In brief

Breathlessness post COVID-19

4 May 2022

Questions

- How to determine those patients who present with ongoing breathlessness in need of urgent review or intervention due to suspected pulmonary embolus?
- What is the evidence-based management approach for breathlessness as a symptom of post-acute sequelae of COVID-19?

Background

- SARS-CoV-2 infection can affect multiple organs, including the respiratory and cardiovascular system.[1]
- Shortness of breath (dyspnoea) is one of the commonly reported symptoms in people experiencing post-acute sequelae of COVID-19.[2]
- The prevalence of persistent breathlessness is estimated to be around 25% three to 12 months after recovery from the acute phase of COVID-19.[3]

Summary

Assessment of ongoing breathlessness and suspected pulmonary embolism

- The National Institute for Health and Care Excellence (UK) guideline, as well as other guidelines and individual studies, recommends that patients with ongoing breathlessness and a history of COVID-19 should be referred to relevant acute services if they have signs or symptoms that could be caused by an acute or life-threatening complication. Possible complications include (but are not limited to) cardiac chest pain, acute onset or severe shortness of breath, and other signs of severe lung disease.[4-6]
- In investigating suspected pulmonary embolism post COVID-19 infection, the following are recommended:
    - High suspicion if the respiratory symptoms worsen abruptly, typical symptoms of deep-vein thrombosis and/or acute unexplained right ventricular dysfunction[7]
    - The same D-dimer threshold (500ng/ml) used among non-COVID-19 patients to rule out pulmonary embolism can be used as it had high sensitivity at above 90%.[8] Age-adjusted D-dimer strategy had superior specificity compared to the absolute D-dimer test threshold.[9]
    - Using pre-test probability or predictive scores for suspected pulmonary embolism to decrease imaging testing, including CT pulmonary angiogram (CTPA), was found to be promising.[10-12]

Managing breathlessness

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- Peer-reviewed literature most commonly suggests non-pharmacological strategies for managing breathlessness as a symptom of post-acute sequelae of SARS-CoV-2.[13-18] These strategies include:
    - Self-management:
        - Breathing exercise[13]
        - Limiting factors that exacerbate dyspnea, including stopping smoking, avoiding pollutants, avoiding extremes in temperature and exercising[13]
        - Optimal body positioning[13]
        - Ongoing education and support[5]
    - Rehabilitation:
        - Individualised rehabilitation programs, including pulmonary rehabilitation, provided by an interdisciplinary team. Nature and extent of rehabilitation should be informed by the care setting and COVID-19 severity[14]
        - Telerehabilitation and virtual rehabilitation programs[15, 16]
        - Moderate to high-intensity aerobic exercise[17]
        - Modified rehabilitation such as stretching, body rotations, acupressure and massage[18]
- In Australia, the Royal Australian College of General Practitioners (RACGP) published guidelines recommending care of patients with post–COVID-19 conditions. Recommendations for care include pulmonary rehabilitation, chest X-ray if breathlessness persists after 12 weeks, an individualised plan to return to exercise, and corticosteroids for inflammatory lung disease.[4]

Evidence

Peer-reviewed literature

- Compared to the other post-acute symptoms which showed a progressive decrease in prevalence over time, dyspnoea remained at a stable prevalence over one-year follow up.[19] Dyspnoea was the most reported symptom (around 70%) in both the COVID-19 and non-COVID-19 patients with pulmonary embolism.[20]
- For ongoing breathlessness post COVID-19, supported self-monitoring at home, which may include heart rate, pulse oximetry or symptoms, was often recommended.[4, 5] Other assessment and monitoring options include offering appropriate exercise tolerance tests or pulmonary function tests suited to the person's ability.[5] A chest X-ray may be required if the person is continuing to experience breathlessness by 12 weeks, and it is clinically indicated.[4-6]
- Strategies to manage breathlessness as a symptom of post-acute sequelae of COVID-19 with promising results include: individualised rehabilitation programs provided by an interdisciplinary team with pulmonary rehabilitation component, [14, 21-24] modified rehabilitation exercises,[18] telerehabilitation programs based on respiratory exercises, [16, 18] deep breathing exercises with Triflo,[25] and moderate-to high-intensity aerobic and breathing exercises.[17]
- Evidence suggests that risk factors for developing pulmonary embolism in the post-acute COVID-19 phase include admission into an intensive care unit during the acute phase, corticosteroid administration during COVID-19 treatment, recent immobilisation, previous thromboembolic disease, obesity, and being male. [20, 26-33] The risk of developing pulmonary embolism is highest in the first two weeks following infection and diagnosis, and the risk decreases over time.[26, 34]

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- For investigating suspected pulmonary embolism in patients with breathlessness, the D-dimer measurement which is generally used for exclusion of pulmonary embolism, has decreased specificity in COVID-19 patients.[10, 35, 36] However, its sensitivity (with a threshold of 500ng/ml) remained high at above 90%.[8] Age-adjusted D-dimer strategy improved specificity compared to absolute D-dimer threshold.[9]
- Studies suggest using pretest probability or predictive scores for suspected pulmonary embolism to decrease imaging testing, including CTPA. One systematic review found the CHOD score (C-reactive protein, heart rate, oxygen saturation, D-dimer) to be the most promising predictive score for the occurrence of pulmonary embolism in hospitalised COVID-19 patients.[37] Recent studies also suggest risk prediction models using D-dimer and the extent of lung damage on CT scan,[10] or echocardiography, troponin, cell blood count parameters.[11, 12]

Grey literature

- The Royal Australian College of General Practitioners (RACGP) published a guideline to support general practice teams to collaborate with local hospital services and/or community-based multidisciplinary services in the care of patients with post-COVID-19 conditions. For management of breathlessness, recommendations include:
    - Optimise management of pre-existing respiratory conditions
    - Recommend respiratory muscle conditioning (pulmonary rehabilitation)
    - Consider chest X-ray at 12 weeks for patients who have had significant respiratory illness
    - Corticosteroids could be considered for inflammatory lung disease
    - Recommend gradual commencement or return to symptom-limited exercise, guided by tertiary-trained exercise professionals
    - Referral to a speech pathologist for management of chronic cough, hoarse voice or dysphagia
    - Consider home pulse oximetry measurement
    - Referral to an accredited practising dietitian if symptoms interfere with nutrition, and speech pathology if dysphagia is present[4]
- The National Health Service (NHS) list pulmonary embolism for consideration as a compilation from post-acute SARS-CoV-2 in patients presenting with breathlessness. The requirements for assessment in this population include oxygen saturation at rest and post-exertion, if safe to do so, using the one-minute sit-to-stand test, chest X-ray, electrocardiogram, and B-type natriuretic (BNP).[38]
- In the UK, the National Health Service Leeds Clinical Commission Group published a flowchart for managing the long-term effects of SARS-CoV-2. It recommends that If breathlessness is not improving three months post-covid, a review can be considered. Red flags for patients with breathlessness include:
    - Acute onset (<48 hours) and severe shortness of breath O_2<93% (if new for the patient)
    - Resting pulse <60 bpm or >120 bpm
    - Respiration rate >30 breaths per minute
    - Myocardial ischaemia (chest pain)
    - Syncope/postural dizziness
    - Heart failure
    - Shock (hypotension)[6]

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To inform this brief, PubMed and Google searches were conducted using terms related to (COVID-19 AND pulmonary embolism) AND (assess OR manage) on 04 April 2022.

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