

INVESTIGATION INTO COMPLIANCE WITH PHYSIOTHERAPY REGIMEN IN CYSTIC FIBROSIS*

L M Davids BSc Physiotherapy, BA Hons
Control physiotherapist, Red Cross War Memorial
Children's Hospital, Rondebosch, Cape

L D Henley PhD
Research Officer, Department of Paediatrics, University
of Cape Town

Cystic fibrosis (CF) is a chronic disease which requires lifelong intensive medical supervision. The treatment regimen is multifaceted and complicated, demanding continuous careful monitoring by the family, especially the mother. Adherence to all aspects of the regimen at all times is probably rarely achieved. Chest physiotherapy (CPT) is the most time-consuming and least liked aspect of therapy¹ and compliance is likely to be poor.

It has long been felt by one of the authors (LD) that regular CPT was not being performed on the majority of the patients attending the CF clinic at the Red Cross War Memorial Children's Hospital. If this is correct it would be of importance to know whether the lack of *regular* CPT had any effect on the medical status of the patients.

The aims of this study were to assess the regularity of CPT and/or alternative therapies administered to CF children. The relationship between regular CPT and clinical outcome as measured by the number of days in hospital was determined. The influence of selected sociodemographic variables (age of patient, social class of family) on compliance with regular CPT as well as patient attitudes to this therapy were also studied.

Literature Study

In recent years the actual benefits of regular CPT, i.e. postural drainage, percussion, vibrations and cough, have come under scrutiny. Various alternative therapies have been investigated.

There is general agreement that in advanced disease CPT has a role to play. Evidence of its importance in the moderate and mild cases is conflicting.²

Chest Physiotherapy

Reisman et al³ in a recent three year prospective study have shown that patients receiving conventional CPT have less deterioration in pulmonary function than those practising forced expiration technique (FET). All patients took some form of exercise. They conclude that even in patients whose symptoms and sputum production are minimal, pulmonary disease progressed more rapidly when CPT is not practised. This is the most positive evidence to date for the use of regular CPT.

SUMMARY

A cross-sectional postal survey was conducted among 66 patients with cystic fibrosis and their parents to determine the nature and frequency of performance of chest physiotherapy, physical exercise and nebulization. Data were collected by means of structured questionnaires. Fifty-five patients received chest physiotherapy. Approximately 48% of these patients received physiotherapy once or twice a day whereas the remaining patients did physiotherapy only in the presence of a chest infection or once or twice a week. No sociodemographic or medical data were significantly associated with how often physiotherapy was performed. Three-quarters of the patients engaged in physical exercise. Fourteen patients substituted exercise for physiotherapy although more than half this group relied upon physiotherapy during respiratory infections. Findings suggested a measure of ignorance concerning the methods of chest physiotherapy. Of the 50% of patients who used a nebulizer almost one half were inadvertently nebulizing antibiotics before physiotherapy. Findings are discussed in the light of current controversies surrounding the efficacy of chest physiotherapy in the treatment of cystic fibrosis.

OPSOMMING

'n Dwarsprofiel oorsig is per pos gedoen onder 66 pasiënte met sistiese fibrose en hul ouers om die aard en frekwensie van die uitvoer van borsfisioterapie, fisiese oefening en nebulisasie vas te stel. Data was versamel deur middel van gestruktureerde vraelyste. Vyf-en- vyftig pasiënte het borsfisioterapie ontvang. Ongeveer 48% van hierdie pasiënte het fisioterapie een of twee maal per dag ontvang, terwyl die oorblywende pasiënte dit slegs in die teenwoordigheid van 'n borsinfeksie ontvang het of een of twee maal per week. Geen sosiodemografiese of mediese data was aanmerklik verbonde met hoe dikwels fisioterapie uitgevoer is nie. Drie-kwart van die pasiënte het deelgeneem in fisiese oefening. Veertien pasiënte het oefening vir fisioterapie substitueer, alhoewel meer as die helfte van hierdie groep staat gemaak het op fisioterapie gedurende respiratoriese infeksie. Die bevindings stel 'n mate van onkunde in verband met die metode van borsfisioterapie voor. Van die 50% van pasiënte wat 'n stuifspoeier gebruik het, het amper die helfte onbewus antibiotikas vòr fisioterapie verstui. Die bevindings word bespreek in die lig van die huidige twispunt wat die werk saamheid van borsfisioterapie in die behandeling van sistiese fibrose omsingel.

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Earlier work concludes that conventional CPT is of value in patients with large sputum volumes.^{4,5,6} Most of these studies deal with short term effects.

Alternative Techniques

A number of techniques which are simpler to perform and less time-consuming have been investigated. Because directed coughing is simple and the patient can do it by himself, studies were performed to find out whether it is as effective as CPT. Conflicting results were obtained with de Boeck and Zinman⁷ finding cough as effective as CPT, while Bateman et al⁸ found CPT the more effective.

Positive expiratory pressure (PEP) as an alternative therapy, has also been investigated. Again the results are inconclusive. Van Hengstum et al⁹ found PEP less effective than FET but van Asperen et al¹⁰ found PEP as effective as conventional CPT.

Exercise is being increasingly advocated. Before prescribing exercise, care needs to be taken in assessing the respiratory status of the individual patient. Generally exercise forms a useful adjunct to the other therapies.^{11,12,13}

Coates² concludes that "In demonstrable lung disease, some form of therapy aimed at improving pulmonary toilet has a role to play in the treatment of CF". It would seem that conventional CPT is still the basic standard with which all other therapies must be compared.

Compliance

"Lying head down over a bed once or twice a day for 20 minutes is an exercise that few doctors would find time to adopt unless the rewards were appreciable".¹⁴ It is not surprising that most CF patients find conventional CPT tedious and unpleasant to perform.

The immediate effects of CPT are not obvious in the mild or moderate case and it is these patients who are less compliant. Eigen et al¹⁵ maintain that compliance with a medical regimen is improved when there is evidence that the treatment is effective. The physiotherapy regimen is complicated and time-consuming and frequently interferes with the family dynamics. The quality of life of the patient and his family may be affected by CPT.¹⁵

In a study done¹⁶ comparing FET with CPT it was found that compliance with either of these regimens depended on the family attitudes and interpersonal relationships. Fong et al¹⁷ found that the patients who worried more about their health were more likely to be compliant with the medical regimen. The physiotherapy schedule was an obstacle to full compliance. They suggested that stressing the severity of the disease and the effectiveness of CPT might improve compliance.

Muszynski-Kwan et al¹⁸ in their review of compliance with a CPT regimen recommend a realistic and individualised approach to each patient. They find that the therapist and the patient must cooperate and the treatment protocol must take into account the patient's life-style as well as his pulmonary status.

There is general consensus that a holistic approach must be used in order to prescribe the most effective and yet the least intrusive programme of physiotherapy.

METHOD

The study design consisted of a cross-sectional survey among all the patients with CF and their parents who attended the CF clinic at the Red Cross War Memorial Children's Hospital in Cape Town between January 1, 1985 and June 30, 1988. This is the only referral centre for CF patients in the region and 76 patients were seen during this period. One family could not be traced. Letters were sent to the remaining 70 families (5 families had 2 affected children) to advise them of the aims of the study and a structured questionnaire, in the home language of choice, was sent to each family. The questionnaire was pretested for acceptance and comprehension among 6 CF families. After 4 weeks a second questionnaire was sent to families who did not respond to the initial mailing.

Fixed-choice questions examined the following aspects of the CF treatment regimen: chest physiotherapy (postural drainage, percussion, vibrator, Phys-Pep mask,¹⁹ forced expiratory technique), physical exercise and nebulization.

Socio-demographic (age) and medical (number of days in hospital) data were obtained from clinic records. Social class was determined by father's occupation in accordance with the British Registrar General's grading system.²⁰

Permission for this study was granted by the Ethics and Research Committee of the University of Cape Town Medical Faculty.

The Chi-square and Wilcoxon rank sum tests were used to examine relationships between variables.

RESULTS

Completed questionnaires were received from 66 patients. This reflected a response rate of 88 percent. Fifty-six questionnaires were completed by mothers, 8 by patients and 2 by fathers. Physiotherapy was performed most frequently by mothers (n = 35) followed by the patients themselves (n = 12). Fathers (n = 8) were least likely to administer physiotherapy.

The mean age of CF patients was 9.3 years (range 1-24 years). Fifty-three percent of patients came from social classes I and II. Twenty-five (37.9%) patients had spent an average of 35.5 days in hospital (range 4-70 days) between January 1, 1985 and June 30, 1988.

Chest Physiotherapy and Physical Exercise

Respondents had to indicate whether chest physiotherapy and/or physical exercise formed a part of the CF patient's

TABLE I

TECHNIQUES OF PHYSIOTHERAPY (% DISTRIBUTION) USED BY CF PATIENTS ¹	n	% ²	x Age (yrs)
Postural drainage	10	18.2	6.5
Percussion	31	56.4	6.7
Vibrator	10	18.2	12.5
Phys-Pep mask	21	38.2	12.9
Forced expiratory technique	10	18.2	13.6

¹ n = 55

² Total is greater than 100% as patients use multiple techniques.

treatment regimen. Six patients did not perform physiotherapy or exercise, 11 performed physiotherapy only and 5 patients included both physiotherapy and exercise in their treatment. Fourteen patients engaged in exercise in place of regular physiotherapy although nine of these patients relied upon physiotherapy in the presence of respiratory infections. Thus a total of 55 patients (83.3%) were doing physiotherapy either alone or in combination with physical exercise.

The frequency and mean age of patients using the different techniques of physiotherapy are presented in Table I. Respondents had to indicate whether the patient coughed during physiotherapy and the approximate amount of sputum produced during coughing. Only four (7.3%) out of the 55 patients did not cough during physiotherapy. Most (84.0%) were "fairly productive" and 5% were "very productive". In most patients (78%) each physiotherapy session lasted about 15 minutes but ten (18%) patients took between 15 and 20 minutes to complete physiotherapy. Only two (4%) patients had sessions lasting approximately 45 minutes. Respondents had to describe the patient's reaction to physiotherapy. Seventy-one percent "tolerated" physiotherapy, with equal proportions (14.5%) either "enjoying" or "hating" this aspect of treatment.

TABLE II

FREQUENCY OF PERFORMANCE OF PHYSIOTHERAPY (% DISTRIBUTION)¹

	n	%
Only when infected	23	41.8
Once a day	13	23.6
Twice a day	13	23.6
Once a week	1	1.8
Twice a week	5	9.1

¹ n = 55

The frequency (i.e. how often) of performance of physiotherapy is presented in Table II. For the purpose of this study "regular" physiotherapy has been defined as "at least once or twice a day". Of those patients performing physiotherapy less than half (47.3%) were doing so regularly. The remaining 52.7% performed physiotherapy somewhat irregularly, i.e. once or twice a week or only when a chest infection was present. The frequency of performance was further analysed according to patient's age, social class and whether he/she had been hospitalised. None were significantly associated with the "regular" or "irregular" performance of physiotherapy. Frequency was also analysed according to the number of days patients had spent in hospital. There was no significant difference in the length of hospitalisation of patients who performed physiotherapy on a regular or irregular basis (\bar{x} 37.9 versus \bar{x} 20.5 days respectively $z = 1.81, p = 0.07$).

Seventy-four percent of all patients engaged in physical exercise. Running was the most popular form of exercise (n = 26) followed by swimming (n = 22) and trampolining (n = 17). Other frequently reported forms of exercise included skipping, aerobics, somersaults, dancing, gymnastics, cycling, tennis and horse-riding.

Respondents had to specify which technique of physiotherapy or physical exercise was the most effective for removing secretions. Almost half the sample selected physical exercise whereas postural drainage and the vibrator were the

TABLE III

DISTRIBUTION OF RESPONDENTS' PERCEPTIONS OF MOST EFFECTIVE METHOD FOR REMOVING SECRETIONS.¹

Preferred technique	n
Postural drainage	2
Percussion	11
Vibrator	3
Phys-pep mask	9
Forced expiratory technique	6
Physical exercise	29

¹ n = 60 (6 patients did not do physiotherapy or exercise).

least favoured methods for mobilising secretions (Table III).

Nebulization

Thirty-three patients (50%) used a nebulizer. Almost half of these patients (n = 16) used the nebulizer twice daily, seven patients used it once a day and eight only in the presence of a chest infection. Findings reflecting which medicines were used in the nebulizer and whether they were administered before or after physiotherapy are presented in Table IV.

TABLE IV

NATURE AND TIMING OF MEDICATION USED BY CF PATIENTS DURING NEBULIZATION.¹

Medication	Physiotherapy	
	Before	After
Mistabron	19	-
Ventolin	22	3
Antibiotics	10	11

¹ n = 33

DISCUSSION

At the Red Cross Was Memorial Children's Hospital CF clinic a physiotherapist is available to assist patients. New patients are taught postural drainage, i.e. tipping and positioning from side to side and percussion. The importance of CPT is stressed including coughing. As the patients grow older more techniques are demonstrated to the parents, viz. FET, Phys-Pep and the use of a mechanical vibrator. Exercise is promoted. The physiotherapy programme is further discussed with those parents who request it.

It can be seen from Table I that this system is not really adequate. In Table I, 31 patients reported that percussion was used and yet only ten reported using postural drainage. The use of percussion and/or the vibrator implies the use of postural drainage. Either the terminology was not understood or CPT is not being properly carried out. FET can also be used with postural drainage or when using the Phys-Pep mask. It is obvious from the replies that the whole physiotherapy programme needs to be revised and individualised.

Only 26 of the 66 respondents, i.e. $\pm 40\%$ performed regular (once or twice a day) CPT. This group included mild, moderate and severely affected patients. Twelve of the 26 were not hospitalised during the period under consideration.

No significant difference was found in the periods of hospitalisation of those performing regular CPT and those doing it on an ad hoc basis.

Days in hospital was the only parameter available to the authors by which the effectiveness of CPT could be assessed. The patients at the clinic do not have routine regular chest X-rays or lung function studies to monitor pulmonary status. It is thought that since the long-term prognosis is poor, regular testing may cause anxiety in patients and parents and add little to clinical decisions on treatment (personal communication).

Our results suggest that regular CPT plays a very small role in the general medical status of the patients. However, some form of pulmonary toilet is carried out by the majority of our patients (55/66) either as CPT when thought to be indicated or as regular exercise - so it is difficult to judge the importance of regular CPT. In the light of the Toronto study of Reisman et al.³ which maintains that deterioration of pulmonary function was less in those receiving conventional CPT, more accurate background data (Chest X-rays, pulmonary function studies) are needed in order to establish the actual importance of regular CPT versus an ad hoc pulmonary toilet.

It is interesting to note (Table III) that physical exercise was perceived to be the most effective method of removing secretions. Physical exercise is enjoyed by most people and the child is active during that period. CPT is essentially a passive treatment (except for coughing) and the child must be controlled. This demands much more psychologically from both parent and child. It is possible that the patients' and parents' perceptions of effectiveness and their enjoyment of the exercise are very closely linked.

Table IV shows the timing and nature of the medication used by means of nebulization. It is generally accepted that nebulized antibiotics should be given after CPT because the drugs are not easily absorbed into mucus-filled airways.²¹ If a mucolytic and/or a broncho-dilator are being used, these should be administered before CPT and a double period of nebulization is necessary. What usually happens is that all the substances are nebulized together before CPT to save time. It is doubtful if in these circumstances much of the antibiotic is absorbed and its effectiveness may be diminished.²¹

Broncho-dilators in a nebulized form are effective,²² but whether mucolytics administered in this way affect the sputum is dubious. The nebulized mucolytic probably does not reach far enough down the airways to thin secretions. A short period of broncho-dilator nebulization followed by effective CPT and then a period of antibiotic nebulization (if indicated) would appear to be the most logical theoretical sequence.

CONCLUSION

In the CF patient the whole treatment regimen needs to be individualised. The attitude of the child and his family including their lifestyle must be taken into consideration. It is doubtful whether one should impose a full CPT programme on a generally well child or one with predominantly digestive symptoms. Exercise and/or Phys-Pep with FET might well be sufficient. More studies need to be performed to confirm the Toronto experience which suggests that CPT is effective in preventive as well as maintenance care. Such studies would require regular chest radiographs and pulmonary function

tests to provide reliable evidence of improvement or deterioration. If the effectiveness of CPT can be shown, its importance must be conveyed to the parents and patients. Understanding of an individualised programme should improve compliance with the treatment regimen.

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