

Introduction of a New Physiotherapy Technique for Preventing Respiratory Complications in Acute Spinal Cord Injured Patients

F BASHIR

Department of Physiotherapy Department, Sir Ganga Ram Hospital Lahore, Pakistan.
Correspondence to Dr. Fouzia Bashir Consultant Physiotherapist & Head of Physiotherapy Department.

This prospective study was carried out at Neurosurgery departments of Lahore General Hospital Lahore and Mayo Hospital Lahore, Pakistan on 82 hospitalized patients of acute spinal cord injured. Purpose of this study was to evaluate the effects of lateral rotation of the trunk on the development of respiratory complications and consequent reduction in mortality rate and role of third party in the management of spinal cord injured (SCI) patients. In this study, this technique was applied in group-A in which no patient died and no patient develop any respiratory complication in contrast to group-B and C. Therefore, results of this study, proved that it is a very effective technique in preventing respiratory complications and consequent mortality rate. Participation of third party is essential to achieve these results. It is recommended to use this new technique for the management of acute spinal cord injured patients.

Key words: Pneumonia, chest physiotherapy-SCI, respiratory complications-prevention, mortality -SCI,

Once the patient survived off the initial injury, mortality rate with respiratory complications is very high among spinal cord injured all over the world. For thousands of year, a spinal cord injured mean: If the patient survived the accident or the pneumonia, that was likely to set in soon after, he was destined to spend whole life in a wheel chair¹. The commonest cause of death in United States in spinal cord injured is respiratory failure although in the past, it was renal failure². The spinal cord injured is at increased risk of developing pneumonia and respiratory failure. Postural drainage, usual modes of physiotherapy (thoracic expansion exercises and forced expiratory maneuvers)^{3,4} and other mechanical techniques (suction) etc are basically directed for the treatment of established respiratory complication i.e., pneumonia and atelectasis rather than for the prevention. It is easy to prevent rather than to treat an illness. According to Jetty's study, type of intervention is related to outcomes⁵. Therefore, there must be some effective methods of treatment to reduce and prevent the risk of developing respiratory complications and consequent deaths.

In developing countries there is shortage of professionals, experts and treatment facilities in contrast to developed countries. In order to combat this deficiency, patient's attendants were involved in the treatment of spinally injured patients.

So this study is directed to find out the effects of lateral rotation of the trunk on respiratory status of the patient and consequent mortality in these patients and to evaluate whether patient's attendants should participate in the treatment or not?

Material and method

Clinical trials were performed from February 1999 to November 1999 on 82 hospitalized patients with acute unstable spinal cord injuries (from cervical to lumbar spine) with neurological deficit who survived off the initial

injury, at Neurosurgery department of Lahore General Hospital Lahore and that of Mayo Hospital Lahore, Pakistan. However, study does not include stable spinal cord injured patients and those without neurological deficit.

Patients were divided into three groups. Group-A consisting of 32(39.02%) patients, physiotherapy was done by Physiotherapist and attendants were fully involved in the treatment. Only in this group, patient's attendants (third party) were trained to carry out therapy of their patients as advised. Group-B comprises of 22(26.82%) patients but only Physiotherapist performed physiotherapy. In group-C consisting of 28(34.14%) patients, no physiotherapy was done at all.

Table 1. Spinal cord injured patients

Variable	n=	%age
Male/Female	76/06	92.68%/7.31%
Mode	Males	
Age		
Range	12-70Y	
Median	30Y	
Mode	40	
Total patients operated	42	51.21
Patients managed conservatively	40	48.78
Cervical traction	28	34.14
Site of lesion:		
Cervical spine	48	58.53
Thoracic spine	16	21.95
Lumbar spine	16	19.51
Mode cervical spine	48	58.53

Treatment techniques includes lateral rotation of the trunk (after every one hour), maintained by a pillow from shoulders to hips causing tilting of the trunk on the opposite side, deep breathing exercise with coughing/huffing^{4,3}. But modified postural drainage⁴, suction, nebulization with ventoline solution and steam inhalation (four hourly) were employed when required routinely for the management of established respiratory complication.

Table 2. Techniques of chest physiotherapy applied

Variable	Group A (n=32) N (%)	Group B (n=22) N(%)	Group C (n=28) N(%)
Lateral rotation by:			
Physiotherapist	32(100)	22(100)	00
Attendants	32 (100)	06(27.27)	02(7.14)
Deep breathing Exercises	32(100)	04 (18.18)	02(7.14)
Coughing/huffing	32(00)	04(18.18)	02(7.14)
Steam Inhalation	02 (6.25)	04(18.18)	02(7.14)
Postural Drainage	–	04(18.18)	02(7.14)
Nebulization	–	04(18.18)	02(7.14)
Suction.	–	02 (9.09)	04(14.28)

Table-3 Comparative study

Variables	Group-A (n=32) N(%)	Group (n=22) N(%)	Group-C (n=28) N(%)
Complications developed			
Atelactasis	00	10(45.45)	26(14.28)
Pneumonia	00	10(45.45)	22(85.67)
Mortality rate*	00	06(27.27)	06(21.42)
Length of hospital stay:			
Range	4 -42	6 -158	5 - 44
Median	12	16	15.5
Mean	14.06	31.90	19.42

*Total deaths were 12(14.63%) among 82 patients.

Results

Study shows that development of respiratory complications and mortality rate was nil in group-A whereas in group-B, 45.45%(n=10) patients developed these complications with mortality rate of 27.27%(n=06) as shown in table-3. In group C, (n=26,14.28%) developed atelactasis and pneumonia in (n= 22, 85.67%) and 21.21% deaths occurred. However, hospital stay was longer in group-C i.e.6-158 days and shortest in group-A i.e.4-42 days (table-3). In group-A, neither postural drainage nor suction or nebulization was done in contrast to group-B & C as indicated in table-2. Incident of trauma was common in males (n=76) with age ranging from 12-70 years and commonest site of trauma was cervical spine(n=48,58.53%).A total of (n=42,51.21%)patients underwent neurosurgery, while (n=40,48.78%) and (n=28,34.14%) patients were managed conservatively and on cervical traction respectively (Table-1).

Discussion

Spinal cord injury is a devastating condition typically affecting young people with a preponderance of males⁶. In this study also, incident was more in males (n=76,92.68%) than in females (n=06,7.31%).Pulmonary complications remain a major cause of morbidity and mortality in Spinal cord injured⁷. Pneumonia is one of the most common complication and leading cause of death in acute spinal cord injured. Preventive measures are very important to reduce the risk of pneumonia, atelectasis and plugging of airways with mucous. Therefore, It appears that muscle strength may be a more important factor than muscle tone in determining pulmonary function in spinal cord-injured patients and that both strength and tone are closely related

to negative inspiratory pressure⁸. Although spinal cord injury is devastating and can compromise the respiratory system, particularly when the cervical cord is injured, aggressive use of noninvasive respiratory muscle aids can reduce the otherwise commonly seen complications of pneumonia, bronchial mucous plugging, atelectasis, and respiratory failure⁹.

Extensive study is being conducted all over the world to control the development of respiratory complications and consequent mortality rate but still major cause of death among acute spinal cord injured still remain respiratory infections and respiratory failure.

These paralyzed patients remain bed ridden after injury. Their static posture contributes in the development of respiratory complications. Lateral rotation of the trunk keeps them moving and prevents the accumulation and plugging of secretions in the respiratory bronchi and bronchioles. Deep breathing exercises further help to squeeze any accumulated secretions and coughing/huffing^{3,4} serves to expel secretions from air passages. Involvement of third party in the management of these patient ensure that treatment is being followed/carried out as advised in order to achieve full results of the treatment. In group-A, only this technique was employed. No death and no respiratory complication developed in this group.

Coughing/huffing^{3,4} is an effective mean of clearing air passages in neurologically intact individuals but not in Spinal cord injured patients because muscles involved in coughing are innervated by nerves arising from various levels of spinal cord⁷. Therefore, lateral rotation of the trunk here serve as a substitute.

In third world countries, there is a deficiency of trained and qualified Physiotherapist as well as treatment facilities for these SCI patients as compared to that in advanced countries. Involvement of attendants reduces this deficiency, also save money. They remain with their patients all the time. Spinal cord injured patients with paralysis of trunk and abdominal muscles will cough but with reduced frequency if their coughing is dependent on a caregiver⁷. Positive results can be obtained only if treatment will be carried out, otherwise not.

In group-B, 45.45%(n=10) patients developed respiratory complications and (n=06,27.27%) deaths occurred because third party was not involved. In group-C, no physiotherapy was done but in (n=2,7.14%) patients physiotherapy was done by attendants of patients themselves. Consequently, rate of developing respiratory complication was also higher in this group. Postural drainage, suction and nebulization has to be done in group-B&C for treating atelactasis and pneumonia (Table-2).Whereas in group-A, preventive method employed was so effective that none of the patient require these procedures(Table-2). Moreover, duration of hospital stay was also less in group-A (Table-3). Longer stay in group-B

was because one patient underwent Laparotomy and developed other surgical related complications.

Results of this study reveal that this simple technique is very effective in controlling and preventing the respiratory infections and resultant deaths among spinal cord injured patients. Involvement of third party in the management of these paralyzed patients is very effective and essential in order to get positive effects of therapy.

It is strongly recommended to use this new technique for the prevention of respiratory complications and deaths.

Conclusion

This study prove that lateral rotation of the trunk along with deep breathing exercises and coughing, is an effective mean of controlling the respiratory complications as well as resultant mortality rate. However, involvement of third party in treatment of these patients is very useful, essential and cost effective.

Dedication

This article is dedicated to my brothers, Khalid and Amir as well as to Late Dr Khuram Shafique.

References

1. Amita M. Nerve Research could put chairs in the past Published in USA Today 1998.
2. American Paralysis Association. The facts about spinal cord injury and CNS. 1999. The University of Alabama National Spinal Cord Injury Statistical Center, The Dana Alliance for Brain Initiatives and Paralyzed Veterans of America.
3. B.A. Webbe, D.V. Gaskell. Surgical Conditions, In: The Brompton Hospital Guide to Chest Physiotherapy, Blackwell Scientific Publications, Oxford, London, Edinburgh, Boston, Melbourne. 1980: 66:81-82.
4. Fouzia Bashir, Asad Ullah Malik, Physiotherapy in post-operative atelectasis; PPMJ 1991 Vol.10(3): 92-96.
5. Jette DU. Physical Therapy and Health Outcomes in patients with spinal Impairments, Phy Ther 1996; 76: 930-41.
6. Bracken MB. Pharmacological interventions for acute spinal cord injury (Cochrane Review). In: The Cochrane Library, Issue 2 2002. Oxford: Update Software.
7. Wang AY; Jaeger RJ; Yarkony GM. Cough in spinal cord injured patients: the relationship between motor level and peak expiratory flow; Turba RM, Spinal cord 1997; 35(5): 299-302..
8. Roth EJ, Lu A, Primack S, Oken J, Nusshaum S, Berkowitz M, Powley S. Ventilatory function in cervical and high thoracic spinal cord injury, Relationship to level of injury and tone, University Medical School, Chicago, Illinois, USA, Am J Phys Med Rehabil 1997 76:262-7.
9. Viroslav J, Rosenblatt R, Tomazevic SM. Respiratory management, survival, and quality of life for high-level traumatic tetraplegics. Dallas Rehabilitation Institute of Health South, Texas, USA; Respir Care Clin N Am 1996; 2: 313-22.