

Coronavirus Disease 2019 (COVID-19): A Perspective from China Zu ZY, Jiang MD, Xu PP, Chen W, Ni QQ, Lu GM, Zhang LJ. Radiology. 2020 Feb 21.

COVID 19

Radiologische Befundung

Update 26.03.2020

Prof. Dr. med. Marika Ganten

Konsensus AG Thoraxbildgebung der DRG

Berlin, 20.03.2020

1. Primärscreening von SARS Cov-2 : PCR
2. Bei negativem PCR Test und Verdacht serielle PCR Tests
3. **Low dose CT** Zeichen sind nicht spezifisch
doch China zeigt, native LDCT kann die Diagnose stellen,
wenn:
 1. passende klinische Symptome
 2. negativer PCR Test
 3. Exposition
 4. klinische KonsequenzBestätigung: serielle PCR

Konsensus AG Thoraxbildgebung der DRG

Berlin, 20.03.2020

4. negative LDCT schließt COVID-19 nicht aus. NPP 83%

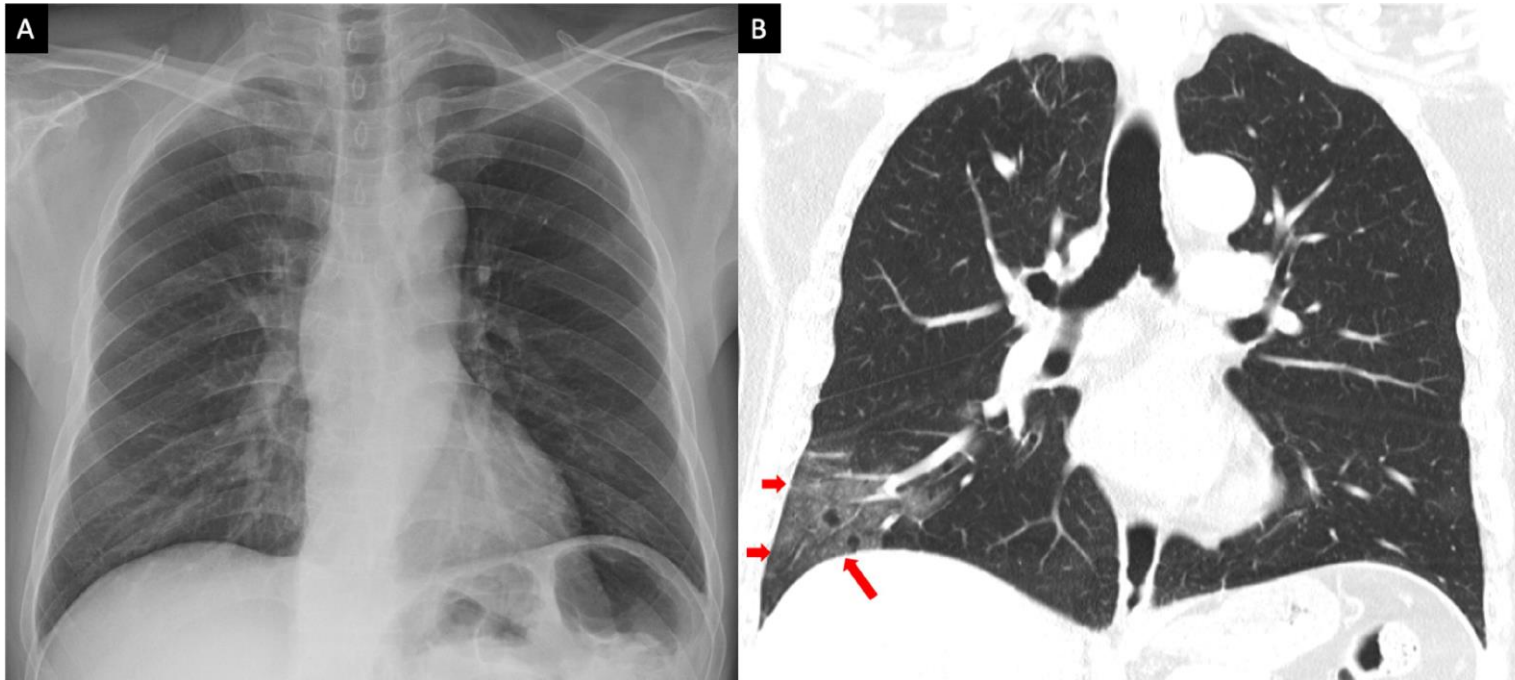
5. natives LDCT oder Röntgen Thorax:

Staging und Verlaufskontrolle

6. Radiologe soll typische LDCT Befunde von COVID-19 kennen,
Zufallsbefund COVID 19 zu stellen (z.B. ? LAE)

Untersuchungstechnik

Native Low Dose Dünnschicht-CT



RX Thorax ist ungeeignet zur frühen Detektion des Milchglasinfiltrates

Typische Muster

- Milchglastrübungen (Ground Glass Opacities – GGO)
- Bilateraler Befall (initial ggf. einseitige Milchglastrübungen rundlich)
- Reverse Halo sign
- crazy-paving-Muster
- Konsolidierungen



Hier: Periphere GGO bds.

Song, F., et al. Emerging Coronavirus 2019-nCoV Pneumonia. Radiology, 200274 (2020)

Typische Befunde

Crazy Paving “verrücktes Kopfsteinpflaster”

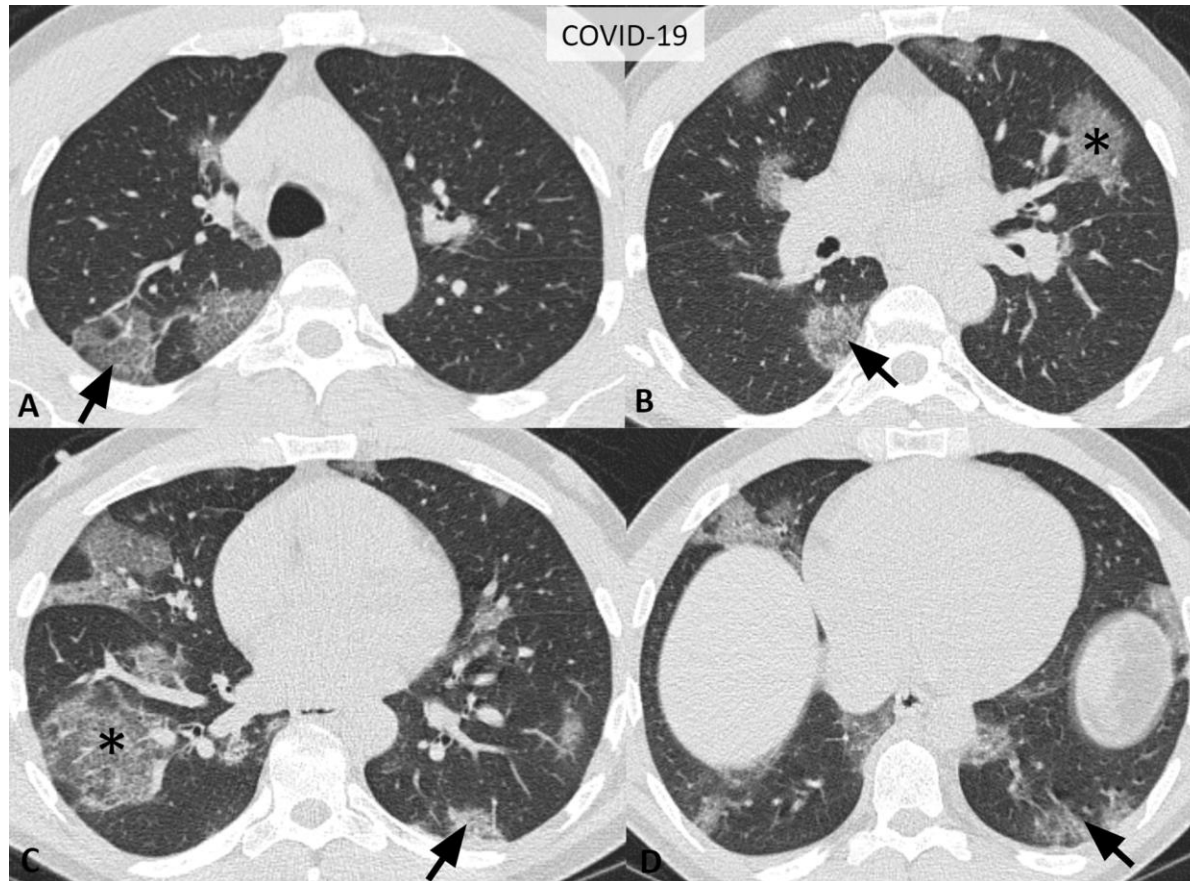


Septale
Verdickungen,
scharfe Ränder von
Milchglas

confirmed Coronavirus Disease Crazy paving pattern. A 69-old-year woman presenting with fever, GGO with typical crazy paving pattern (arrow).

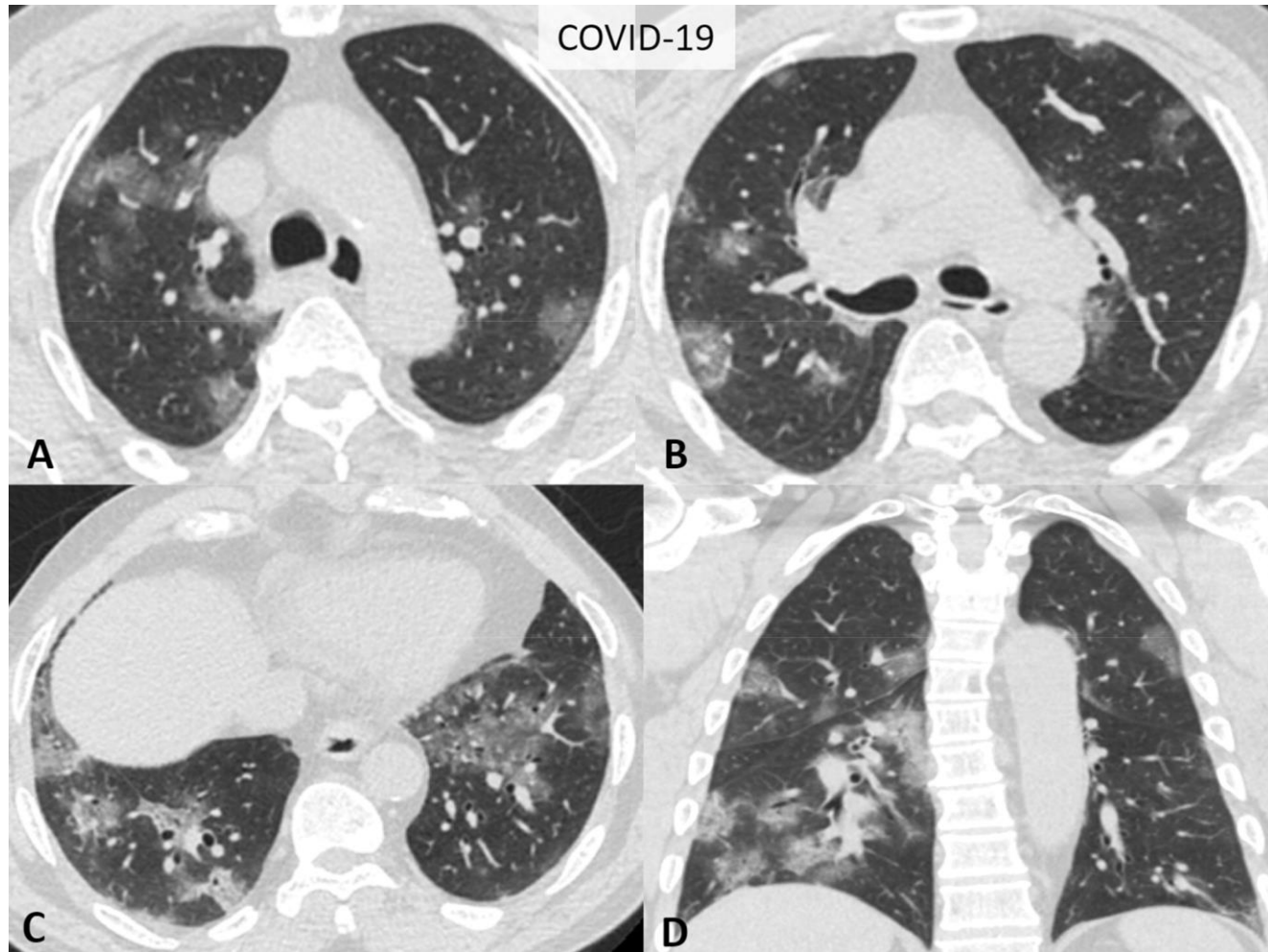
Typische Befunde

52-year-old man with a positive RT-PCR (A-D) show bilateral, multifocal rounded (asterisks) and peripheral GGO (arrows) with superimposed interlobular septal thickening and visible intralobular lines (“crazy-paving”).



Typische Befunde

77-year-old man with a positive RT-PCR show bilateral, multifocal rounded and peripheral GGO.

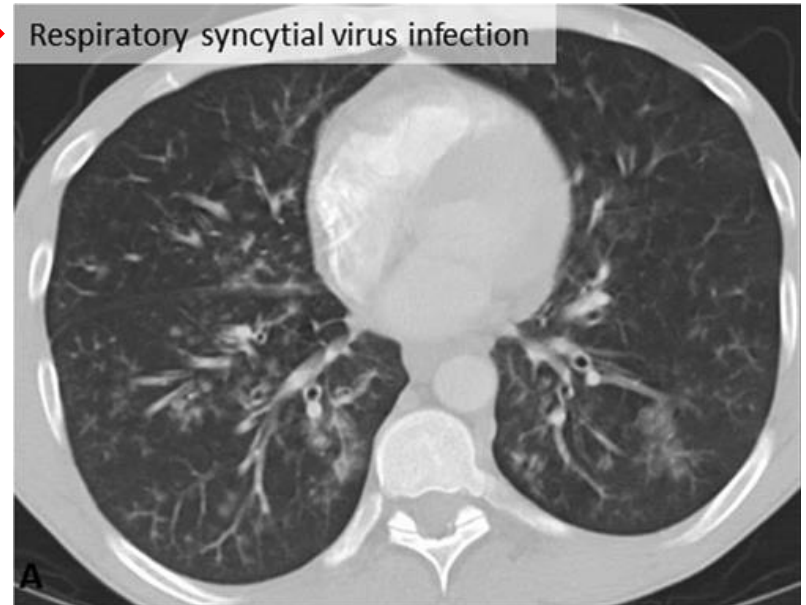


Simpson S. et al Radiological Society of North America Expert Consensus Statement on Reporting Chest CT Findings Related to COVID-19. Endorsed by the Society of Thoracic Radiology, the American College of Radiology, and RSNA. Radiology

Un-Typische Muster

NICHT Typisch:

- Lymphadenopathie
- Pleural effusion
- Tree-in-bud opacities (siehe Bild)
- Centrilobular distribution (siehe Bild)
- Cavitation



DD Muster

CT findings for COVID-19 vs. non-COVID-19 pneumonia		
	Non-COVID-19	COVID-19
Ground-glass opacity	68%	91%
Peripheral distribution	57%	80%
Vascular thickening	22%	59%
Fine reticular opacity	22%	56%
Reverse halo sign	1%	5%

The differences were statistically significant ($p < 0.001$).

Clinical Features and Chest CT Manifestations of Coronavirus Disease 2019 (COVID-19) in a Single-Center Study in Shanghai, China

Zenghui Cheng¹, Yong Lu¹, Qiqi Cao¹, Le Qin¹ ... Show all

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Citation: American Journal of Roentgenology: 1-6. 10.2214/AJR.20.22959

TABLE 3: Comparison of Imaging Features on Chest CT Images of Patients With Coronavirus Disease 2019 (COVID-19) and Patients With Non-COVID-19 Pneumonia

Imaging Feature	Patients With COVID-19 (<i>n</i> = 11)	Patients With Non-COVID-19 Pneumonia (<i>n</i> = 22)	<i>p</i>
Pattern of opacities			
GGO	11 (100.0)	20 (90.9)	0.54
Mixed GGO	7 (63.6)	16 (72.7)	0.70
Consolidation	6 (54.5)	17 (77.3)	0.24
Subsegmental	6 (54.5)	14 (63.6)	
Segmental	0 (0.0)	3 (13.6)	0.53
Air bronchogram	8 (72.7)	6 (27.3)	0.02 ^a
Centrilobular nodules	3 (27.3)	17 (77.3)	0.00 ^a
Tree-in-bud sign	1 (9.1)	6 (27.3)	0.38
Reticular pattern	9 (81.8)	5 (22.7)	0.00 ^a
Subpleural linear opacity	2 (18.2)	6 (27.3)	0.69
Bronchial dilatation	3 (27.3)	3 (13.6)	0.38
Cystic change	1 (9.1)	0 (0.00)	0.33
No. of affected lobes, median (IQR)	5 (4–5)	3.5 (2–4)	0.00 ^a
No. of affected segments, median (IQR)	15 (11–17)	9 (2–11)	0.00 ^a
Right lower lobe (≥ 4 segments affected)	8 (72.7)	8 (36.4)	0.07
Left lower lobe (≥ 3 segments affected)	7 (63.6)	11 (50.0)	0.71
Primary distribution of opacities			
Central	0 (0.0)	15 (68.2)	
Peripheral	11 (100.0)	7 (31.8)	0.00 ^a
Lymphadenopathy	0 (0.0)	3 (13.6)	0.53
Pleural effusion	0 (0.0)	5 (22.7)	0.14

Note—Except where otherwise indicated, data are number (%) of patients. GGO = ground-glass opacity, IQR = interquartile range.

^aStatistically significant difference.

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Typischer Verlauf Bild

0-2d nach Symptombeginn:

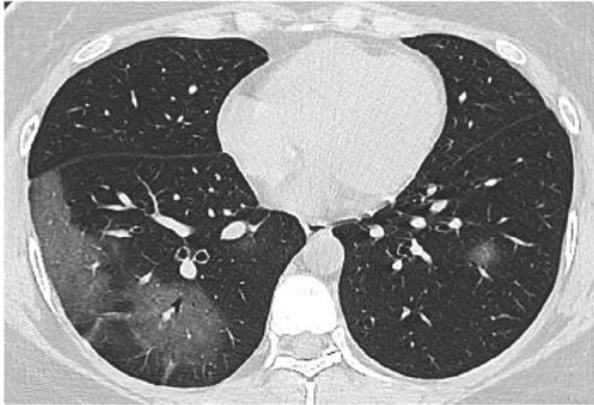
50% der COVID-19 Kranken haben normales CT

Erste Befunde im CT sind periphere multifokale runde GGO bei 50-70%, ggf reversed Halo sign

9-13 d Höhepunkt der Lungenmanifestation
Konsolidierung ggf. Crazy Paving

Langsame Infiltratauflösung subpleurale Bänder
ca 1 Monat

Typischer Verlauf Bild

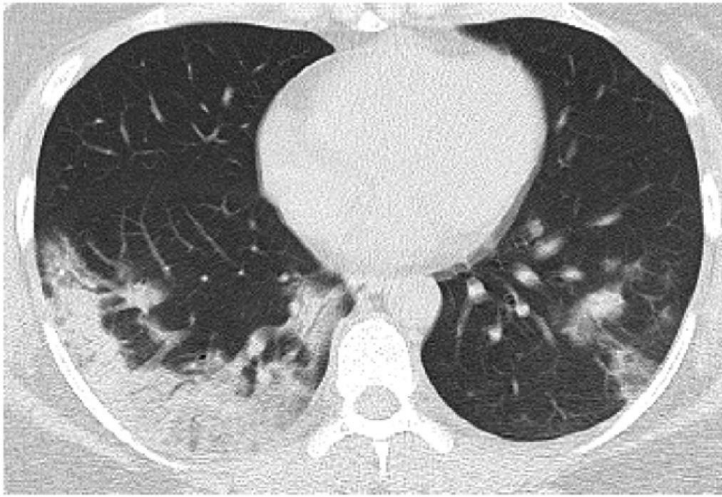


35-year-old woman with COVID-19 pneumonia. (a) Scan obtained on illness **days 1** showed multiple **pure ground-glass opacity (GGO)** mainly in right lower lobe.



Scan obtained on illness **days 5** showed increased extent of **GGO** and **early consolidation**.

Typischer Verlauf Bild

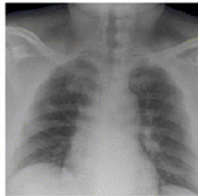

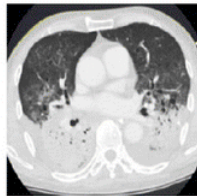


Scan obtained on illness **days 11** showed **multiple consolidation** with almost the same extent



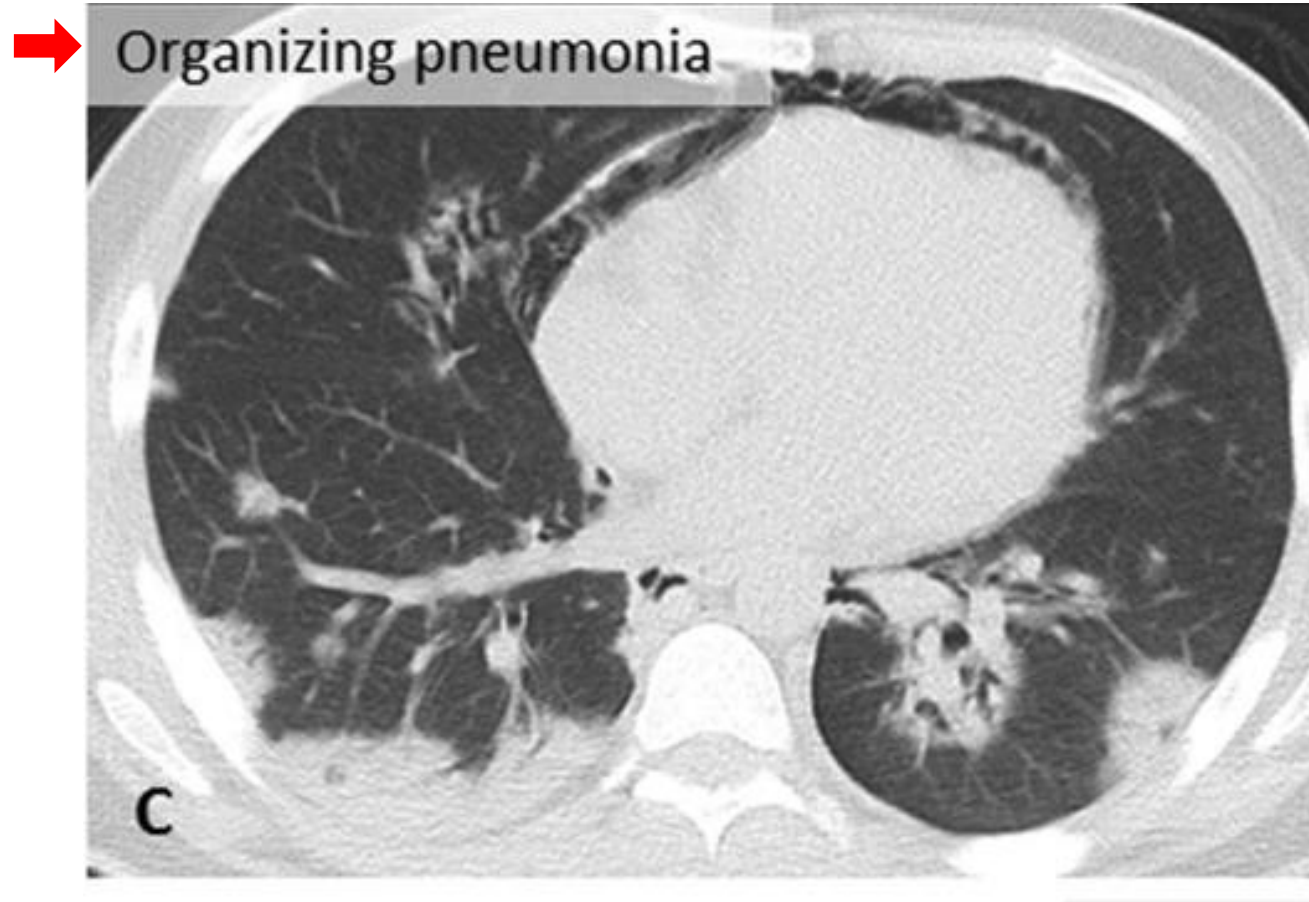
Scan obtained on illness **days 15** showed a mixed pattern with a slightly smaller extent, and the perilobular **consolidation**. The patient was discharged on illness days 17

Typischer Verlauf Klinik und Bild

							
FIRST WEEK				SECOND WEEK			
WARD Illness day 4	WARD Illness day 5	WARD Illness day 6	WARD Illness day 7	WARD/ICU Illness day 8	ICU Illness day 9	ICU Illness day 10	ICU Illness day 11
Initial important viral shedding		Decrease of the viral shedding sometimes associated with transient respiratory deterioration		Respiratory failure, increase of the viral shedding and viremia or Decrease of the viral shedding, and superinfections			Duration of viral excretion unknown
NO		Consider oxygen support	FNC	FNC followed by MV	MV		MV

Achtung, nach meist 7d leichtem Verlauf ändert sich die Immunantwort und es kann relativ unvermittelt zur respiratorischen Dekompensation kommen

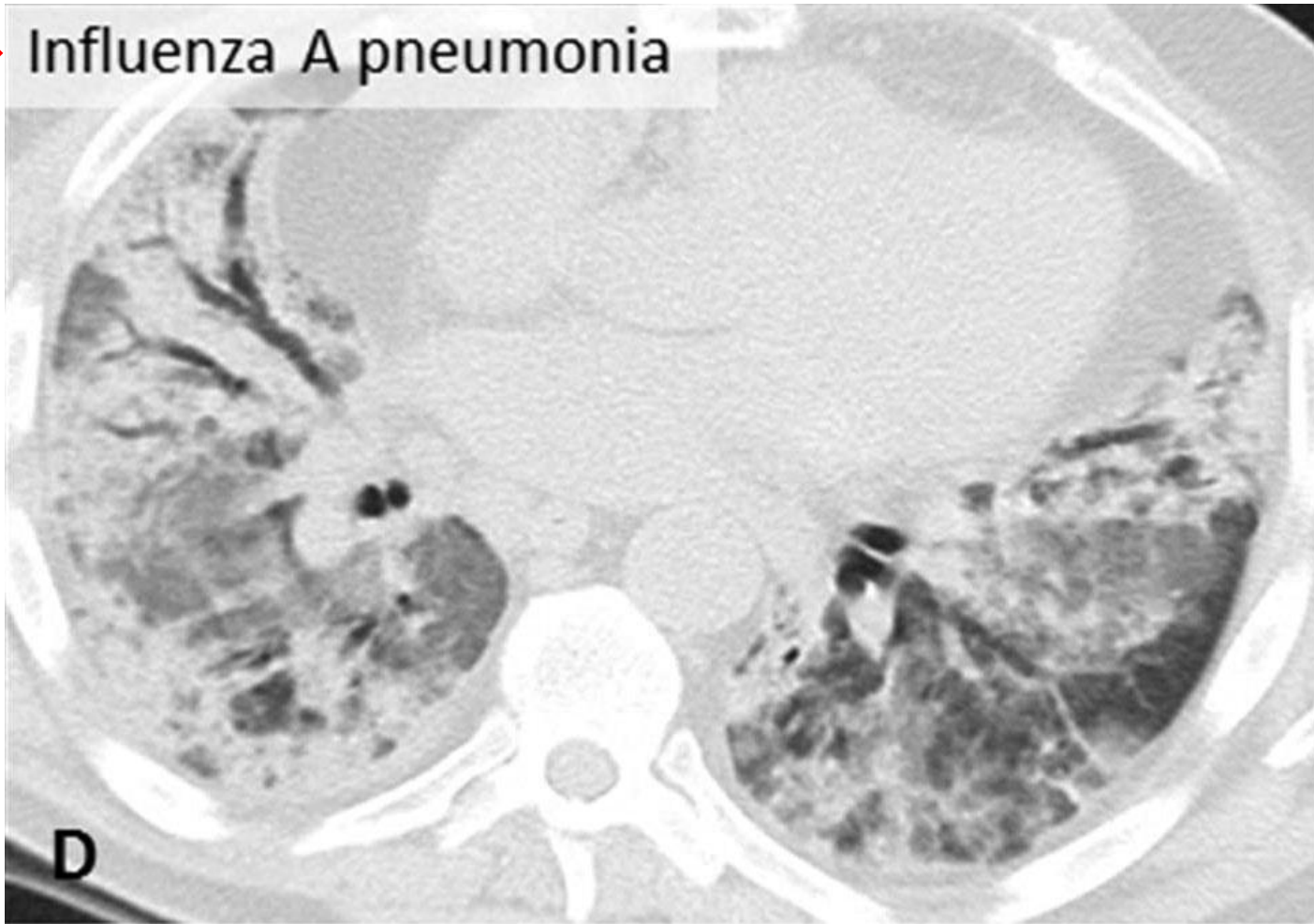
Differentialdiagnosen



Differentialdiagnosen



Influenza A pneumonia



Differentialdiagnosen



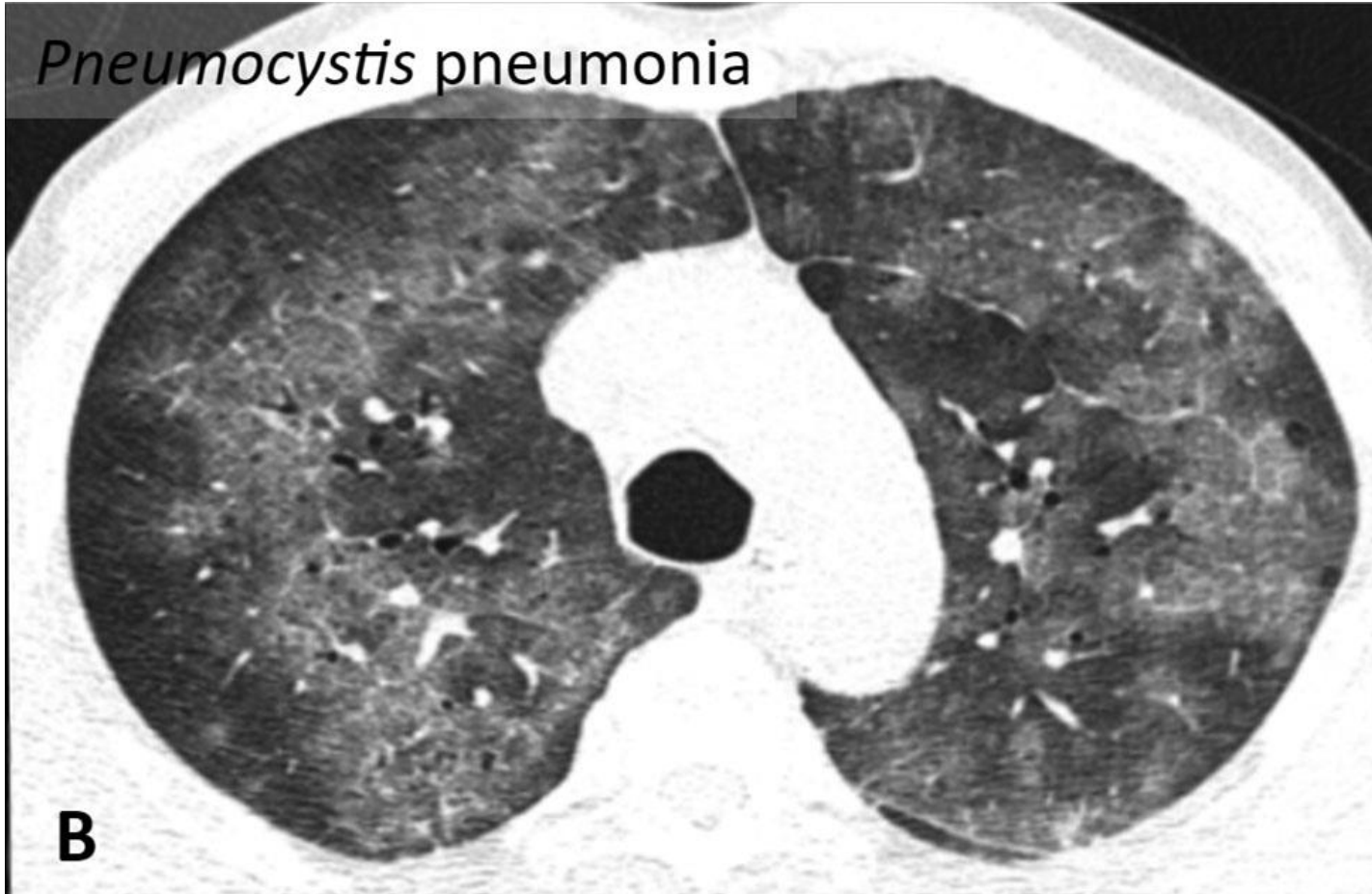
Drug toxicity



Differentialdiagnosen



Pneumocystis pneumonia



Diskussion ob CT zum Screening geeignet sein könnte oder zum Ausschluss einer Erkrankung entsteht auf dem Boden chinesischer Daten:

*'1014 patients, the **sensitivity**, specificity, accuracy of chest CT in indicating COVID19 infection were **97%** (580/601), 25% (105/413) and 68% (685/1014), respectively. The positive predictive value and **negative predictive value** were 65% (580/888) and **83% (105/126)**, respectively'*

Correlation of Chest CT and RT-PCR Testing in Coronavirus Disease 2019 (COVID-19) in China: A Report of 1014 Cases

Tao Ai*, Zhenlu Yang*, Hongyan Hou, Chenao Zhan, Chong Chen, Wenzhi Lv, Qian Tao ... Show all Authors

* Tao Ai and Zhenlu Yang contributed equally to this work.

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Beispiel: 2-fach negative PCR Tests bei positivem CT

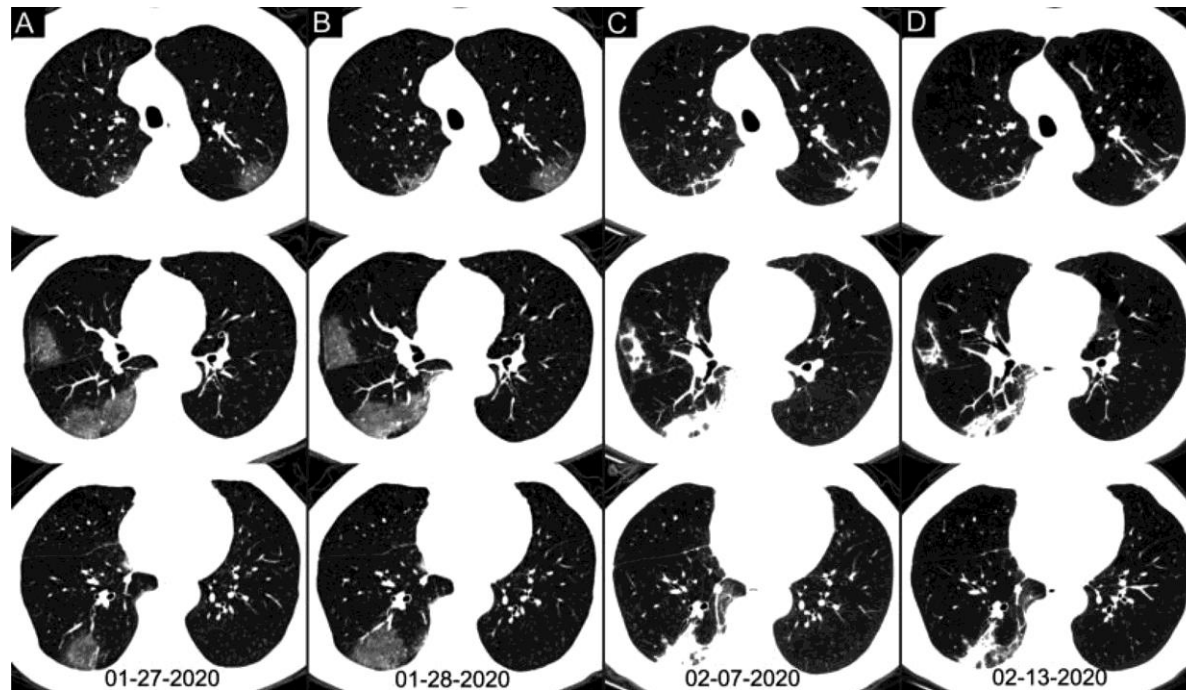


Figure 5: **Chest CT images of a 62-year-old man with fever for 2 weeks, and dyspnea for 1 day.** Negative results of RT-PCR assay for the SARS-CoV-2 using a swab samples were obtained on February 3 and 11, 2020, respectively. (column A) Chest CT with multiple axial images shows multiple ground-glass opacities in the bilateral lungs. (column B) Chest CT with multiple axial images shows enlarged multiple ground-glass opacities. (column C) Chest CT with multiple axial images shows the progression of the disease from ground-glass opacities to multifocal organizing consolidation. (D column) chest CT with multiple axial images shows partial absorption of the organizing consolidation.

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Befundungsempfehlung qualitativ

Klassifizierung	CT Muster	Text
Typisches Bild	Peripheres bilaterales Milchglas mit/ohne Konsolidierung und septalen verdickungen (crazy paving)	Bildbefund passend zu COVID 19 Pneumonie DD andere Pneumonie (Virus, Drogenmissbrauch)
Indeterminiertes Bild	Keine typischen Befunde und Diffuses Milchglas, mit/ohne Konsolidierung atypisch verteilt nicht rund Oder wenige nicht runde Milchglas	Bildbefund kann bei Covid 19 Pneumonie vorkommen aber relativ unspezifisch, daher auch andere Pneumonien in Betracht ziehen
Atypisches Bild	Keine typischen oder indeterminierten Befunde und Isolierte Konsolidierung, kleine Knoten, Kavernen, interlobulare verdickungen und Pleuraerguss	Bildbefund atypisch für COVID 19 Pneumonie, andere Ursache in Betracht ziehen
Negativ für Pneumonie	Keine Muster suggestiv für Pneumonie	Kein Hinweis auf COVID-19 Pneumonie im CT Bildbefund

Befundungsempfehlung quantitativ

- Etablierte quantitative Scores recht aufwendig in der Routine [1]
- Eine quantitative Einschätzung **separat für linke und rechte Lunge** sollte vorgenommen werden
 - kleinvolumig
 - mittelvolumig
 - großvolumig
- Im Verlauf **Änderungen der Quantität und Qualität** dokumentieren

Weitere aktuelle Infos Literatur

<https://www.rsna.org/covid-19>

https://pubs.rsna.org/2019-ncov_articles

Bleiben Sie gesund!



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