

## CASE STUDY

## COURSE OF A SARS-CoV-2 PNEUMONIA IN A MIDDLE-AGED MALE PATIENT

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### ABSTRACT

The SARS-CoV-2 infection has recently been declared a pandemic by the WHO. Most fatalities occur in elderly people with comorbidities. However, SARS-CoV-2 pneumonias do also occur in younger patients with no comorbidities or risk factors at all. We report here on one of the "early" cases that occurred in Germany. A 57-year-old man was infected and developed pneumonia after a skiing vacation in Northern Italy. Other members of the travel group also fell ill, but only showed flu-like symptoms. Only a few if any infections originated from the affected person; at this point in time the infection situation in the region could still be grasped. Under supportive measures, the disease developed positively despite impressive radiological findings. The positive course is likely also due to the age of the person affected and the lack of any risk factors. The case does also exemplify that a good health condition does not necessarily protect from acquiring a moderately severe SARS-CoV-2 infection.

**KEY WORDS:** SARS-CoV-2, pneumonia, SARS, transmission, detection, liver injury, adrenocorticotrophic axis, prolactin

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### INTRODUCTION

In December 2019, a cluster of pneumonias of initially unknown cause occurred in the Chinese city of Wuhan [1, 2]. The sequencing and analysis of samples from the lower respiratory tract led to the discovery of a novel corona virus, which was initially named "2019 novel coronavirus" (2019-nCoV). Meanwhile, the name SARS-CoV-2 has become more common. The number 2 in the name stems from the fact that from November 2002, starting from Guangdong, China, there were also new types of pneumonia for which coronaviruses were the cause [3, 4]. As a result of the rapid spread of SARS-CoV-2 in the Hubei Province, the virus has now spread worldwide. In Europe, Northern Italy was the first to be hit and was hit the hardest until now [5].

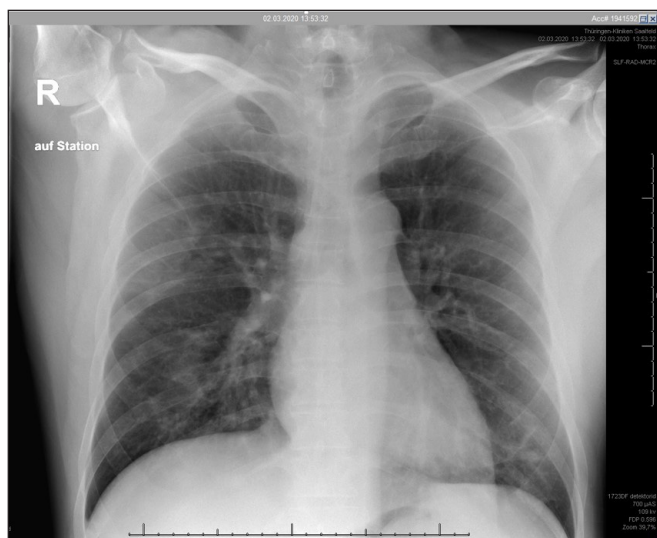
Given the speed of spread, the virus is considered highly infectious. However, the analysis of different epicenters worldwide also indicates a different virulence depending on location, especially in terms of infectivity and mortality. This does not only appear to be due to the frequency of tests, or the local age distribution and the performance of the local health systems. In general, RNA viruses, like coronaviruses, have a high mutation rate, although the rates are reported moderate compared to those in other RNA viruses [6]. In a recent genomic analysis of 103 SARS-CoV-2 genomes, Tang et al. [7] already hints at genetic variants, the two main types were classified as S- and L-type. The authors examined the extent of the molecular divergence between SARS-CoV-2 and other related coronaviruses and were able to demonstrate that two different strands of the virus have spread thus far – a so-called "L-type" and an

"S-type". Accordingly, the L-type is the more aggressive of the two: About 70 percent of those infected worldwide are affected by this type. This subtype probably developed from the less virulent S-type and subsequently mutated. The mutation may be responsible for the faster spread. L and S is the abbreviation for leucine and serine, the abbreviation was chosen due to variations in the corresponding codons.

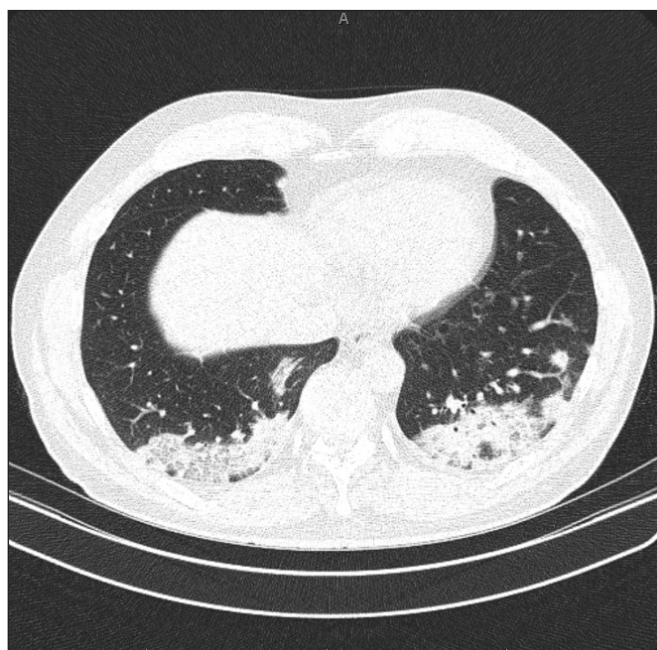
We report here on the well-documented case of a patient and the course of the disease who contracted viral pneumonia after a stay in Northern Italy and who despite extensive social contacts seems to have not or only hardly spread the virus.

### CASE DESCRIPTION

A 57-year-old male patient went on a skiing trip in the North Italian province of Trento from February 8<sup>th</sup> until February 15<sup>th</sup> 2020. At that time, this region had not yet been classified as a risk area by the Robert Koch Institute (The Robert Koch Institute is the central institution of the German government in the field of disease monitoring and prevention). In retrospective, the patient does not remember any contacts with persons who may have been symptomatically infected. On February 20<sup>th</sup>, 2020 the patient developed fever, arthralgia and dry cough in combination with a general feeling of illness. Rhinorrhea was never among the symptoms. The patient did not report a loss of taste or smell. Since there was no significant improvement after symptomatic measures, the general practitioner prescribed Amoxicillin 2 x 750 mg.

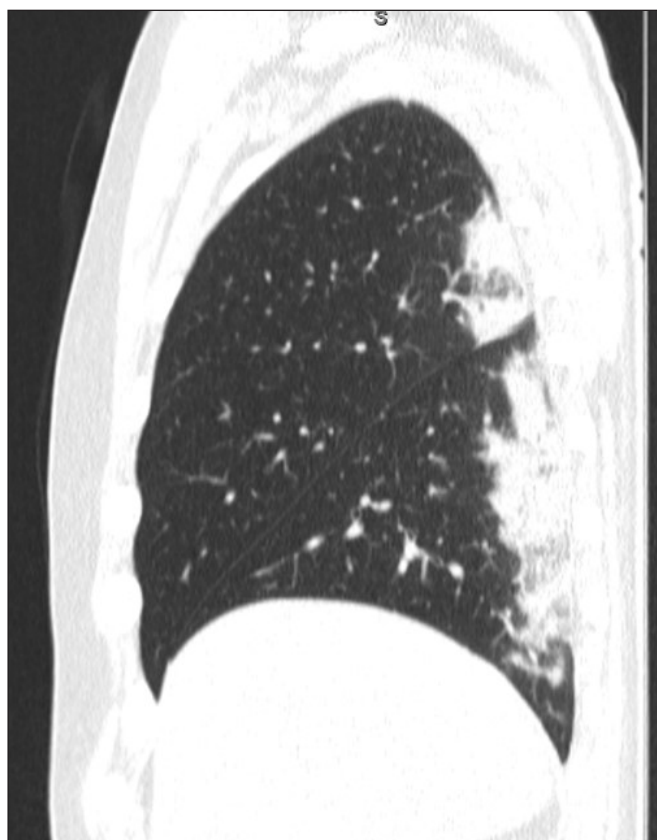


**Fig. 1.** The chest X-ray at admission shows right infrahilar airspace opacities and bipulmonally isolated small-spot densifications, which are most likely caused by small infiltrates. There are no major pleural effusions and no congestion.



**Fig. 2.** Computed tomography chest: progress of the bipulmonary infiltrations compared to the initial chest X-ray with an organizing pattern and peripheral predominant distribution. Some of these still impress as ground glass opacities but are now mostly consolidated and confluent with the main findings in the dorsal lower lobe portions on both sides. Smaller subpleural infiltrates can be detected on both sides up to the upper lobe. No melts and no evidence of empyema. Reactively enlarged mediastinal lymph nodes and individual intrapulmonary lymph nodes.

With a therapeutic effect still lacking, the patient presented himself on February 29<sup>th</sup>, 2020 in our clinic, where a swab for influenza and SARS-CoV-2 was conducted. The hospitalization then took place on March 3<sup>rd</sup>, 2020 with persistent fever and hypotensive circulatory dysreg-



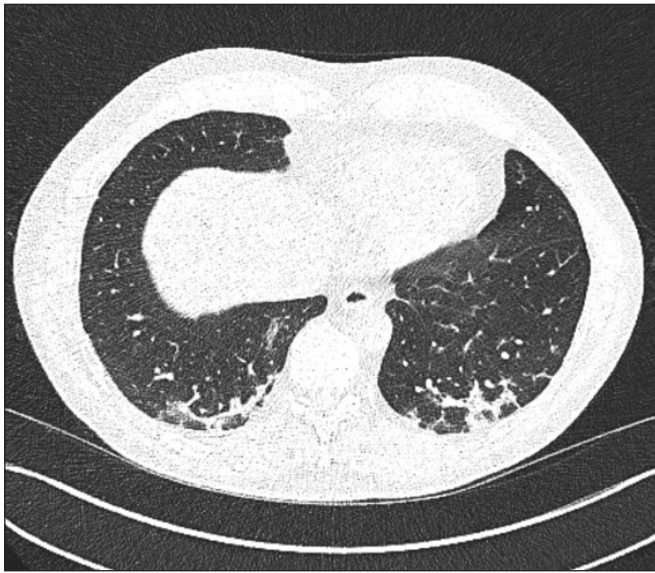
**Fig. 3.** CT thorax, sagittal reconstruction: note the dorsally predominant distribution of the infiltrations, ground glass opacities and consolidations.

ulation. In the evening, the laboratory notified us that the patient was positive for the SARS-CoV-2 virus; there was no influenza infection.

During the physical examination, the 57-year-old patient presented himself in a good nutritional condition (BMI 26 kg/m<sup>2</sup>) and physical fitness along with a currently significantly impaired general condition. The body temperature was 38.3°C. The patient showed unproductive cough and fatigue. The pulmonary auscultation revealed a crackling sound, basal on both sides, stronger on the right than on the left. Other than that, the physical examination showed no abnormalities. There were no chronic diseases, no regular medication, no nicotine or alcohol abuse. No family history for diabetes mellitus or pneumological diseases could be determined either. There were loose stools for 2 days while taking the antibiotics.

#### LABORATORY VALUES AT ADMISSION

Pathological: ASAT 2.75 µcat / l (0.17-0.85); ALAT 2.55 µcat / l (0.17-0.83); Gamma-GT 2.16 µcat / l (0.17-1.19); CrP 91.4 mg / l (<5); erythrocyte sedimentation rate 82/90 mm / h. In the small blood count with an otherwise normal status and normal leukocyte count, the lymphocytes were found to be slightly reduced in absolute terms at 0.4 Gpt / l (1.1-3). The following values were within normal range: sodium, potassium, creatinine, CK, CK-MB, troponin-T,



**Fig. 4.** The computed tomography (CT) of the chest from March 26th, 2020 shows a significant reduction of the bipulmonary infiltrations compared to March 6th 2020.

procalcitonin, coagulation, TSH, fT3, fT4. The serologies for hepatitis A, B, C and E were negative. The HbA1c is 6% (4.8-6%). The stress response to the event is adequate: ACTH 61.3 ng/l (4.7-48.8), cortisol 28.7 µg/dl (4.82-19.5), prolactin 19.0 µg/l [4-15].

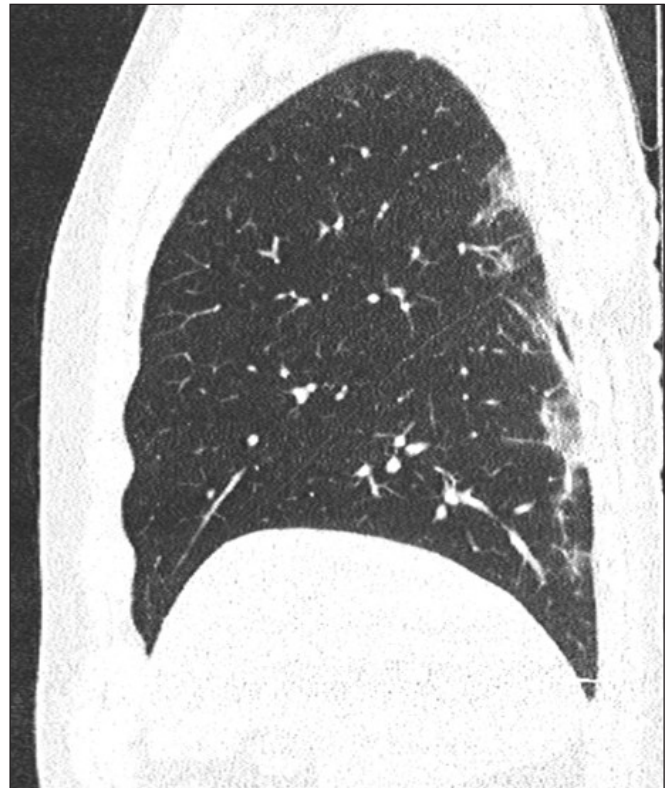
The SARS-CoV-2 infection was diagnosed using oropharyngeal smears using a multiplex real-time PCR with three specific gene probes (N, E and RdRp). The detection limit is 100 RNA copies/reaction.

The chest X-ray on March 2nd, 2020 showed right infrahilar airspace opacities and bipulmonally isolated small-spot densifications, which are most likely caused by small infiltrates. There are no major pleural effusions and no congestion (Fig. 1).

The computed tomography (CT) of the chest from March 6<sup>th</sup>, 2020 showed a clear progress of the bipulmonary infiltrations compared to the chest X-ray with an organizing pattern and peripheral predominant distribution. Some of these still impress as ground glass opacities but are now mostly consolidated and confluent with main findings in the dorsal lower lobe portions on both sides. Smaller subpleural infiltrates can be detected on both sides up to the upper lobe. There were no melts and no evidence of an empyema. The picture revealed reactively enlarged mediastinal lymph nodes and individual intrapulmonary lymph nodes (Fig. 2-3).

#### COURSE 1

The patient was isolated, infused and treated with inhalations. We did not prescribe antibiotics. There was no fever from March 7<sup>th</sup>, 2020 on. Ventilation therapy was never necessary. The patient was largely cough-free in the further course, CRP had normalized from March 13<sup>th</sup>, 2020. The serum transaminases were sinking. The patient was discharged from our hospital after two negative swabs were made according to the



**Fig. 5.** The computed tomography (CT) of the chest from March 26th, 2020 shows a significant reduction of the bipulmonary infiltrations compared to March 6th 2020.

recommendations of the Robert Koch Institute (March 15th and 16th, 2020) in a good clinical condition.

The patient lives in a small German town with approximately 13,000 inhabitants. The local public health department identified 178 contacts. In a first test series, all contact persons for the SARS-CoV-2 virus were tested and there were initially 2 positive results. Both affected individuals belonged to the travel group and had already shown mild flu symptoms during their stay in Italy. Other people from this area who later contracted the virus had also been in this region in Italy.

#### COURSE 2

The patient was reinvestigated in March 26<sup>th</sup>, 2020. He still reports a slight shortness of breath during exercise, otherwise there is well-being. The serum transaminases had normalized. The CT of the thorax revealed a significant improvement in terms of a reduction of the infiltrations compared to the state in March 6<sup>th</sup>, 2020 (Fig. 4-5).

#### DISCUSSION

The case described here was the first to occur in the German Federal State of Thuringia. Since the epidemic was not spread in the region, it can be demonstrated that despite abundant social contacts, cases seem to be possible in which the SARS-CoV-2 virus hardly spreads. The



“contact persons” who were tested positive were likely to have already been infected in Italy. Due to the now known dynamic conversion of the reverse-transcription polymerase chain reaction (rt-PCR) according to Ai et al. [8] a re-test of the contact persons is actually desirable after a few days. However, it should be noted that there were no new (clinical) cases of SARS-CoV-2 in connection with this patient in the small town in the following days.

On March 1st, 2020 the number of infected persons in the whole of Germany was 117, the second case in Thuringia was reported on March 8th, 2020. At a spatial distance of 86.5 km, there is no relationship to the case described here.

There is no doubt in the diagnosis of SARS-CoV-2 infection. There were several positive smears of the virus with different swabs. The patient’s viral pneumonia also shows the typical picture of a SARS-CoV-2 infection. In a recently published imaging study by Ai et al. [8] a sensitivity of 97% for the SARS-CoV-2 virus was demonstrated in 1014 patients who had chest CTs performed.

In the overview and review, it can be stated that the patient did not spread the infection, or at most only to a very small extent; even his own family was tested negative. The factors as to why some individuals can infect large numbers of other people (“superspreaders”) include diverse and close social contacts [9], spatial confinement, especially in health facilities [10–12], a high concentration of the infectious agent [13], as well as an increased virulence of the virus [14, 15]. “Atypical” disease symptoms, which may be the result of a co-infection with other microorganisms, were also discussed [16]. The phenomenon of “super-spreading” was also observed during the SARS outbreaks in 2002–2003: not all patients who harbored the virus were equally contagious. The majority of those affected had very little infectivity [17].

In the case described, the close social contacts would have favored superspreading. However, no results are yet available on the viral load. Whether a virus variant with lower virulence was present remains purely speculative. According to the results of Tang et al. [7] there are already mutations in the SARS-CoV-2 (see introduction). Whether and to what extent there are cases in which infected people with only minor symptoms of the disease and therefore a lack of diagnosis do not pass the infection as well remains speculative.

We regard the elevated transaminases in terms of an accompanying hepatic reaction in SARS-CoV-2 infection. Huang et al. [2] also reported increased ASAT levels in 37% of their patients, for example. Previous serum transaminase levels requested by the family physician in the case described here were always within the normal range. The short application of amoxicillin and the relatively long persistence of elevated liver values makes a drug-induced liver damage very unlikely. Interestingly, liver injury has also been previously reported in the first SARS-CoV outbreak, as well as in the Middle East Respiratory Syndrome (MERS) –CoV outbreak [18].

The clinical picture of SARS-CoV-2 infection is highly variable. It ranges from asymptomatic cases [19], which, however, do not only provide casuistic indications that the

infection can already be transmitted at an asymptomatic stage, but that an infectivity could also persist after clinical healing. The other extreme variant is death, in Italy the average age for these tragic events was 81 years and more than 2/3 of those affected were comorbid (diabetes, cardiovascular diseases, tumor diseases, history of nicotine abuse) [5]. The patient, whose case is described here, had the ideal conditions for a positive course: in addition to age, there was no comorbidity and no nicotine consumption in the past. However, this case does also exemplify that a good health condition does not necessarily protect from acquiring a moderately severe SARS-CoV-2 infection.

## CONCLUSION

The case described occurred at a time when the SARS-CoV-2 infection was still rare in the region and the infection and spreading routes could still be understood relatively well. It is interesting that the patient was seriously ill himself, but did not spread the infection, or at least only to a small extent. In general, RNA viruses have a high mutation rate [6]. Knowledge of the infection is currently growing rapidly, and it is to be expected that the implementation of clinical information when sequencing the genetic material can also lead to interesting insights into the different properties and their causes in the various mutants to be assumed.

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**Conflict of interest**

*Authors declare no conflict of interest.*

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