COVID-19 specific tissue and data collection from autopsies of deceased patients

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Summary

- The coronavirus disease 2019 (COVID-19) is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and has emerged as global pandemic.
- **Human biological samples of COVID-19-positive and deceased patients** are an invaluable resource for modern biomedical research and translational medicine. Hence, tissue and data samples from autopsies are essential for the analysis of COVID-19 as the infection leads to organ specific disease, which may become lethal.
- Heidelberg pathologists have therefore performed autopsies on COVID-19-positive cases and acquired preserved tissues and histopathological/clinical data related to these autopsies for research use.
- The DZIF Tissue Biobank aims to set up and extend **specialized tissue collectives available for COVID-19 based research projects**. Thus, COVID-19 specific tissue samples can be requested from the DZIF Tissue Biobank Heidelberg.

COVID-19 specific tissue collection at the DZIF Tissue Biobank Heidelberg

How?

- During two month (April and May 2020), a total of 13 patients who had died of COVID-19 after in-patient treatment at the Heidelberg University Hospital were autopsied in compliance with strict adherence to safety precautions and in accordance with a specific ethical vote authorized by the ethics commitee of the Medical Faculty of the University Heidelberg for this purpose.
- 10 of the 13 patients were male, 3 were female and the average age of all deceased was 74.6 years (Figure 1).
- Tissue samples from a wide variety of organs were taken and stored, both formalin-fixed and paraffin-embedded as well as cryo-preserved (Figure 2), at the DZIF Tissue Biobank in Heidelberg.

Who?

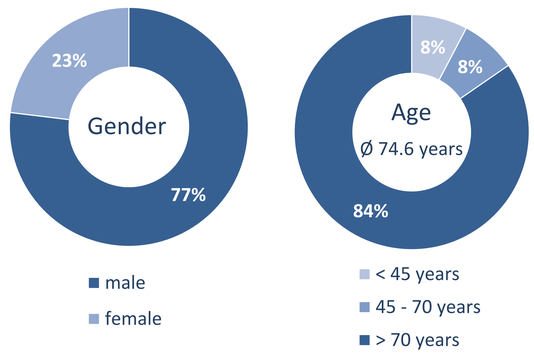

Figure 1: In this study, 10 of 13 patients were male. The average age of all deceased patients having major pre-existing diseases was 74.6 years (n=13).

What?

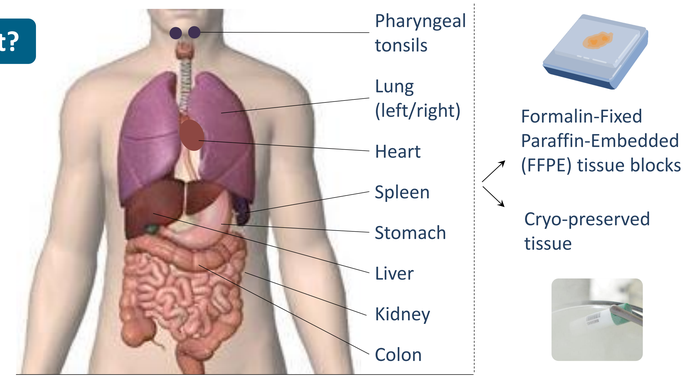

Figure 2: Tissue samples of various organs were taken. The tissue collection includes formalin-fixed paraffin-embedded (FFPE) as well as cryo-preserved tissue specimens at the DZIF site in Heidelberg[1].

Publication results

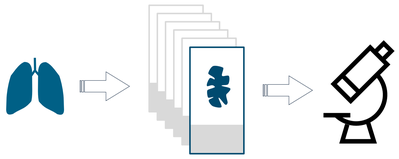

Figure 3: FFPE slides of lung tissue were stained using hematoxylin-eosin (H&E) as well as Acid Fuchsin Orange G (AFOG) and were microscopically evaluated.

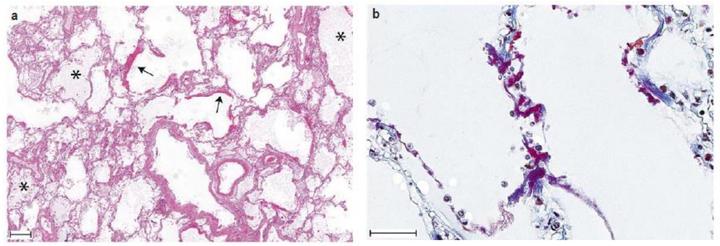

Figure 4: Lung tissue from a deceased patient (duration of illness, 7 days; no invasive ventilation): (a) patchy edema (*) and focal formation of alveolar hyaline membranes (arrows); H&E (b) Alveolar septum with fibrinoid microthrombus; AFOG. Bars (a) 200µm and (b) 50µm.

A Heidelberg research group (Kommoss & Schwab et al. 2020) used the COVID-19 specific tissue collective for examination of lung tissue. The tissue samples were analyzed (Figure 3) together with clinical data from the patients' medical records. They showed that microthrombosis of the fine pulmonary arteries cause damage to the alveoli and appears to be characteristic of these cases (Figure 4). The main results of the study are:

- Optically detectable pulmonary changes in severe COVID-19 show a characteristic sequence and distribution of damage.
- Alveolar capillary microthrombi can be found in all phases of the severe disease.
- The overall histomorphological aspect of lung damage indicates that alveolar capillary damage is a main cause of disease progression and development of acute respiratory distress syndrome (ARDS).
- Detectable histological changes in lungs of patients with COVID-19 explain oxygenation disturbance in early phase of the disease while having a normal compliance of the lung parenchyma.

Conclusion

Autopsies and the associated collection of tissue and data samples are of central importance for the systematic assessment of new diseases such as COVID-19 and form the basis for further mechanistic investigations. The specific collection of COVID-19 samples from autopsies of deceased patients will be further extended. Eventually, research outcomes resulting from this lead to improved patient treatment.

References

[1] DZIF Tissue Biobank

[2] Kommoss F.K.F, Schwab C., Tavernar L., Schreck J., Wagner W.L., Merle U., Jonigk D., Schirmacher P., Longerich T. (2020) The Pathology of severe COVID-19 related lung damage – mechanistic and therapeutic implications. Dtsch Arztebl Int 2020; 117: 500-6. DOI: 10.3238/arztebl.2020.0500.

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