The Libyan International Medical University

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Cystic fibrosis: physical exercise versus chest physiotherapy

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Report Submitted to fulfill the requirements for Scientific Research Activity

Date of Submission: 9/3/ 2020

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Abstract :

Cystic fibrosis (CF) may be a life threatening disease resulting in accumulation of thick mucus which will affect the lungs , sudoriferous glands (sweet gland) and other organs , due to chromosomal mutation in CFTR gene that encodes the CFTR protein (cystic fibrosis trans membrane conductance regulator protein) this report is based on a study that has been done on 12 children with CF that include work out program , were the physiotherapy and aerosol inhalation was stopped for a span of 17 days of the program , but it didn't achieve to a major response.
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Introduction:

Cystic fibrosis a genetic abnormality which will effect lungs , reproductive tract , and gastrointestinal system .It's an autosomal recessive disease , a chromosomal mutation in CF- associated gene that provide instruction to form CFTR protein (cystic fibrosis trans membrane conductance regulator protein) , this protein pumps chloride ions into different secretions this ion help draw water into the secretions which will wind up thinning that out .The abnormalities in this protein leads to an accumulation of thick , sticky , dehydrated mucus which will eventually clog the lungs and impair the mucociliary clearance and also gives an appropriate environment for bacterial growth .
Cystic fibrosis result in pancreatic insufficiency and decreased reabsorption of sodium , chloride ions in sudoriferous glands , resulting in the production of hypertonic sweat. (Δf508) : it is the commonest typical kind of CFTR mutation which is basically the deletion of three base pairs which will end in loss of phenylalanine residue of amino acid in position 508 .(1)
Patients suffering of cystic fibrosis may be life- long treating with antibiotics due to recurrent bacterial infection ,and medications to decrease the thickness of the mucous , also they will be undergoing aerosol inhalation and physiotherapy .The idea of physiotherapy it to clear the sputum from the airway to stop the disease progression by a techniques called "airway clearance techniques" or in abbreviation (ACT).(2)

The main purpose of this report is to discuss the effect of physical activity on 12 children who has had cystic fibrosis .

Method and Material :

this report is based on a study that has been done on 12 children with CF that include work out program , were the physiotherapy and aerosol inhalation was stopped for a span of 17 days of the program , but it didn't achieve to a major response.

A total of 6 boys and 6 girls with the median age of 10 years were sent to pediatric rehabilitation(3) hospital in mountainous area, the youngsters had positive sweat test with stable clinical condition .The routine therapeutic regimen included pancreatic enzyme replacement and appropriate diet .Chest physiotherapy and aerosol inhalation twice a day and 5 children were taking oral antibiotics , but no bronchodilators . Two months prior to the admission parents and children were instructed to keep going on the inhalation physiotherapy routine .This study was conducted within summer time to scale down any seasonal influences or any health associated problems effecting pulmonary function . the hospital study which this report is based upon had lasted for 17 days and during this time the **aerosol inhalation and chest physiotherapy was stopped** and the rest of therapeutic regime was maintained.

All children participated in program of physical exercise and sport lead by physiotherapist and this activity included:

1- Swimming and diving twice a day, 2- jagged for 3 Km , 3- gymnastics , 4-skipping and other activity.

After the ending of the course the kids went back to their home and resumed their precourse inhalation physiotherapy routine , and also the ventilator status was assessed:

A- 1 Day before admission , B-1 Day the end of hospital stay , C-8 Weeks later

The peak expiratory rate of flow (**PEFR**) with Wright peak flow meter was measured in addition to the measure of forced vital capacity (**FVC**) , forced expiratory volume (**FEV**) ,functional residual capacity (**FRC**) , residual volume (**RV**) , and lastly total lung capacity (**TLC**).

also during the whole training course each child (**PEFR**) was measured daily and the best 3 consecutive measurement was recorded.(3)

Result:

the kids swam and dived for 32 hour , hiked for 160 Km for 64 hour , and undertook other physical activities for 32 hour therefore performance and endurance was evident , additionally the 6 non swimmers learned how to swim . but it failed to meet satisfactorily ,Two of the children had problems , and a 6 years old girl became **dysphonic and cyanotic ,** she continued her inhalation physiotherapy routine for day 4 , and the second child in the 5^{th} day suffered of a mild **upper respiratory tract infection** . So the measurement were obtained only from 10 children , and force the entire group(**FVC**) , (**FEV**) , (**FEF**) , and (**PEFR**) improved significantly after the course(3)

Table: pulmonary function tests and statistical comparison

Tests	(A)	(B)	(C)
(FVC)	88.0	93.8	88.8
(**FEV**)	70.6	79.2	73.0
(**FEF**)	41.6	52.9	45.4
(**PEFR**)	90.9	109.1	104.9
(**TLS)**	105.2	110.6	104.9

A= assessment 1 day prior to admission, **B**= assessment 1 day after end of hospital stay, **C**= assessment 8 weeks after , **FVC**= forced vital capacity, **FEV**= forced expiratory volume , **FEF**= forced expiratory flow , **PEFR**=peak expiratory flow , **TLC**= total lung capacity

FEV and FEF decreed significantly from B to C , apart from PEFR there are no pronounced difference between A and C , TLC increased moderately from A to B ,

RV showed simulates tendency to decrease , and this volume change however , failed to reach significance .

Discussion:

This study discussed a beneficial effect of physical exertion on children with cystic fibrosis , the children contend the physical exertion routine "swimming" even after the program was concluded , but the inhalation physiotherapy had been maintained .The training course failed to alter the beneficial response , but improve of ventilator muscle endurance. And there's a decent response and positive change in PEFR. Moderate increase in TLC within the presence of decreeing RV and TLC , and PEFR failed to decrease significant after the ending of the course . additionally that all the parameters returned to pre-training levels. The improvement of airways function seems to rely upon the upkeep of physical activity. swimming seems to be a vital a part of the program . The goal failed to tolerate the number of exercises needed to clear her secretion and chest physiotherapy was resumed (3) . (4) there's another study that said that the exercise is a vital part and will be recommended for all cystic fibrosis patients , no patient should be put aside from participating in the exercise because of the disease severity . and also the severity of lung disease may be defined by graded exercise test. For those patients awaiting transplantation the power to extend mobility will make them fitter for the rigors of the surgery . also the regulation aerobics in cystic fibrosis is related to a significantly decreased risk of dying and improve sputum clearance .
Currently there are not any published perspective long term studies showing that regular exercise decrease mortality in cystic fibrosis patients (4)

Conclusion:

Cystic fibrosis is a dangerous hereditary disease that will effect in different organs of the body specially the lung and other organs , it will lead to build up of huge amount of thick , dehydrated ,sticky mucus which is heard to expelled out of the body and make a appropriate environment for bacterial growth and con end with respiratory failure

This study show that regular physical exertion and sport maybe a substitute for inhalation and physiotherapy routine in same of kids(2) children were excluded because of the advancement of same health problems and also the program failed to get the expected result

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