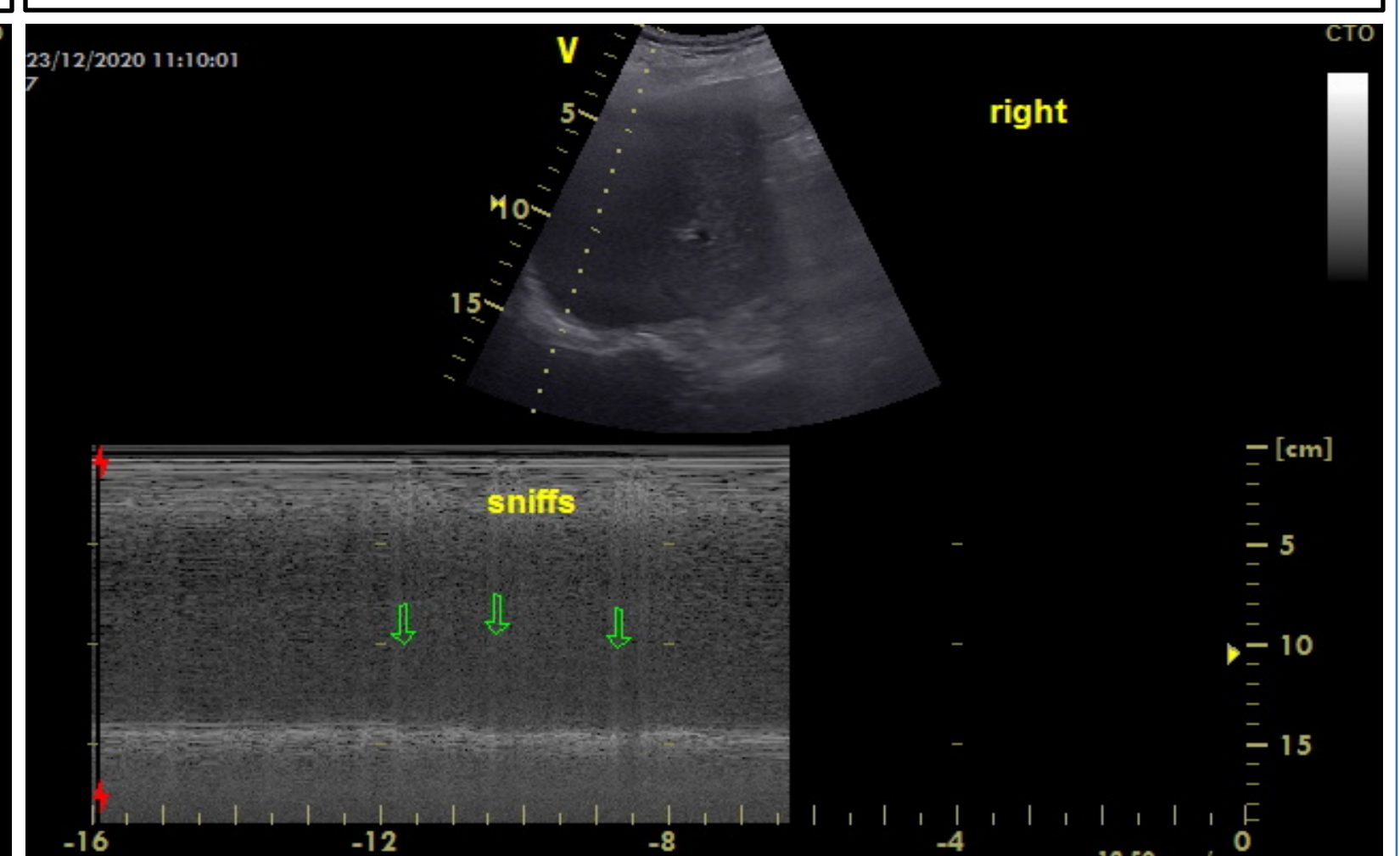


Image 4. M-mode recording of the right diaphragm: There is an absence of diaphragmatic excursion with a negative sniff test.

References

1. Dres M, Dubé B, Mayaux J, Delemazure J, Reuter D, Brochard L et al. Coexistence and Impact of Limb Muscle and Diaphragm Weakness at Time of Liberation from Mechanical Ventilation in Medical Intensive Care Unit Patients. *American Journal of Respiratory and Critical Care Medicine*. 2017;195(1):57-66.

Conflicts of interests

The authors have nothing to declare.