Rules to use Imaging Diagnostics in Covid Patients 19

From the data emerged on Chinese patients with Covid-19 it is clear that at the onset the most frequent symptoms are fever in about 90% of cases and cough in about 70% of cases. Diarrhea is uncommon approximately 4% of cases [1]. The average incubation period is 5 days [1,2]. Lymphocytopenia is present in approximately 80% of patients at the time of hospitalization. The median duration of hospitalization is approximately 13 days [3]. About 5% of these patients need intensive care. Most patients receive the diagnosis of pneumonia (about 90%) upon entering the emergency room, in the minority of cases they develop into ARDS (about 5%) and shock (1.1%) [3]. Men are most affected by Covid-19 (approximately 60%) and the mortality rate reaches 7% [2-3]. Summarizing the main clinical data of patients with Covid-19 are fever (about 90%), cough (about 70%), myalgia or fatigue (about 35%), expectoration (about 30%), dyspnea (about 22%). Minor symptoms include headache or dizziness (around 12%) diarrhea (around 4%) and nausea and vomiting (around 4%) [2]. In laboratory tests the most common findings are lymphocytopenia (approximately 80%), increase in CRP (approximately 45%), increase in LDH (approximately 29%) and leukocytopenia (approximately 30%), all the data are consistent with respiratory virus infection.

In this scenario, Imaging can make its contribution.

Chest CT without contrast can show the most characteristic findings [4]. Bilateral "ground glass" opacities are the most common radiological finding (about 60%) [1].

The chest X-ray examination, even in clinostatism, while not offering highly specific findings, allows a first classification of patients, especially in the emergency room, and can direct the differential diagnosis towards other possible causes of pulmonary parenchymal involvement, other than infection Covid-19. In addition, the chest X-ray examination at the patient's bed, in hospitalized patients and in intensive care, is a valid tool for the evolutionary monitoring of pneumonia [5-6].

The chest ultrasound (POCUS - Point-Of-Care UltraSound), performed by trained medical personal, at the patient's bed, can also represent a monitoring tool to evaluate the effectiveness of the pronation-supination maneuvers [7-8]. In this sense, the systematic application of the POCUS can reduce the use of different diagnostic imaging resources, also reducing the staff exposed to the danger of contagion and help optimize therapies especially in critically ill patients [9].

Ultrasound of the abdomen is not recommended; the examination has no evidence of utility in these patients, since the symptomatology is substantially respiratory. Other uses of ultrasound (soft tissues, superficial organs, vascular Doppler) also have very limited indication. Furthermore, the ultrasound examination requires prolonged contact between the operator and the patient, and therefore has a series of contraindications.

Ultrasound, like any procedure performed on patients in isolation, introduce the risk of reducing the effectiveness of the isolation itself, and, as all other procedures, must be limited to the essential indications. In addition, the use of the material to prevent the transmission of the

pathogen from the infected patient (e.g. PPE) to health professionals, is part of all those resources, subject to availability, that must be used with measure.

Finally, the exposure of healthcare personnel, in order to prevent their contagion, should be limited to the only essential operations.

Indications of ultrasound examination

For patients with COVID-19, the purposes of the ultrasound examination include 1) to determine whether there are multiple organ damages, such as the heart, kidney, liver, chest, abdominal cavity, and intestines; 2) to determine whether exists secondary diseases, such as lower limb venous thrombosis and pulmonary embolism; 3) Critical and death cases are more common in older patients, and sometimes associated with other medical conditions (such as coronary heart disease, diabetes, chronic renal insufficiency, chronic respiratory diseases, history of surgery, especially history of chest surgery, history of tumors, etc). Ultrasound examination needs to assess the other disease of the patients; 4) Abdominal pain, chest pain or other symptoms occurred during the hospitalization of patients, ultrasound is needed to determine its etiology, such as urinary tract stones, gallbladder stones, aortic dissection, appendicitis, etc .; 5) Cardiac function evaluation, hemodynamic evaluation; 6) Pulmonary ultrasound can be dynamically and effectively performed for monitoring; 7) Ultrasound-guided interventional punctures: such as venipuncture, pleural and abdominal fluid aspiration, thoracic and abdominal fluid drainage, or pericardial effusion drainage, etc.

Essential bibliography:

1. Jiang F, Deng L, Zhang L, Cai Y, Cheung CW, Xia Z. Review of the Clinical Characteristics of Coronavirus Disease 2019 (COVID-19). 2020;2019.
2. Li L-Q, Huang T, Wang Y-Q, Wang Z-P, Liang Y, Huang T-B, et al. 2019 Novel Coronavirus Patients' Clinical Characteristics, Discharge Rate and Fatality Rate of Meta-Analysis. J Med Virol 2020;(3):0–2.
3. Guan W-J, Ni Z-Y, Hu Y, Liang W-H, Ou C-Q, He J-X, et al. Clinical Characteristics of Coronavirus Disease 2019 in China. N Engl J Med [Internet]. 2020;1–13.
4. Dai W, Zhang H, Yu J, Xu H, Chen H, Luo S, et al. CT Imaging and Differential Diagnosis of COVID-19. Can Assoc Radiol J [Internet]. 2020;084653712091303.
5. Porté F, Basit R, Howlett D. Imaging in the intensive care unit. Surg [Internet]. 2009;27(11):496–9.
6. Suh RD, Genshaft SJ, Kirsch J, Kanne JP, Chung JH, Donnelly EF, et al. ACR Appropriateness Criteria® Intensive Care Unit Patients. J Thorac Imaging [Internet]. 2015;30(6):W63–5.
7. Peng QY, Wang XT, Zhang LN, Critical C, Ultrasound C, Group S. Findings of lung ultrasonography of novel corona virus pneumonia during the 2019 – 2020 epidemic. Intensive Care Med [Internet]. 2020;(87):6–7.
8. See KC, Ong V, Tan YL, Sahagun J, Taculod J. Chest radiography versus lung ultrasound for identification of acute respiratory distress syndrome: A retrospective observational study. Crit Care. 2018;22(1):1–9.
9. Pontet J, Yic C, Díaz-Gómez JL, Rodriguez P, Sviridenko I, Méndez D, et al. Impact of an ultrasound-driven diagnostic protocol at early intensive-care stay: a randomized-controlled trial. Ultrasound J 2019;11:24 https://doi.org/10.1186/s13089-019-0139-2