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COVID-19 in Sarcoidosis Patients

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Several post-COVID-19 inflammatory disorders and autoimmune diseases have been discovered [1] since global COVID-19 pandemic started [2]. Association between these diseases is still to be investigated [2]. Common genes between COVID-19 and sarcoidosis are demonstrated in **Figures 1 & 2** [3]. Nevertheless, sarcoidosis organ involvement, demographics, and type of sarcoidosis treatment at the time of COVID-19 diagnosis are related to hospital admission, non-invasive ventilation or high flow oxygenation, intubation [4]. A retrospective hospital-based cohort study of 585 French sarcoidosis patients in 2017, demonstrated an estimate of a 5 % frequency of severe infections that resulting in hospital admission and death [5]. A typical HRCT feature in sarcoidosis is the presence of well-defined micronodules scattered along the broncho-vascular bundle, veins, fissures and pleura in a characteristic lymphatic distribution. Occasionally, "galaxy sign", a highly suggestive of pulmonary sarcoidosis (predominance of a mid-to-upper lung zones) may demonstrates conglomerate masses that are surrounded by a multitude of micronodules **(Figure 3)** [6].

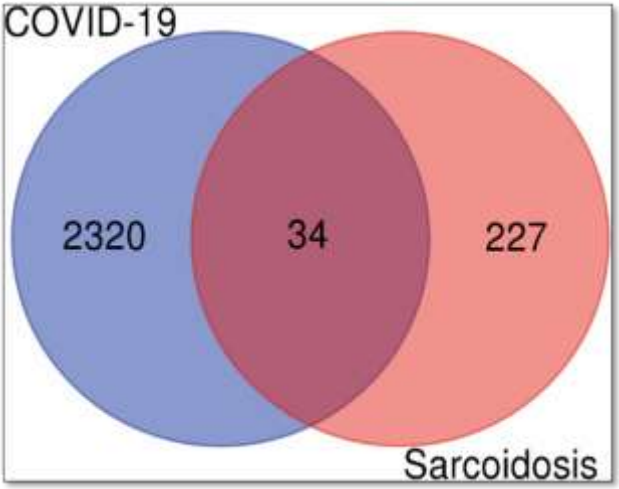

Figure 1. Demonstrating a Venn diagram of commonly differentially expressed upregulated genes. Common 34 upregulated genes were identified from 2320 upregulated genes of COVID-19 infection and 227 upregulated genes of sarcoidosis [3].

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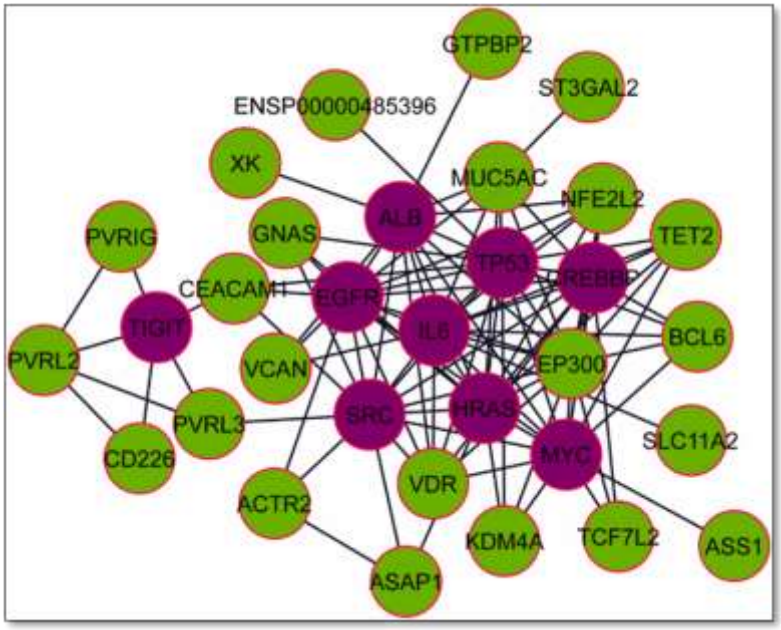

Figure 2. Demonstrating protein-protein interactions (PPIs) network for common upregulated genes from COVID-19 and sarcoidosis. The light green color nodes indicate common upregulated genes. Network consists of 32 nodes and 102 edges [3].

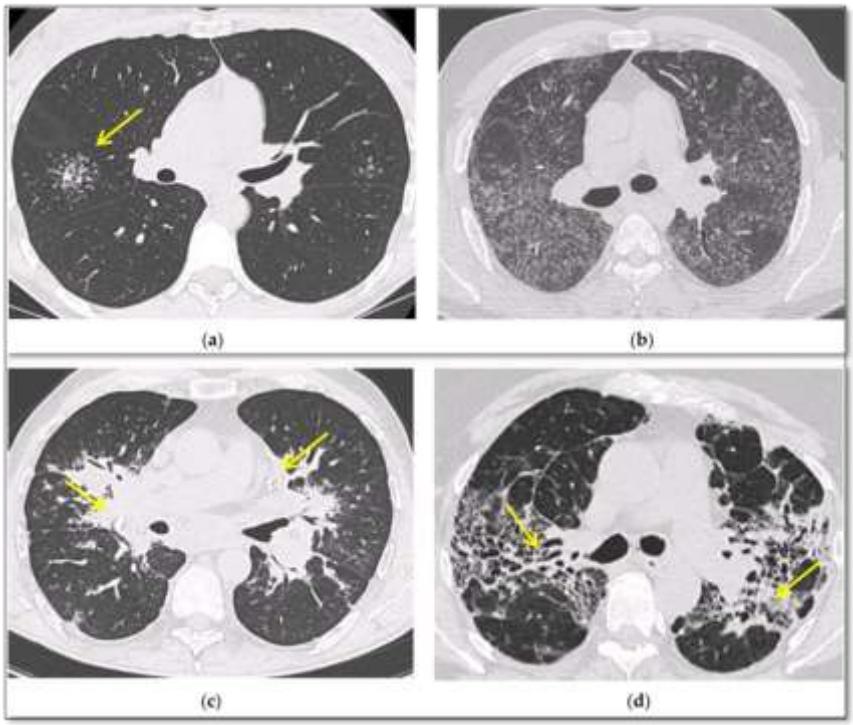

Figure 3: Demonstrating irregularly marginated nodule surrounded by multiple small nodules ("Galaxy sign", yellow narrow), this is typical of sarcoidosis (a); ground-glass-like increased attenuation resulting from diffuse micronodules randomly distributed ("Miliary sarcoidosis") (b); enlarged and partially calcified (yellow narrows) bilateral hilar lymph nodes (c); fibrotic sarcoidosis with cystic changes and traction bronchiectases (yellow narrows) predominantly in the perihilar region and upper lobes. Nodular abnormalities are minimal/absent, but the appearance and the location of the fibrosis are very suggestive of the diagnosis of sarcoidosis (d) [6].

Where VDR dominantly connected to 14 different kinds of drug, protein drug interaction network collected from DrugBank provides proper treatment. Vitamin D and some of its analogous compounds might play significant roles in modulating both COVID-19 and sarcoidosis conditions is indicated by this network **(Figure 4)** [3].

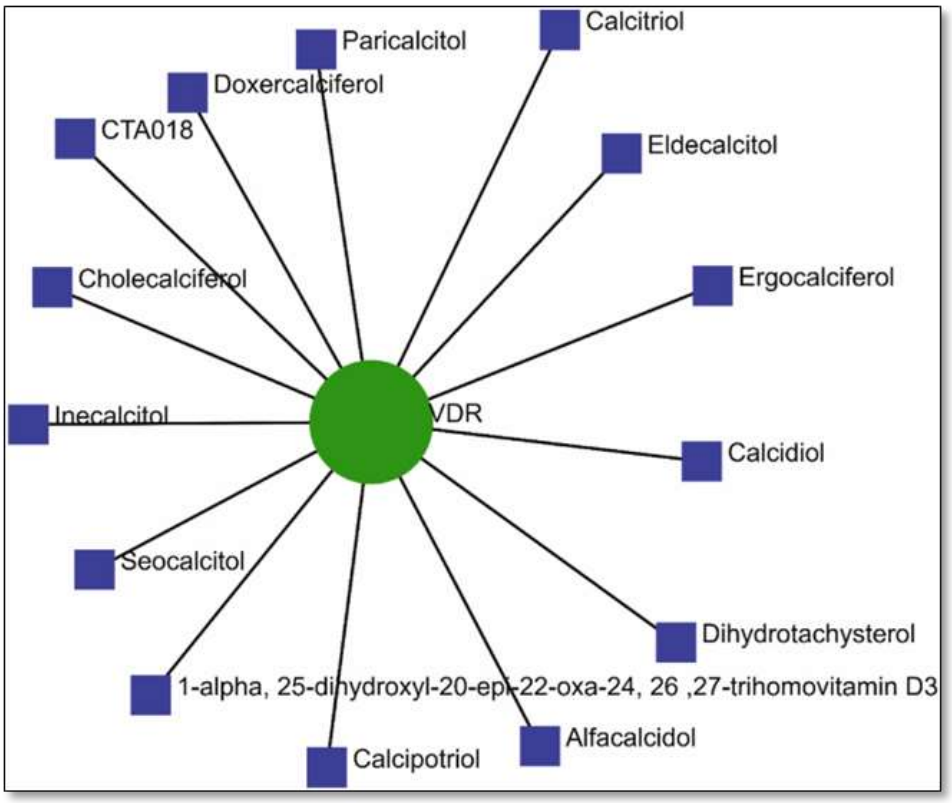

Figure 4. Demonstrating drugs protein interaction network [3].

Besides sarcoidosis of lungs, symptomatic and accidental extrapulmonary sarcoidosis is also found around the world **(Figures 5-7)** [7-9].

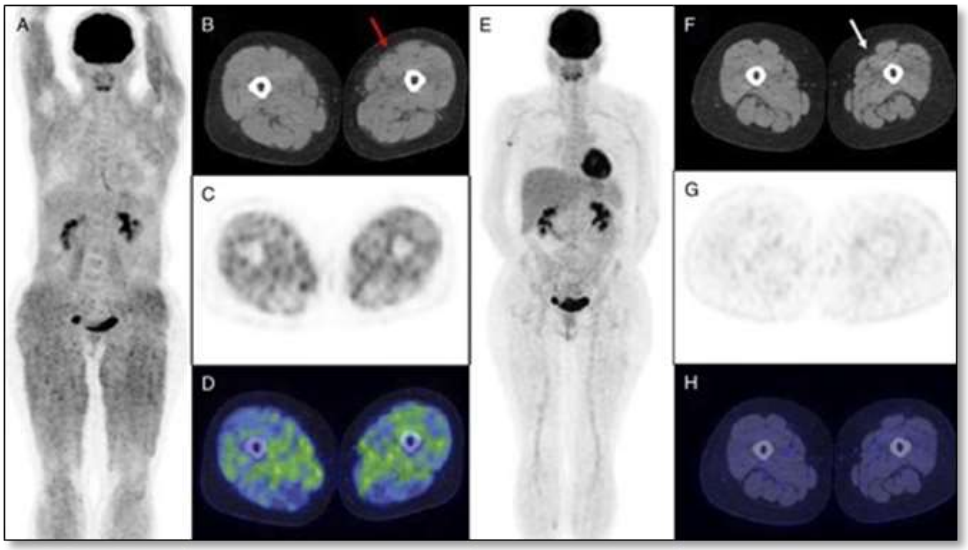

Figure 5. Demonstrating isolated muscular sarcoidosis, revealed by hypercalcemia and 18F-FDG PET/CT [7].

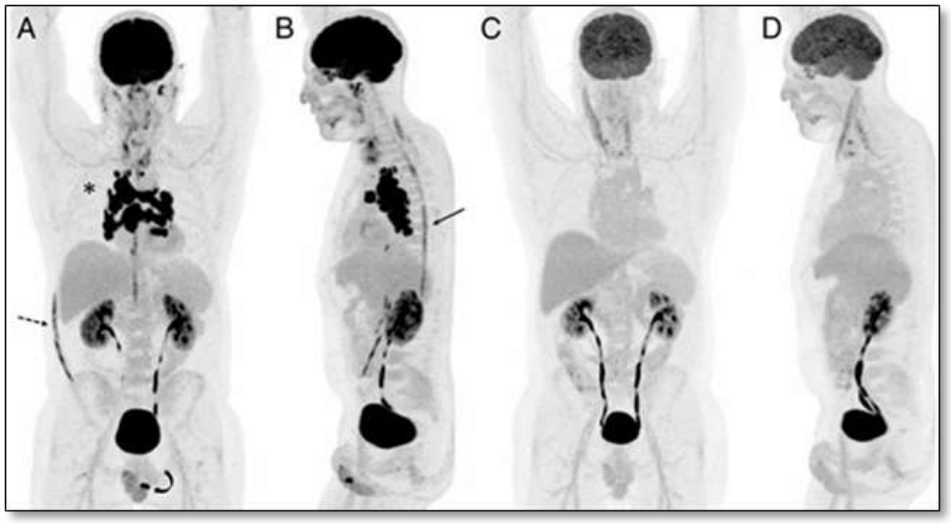

Figure 6. ^{18}F-FDG PET/MRI for Diagnosis and Treatment Efficacy Evaluation of Spinal Sarcoidosis [8].

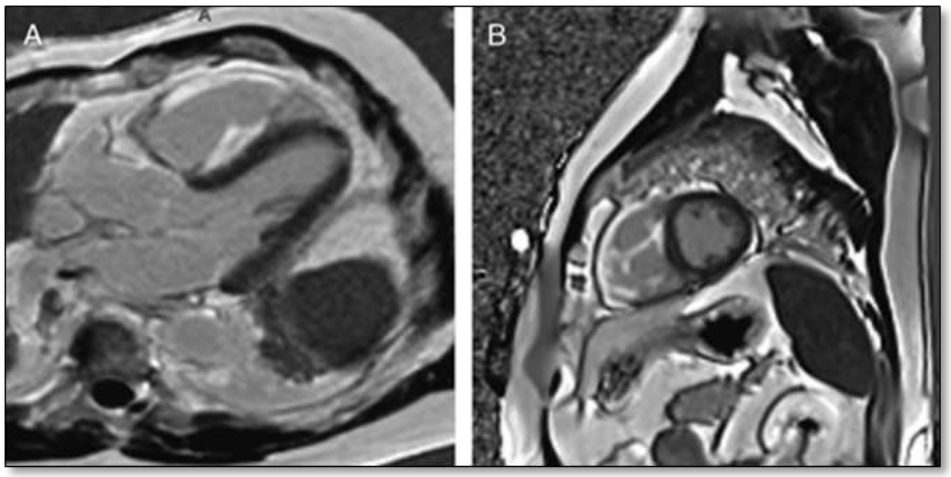

Figure 7. Demonstrating FDG PET of Isolated Right Ventricular Sarcoidosis [9].

In conclusion, hub gene identification might have significant roles in modulating sarcoidosis and COVID-19 infection. In the literature, cases with sarcoid-like granuloma have been reported very few. Sarcoid-like immune response to COVID-19 could be noncaseating granulomas due to short time from disease to develop granuloma.

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