TUGAS AKHIR KARDIOPULMONAL

Nama : Salsabilla Fiskaningrum
NIM : 1810301028

PRODI FISIOTERAPI
FAKULTAS ILMU KESEHATAN
UNIVERSITAS ‘AISYIYAH YOGYAKARTA

RESUME JURNAL 1

Safety and Effificacy of Chest Physiotherapy in Patients With COVID-19: A Critical Review

Pandemi global COVID-19 saat ini telah membuat seluruh dunia terhenti, menyebabkan morbiditas, kematian, dan perubahan peran pribadi. Penyebab yang lebih umum morbiditas dan kematian pada pasien ini termasuk pneumonia dan gagal napas, yang menyebabkan pasien membutuhkan ventilasi buatan dan teknik lain yang bisa meningkatkan fungsi pernafasan. Salah satu teknik ini adalah fisioterapi dada, dan ini telah terbukti meningkatkan pertukaran gas, membalikkan perkembangan patologis. fisioterapi dada berupa latihan otot pernafasan, senam batuk,
Latihan diafragma, latihan peregangan, dan latihan di rumah telah menghasilkan peningkatan FEV1 (L), FVC (L), FEV1 / FVC%, menyebarkan kapasitas paru-paru untuk karbon monoksida (DLCO%), ketahanan, dan kualitas hidup, dan pengurangan gejala kecemasan dan depresi. Namun, masih ada kontroversi mengenai apakah fisioterapi dada dapat menyebarkan aerosol dan mempercepat laju penyebaran infeksi, terutama sejak COVID-19 sangat menular. Sementara beberapa penulis percaya itu mungkin, yang lain percaya aerosol yang dihasilkan oleh fisioterapi dada tidak dalam jangkauan pernapasan.

Fisioterapi dada (terapi posisi) yang digunakan di pasien dengan COVID-19 selama ventilasi mekanis.
Prosedur : Terapi posisi, Pasien bisa diletakkan dalam posisi tengkurap, 12-16 jam per hari, sebaiknya dalam 72 jam intubasi endotrakeal. Jika ini efektif, itu harus diulang sampai rasio PaO 2 / FiO 2 (P / F) ≥150 mmHg dengan PEEP ≤0.60 untuk pada setidaknya 4 jam dalam posisi terlentang Siklus aktif pernafasan (jalan nafas teknik pembersihan)

Pada saat pemberian intervensi terapis dan petugas kesehatan lainnya kenakan alat pelindung untuk melindungi diri dari infeksi. Di dalam cara, kita bisa menyelamatkan nyawa puluhan ribu orang yang mungkin terinfeksi COVID-19. Namun jika bedah masker tersedia, pasien dapat memakainya selama prosedur mencegah penyebaran infeksi.

Untuk pasien COVID-19, tujuan fisioterapi dada adalah untuk meredakan dispnea dan meredakan kecemasan dan depresi pada jangka pendek, dalam jangka panjang, itu adalah untuk meningkatkan fungsi fisik, yang pada akhirnya akan meningkatkan kualitas hidup dan bantuan kembali ke masyarakat.

Indikasi dan kontraindikasi fisioterapi dada pada pasien di ventilasi mekanis.

Indikasi : Fungsi pernapasan, Fungsi kardiovaskular, Fungsi sistem saraf Lain, Fraksi oksigen inspirasi (FiO2) ≤0.6, saturasi oksigen darah (SpO2) ≥90%, frekuensi pernapasan ≤40 napas / menit, ujung positiftekanan ekspirasi (PEEP) ≤10 cmH2O (1 cmH 2 O = 0,098 kPa), tidak adanya resistensi ventilator, tidak adanya jalan napas tersembunyi yang tidak aman masalah, kesulitan bernapas, batuk parah atau produktif episode, dan CT atau paru perubahan ultrasound konsisten dengan konsolidasi Tekanan darah sistolik ≥90 mmHg atau ≤180 mmHg, rata-rata tekanan arteri (MAP) ≥65 mmHg atau ≤110 mmHg, jantung tingkat ≥40 denyut per menit (bpm) atau ≤120 bpm, tidak ada aritmia baru atau miokard iskemia, tidak adanya syok dengan tingkat asam laktat ≥4 mmol / L, tidak adanya ketidakstabilan baru trombosis vena dalam dan

emboli paru, dan ketiadaan dari stenosis aorta yang dicurigai Richmond Agitasi-Sedasi Skala (RASS) skor: −2 hingga +2 dan intrakranial tekanan <20 cmH 2 O Tidak adanya tidak stabil patah tulang tungkai dan tulang belakang, tidak adanya dasar yang parah penyakit hati / ginjal atau baru semakin memburuk gangguan hati / ginjal, tidak adanya perdarahan aktif, dan suhu ≤38.5 ◦ C Kontraindikasi / Penghentian Intevention Kebutuhan oksigen tingkat rendah.

Indikasi dan kontraindikasi fisioterapi dada pada pasien setelah dipulangkan.

Indikasi : Saturasi oksigen darah ≤95%, keadaan mental mini skor ujian (MMSE)> 21, tidak ada COPD atau pernafasan lainnya penyakit, dan ekspirasi paksab volume dalam 1 detik (FEV1) 70% Denyut jantung> 100 detak per menit dan tekanan darah <90/60 mmHg atau> 140/90 mmHg dispnea, batuk parah, sedang atau penyakit jantung parah, dan stroke iskemik atau hemoragik atau penyakit neurodegeneratif Sesak dada, nyeri dada, dan palpitasi jantung Pusing, sakit kepala, kabur penglihatan.

FISIOTERAPI DADA SELAMA PERIODE AKUT

Selama tahap ini, kebanyakan pasien tidak mengalami eksudasi, dan sebagai dengan demikian, fisioterapi dada mungkin tidak direkomendasikan.

FISIOTERAPI DADA SELAMA VENTILASI MEKANIK

Fisioterapi dada dapat digunakan untuk mengurangi lama tinggal di ventilator mekanik dan ICU dan mencegah pneumonia.

fisioterapi dada yang digunakan pada pasien dengan COVID-19 setelah keluar.

Dilakukan berupa Pelatihan pernapasan Pasien harus menggunakan alat genggam perangkat resistansi selama tiga set, dengan 10 bernafas di setiap set. Parameter harus ditetapkan pada 60% dari maksimal individu tekanan mulut ekspirasi dengan sisa 1 menit di antara tiga set Latihan batuk Tiga set batuk aktif harus diadopsi untuk latihan batuk Pelatihan diafragma Pasien harus melakukan maksimal 30 kontraksi diafragma sukarela di posisi terlentang dengan menempatkan media berat (1-3 kg) di perut anterior dinding untuk menahan penurunan diafragma Latihan peregangan Otot pernafasan seharusnya membentang di bawah bimbingan terapis rehabilitasi. Pasien harus ditempatkan di dekubitus terlentang atau lateral posisi dengan lutut ditekuk untuk memperbaiki kurva lumbal. Pasien harus dipesan untuk menggerakkan lengan mereka dalam fleksi, horizontal ekstensi, penculikan, dan rotasi eksternal Latihan di rumah Pasien harus diinstruksikan dengan mengerucutkan bibir pelatihan pernapasan dan batuk. Mereka harus melakukan 30 set per hari.

LAMPIRAN JURNAL 1

Safety and Effificacy of Chest
Physiotherapy in Patients With
COVID-19: A Critical Review

*Auwal Abdullahi 1,2 **
1 Department of Physiotherapy, Bayero University Kano, Kano, Nigeria, 2 Department of Physiotherapy and Rehabilitation Sciences, University of Antwerp, Antwerp, Belgium

The present global pandemic of COVID-19 has brought the whole world to a standstill, causing morbidity, death, and changes in personal roles. The more common causes of morbidity and death in these patients include pneumonia and respiratory failure, which cause the patients to require artifificial ventilation and other techniques that can improve respiratory function. One of these techniques is chest physiotherapy, and this has been shown to improve gas exchange, reverse pathological progression, and reduce or avoid the need for artifificial ventilation when it is provided very early in other respiratory conditions. For patients with COVID-19, there is limited evidence on its effect, especially in the acute stage and in patients on ventilators. In contrast, in patients after discharge, chest physiotherapy in the form of respiratory muscle training, cough exercise, diaphragmatic training, stretching exercise, and home exercise have resulted in improved FEV1 (L), FVC (L), FEV1/FVC%, diffusing lung capacity for carbon monoxide (DLCO%), endurance, and quality of life, and a reduction in anxiety and depression symptoms. However, there are still controversies on whether chest physiotherapy can disperse aerosols and accelerate the rate of spread of the infection, especially since COVID-19 is highly contagious. While some authors believe it is possible, others believe the aerosol generated by chest physiotherapy is not within respirable range. Therefore, measures such as the use of surgical masks, tele-rehabilitation, and self-management tools can be used to limit cross-infection.

Keywords: physiotherapy, pneumonia, COVID-19, mortality, ventilator, critical care

INTRODUCTION

Coronavirus 2019 (COVID-19), more recently known as SARS-COV-2, is a coronavirus that belongs to the β-corona cluster that is spread to a large extent via droplets (1). When one contracts the infection, the virus gets into the lungs and is received by angiotensin-converting enzyme 2 (ACE2), which is expressed in normal humans in types I and II alveolar cells (2). When the virus binds with ACE2, it damages the alveolar cells (1). The alveolar cells function under

normal circumstances to synthesize and secrete surfactant, carry out xenobiotic metabolism, help with transepithelial movement of water, and regenerate alveolar epithelium following lung injury (3). These aforementioned functions help with normal lung functions. Therefore, damage to the alveolar cells may result in respiratory problems, other systemic manifestations, and eventually death (1, 4). Consequently, clinical manifestations of COVID-19 disease include fever, cough, myalgia or fatigue, pneuomia, and complicated dyspnea (4).

In addition, when the respiratory symptoms are severe, they may progress to respiratory failure (acute respiratory distress syndrome), which could lead to death unless it is managed promptly using invasive ventilation (4–6). However, for those with mild to moderate symptoms, non-invasive techniques such as chest physiotherapy can be used (6). The aim of this article is to critically review the nature of respiratory problems in patients with COVID-19 and the safety and effiffifficacy of the use of chest physiotherapy for these patients. Therefore, for the purpose of this review, PubMed and Google Scholar were searched using COVID-19, chest physiotherapy, and pulmonary rehabilitation as keywords.

THE NATURE OF ACUTE RESPIRATORY DISTRESS SYNDROME IN PATIENTS WITH COVID-19

Acute respiratory distress syndrome (ARDS) in COVID-19 usually begins a bit later than in other ARDS. The onset is usually between 8 and 12 days after infection (7–9). It is usually characterized by a dry cough, which is said to be due to respiratory epithelial cells being affffected more than the endothelial cells (10). Consequently, the patients usually present with mild symptoms of cough and dyspnea with no exudation that are inconsistent with laboratory and imaging fifindings including the presence of ground-glass opacities and basilar opacities and lymphocytopenia (8, 10–15). In contrast, some patients, especially those with comorbidities such as neuromuscular disorders and chronic obstructive pulmonary disorders, may at the same time or later develop exudative consolidation and mucous hyper-secretion along with diffiffifficulty in clearing the secretions (15). However, even in those presenting with mild symptoms, the dyspnea may progress quite rapidly and cause the patients to require ventilation (12, 16). Therefore, it is important to be on the alert and ready to use a ventilator for the patients if available. If ventilators are not available, other non invasive techniques such chest physiotherapy can be used on a case-by-case basis (6, 17).

EFFECTS AND SAFETY OF CHEST PHYSIOTHERAPY IN PATIENTS WITH

OTHER RESPIRATORY CONDITIONS AND COVID-19

Chest physiotherapy has been used in many diffffferent respiratory conditions. It has been said to improve gas exchange, reverse pathological progression, and reduce or avoid the need for artifificial ventilation when it is provided very early (18, 19). However, for patients with COVID-19, evidence is still lacking on its effffects, especially during the acute stage, aside from some position papers or recommendations based on anecdotal evidence (15, 17, 20). This is because the features of respiratory problems in patients with COVID-19 signifificantly diffffer from those in other respiratory conditions. For instance, during the acute stage, patients with COVID-19 do not usually have exudation (10, 15). In addition, dyspnea in patients with COVID-19 may rapidly progress to acute respiratory failure (4, 5). Consequently, timely use of mechanical ventilation in such situations is strongly recommended (15, 17, 20).

COVID-19 is highly infectious and spreads rapidly, and there have been concerns about the use of chest physiotherapy in infectious diseases. This is because it has been argued that chest physiotherapy may cause aerosolization (21). This may increase the rate at which COVID-19 spreads. However, later fifindings in similar conditions disproved this view. According to Simonds and colleagues, an evaluation of droplet dispersion in Inflfluenza pandemic and other airborne infections showed that chest physiotherapy signifificantly and predominantly produced droplets of >10µm (22). Droplets of this size are not respirable, as only droplets within inspirable range (about 5µm) can play a signifificant role in the transmission of infections (23). Similarly, a review of aerosol transmission of Inflfluenza A virus cast doubt on whether it is even possible for droplets from chest physiotherapy to transmit infections (24). In addition, in SARS, a disease that shared similar pathophysiology with COVID-19 (7, 25), chest physiotherapy was later recommended (26). Furthermore, overall, the management of COVID-19 is as yet symptomatic, as scientists are still trying to understand its pathophysiology and the viral behavior (1, 27). Therefore, since the disease can kill within days to a month of onset, especially in the elderly and those with weak immunity (9, 28), we can make our patients sneeze or cough out sputum into disposable plastic bags during and after chest physiotherapy to prevent or reduce the chance of aerosolization. A similar measure was recommended previously (20).

TABLE 1 | Description of the chest physiotherapy (positioning therapy) used in patients with COVID-19 during mechanical ventilation [adopted from (17)].

Procedure	Description
Positioning therapy	Patients can be put in a prone position, 12–16 h per day, preferably within 72 h of endotracheal intubation. If this is effective,

it should be repeated until PaO2/FiO2 ratio (P/F) ≥150 mmHg with PEEP ≤0.60 for at least 4 h in a supine position
Active cycle of breathing (airway clearance technique)
Nil
Manual and/ or ventilator hyperinflflation (airway clearance technique)
Nil
Percussion and vibration (airway clearance technique)
Nil
Positive expiratory pressure (PEP) (airway clearance technique)
Nil
Mechanical insuflflation-ensufflflation (airway clearance technique)
Nil
Lung maneuver recruitment Nil
Endotracheal suctioning Nil

Similarly, we can disinfect the surrounding environment, while at the same time, the therapists and other health workers wear protective gear to protect themselves from infection. In this way, we can save the lives of tens of thousands of people who might be infected with COVID-19. However, if surgical masks are available, the patients can wear them during the procedure to prevent the spread of the infection (17). Use of surgical masks and oxygen masks on the face of the patients has been found to deflflect aerosols during chest compression in a simulation and cadaver model (29). In addition, other means such as the use self-management techniques such as the provision of self management pamphlets and educational videos or consultations online, such as via Skype video communications, to help patients manage themselves 24 h a day can be explored (20). This will help reduce the chances of cross-infection.

For patients with COVID-19, the aim of chest physiotherapy is to alleviate dyspnea and relieve anxiety and depression in the short term (6, 20); in the long term, it is to improve physical functions, which will in turn improve quality of life and aid return to society (6, 20). Consequently, the chest physiotherapy interventions recommended and/or used for patients with COVID-19 include airway clearance techniques (active cycle of breathing technique, forced expiratory technique,

percussion and vibrations, positive expiratory pressure (PEP)

TABLE 2 | Indications and contraindications of chest physiotherapy in patients in mechanical ventilations [adopted from (15, 17, 20)].

Respiratory function	Cardiovascular function	Nervous system function	Other
Indication			
Fraction of inspired oxygen (FiO2) ≤0.6, blood oxygen saturation (SpO2) ≥90%, respiratory rate ≤40 breaths/min, positive end expiratory pressure (PEEP) ≤10 cmH2O (1 cmH2O=0.098 kPa), absence of ventilator resistance, absence of unsafe hidden airway problems, diffificulty breathing, severe or productive coughing episodes, and CT or lung ultrasound changes consistent with consolidation	Systolic blood pressure ≥90 mmHg or ≤180 mmHg, mean arterial pressure (MAP) ≥65 mmHg or ≤110 mmHg, heart rate ≥40 beats per minute (bpm) or ≤120 bpm, absence of new arrhythmia or myocardial ischemia, absence of shock with lactic acid level ≥4 mmol/L, absence of new unstable deep-vein thrombosis and pulmonary embolism, and absence of suspected aortic stenosis	Richmond Agitation-Sedation Scale (RASS) score: : 2 to +2 and intracranial pressure <20 cmH2O	Absence of unstable limb and spinal fractures, absence of severe underlying hepatic/renal disease or new progressively worsening hepatic/renal impairment, absence of active hemorrhage, and temperature ≤38.5◦C
Contraindication/ Discontinuation of Intevention			
A low-level oxygen requirement (e.g., oxygen flflow < 5 l/min for SpO2 > 90%)			

				Blood oxygen saturation <90% or decrease of >4% from baseline, respiratory rate >40 breaths/min, ventilator resistance, and artifificial airway dislodgement or migration
				Systolic blood pressure <90 mmHg or >180 mmHg, MAP <65 mmHg or >110 mmHg or >20% change compared with baseline, heart rate <40 bpm or >120 bpm, and new arrhythmia and myocardial ischemia
				Loss of consciousness and irritability
				Discontinuation of any treatment or removal of monitoring tube connected to the patient, patient-perceived heart palpitations, exacerbation of dyspnea or shortness of breath, and intolerable fatigue, and falls in patient

MAP, mean arterial pressure.

TABLE 3 | Indications and contraindications of chest physiotherapy in patients in after discharge [adopted from (20, 30)].

	Respiratory function	Cardiovascular function	Nervous system function	Other
Indication	A blood oxygen saturation of ≤95%, mini-mental state examination (MMSE) score > 21, no COPD or any other respiratory disease, and forced expiratory volume in 1s (FEV1) 70%	A heart rate of >100 beat per minute and a blood pressure of <90/60 mmHg or >140/90 mmHg	Nil	Other diseases that are not suitable for exercise
Contraindication/ Discontinuation of Intervention	Exacerbation of respiratory symptoms and fatigue that are not alleviated with rest, dyspnea, severe cough, moderate or severe heart disease, and ischemic or hemorrhagic stroke or neurodegenerative diseases	Chest tightness, chest pain, and		

heart palpitations
Dizziness, headache, blurred vision
Temperature flfluctuation (>37.2◦C), profuse sweating, and unstable gait
COPD, chronic obstructive pulmonary disease.

therapy (including bubble PEP), positioning and gravity assisted postural drainage, intra- or extrapulmonary high frequency oscillation devices, autogenic drainage), secretion clearance removal (huffff and cough, suctioning, assisted or stimulated cough maneuvers, cough assist machine), and mobilization and exercise prescription, which may trigger a cough and/or sputum expectoration (15, 30). However, it has been recommended that rehabilitation should be provided on a case-by-case basis since patients diffffer in their clinical characteristics (15, 17, 20).

CHEST PHYSIOTHERAPY DURING THE ACUTE PERIOD

During this stage, most patients have no exudation, and as such, chest physiotherapy may not be recommended (15). In addition, procedures such as diaphragmatic breathing, pursed-lip breathing, and bronchial hygiene/ lung re-expansion techniques are contraindicated during this stage (17). The priority here is the use of a mechanical ventilator, especially in those with severe symptoms (6, 17). For those with exudation and mild to moderate symptoms, it has been argued that chest physiotherapy can be used to relieve dyspnoea and depression and anxiety on a case-by-case basis (6, 15). However, to date, there are no studies reporting on the use of chest physiotherapy during the acute stage aside from a recommendation based on anecdotal evidence (17).

CHEST PHYSIOTHERAPY DURING MECHANICAL VENTILATION

Under mechanical ventilation, patients may lose spontaneous breathing (31). This can predispose the patients to developing lung collapse and ventilator-associated pneumonia. In such circumstances, chest physiotherapy can be used to reduce the length of stay in both a mechanical ventilator and ICU and prevent ventilator-associated pneumonia (32, 33). In addition, high-frequency chest wall oscillation for intubated patients resulted in increased dry sputum weight and PaO2 on day 3, decreased lung collapse on days 2 and 3, and culture positivity on day 3 (33). Similarly, in a patient who received 11 sessions of physical therapy consisting of upright body positioning, mobilization and exercise, and the active cycle of breathing

exercise technique every 2 h for 12 h over his 48-h stay in the ICU (six sessions on day one and fifive sessions on day two), arterial oxygen level improved markedly, with radiographic resolution of infifiltration (18). Therefore, since chest physiotherapy reverses pathological progression, prevents atelectasis, improves impaired gas exchange, and decreases culture positivity, which are also some of the pathological hallmarks of COVID-19, it can be utilized in patients with this disease.

Accordingly, the techniques recommended in patients who are on a ventilator include airway clearance techniques, lung maneuver recruitment, endotracheal suctioning, and change in posture (17, 20). The airway clearance techniques recommended include positioning, active cycle of breathing,

TABLE 4 | Description of the chest physiotherapy used in patients with COVID-19 after discharge [adopted from (30)].

Procedure	Description
Respiratory training	Patients should use a hand-held resistance device for three sets, with 10 breaths in each set. Parameters should be set at 60% of the individual's maximal expiratory mouth pressure with a rest of 1 min between the three sets
Cough exercise	Three sets of active coughs should be adopted for cough exercises
Diaphragmatic training	Patients should perform 30 maximal voluntary diaphragmatic contractions in the supine position by placing a medium weight (1–3 kg) on the anterior abdominal wall to resist diaphragmatic descent
Stretching exercise	The respiratory muscles should be stretched under the guidance of a rehabilitation therapist. The patient should be placed in the supine or lateral decubitus position with the knees bent to correct the lumbar curve. Patients should be ordered to move their arms in flflexion, horizontal extension, abduction, and external rotation
Home exercise	Patients should be instructed in pursed-lip breathing and coughing training. They should carry out 30 sets per day

manual and/or ventilator hyperinflflation, percussion and vibration, positive expiratory pressure (PEP), and mechanical insuflflation-ensufflfflflflation (15, 17). However, there are no details on how to perform these techniques aside from positioning therapy, and there have been no studies yet in patients with COVID-19 reporting on the effiffifficacy of the techniques. See **Table 1** for details of the positioning therapy technique. In addition, lung maneuver recruitment needs to be used with caution since it may have severe adverse effffects (34). Furthermore, chest physiotherapy during this period is indicated or contraindicated based on

the status of the respiratory, cardiovascular, and neurological functions of the patients. See **Table 2** for details of the indications and the contraindications.

POST-EXTUBATION AND AFTER DISCHARGE

Post-extubation, many patients may develop respiratory failure again (35). This can be prevented using chest vibration and percussion (36). In patients with COVID-19, there seem to be no reports on the use of chest physiotherapy immediately post-extubation. However, following discharge, rehabilitation involving respiratory muscle training, cough exercise, diaphragmatic training, stretching exercise, and home exercise has been applied (30). These forms of training and exercise, when performed for two sessions per week for 6 weeks, resulted in improved FEV1 (L), FVC (L), FEV1/FVC%, diffffusing lung capacity for carbon monoxide (DLCO%), endurance, and quality of life and a reduction in anxiety and depression symptoms. See **Tables 3**, **4** for the indications and contraindications of chest physiotherapy and descriptions of the techniques used during this stage, respectively.

CONCLUSION

Chest physiotherapy may improve respiratory functions and quality of life in patients with COVID-19, especially after discharge. During the acute stage, evidence is still lacking on its usefulness, aside from some professional recommendations based on anecdotal evidence. However, it should be noted that chest physiotherapy is an individualized treatment based on the patient's particular presentations. Therefore, when patients present with symptoms that can benefifit from chest physiotherapy, it may be given while the patients are closely observed for any adverse events. In addition, when administering chest physiotherapy for patients in the acute stage, measures such as the use of surgical masks, if available, should be taken to prevent cross-infection.

AUTHOR CONTRIBUTIONS

AA contributed solely to the conception, writing, and all sections of this article.

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Conflflict of Interest: The author declares that the research was conducted in the absence of any commercial or fifinancial relationships that could be construed as a potential conflflict of interest.

RESUME JURNAL 2

Pengaruh latihan pernapasan diafragma dan umpan balik latihan pernafasan di paru berfungsi pada orang dewasa yang sehat

Respirasi menunjukkan pertukaran oksigen dan karbon dioksida antara udara dan jaringan. Itu dikendalikan oleh aktivitas otot pernapasan dan mekanisme neurologis. Diafragma, salah satu otot pernapasan, memainkan peran kunci dalam pompa pernapasan. Selain itu, ini mempengaruhi fungsi pernapasan untuk mengontrol pernapasan serta postur tubuh manusia

Tiga puluh satu subjek yang tidak memiliki riwayat neuromuskuler, ortopedi, dan gangguan kardiopulmoner berpartisipasi dalam penelitian ini. Tujuan dan prosedur penelitian ini dijelaskan untuk semua subjek, dan mereka memberikan persetujuan tertulis sebelum berpartisipasi. Terapis menekan tombol start, dan subjek menarik napas saat jarum jingga mengarah ke tanda "Masuk" dan menghembuskan napas saat jarum mengarah ke "OUT". Sebelum latihan, simpatisan mengajari subjek bagaimana secara akurat melakukan latihan dua atau tiga kali agar mereka bisa menyesuaikan diri dengan metode. Kelompok MBE diminta untuk meletakkan tangannya di rektus abdomi- Otot nis tepat di bawah kartilago kosta anterior, dan menarik napas perlahan dan dalam hanya dengan membengkak perutnya tanpa menggerakkan dada bagian atas sambil merilekskan bahunya. Kemudian, subjek menghembuskan semua udara secara perlahan. Selama terhirup, udara dihirup melalui hidung, dan perutnya bengkak. Setelah nafas dihentikan pada saat terakhir, subjek menghembuskan udara sesuai dengan nafas bibir yang dikerutkan, yang dengannya subjek menghembuskan napas udara melalui mulut dengan bibir setengah terbuka dan perut dibuat cekung.

Terdapat perbedaan yang signifikan pada kapasitas vital fungsional (FVC) dan kapasitas vital lambat (SVC) sebelum dan sesudah semua latihan pernapasan ($p < 0,05$). Ada perbedaan yang signifikan antara kelompok dalam FVC ($p < 0,05$). Namun, tidak ada perbedaan kelompok ditemukan di SVC ($p > 0,05$)

Perbedaan yang signifikan pada FVC dan SVC diamati sebelum dan sesudah semua pernafasan latihan ($p < 0,05$). Perbedaan yang signifikan antara kelompok dalam FVC diamati ($p < 0,05$) meskipun tidak ada perbedaan yang signifikan SVC diamati ($p > 0,05$). Pada latihan pernafasan dengan menggunakan alat bantu pernafasan, subjek menggunakan pernafasan aksesori otot lebih dari diafragma, menunjukkan respirasi toraks dengan mengangkat bahu atau menggerakkan dada mereka untuk pernafasan dan pernafasan yang berlebihan. Hasil tersebut sesuai dengan penelitian yang menggunakan latihan pernafasan perangkat ambang batas tidak menyebabkan perubahan dalam aktivitas diafragma tetapi secara signifikan meningkatkan aktivitas sternocleido- otot mastoid Kelompok MDBE menunjukkan resistensi pernafasan dengan mengerucutkan bibir disertai diafragma pernafasan; kelompok menunjukkan peningkatan FVC yang lebih tinggi mungkin

karena mereka menggunakan diafragma lebih banyak daripada kelompok FBE. Saya Disarankan agar hasil penelitian ini dapat digunakan sebagai data dasar untuk pengembangan jenis pernafasan baru olahraga.

LAMPIRAN JURNAL 2

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Original Article

Effects of diaphragm breathing exercise and feedback breathing exercise on pulmonary function in healthy adults

Min-Sik Yong, PT, PhD1), Hae-Yong Lee, PT, PhD1), Yun-Seob Lee, PT, PhD1)*
1) Department of Physical Therapy, Youngsan University: 288 Joonam-ro, Yangsan, Gyeongsangnam-do, Republic of Korea

Abstract. [Purpose] The present study investigated effects of diaphragm breathing exercise and feedback breath
ing exercise on respiratory function. [Subjects and Methods] Thirty-one subjects were randomly assigned to two
groups; the feedback breathing exercise group and the maneuver-diaphragm exercise group. The feedback breath
ing exercise group was asked to breathe with feedback breathing device, and the maneuver-diaphragm exercise
group was asked to perform diaphragm respiration. Respiratory function was evaluated when a subject sat on a
chair comfortably. [Results] There was a significant difference in the functional vital capacity and slow vital capac
ity before and after all breathing exercises. There was a significant between-group difference in functional vital
capacity. However, no between-group difference was found in slow vital capacity. [Conclusion] Diaphragm breath
ing exercise and feedback breathing exercise can affect respiratory function.

Key words: Diaphragm breathing exercise, Feedback breathing exercise, Respiratory function
(This article was submitted Aug. 1, 2016, and was accepted Oct. 5, 2016)

INTRODUCTION

Respiration indicates exchange of oxygen and carbon dioxide between the air and the tissues. It is controlled by activities
of respiratory muscles and neurological mechanism1, 2). The diaphragm, one of respiratory muscles, plays a key role in the
respiratory pump. In addition, it influences respiratory function of controlling breathing as well as human posture3–5). The res
piration performed by diaphragmatic contraction is the diaphragmatic respiration6). There have been many studies related to
it so far; the diaphragmatic respiration has been used in various fields including Pilates, yoga, and exercises emphasizing core
stability7). In particular, the lung functions and the trunk stability can be promoted through the diaphragmatic respiration8). It
is expected that respiratory function is improved by increasing strength and endurance in respiratory muscles through various
types of exercise9). Previous studies reported that respiratory exercise using feedback respiratory device has been usually

used as a respiratory exercise method for recovering respiratory function. It was reported that endurance and quality of life in
patients with chronic obstructive pulmonary disease were facilitated through feedback breathing device which can enhance
both inspiration and expiration simultaneously10). The intervention depends on the training using respiratory devices due to
time restriction although applying direct respiratory training to patients who need respiratory therapy is needed. Respiration
is one of the most important issues for life conservation, and its significance has been mentioned in many studies11). In this
regard, it is necessary to measure exact pulmonary function. The present study investigated effects of diaphragm breathing
exercise and feedback breathing exercise on respiratory function.
*Corresponding author. Yun-Seob Lee (E-mail: leeys@ysu.ac.kr)
J. Phys. Ther. Sci. Vol. 29, No. 1, 2017

SUBJECTS AND METHODS

Thirty-one subjects with no history of neuromuscular, orthopedic, and cardiopulmonary disorder participated in this study.
They were randomly assigned to two groups; the feedback breathing exercise (FBE) group (n=15; age, 20.79 ± 0.85 years;
height, 160.22 ± 8.53 cm; weight, 59.17 ± 9.66 kg) and the maneuver-diaphragm exercise (MDE) group (n=16; age, 21.8
± 1.61 years; height, 167.87 ± 8.03 cm; weight, 62.73 ± 9.38 kg). The purpose and procedures of this study were explained
to all subjects, and they provided written informed consent prior to participation. This study adhered to the Declaration of
Helsinki. FBE group was asked to sit with a mouthpiece in his/her mouth, watching the TIGER® mainframe.The investigator
pressed the start button, and the subject breathed in when the orange needle directed toward the “In” mark and breathed out
when the needle toward the “OUT.” Before the exercise, the investigator taught the subjects how to accurately perform the
exercise two or three times for them to adjust to the method. MBE group was asked to put his/her hands on the rectus abdomi
nis muscle immediately below the anterior costal cartilage, and to inhale slowly and deeply only by swelling his/her abdomen
without moving his/her upper chest while relaxing his/her shoulders. Then, the subject exhaled all the air slowly. During
inhalation, the air was breathed in through his/her nose, and his/her abdomen was swollen. After the breathe was suspended
at the last moment, the subject exhaled the air according to the pursed lip breathing, with which the subject breathed out the
air through his/her mouth with his/her lips half-opened and his/her abdomen made hollow. CardioTouch 3000S (BIONET,

Korea) was used to evaluate respiratory function when a subject sat on a chair comfortably. All subjects were given sufficient explanation and demonstration for enhancing accuracy before measuring. Paired t-test and independent t-test were used to examine effects of feedback breathing and diaphragm breathing on respiratory function. Statistical analyses were performed using SPSS ver. 21.0, and statistical significance was set at $p<0.05$.

RESULTS

There was a significant difference in the functional vital capacity (FVC) and slow vital capacity (SVC) before and after all breathing exercises ($p<0.05$). There was a significant between-group difference in FVC ($p<0.05$). However, no between group difference was found in SVC ($p>0.05$) (Table 1).

DISCUSSION

Respiration, the process in which oxygen in the air is sent to the tissues and carbon dioxide is emitted to the air, can be divided into thoracic and diaphragmatic respiration basically12, 13). In particular, there have been many researches using diaphragmatic respiration. The concept of the diaphragmatic respiration is applied to strengthening exercise for abdominal and back muscles, and the exercise is introduced as a therapeutic approach for musculoskeletal disorders14). The diaphragm chiefly used in the diaphragmatic respiration has significant influence on back pain3). In addition, it may prevent falling through maintaining the center of gravity (COG) within the base of support (BOS)15). The present study compared diaphragm breathing exercise and feedback breathing exercise in order to investigate which method may affect respiratory function more significant. From the results obtained, significant differences in FVC and SVC were observed before and after all breathing exercises ($p<0.05$). Significant between-group difference in FVC was observed ($p<0.05$) although no significant difference in SVC was observed ($p>0.05$). In the breathing exercise using the feedback respiratory device, the subjects used the breathing accessory muscles more than the diaphragm, showing thoracic respiration by raising their shoulders or moving their chests for excessive inhalation and exhalation. Such result is consistent with that of the study in which breathing exercise using threshold device did not induce changes in diaphragmatic activities but significantly increase activities of the sternocleido mastoid muscle16). The MDBE group showed exhalation resistance with their lips pursed accompanied with diaphragmatic respiration; the group showed higher increase in FVC maybe because they used the diaphragm more than the FBE group. It is suggested that the results of the present study can be used as the baseline data for development of new type of breathing exercise.

Table 1. Effects of feedback breathing exercise and diaphragm breathing exercise on SVC and FVC (Unit: liter)

FBE

MDBE
pre
post
pre
Post
SVC
5.85 ± 1.5
6.44 ± 1.3*
5.32 ± 1.4
6.05 ± 1.3*
FVC
3.05 ± 0.6
3.30 ± 0.6*
2.86 ± 0.8
3.27 ± 0.7*#
Values are reported as the Mean ± SD.
*p<0.05 vs. pre, #p<0.05 vs. FBE post**Acknowledgement**
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RESUME JURNAL 3

Management of Subcutaneous Emphysema in Low Income Setting Eastern of DR Congo: Rare Complication of Inhalation Foreign Body Type Peanut. Case Report

Dalam kasus ini, laporkan hasil pengelolaan emfisema subkutan kotor setelah menghirup kacang tanah pada gadis berusia tahun yang berkonsultasi ke rumah sakit kami dengan gejala pneumonia setelah menghirup jenis benda asing tujuh hari sebelumnya. Selama dirawat di rumah sakit, dia mengalami emfisema subkutan yang parah dikelola menggunakan sayatan subkutan subklavikula untuk aspirasi yang berhubungan dengan antibiotik, terapi oksigen, dan dada fisioterapi.

Predisposisi anatomis jalan napas dan pelindung yang kurang Mekanisme anak merupakan penyebab utama tingginya angka komplikasi benda asing dan usia paling umum yang terkena komplikasi tersebut adalah anak di bawah 6 tahun

Dilakukan insisi subkutan subklavikula untuk aspirasi terkait dengan antibiotik, oksigen dan fisioterapi dada yang membantu kita untuk lebih meningkatkan kesehatan pasien kami dalam satu minggu dan kesehatan.

LAMPIRAN JURNAL 3

Management of Subcutaneous Emphysema in Low Income Setting Eastern of DR Congo: Rare Complication of Inhalation Foreign Body Type Peanut. Case Report
Article · January 2019
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***Corresponding author:** Franck Katembo Sikakulya, Department of Surgery, Université Catholique du Graben, Butembo, North-kivu, Democratic Republic of the Congo, Tel: +243993078764; E-mail: francksikakulya@gmail.com
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Management of Subcutaneous Emphysema in Low Income Setting Eastern of DR Congo: Rare Complication of Inhalation Foreign Body Type Peanut.
Case Report
Franck Katembo Sikakulya1 *, Amos Kaghoma Sivulyamwenge1 , Francois Mbahweka Katsuva2 and Claude Kasereka Masumbuko1
1Department of Surgery, Université Catholique du Graben, Butembo, Democratic Republic of the Congo
2Department of Paediatric, Université Catholique du Graben, Butembo, Democratic Republic of the Congo
Keywords: Pneumonia; Oxygen therapy; Chest physiotherapy
Introduction
Inhalation of Foreign Bodies (FBs) in airway tract remains a serious and fatal event if not managed properly in time and might be a key causer of chronic lung injuries [1,2]. It is a leading cause of sudden death in old children [3].
The most common objects that children inhaled are food, seeds, coins, balloons, hard candy and chewing gum. One-third of them

are vegetables especially nuts and generally peanuts [4]. The clinic of FBs inhaled can be asymptomatic or present as acute respiratory difficulty, choking and wheeze usually in absence of fever. Subcutaneous emphysema is an unusual complication of airway's foreign body. In the absence of suspicion of inhalation of foreign body, such complications can lead to misdiagnosis, mismanagement and delay in appropriate care, which expose to a high morbidity and mortality [5].

In this case report, we are reporting the management of a 6 year old girl with gross subcutaneous emphysema of face, neck, chest secondary to an unusual foreign body (peanut) in the airway tract.

Case Report

A 6 year old girl admitted in the pediatric department of the teaching Hospital of Catholic University of Graben with cough, fever and respiratory distress following accidently inhalation of peanut six days before his admission.

Birth history and past medical history were unremarkable. There was neither family history of asthma, atopy nor any contact with pulmonary tuberculosis. Initial AP (Anteroposterior) chest radiograph (Figure 1) revealed no abnormality. The pulmonary exam revealed crepitations in the left lung and absent breath sounds on the right side indicated a bronchopneumonia on that side. She underwent treatment of bronchopneumonia receiving Dexamethasone 4 mg and Ceftriaxone 750 mg daily; nebulisation on Salbutamol once daily; Metronidazol 750 mg daily and oxygen therapy during one week without success. Despite this management, the child's condition worsens and developed subcutaneous emphysema of the chest, neck and face (Figure 2). Thus the child was referred to surgery department for management.

In surgery department, the child was tachypnic and tachycardia.

Abstract

A Foreign Body (FB) in airway tract remains a serious and fatal event if not managed properly in time. We present in this case report a result of management of a gross subcutaneous emphysema following inhalation of peanut at a 6 year old girl who consulted our hospital with symptomatology of pneumonia following inhalation of foreign body type peanut seven days earlier. During her hospitalization, she developed a gross subcutaneous emphysema which was managed using subclavicular subcutaneous incision for aspiration associated on antibiotics, oxygen therapy and chest physiotherapy. The condition resolved within fifteen days. Bronchoscopy remains the good approach to remove and to prevent the complications of inhalator foreign body.

Swelling was clinking, crepitations and crunching on palpation and tender on touch. A plain X-Ray posto-anterior view of the Chest done, showed a huge subcutaneous emphysema affecting the face, neck and chest (Figure 3). Due to luck of bronchoscopy, the child underwent

Figure 1: Chest radiograph normal 7 days after inhalation of foreign body.**Citation:** Sikakulya FK, Sivulyamwenge

The clinic and the complications depend on the location of foreign body in the airway tract. It is indicated that organic substances induce more severe mucous inflammation. On the other hand, patients who aspirate small inorganic bodies tend to be asymptomatic in the long term, unless full obstruction of a terminal airway is caused [6].
Little reports in literature are known about lower airway foreign body presenting as subcutaneous surgical emphysema. Mehta and Sarin cited in their survey two authors who had reported cases children with pneumo-mediastinum and subcutaneous emphysema following foreign body aspiration [7].
a subclavicular subcutaneous incisions for aspiration to reduce the emphysema with Tazex (association of Ceftriaxone and Tazobactam) twice 562.5 mg per day, Gentamycin 40 mg once daily and Oxygen therapy associated to the chest physiotherapy for ten days. Two weeks later patient was released from our hospital healthy (Figures 4 and 5).

Discussion

The anatomical predisposition of airway and less mature protective mechanism of children is a leading cause of high rate of complications of foreign body and the commonest age affected by those complications is a child younger than 6 years [3]. In our case report our girl describe was a 6 year old. Our patient developed a serious and dangerous pneumonia due to inhalation of vegetable foreign body type peanut. According to the literature, it is reported that One-third of foreign bodies are vegetables especially nuts and generally peanuts [4].

Figure 2: Subcutaneous emphysema with subcutaneous chest tube.

Figure 3: Subcutaneous emphysema on X-Ray chest.

Figure 4: X-Ray chest showing lung without subcutaneous emphysema 15 days later.

Figure 5: The 6 years old girl 15 days after treatment.**Citation:**
Sikakulya
FK
, Sivulyamwenge
AK
, Katsuva

Complication such as Subcutaneous emphysema is induced because of peculiar arrangement of facial planes in the neck, chest and an excessive pressure gradient at the alveolar level, facilitating extra alveolar migration of air in the subcutaneous tissue [8]. Our case, presented the foreign body located clinically in the right lung and inducing the fermentation of alveoli in the lower way of lung inducing rupture of alveoli and escaping of air along the large pulmonary vessels to the mediastinum. From there the emphysema extended to the chest, neck and scalp through the subcutaneous tissue.

We undertook a subclavicular subcutaneous incision for aspiration associated on antibiotics, oxygen and chest physiotherapy which help us to better improve the health of our patient within one week and health. A variety of technics to manage subcutaneous emphysema have been described in case reports. O'Reilly et al. reported in their case report some technics of management of subcutaneous emphysema by using bilateral 3 cm infraclavicular incisions down to pectoralis fascia, using a trochar-type chest tube as a subcutaneous drain and using of a modified micro catheter [9].

Conclusion

Foreign body is a serious problem in low income setting due to the lack of equipment in management. The using of subclavicular subcutaneous incision for aspiration associated on antibiotics, oxygen and chest physiotherapy remains a solution to manage the subcutaneous emphysema to improve the health of children with this complications following inhalation of foreign body in low income setting. Bronchoscopy remains the good approach to remove and to prevent the complications of inhalator foreign body.

Declaration of Patient Consent

Authors certify obtained all appropriate consent form from her parents. In the form the parents have given their consent for their images and other clinical information to be reported in this case report.

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None existed.

Conflicts of Interest

None existed.

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