# CHEST CT BODY COMPOSITION CHANGES AT 3 AND 6 MONTHS AFTER SEVERE COVID-19 PNEUMONIA

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## BACKGROUND

Critical illnesses are known to influence **body composition**, due to protein catabolism, prolonged immobilization, and strong inflammatory reactions.
COVID-19-induced body composition changes may play a role in some of the manifestations of **post-COVID-19 syndrome**. Data on body composition changes after COVID-19 are scarce.

## METHODS

All consecutive COVID-19 patients who underwent baseline (T0) CT scan (27/02/2020-15/05/2020) and two **follow-up CT** scans after 2-3 months (T1) and 6-7 months (T2) were enrolled. Follow-up CT scans were proposed to all COVID-19 survivors who had been hospitalized with respiratory failure or baseline CT disease extension ≥40%.
CT were **retrospectively analyzed** to collect: pectoral muscle area (PMA) and density (PMD); area of total, visceral, intermuscular adipose tissue (TAT, VAT, IMAT) at T6-T7, and liver-to-spleen ratio (L/S).
**Outcomes** were CT body composition changes (ΔT1-T0 and ΔT2-T0), while **putative determinants** were CRP curve integral and D-dimer peak during hospitalization, and length of hospital stay (LOS). Models were adjusted for age, sex, and baseline total adipose tissue area.

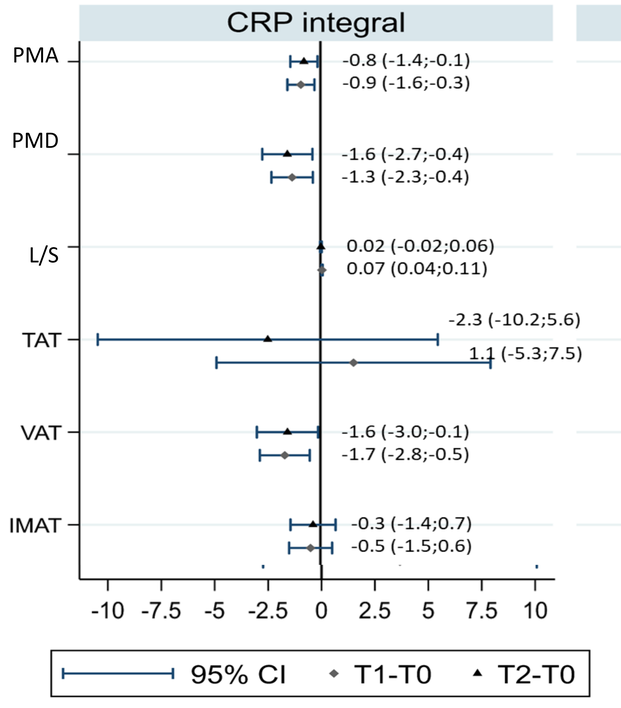
| | Mean (95%CI) | | |
|---|---|---|---|
| | **ΔT1-T0** | **ΔT2-T1** | **ΔT12-T0** |
| **PMA** | -0.8 (-1.4;-0.2) | -0.3 (-0.8;0.2) | -1.11 (-1.7;-0.5) |
| **PMD** | -0.2 (-1.1;0.8) | 3.1 (2.1;4.1) | 2.9 (1.8;4.1) |
| **L/S ratio** | 0.1 (0.1;0.2) | 0.04 (0.01;0.07) | 0.17 (0.13;0.20) |
| **TAT** | -1.7 (-7.9;4.6) | -1.5 (-7.2;4.3) | -3.1 (-10.8;4.5) |
| **IMAT** | -0.8 (-1.7;0.2) | -0.5 (-1.5;0.5) | -1.2 (-2.2;-0.2) |
| **VAT** | -2.2 (-3.4;-1.1) | -1.3 (-2.7;-0.0) | -3.6 (-4.9;-2.2) |

**Table 1**
Chest CT body composition parameters changes from baseline (T0) to 2-3 months (T1) and 6-7 months (T2) after COVID-19.

**Chest CT body composition parameters** at disease onset, and after 2-3 and 6-7 months were collected.
**Muscle and fat loss** after COVID-19 is faster in the first months, but slowly continues till 6-7 months.
Fat loss is more apparent in **visceral compartments**.
**Inflammatory burden** is associated with the degree of muscle and visceral/liver fat loss.

## RESULTS

- A total of **208 patients** were included in the study (mean age 65.6 ± 11 years, 65 (31.3%) females).
- A **decrease in mean PMA, visceral fat area, and steatosis** (increasing L/S ratio was registered, faster from T0 to T1, and slower from T1 to T2. **PMD increased** (i.e intramuscular fat decreased) only from T1 to T2. (Table 1)
- **Increasing CRP integral** was significantly associated with higher PMA reduction and lower PMD increase, higher steatosis and VAT decrease, but not with TAT and IMAT decrease (Figure).
- **Increasing LOS** showed similar but milder associations with body composition changes, while **D-dimer peak** was not associated.




## CONCLUSIONS

**Muscle and fat loss** evaluated by means of serial CT scans is faster in the first 2-3 months after COVID-19 diagnosis, but slowly **continues until 6-7 months after diagnosis**.
Fat loss is more apparent in **visceral compartments**, including VAT and liver steatosis.
The **inflammatory burden** evaluated by means of integral of the CRP curve built during the whole disease course is associated with the degree of muscle loss and visceral, liver and intramuscular fat loss, while COVID-19 related **coagulopathy** evaluated by means of highest D-dimer during disease course is not associated with body composition changes.
Since associations of LOS with body composition changes are milder, the effect of inflammation seems at least partially independent of the **prolongation of hospital stay**.
A **selection bias** cannot be excluded since only severe pneumonia survivors were included.
The next step will be to evaluate if body composition changes are related to **functional impairment** in post-COVID-19 patients. If that were the case, specific **rehabilitation programs** may be individualized based also on body composition changes.

## ADDITIONAL KEY INFORMATION

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A **video presentation** is available as Supplementary Material.

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