

Case Report

Chest Wall Stretching Exercise as an Adjunct Modality in Post Operative Pulmonary Management

Vikram M (✉)¹, Leonard Joseph H², Kamaria K¹

¹Department of Physiotherapy, Faculty of Health Sciences, Universiti Teknologi Mara, Puncak Alam, Selangor, Malaysia

²Physiotherapy Program, Faculty of Allied Health Sciences, Universiti Kebangsaan Malaysia, Kuala Lumpur, Malaysia

Abstract

Emphysematous pyelonephritis is a form of infection of the kidney. Chest physiotherapy was executed on a 15-year-old girl who had complications such as secretion retention and pleural effusion following percutaneous pigtail nephrostomy in addition to oxygen therapy and medical management to promote respiratory functions. The processes to increase chest wall mobility includes particular passive stretching and mobilization. Chest mobility exercises composed of an intercostal stretch on a determined intercostal space using index fingers, thoracic rotation and anterior compression with stretching in sitting position to improve respiratory functions. These exercises were suggested to the patient as a regular daily treatment along with low-level incentive spirometry breathing exercises. Following 9th sessions of treatment patient demonstrated satisfactory improvement by means of increasing in chest expansion and reduction in dyspnea level without using supplemental oxygen. The results expressed a substantial clinical improvement in reduction of dyspnea level and improvement in chest expansion.

Keywords: Passive stretching, pleural effusion, post-surgical, chest physiotherapy, dyspnea

Correspondence:

Vikram Mohan, Department of Physiotherapy, Faculty of Health Sciences, Universiti Teknologi MARA, Bandar Puncak Alam - 42300, Selangor, Malaysia. Tel: 006-03-32584367, Fax: 006-03-32584599 Email: mohanvikram2001@yahoo.com

Date of submission: Nov 11, 2011

Date of acceptance: March 4, 2012

Introduction

Emphysematous pyelonephritis (EPN) is known to cause fever, abdominal pain and pyuria as because of infection of the kidney (1). Chest physiotherapy has been shown to be a treatment modality (2) in order to improve respiratory functions following any kind of surgery to the chest and abdominal wall. A major complications associated with EPN following percutaneous pigtail nephrostomy are bleeding, sepsis and injury to an adjacent organ (3,4). Besides complications such as secretion retention and pleural effusion (3,4) is the common troubles accounted to be symptomatic which may lead to an inability to maintain normal blood gases, respiratory impairment

and physical disability. A case of EPN who was handled surgically was successfully treated in the context of passive chest wall stretch for secretion retention and pleural effusion to re-expand the lung.

Case Report

A 15-year-old girl was admitted to a hospital following a fever and abdominal pain, was diagnosed to have EPN after a preliminary investigation. She underwent percutaneous pigtail nephrostomy and was brought to the intensive care unit. Physiotherapy reference was given to manage her complication following pig tail nephrostomy, left pleural effusion when she was shifted to the ward. At the time of

assessment she was awake, conscious, alert with oxygen mask 10 liters/min. Vital signs recorded were temperature: 38° Celsius, pulse rate: 100 beats/minute, blood pressure: 108/85 mmHg and the respiratory rate: 20 breaths/minute. Physiotherapy examination revealed, patient is on pleural drain and surgical drain which was performed through the intercostal approach in which 11 and 12th intercostal space were spared.

Physical examination

Subjective assessment of dyspnoea was performed using rate of perceived exertion (RPE), 10 points scale which has different grades of shortness breath from nothing at all (Grade 0) to Maximal (Grade 10) (5). Objective assessment of chest revealed the breathing pattern varied with pain, noted to have more abdominal breathing than chest breathing. Chest expansion measurement was executed using measuring tape at the level of axilla and at the level of xiphoid process. Auscultation disclosed decreased vesicular breath sounds bilaterally with left side greater than the right side. Evaluation of chest x-ray (AP view), evidenced left side lower zones consolidation with minimal left sided pleural effusion. Measurement of chest expansion and RPE scale were performed at the beginning and on 2nd, 5th, 7th and 9th day of treatment.

Protocol

The chest physiotherapy treatment protocol consisted of 15 minutes of chest wall stretching exercises and 15 minutes of breathing exercises using low level resisted incentive spirometry device.

The chest wall stretching exercises was performed by the therapist while the patient was in sitting. Initially three intercostal stretch was applied over the third and eighth intercostal space on both inspiration and expiration (6) using index fingers with the help of both hands, which was followed by low level resisted incentive spirometry exercises. Then thoracic rotation and mid-sternum stretching via compression anteriorly were performed in sitting position (7). Finally, extension of the mid-thoracic spine was performed in supine lying (7) passively, with the help of pillows placed over the back and enough care was paid over the drains. After each stretching performance, relearning of pulmonary function was enhanced by using low-level resistive incentive spirometer exercises. Each technique was repeated 5-10 times per set. At the beginning of the treatment, RPE was 7 and the chest expansion showed a severe reduction at the level of axilla and at the level of xiphoid process. following second and third sessions of treatment in

addition to oxygen therapy, chest expansion increased and the dyspnea level subsided (Table 1). Chest x-ray also showed noteworthy, lung shadows with haziness on the left side and on 9th day the chest x-ray showed clear lung shadows with full expansion of the lung.

Table 1: Respiratory Components.

Day	Grade: RPE Scale	Chest expansion (cm): Axilla	Chest expansion (cm): xiphoid process
1	7	1	2
2	5	2	2
5	4	2	2.5
7	3	2.5	3
9	1	2.5	3.5

Abbreviations: cm, centimeters; RPE, rate of perceived exertion.

Discussion

In this case study, we could demonstrate an improvement in respiratory functions such as reduction in dyspnea level and increase in chest expansion in a patient with renal conditions who underwent percutaneous pigtail nephrostomy, when an additional specific chest physiotherapy exercise was given along with routine chest physiotherapy. Chest physiotherapy was directed to help a patient to relieve from postoperative pulmonary complications (2). Chest physiotherapy following any form of procedure, is a treatment modality in the respiratory management (2). Outcomes are known to be improved depending upon the impact of the respiratory impairment and the area where the procedure or surgery is being performed. However, the appropriate level of effectiveness of it is uncertain.

The present study is supported by literature which described the benefit of chest wall stretching in pulmonary patients as well as in normal subjects on expired tidal volume, dyspnea and chest expansion (6,7). The aim of using chest wall mobility exercises was to improve chest wall excursion and regain the normal respiratory mechanics following any form of surgery. Neurofacilitatory techniques are specialized approach which includes passive stretching of intercostal muscles, thoracic extension, lateral flexion of the trunk and rotation of vertebral segments (8). The present study supports earlier reports which depicted intercostal stretch may enhance the chest wall elevation and thus increase expansion to improve intra-thoracic lung volume which contributes to improvement in flow rate percentage (8). This may

contribute to the increase in ventilator capacity such as tidal volume, minute ventilation and oxygen status (8). Hence, we adopted a modified methodology such as extension of mid-thoracic spine passively with the aid of pillows in our study. We may speculate that a specific exercise programme induced or improved the mobility of the thoracic cage thereby promoted respiratory indices. In this case study, the improvement in respiratory functions made it possible to wean oxygen as early as possible. Of course, foster investigation allowing in more patients are essential to definitively evaluate the quality of treatment in the context of physiotherapy for treating patients with various conditions following a surgery is needed.

Conclusion

This study establishes a betterment of respiratory functions such as reduction in dyspnea level and improvement in chest expansion when implementing a specific stretching protocol following a percutaneous pig tail nephrostomy with complications. The results of our study may add new information about physiotherapeutic aspects in surgically managed emphysematous pyelonephritis.

Acknowledgment

The authors are grateful to Assoc.Prof.Dr.Srijit Das, Faculty of Medicine, Universiti Kebangsaan Malaysia, Kuala Lumpur, Malaysia for all technical help in editing the manuscript.

References

1. Ubee SS, McGlynn L, Fordham M. Emphysematous pyelonephritis. *BJU Int* 2011; 107(9):1474-8.
2. Stiller KR, Munday RM. Chest physiotherapy for the surgical patient. *Br J Surg* 1992; 79(8):745-9.
3. Dyer RB, Regan JD, Kavanagh PV, Khatod EG, Chen MY, Zagoria RJ . Percutaneous nephrostomy with extensions of the technique: step by step. *Radiographics* 2002; 22 (3): 503-25.
4. Sood G, Sood A, Jindal A, Verma DK, Dhiman DS. Ultrasound guided percutaneous nephrostomy for obstructiveuropathy in benign and malignantdiseases. *Int Braz J Urol* 2006; 32(3):281-6.
5. Capodaglio EM. Comparison between the CR10 Borg's scale and the VAS (visual analogue scale) during an arm-cranking exercise. *J Occup Rehabil* 2001; 11(2):69-74.
6. Puckree T,Cerny F,Bishop B. Does Intercostal Stretch Alter Breathing Pattern and Respiratory Muscle Activity in Conscious Adults? *Physiotherapy* 2002; 88(2):89-97.
7. Leelarungrayub D, Pothongsunun P, Yankai A, Pratanaphon S. Acute clinical benefits of chest wall-stretching exercise on expired tidal volume, dyspnea and chest expansion in a patient with chronic obstructive pulmonary disease: a single case study. *J Bodyw Mov Ther* 2009; 13(4):338-43.
8. Chang A, Paratz J, Rollston J. Ventilatory effects of neurophysiological facilitation and passive movement in patients with neurological injury. *Aust J Physiother* 2002; 48(4):305-10.