



Impact of ultrasound settings on B-lines: observational study in IMV patients

A. Gonçalves,¹ J. Fonseca,² J. Leote,^{3,4} R. Loução,⁵ H. Dias,⁴ I. Ribeiro,³ R. Meireles,³ R. Varudo,³ J. Bacariza,³ F. Gonzalez,³ on behalf of EchoCrit group.

1 - Cardiology Department, Hospital de Cascais; 2 - Neurology Department, ULS Santa Maria; 3 - Critical Care Department, Hospital Garcia de Orta EPE, Almada, Portugal; 4 - Escola Superior de Tecnologia da Saúde de Lisboa, Instituto Politécnico de Lisboa, Lisboa, Portugal; 5 - Center of Neurosurgery, University Hospital of Cologne, Germany.

INTRODUCTION

Currently, there aren't lung ultrasound (LUS) established guidelines for identification of B-lines.¹⁻⁶

The aim of this study was to evaluate if the US settings have an impact on the number of B-lines in invasively ventilated patients.

METHODOLOGY



Population

ICU patients under invasive mechanical ventilation (IMV)



Exclusion Criteria

- Chronic obstructive pulmonary disease
- Asthma
- Pulmonary fibrosis
- Lung thromboembolism and tumors
- Bronchopleural fistula
- Tracheostomy and hemodynamic instability
- Transplant recipients and pregnant patients

1 Passive invasive ventilation

Pressure regulated volume controlled

2 LUS on one thorax region

With most B-lines.

5s duration, inspiration and expiration

3 20 Test recordings

US settings with different conditions



3 Clinicians were asked: Number of B-lines during inspiration and expiration

RESULTS

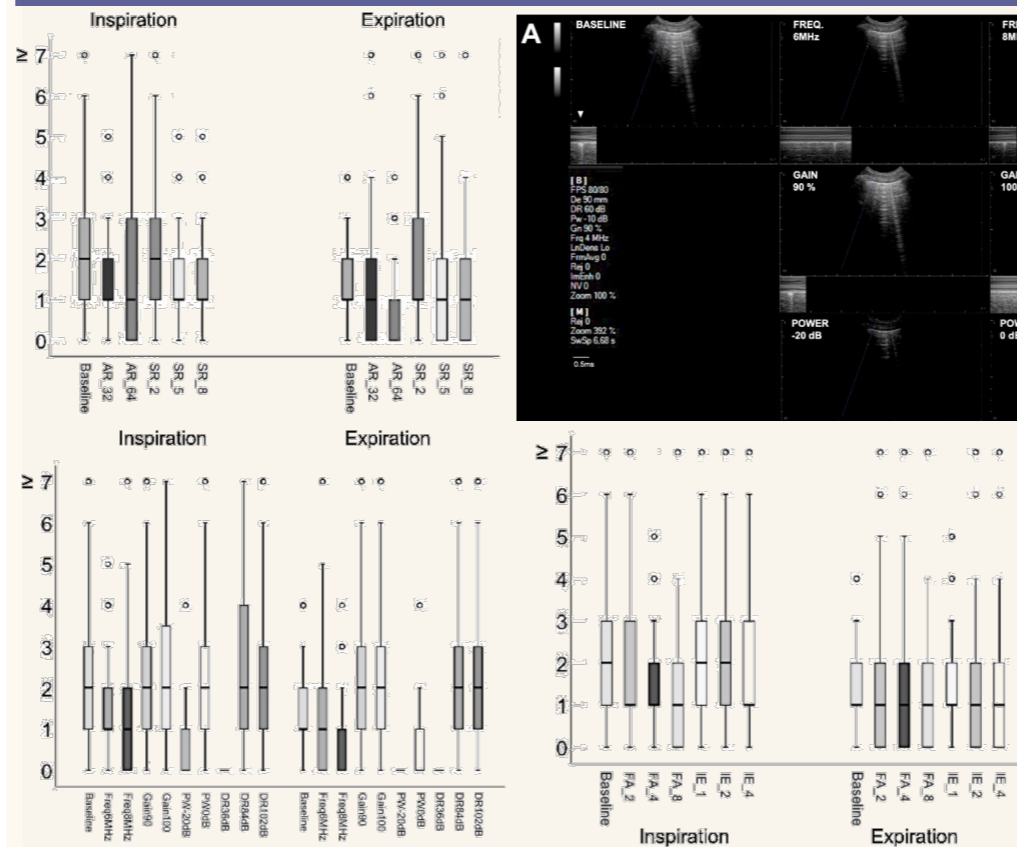


Figure 1 – Median number of vertical artifacts (VA) for the baseline recordings and test recordings after varying US conditions of different parameters

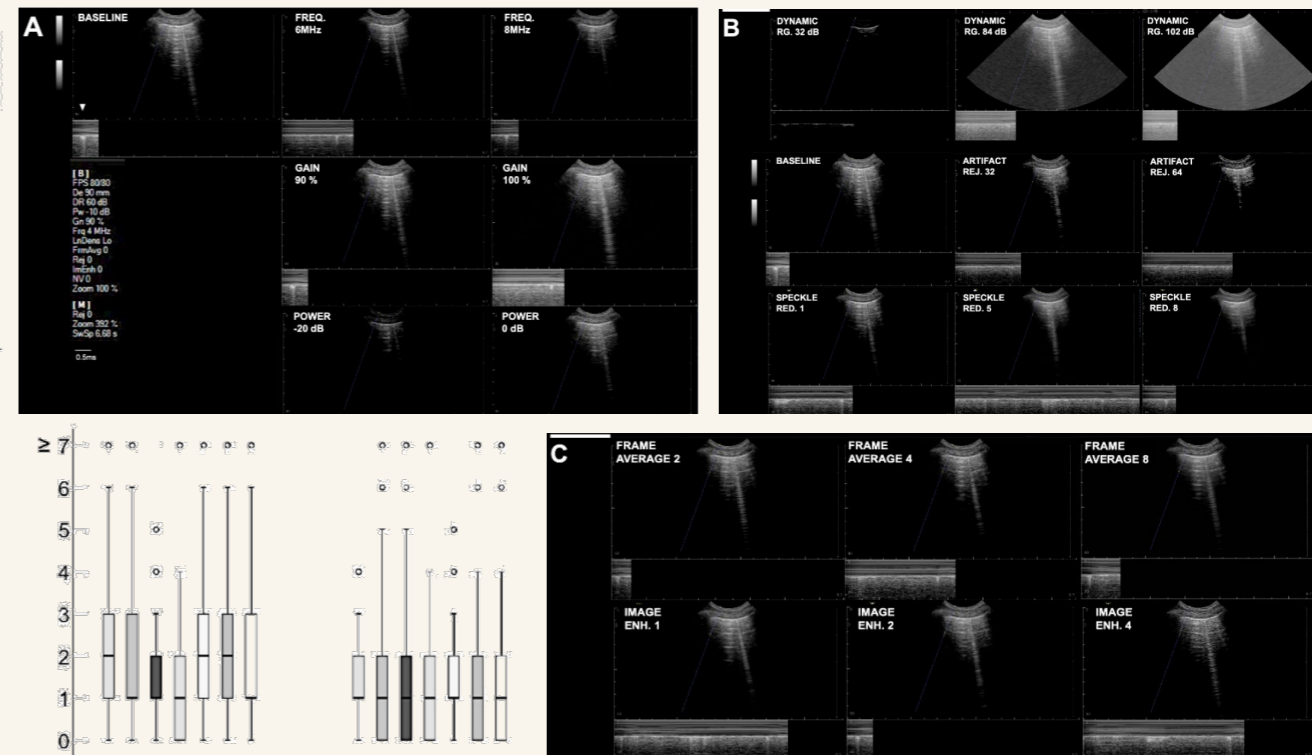


Figure 2 – Example of US parameters influence on the B-lines.

(A) VA are better visualized with lower probe frequencies; Using gain near the upper limit of the US system, VA are better visualized; By reducing the power to -20dB the number of VA significantly reduces.

(B) Changing the dynamic range (DR) to 32 dB, the of VA reduces; With artifact rejection (AR) in 64 elements of the probe, the median number of VA was reduced. Only the tested level 8 of speckle reduction (SR) diminished the clinicians' VA number.

(C) No significant differences were identified between test conditions and baseline recording with the use of Image Enhancement (IE) tools.

DISCUSSION & CONCLUSION

US preset should use lower probe frequency, with a gain and power adjusted for a value near the available upper limit with a hyperechoic pleura, an intermediate value of dynamic range adjusted for a discernable background media contrast, without any other artifact filtering or image enhancement tools.