

Case Report

Sonographic Features of Advanced Stage COVID-19 Pneumonia

Dirk-André Clevert, MD

Professor of Radiology, Honorary Doctor (TSM-Univ.),
Section Chief, Interdisciplinary Ultrasound-Center, Department of Radiology,
University of Munich-Grosshadern Campus, Munich, Germany

Introduction

Coronavirus disease 2019 (COVID-19) is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). According to the World Health Organization, COVID-19 disease increases daily globally. As of the 8th of May, 2020, there have been over 3.7 million officially reported confirmed COVID-19 cases worldwide, more than 1.6 million of which are from Europe and more than 1.5 million from the Americas. United States of America had the most confirmed cases with 1,215,571, followed by Spain with 221,447, Italy with 215,858, United Kingdom with 206,719, Russia with 187,859 and Germany with 166,091. As of today, 259,474 people have deceased worldwide due to the COVID-19 pandemic [1].

The standard method of testing for COVID-19 is RT-PCR using respiratory samples from nasopharyngeal swabs. In patients with high clinical suspicion, a combination of laboratory RT-PCR and chest imaging methods including chest CT, X-ray and lung ultrasonography (LUS) may help improve COVID-19 diagnosis [2]. LUS is particularly advantageous because of its diagnostic accuracy, portability, safety, repeatability and cost-effectiveness [3]. Additionally, lung ultrasound allows the rapid assessment of the severity of COVID-19, enabling the tracking of the evolution of the disease [4]. In this report, we describe a case with a severe progression of COVID-19 pneumonia.

Sonographic features of COVID-19 pneumonia

A 58-year-old man with confirmed positive SARS-CoV2 test was treated at the intensive care station in a peripheral hospital in the South of Bavaria. Due to the complexity and progression of the disease, the patient was transferred to our intensive care unit (ICU). On the day of admission the patient already had to undergo intubation. Laboratory chemistry showed clearly increased values for CRP (41.1 mg/dl, N <0.5), leucocytes (10.2 G/l) as well as D-dimer (3.9 µg/ml, N <0.5), LDH (819 U/l, N <249) and Interleukin (1809 pg/ml).

According to the hospital protocol, an HR-CT examination of the lungs was performed (Fig 1). The lung CT demonstrated indications of COVID-19 pneumonia with typical triangular, subpleural ground-glass opacity (GGO) and extensive bilateral consolidations of the lungs. The extensive consolidations suggest an advanced course of the disease.

The follow up examination was performed the following day at the ICU using the mobile Samsung HM70A ultrasound system with a curved array transducer CA1-7AD and a linear transducer LA3-16AD. The ultrasound examination demonstrated the following findings, which correlate well with the initial CT (Fig 2).

With increasing respiratory insufficiency under intubation the indication for an extracorporeal membrane oxygenation (ECMO) was given to aid respiratory and cardiac function. Unfortunately in the follow-up CT examination performed two weeks later (Fig 3), progression of the lung disease was detected. Ultrasound examination confirmed the findings (Fig 4).

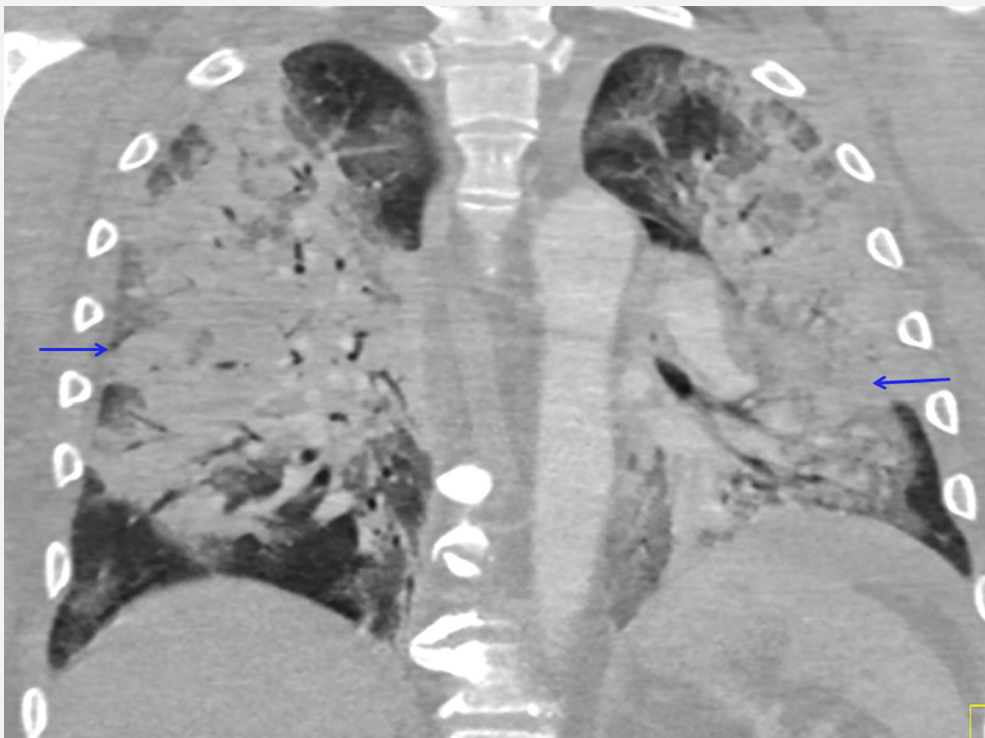
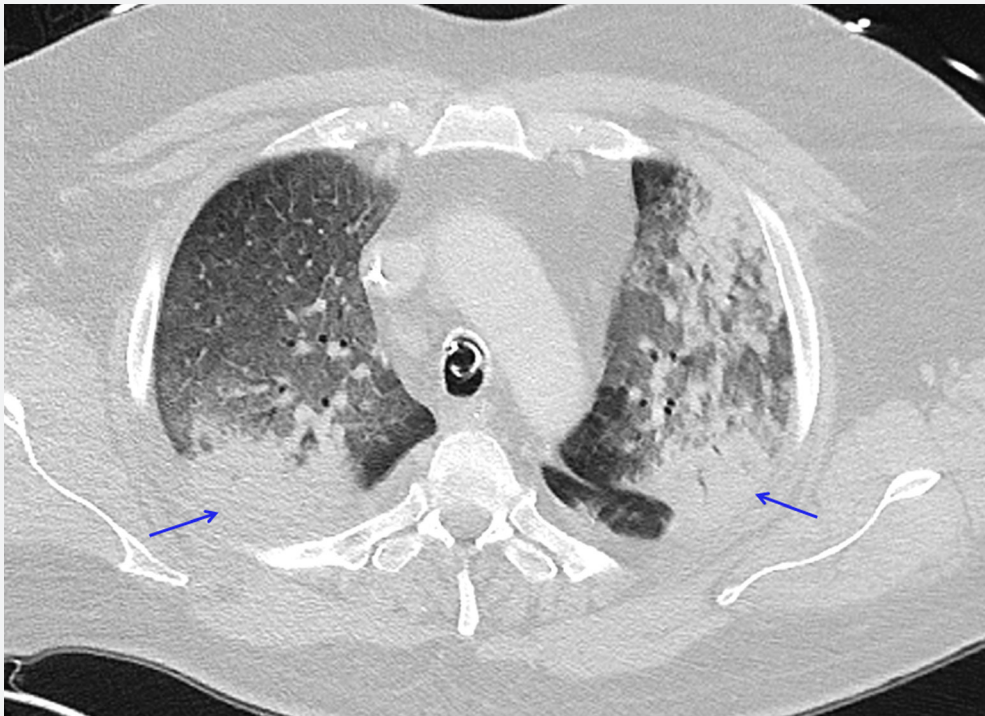


Fig 1. CT images in a 58-year-old man with COVID-19 pneumonia.

A) Axial lung CT shows finding of COVID-19 pneumonia with typical triangular, subpleural ground-glass opacity (GGO) and extensive bilateral consolidations (blue arrows).

B) Coronal lung CT shows finding of COVID-19 pneumonia with extensive bilateral consolidations (blue arrows).

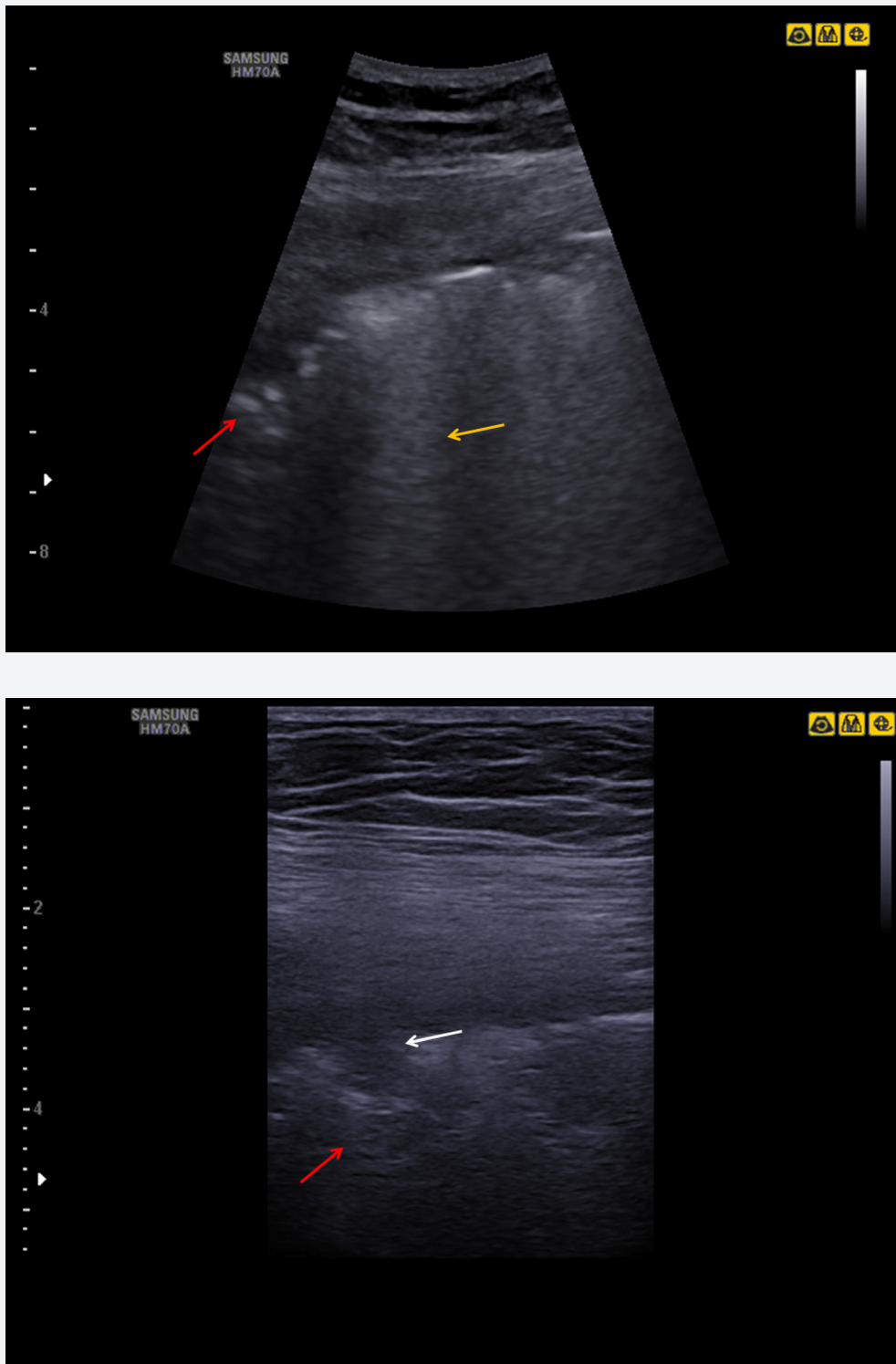


Fig 2. Lung ultrasound using the Samsung HM70A.

- A) Detection of multiple of B-lines (yellow arrow) using a curved array transducer. Ultrasound findings show areas of consolidation and air bronchogram signs (red arrow).
- B) Detection of thickening and irregularity of the pleural line (white arrow) and areas of consolidation and air bronchogram signs (red arrow) using a high-frequency linear transducer.

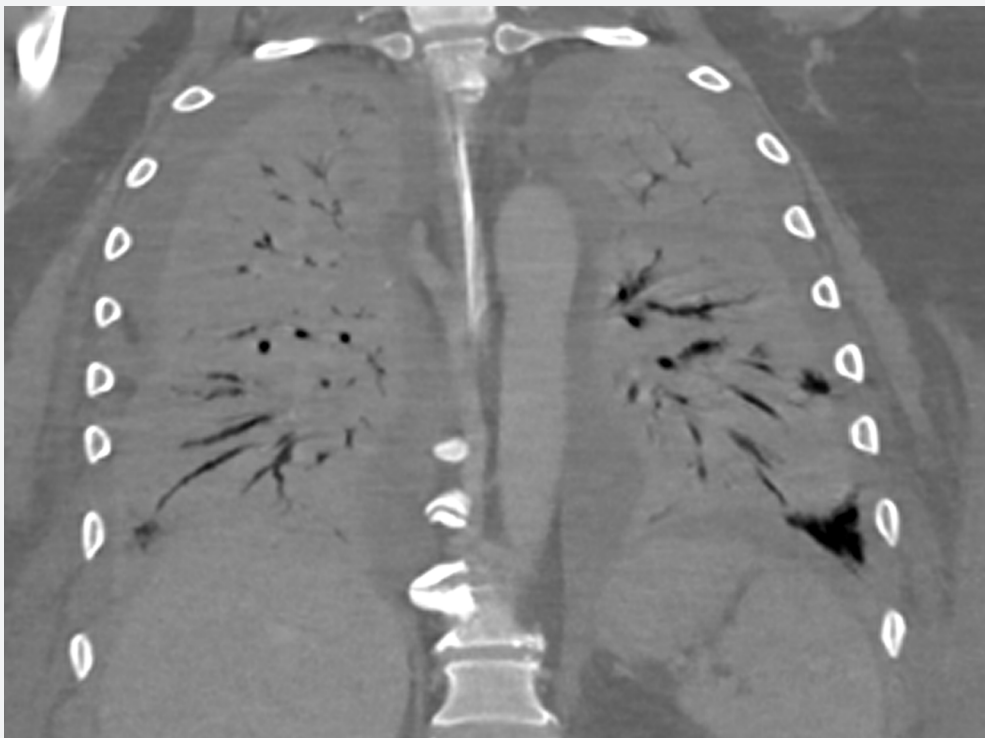
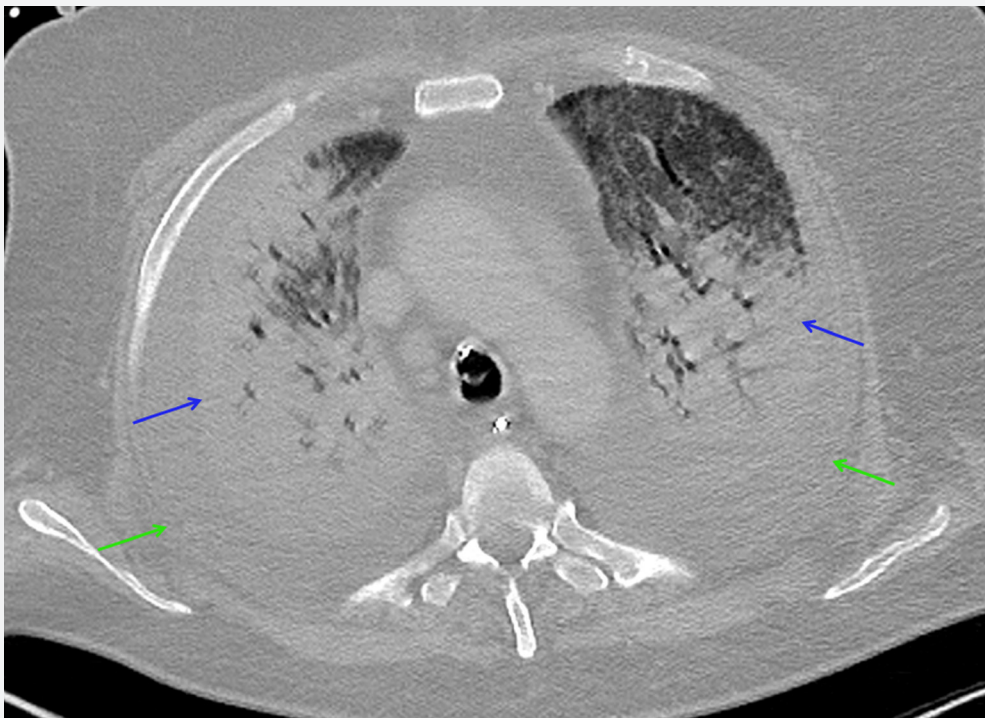


Fig 3. CT images in a 58-year-old patient with advanced stage COVID-19 pneumonia.

- A) Axial lung CT shows a progress of COVID-19, including extensive bilateral consolidations (blue arrows) and pleura effusion (green arrows) on both sides.
- B) Coronal lung CT confirmed the extensive bilateral consolidations of the lung and the pleura effusion.

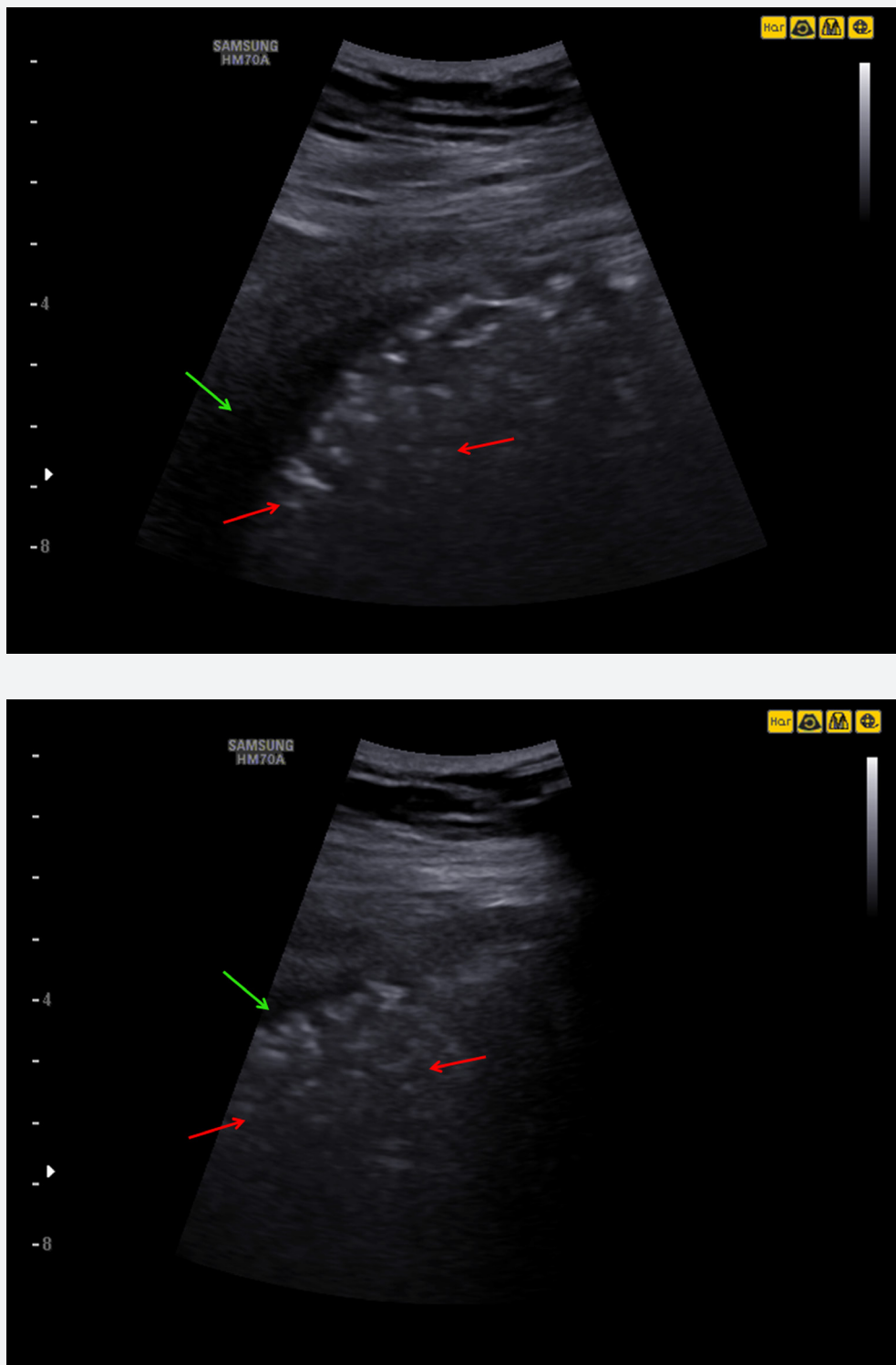


Fig 4. Lung ultrasound using the Samsung HM70A with a curved array transducer.

- A) Detection of multiple areas of consolidation with air bronchogram signs (red arrows) and the pleura effusion (green arrow) on the left side of the lung.
- B) Detection of multiple areas of consolidation with air bronchogram signs (red arrows) and the small pleura effusion (green arrow) on the right side of the lung.

Two days after the last ultrasound examination, the patient developed a severe progression of the disease and was held under maximum medical treatment at the ICU. Unfortunately the patient passed away.

Typical for the ultrasound findings in COVID-19 disease are the irregularity and the thickening of the pleural line. The pleural line signs could be detected starting from unsmooth to discontinuous and interrupted. B-line artefacts could vary from focal to multifocal with confluent patterns, while the consolidations could vary in different patterns including multifocal small subpleural consolidations up to non-translobar and translobar with occasional air bronchograms. Uncommon in coronavirus COVID-19 disease are pleural effusions.

References

- [1] World Health Organization; Coronavirus disease (COVID-2019) situation report 109.
- [2] Lomoro P, Verde F, Zerboni F, Simonetti I, Borghi C, Fachinetti C, Natalizi A, Martegani A. COVID-19 pneumonia manifestations at the admission on chest ultrasound, radiographs, and CT: single-center study and comprehensive radiologic literature review. *Eur J Radiol Open*. 2020;7:100231.
- [3] Mayo PH, Copetti R, Feller-Kopman D, Mathis G, Maury E, Mongodi S, Mojoli F, Volpicelli G, Zanobetti M. Thoracic ultrasonography: a narrative review. *Intensive Care Med*. 2019 Sep;45(9):1200-1211.
- [4] Soldati G, Smargiassi A, Inchingolo R, Buonsenso D, Perrone T, Briganti DF, Perlini S, Torri E, Mariani A, Mossolani EE, Tursi F, Mento F, Demi L. Is There a Role for Lung Ultrasound During the COVID-19 Pandemic? *J Ultrasound Med*. 2020 Mar 20.

[Do not distribute this document to customers unless relevant regulatory and legal affairs officers approve such distribution]

* The features mentioned in this document may not be available in all countries. Due to regulatory reasons, their future availability cannot be guaranteed.

* Images may have been cropped to better visualize its pathology.

* This clinical practice review is not an official clinical study or paper presented at a conference. It is a result of a personal study conducted by collaboration between Samsung Medison and Prof. Dirk-André Clevert. This case report is intended to aid customers in their understanding, but the objectivity is not secured.

* 본자료는 공식 임상시험 결과물이나 학회에 발표된 논문이 아니며 삼성메디슨이 Dirk-André Clevert 교수님과 협업하여 산출된 개인 연구의 결과물입니다. 고객의 요청에 따라 이해를 돕기 위해 제공하는 자료일 뿐 객관성은 확보되지 않았습니다.

SAMSUNG MEDISON CO., LTD.

© 2020 Samsung Medison All Rights Reserved.

Samsung Medison reserves the right to modify any design, packaging, specifications and features shown herein, without prior notice or obligation.