Research Letter
Ancillary Diagnostic Testing in Post-COVID Patients

Information and Clinical Utility as to Findings With Therapeutic Implications

After an acute SARS-CoV infection, a significant proportion of patients report experiencing symptoms for longer than 12 weeks. The precise incidence rates are heterogeneous and partly—even in population based approaches—very high (1–3). A subjective perception of dyspnea is a common symptom (1). Data from Germany's Central Research Institute for Ambulatory Health Care in Germany (ZI) show that 18.6% of patients with post-COVID syndrome are being treated by medical specialists.

The current German S1 guideline for post-COVID recommends for persistent dyspnea pulmonary diagnostic evaluation at rest and while exercising, as well as cardiac diagnostic evaluation (1). Currently, however, no evidence exists that these investigations actually always have therapeutic consequences. The question therefore arises to what extent in patients with sustained dyspnea after infection with SARS-CoV-2 ancillary diagnostic testing is required. On this background, we studied the diagnostic value of computed tomography scanning (CT) of the thorax, echocardiography, and lung function testing in patients who presented at a post-COVID outpatient clinic.

Method
The data of patients treated in the post-COVID outpatient clinic at Jena University Hospital between August 2020 and December 2021 were analyzed retrospectively. The analyses were descriptive. We used the WHO ordinal scale to categorize the severity of the initial infection (4).

Results
During the study period, a total of 614 patients presented consecutively in our post-COVID outpatient clinic, of whom 559 had at least one symptom after 12 or more weeks. Most of the patients were female (360/559, 64.4%), had SARS-CoV-2 infection confirmed on polymerase chain reaction (PCR), and the infection had been diagnosed a median of 199 (range 84–487) days previously. In most of the cases, the acute infection had been treated on an outpatient basis (WHO stage 0–2 460/559; 82.3%) (Table 1). 315 patients complained of persistent dyspnea (56.3%). In the setting of a diagnostic investigation, 305 patients (54.6%) underwent lung function testing, 179 underwent echocardiography, and 135 (24.2%) underwent computed tomography scanning of the thorax (Table 2). Findings with therapeutic implications were seen in only a small number of patients. In 37 lung function tests (12.1%) a pathological finding was recorded, with 27 of the most abnormal findings resulting from deviations from the standard values of the diffusion capacity. Even if only patients with dyspnea were considered, the diagnostic yield was only slightly greater (34/203, 16.7%).

CT scanning found that the rate of pathological findings—defined as persistent infiltrates, ground glass opacities, or fibrosis—was not significantly higher in 26 patients (19.3% of all CT scans), and the values were comparable for patients with dyspnea (20 findings, 21.5%). No further new pathological findings occurred. 18 patients (13.3%) had persistent infiltrates, which were categorized as residues in 16 cases (11.9%). In four patients, fibrotic changes were seen, scar residue in three patients (2.2%), and hitherto undetected emphysema in one patient (0.7%).

No association existed between the kind of CT findings and the presence of dyspnea (p=1.000) or the severity of the infection (p=0.714) or the time since the infection (p=0.892). A therapeutic consequence did not arise from the CT result for any of the patients. On echocardiography, abnormal findings were seen too (defined as a new reduction of systolic left ventricular function or new-onset diastolic functional impairment) in only three patients (1.7% of all echocardiography tests). Among these, two were cases of new reduction in systolic left ventricular function and one (0.6 of all echocardiography tests) with new-onset diastolic function impairment. At follow-up (a median 132 days after the initial consultation), 261 of 599 patients (46.7%) still reported dyspnea.

Discussion
Our data show that the added therapeutic value of ancillary diagnostic testing for patients with post-COVID symptoms is low and that the echocardiography finding or CT result were of no therapeutic consequence for any of the patients. The value of ancillary diagnostic testing therefore lies in excluding other disorders. This observation supports the recommendation that in patients without red flags, ancillary diagnostic testing is not required, instead of which clinical follow-up seems justified, such as is also recommended in chapter 6.1 of the German guidelines (1).

However, it should be emphasized that in spite of lacking pathological findings in the established diagnostic evaluation, relevant medical symptoms and therefore subjectively perceived problems may exist. In this setting, general practitioners have a particular part to play as they know their patients best and longest.

TABLE 1

Demographic characteristics of the patients*

	All patients(n = 595)
Sex female (n)	360 (60.5 %)
Age (years)	51 (18–90)
Days passed since infection	199 (84–487)

Pre-existing disorders
  − COPD
  − Arterial hypertension
  − CHC
  − Diabetes mellitus
  − Malignancy
	
	67 (11.3 %)
	162 (27.2 %)
	13 (2.2 %)
	39 (6.6 %)
	9 (1.5 %)

Fully vaccinated before infection	0

*All values are shown as medians and minimum/maximum or as absolute and relative rates.
COPD, chronic obstructive pulmonary disease; CHC, coronary heart disease

TABLE 2

Results from ancillary diagnostic testing in all patients with post-COVID syndrome. as well as separated for patients with and without subjective dyspnea*

	All patients with post-COVID	Patients with dyspnea (n = 315)	Patients without dyspnea (n = 244)
Lung function tests	305 (54.6 %)	203 (64.4 %)	102 (41.8 %)
− of which pathological findings	37/305 (12.1 %) 95% CI [8.5; 15.7]	34/203 (16.7 %) 95% CI [11.8; 22.0]	3/102 (2.9 %) 95% CI [0; 5.7]
Echocardiography	179 (32.0 %)	123 (39.0 %)	56 (23.0 %)
− of which pathological findings	3/179 (1.7 %) 95% CI [0; 4.0]	2/123 (1.7 %) 95% CI [0; 4.2]	1/56 (1.7 %) 95% CI [0; 6.8]
Thoracic CT	135 (24.2 %)	93 (29.5 %)	42 (17.2 %)
− of which pathological findings	26/135 (19.3 %) 95% CI [12.6; 25.9]	20/93 (21.5 %) 95% CI [13.6; 30.2]	6/42 (14.3 %) 95% CI [3.0; 25.0]

*Data are shown as absolute and relative rates. CT, computed tomography; CI, confidence interval

On the background of currently high rates of post-COVID cases (3), the distinction from differential diagnoses—for example, a somatization disorder—is important. The holistic approach proposed by the UK NICE guidelines (5) with a clear restriction to the indication of ancillary diagnostic testing supports this view. It is possible that a better understanding of the pathophysiology of post-COVID syndrome will lead to the establishment of new diagnostic procedures that are better suited to objectivizing the symptoms of the patients. Thoracic ultrasounds is one such potential approach. Without any doubt, for all approaches the benefit for those affected has to be confirmed on the basis of defined clinical and patient relevant endpoints before a recommendation for their use can be formulated.

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