EFFORT'S INFLUENCE ON RESPIRATORY VOLUMES AND FLOWS - REHABILITATION MANAGEMENT

INFLUENŢA EFORTULUI ASUPRA VOLUMELOR ŞI DEBITELOR RESPIRATORII – PROGRAM DE RECUPERARE

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Key words: Induced bronchoconstriction, astma, sportsmen, BPOC

Abstract.
Effort during training session – competitions, during the athlete's daily life or nonathletic people life, the effort of the persons with pathological bronhomotricity (asthma, BPOC) lead to significant respiratory constancy modifications. That is how a new clinical "entity" form, which is called bronhoconstriction, is induced by effort.
Objective. The aim of the study is to determine the tolerance and adaptation to effort and physical therapy recovery in cases of respiratory disfunctions or bronhoconstructive conditions.
Material and Method. A group of subjects divided into three groups: 1 athletes, 2 nonatheltic persons, 3 persons with pathological bronhomotricity (asthma, BPOC). This is a prospective study on the three groups, each group is monitored in standardized conditions and the measurements are made in three stages: before the effort, at 10 minutes after sustaining effort, and at 20 minutes after stopping.
Conclusion. Standardized measurements of respiratory volumes and flows in children and teenagers, especially in those who practice endurance sports in special conditions, discover at an early stage emphasized bronhomotricity. Respiratory measurements, both in athletes and persons with bronchospastic conditions (asthma and BPOC) show tolerance to effort. Respiratory physical therapy has a tremendous recovery potential. Combined with specific drugs, respiratory physical therapy, leads to remarkable results regarding the tolerance to effort.

Cuvinte cheie: bronhoconstricţie indusă, astm, sportivi, BPOC

Rezumat.
Efortul, din timpul antrenamentelor – competiţiilor, din viaţa cotidiană a sportivilor, a personaelor – altele decât la sportivi şi a persoanelor cu bronhomotricitate patologică (astm, BPOC), conduce la modificarea uneori semnificativă a constantelor respiratorii, în felul acesta definindu-se şi noua entitate clinică, aceea de bronhoconstricţie indusă de efort.
Scopul lucrării. Determinarea toleranţei, adaptarii la efort şi recuperarea kinetoterapică în cazurile de disfuncţie ventilatorie prin neadaptare sau prin afecţiuni bronhoconstrictive.
Material. un lot de persoane împărţit în trei grupe: 1. Sportivi; 2. Persone altele decât sportivi; 3. Persone cu bronhomotricitate patologică (astm, BPOC)
Metoda. studiu de tip prospectiv asupra celor trei grupe, fiecare grupă fiind studiată în condiţii standardizate iar măsuratorile au fost făcute în trei etape şi anume: înainte de efort, la 10min. după începerea efortului şi la 20min. după încetarea efortului.
Concluzii: Măsurătorile standardizate ale volumelor şi debitelor respiratorii la copii si adolescenţi, mai ales la cei care practică sporturi de anduranţă în condiţii deosebite, pot descoperi în faza incipientă bronhomotricitatea accentuată. Măsurătorile efactuate la sportive şi la personae cu afecţiuni bromhoconstirctive (astm, BPOC) arată toleranţă la efort. Kinetoterapia respiratorie are un potenţial recuperatoriu deosebit. Combinată cu tratamente medicamentoase, kinetoterapia respiratorie, duce la rezultate remarcabile în ceea ce priveşte creşterea toleranţei la efort.

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Introduction

Effort during training - competitions, in everyday life, the athletes, the personal - other than athletes and people with pathological bronhomotricity (asthma, COPD), sometimes leading to significant changes in respiratory constants defining the way and the new entity clinic, that the exercise-induced bronchoconstriction. (Anticevich SZ. et al., 1996)

Purpose

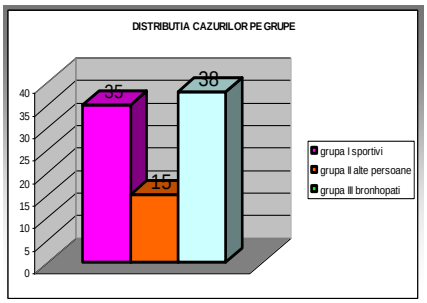
This paperwork aims to determine tolerance, adaptation to stress and recovery ventilator physical therapy in cases of dysfunction or disease by mismatch bronchoconstriction. (Belda J, et al., 2008; Bilien A, Dupont L., 2008)

Material and Methods

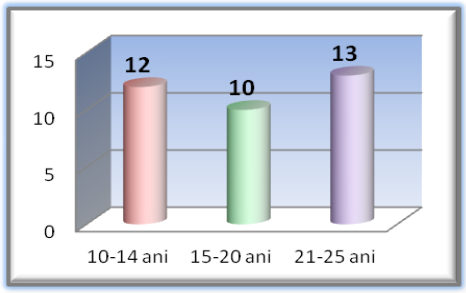
Subjects:

Eighty eight persons were examined under standardized conditions of temperature (20^0-22^0 C), dosed effort and time in the research lab of the University Constantin Brâncuşi. The 88 subjects were divided into three groups:

a). group I – Sports group consisting of athletes, players football, basketball, skiing, swimming - 35 subjects. In this group were selected athletes who work in intense, long term exercise regimen, in wet conditions, low or high temperatures, respiratory allergens (dust, pollen, etc.). Subjects were distributed by age intervals as follows: 12 subjects between 10-14 years, 10 subjects between 15-20 years, and 13 subjects between 21-25 years were assessed.

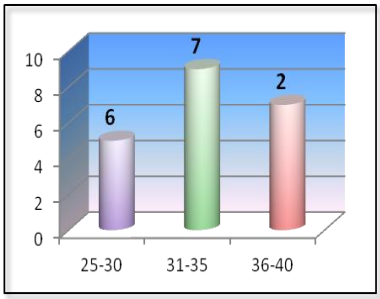


Graph no. 1: Group distribution

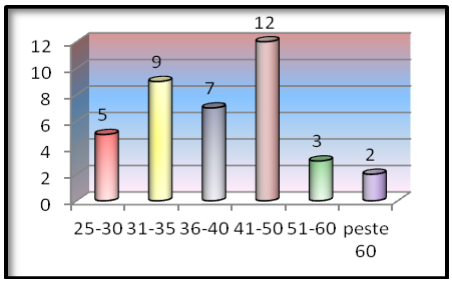


Graph no 2: Age distribution

b). group II – persons other than athletes, aged between 26-30 years, 31-35 years and between 36-40 years. 15 subjects: 7 females and 8 males; with conditions characterized by pathological bronhomotricity and subjects were classified: in the range 26-30 years, were examined 6 people, between 31-35 years were 7 people, and between 36-40 years were 2 people.



Graph no.3 – Age distribution of the second group



c). group III - Pathological personal bronhomotricity (asthma, COPD)- 38 subjects, 18 females and 20 males. In this group the subjects were assigned as follows: between 25-30 years - 5, between 31-35 years - 9, between 36-40 years - 7, between 41 - 50 years - 12, between 51-60 years - 3, and over 60 years - 2 subjects.

Graph no.4 – Age distribution of the third group

In this study, respiratory flow volumes and determinations for all participant groups were done in three steps:

- Before exercise
- During exercise - 10 minutes; after starting effort, which lasted an amount of twenty minutes, consuming an energy of 20 Joules, knowing that this small airways open during backup
- After 30 minutes of rest, after cessation effort.

The following results were obtained normal and/or reduced:

Normal respiratory flow and volumes in Group I:

a) Before exercise: flow values and volumes were normal : FVC: 15 subjects (42.85%); FEF1: 20 subjects (57.14%), PEF: 17 subjects (48.57%), FEF25: 17 subjects (48.57%), FEF50: 26 (78, 28%).

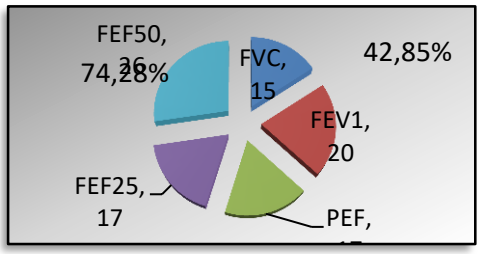


Fig.1 – Normal volumes and flows before effort (group I)

In this group only about half of them were normal. It should be noted that Tiffneau Index and FEF50 values are normal in 85% of subjects examined. Low parameters can be explained by the effort adaptability of athletes, it has been demonstrated that followed by examinations

b) 10 minutes after starting effort: values found were: FVC: 12 (34.28%), FEV1: 23 (65.71%), PEF: 13 (37.14%), FEF25: 12 (34.28%), FEF50: 28 (80%). As mentioned before, measured values increase during effort's development by opening airway and ventilation accessories; growing circulatory flow reserve breathing space. At the end of 20 Joules of effort (after 20 minutes), about 92% of athletes reached normal values for both forced current volume, and the maximum expiratory flow; second Tiffneau and flow index on the small airways are in normal range.

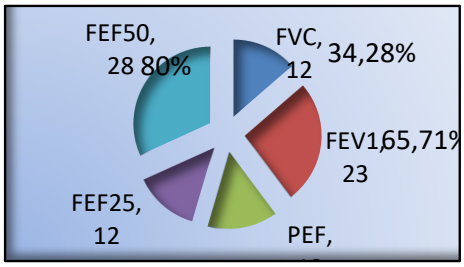


Fig.2 – Air volumes and flows after 10 minutes of effort (first group)

c) After 30 minutes of cessation effort, measured values were: FVC: 16 (45.71%), FEV1: 26 (74.28%), PEF: 16 (45.71%), FEF25: 16 (45.71%), FEF50: 26 (74.28%).

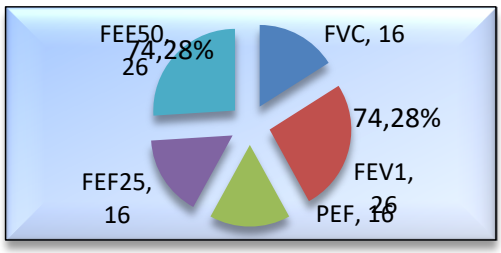


Fig.3 – air volumes and flows, 30 minutes after ceasing the effort

All these values show adaptability to stress and the extent to which athletes recover. However, in some subjects, levels were reduced in various stages of determinations.

Respiratory flow volumes decreased in Group I, before exercise, are presented in table 1. After 10 minutes of effort the decreased values are as follows (table 2)

Table no.1 – decreased values in subjects from the first group

FUNCTION	10-20% ⇩	21-30% ⇩	31-40% ⇩	> 40% ⇩
FVC	**9**	**6**	**6**	**1**
FEV1	**7**	**5**	**2**	**-**
PEF	**7**	**2**	**2**	**3**
FEF25	**9**	**1**	**4**	**4**
FEF50	**4**	**3**	**2**	**-**

Table no.2 – decreased values after 10 minutes of effort

FUNCTION	*10-20%*	*21-30%*	*31-40%*	*> 40%*
FVC	***24***	***4***	***4***	***1***
FEV1	***6***	***5***	***1***	**-**
PEF	***6***	***9***	***4***	***1***
FEF_{25}	***9***	***4***	***6***	***1***
FEF_{50}	***1***	***2***	***2***	***1***

After 30 minutes of exercise cessation, reduced values of measured parameters were:

Table no.3 – Decreased values, 30 minutes after the effort has stopped

FUNCTIA	**10-20%**	**21-30%**	**31-40%**	**> 40%**
FVC	11	6	3	1
FEV1	5	4	1	-
PEF	3	8	4	4
FEF25	4	6	7	2
FEF50	3	3	1	-

Values and normal respiratory flow in Group II:

In group II, the values of flows and volumes also measured under standardized conditions were those expected, demonstrating the ability to adapt to exercise more than 58% of examined by physiological methods, by using the measured values of respiratory capacity:

a) before the Group II effort were:

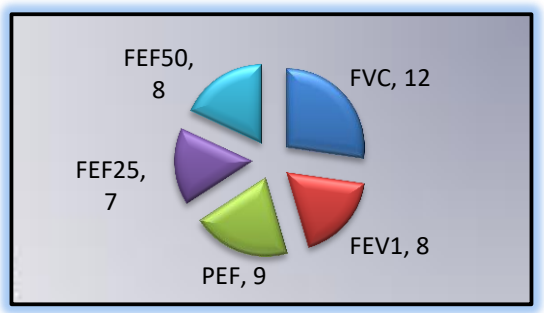


Fig.4 – Air volumes and flows in subjects from the second group after ceasing the effort

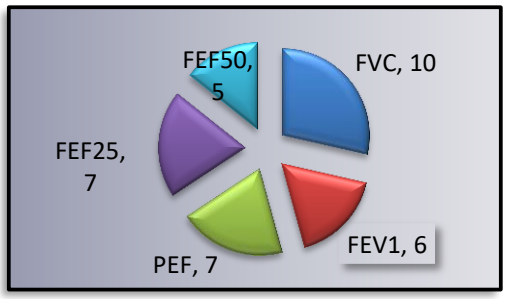


Fig.5 – Normal air flows and volumes measured

b) After 10 minutes of effort (first group), as expected, during exercise, measured values were normalized to a greater number of subjects examined against previous values (fig.5)

c) after 30 minutes of rest of the cessation effort, measured values were:

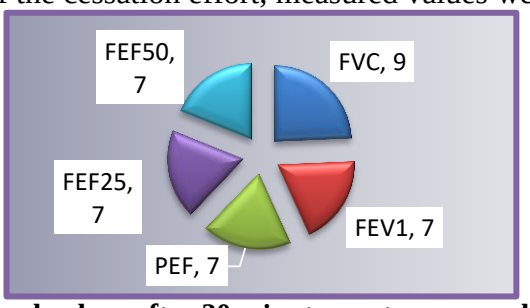


Fig. 6: normal values after 30 minutes rest, measured in group II

Values measured after 30 minutes of rest of the cessation effort demonstrates the adaptation and resilience of subjects in Group II, which differ from subjects in the first group, the subjects trained to support lower long effort recovering and having higher measured values. Also, the number of subjects in Group II values decreased respiratory flow and volume was higher than the group in which subjects. (fig.6)

Table no. 4: diminished value of Group II subjects before starting exercise

FUNCTIA	10-20%	21-30%	31-40%	>41%
FVC	1	1	1	-
FEV1	4	2	1	-
PEF	2	3	1	-
FEF25	5	2	1	-
FEF50	4	2	1	-

Table no. 5: diminished value of debts and volumes measured in group II after 10 minutes of starting effort

FUNCTIA	*10-20%*	*21-30%*	*31-40%*	*> 40%*
FVC	***24***	***4***	***4***	***1***
FEV1	***6***	***5***	***1***	***-***
PEF	***6***	***9***	***4***	***1***
FEF_{25}	***9***	***4***	***6***	***1***
FEF_{50}	***1***	***2***	***2***	***1***

Table no. 6 Flow and volume values group II after 30 minutes of cessation of exercise

FUNCTIA	10-20%	21-30%	31-40%	> 40%
FVC	3	1	2	-
FEV1	5	2	1	-
PEF	4	2	2	-
FEF20	4	4	-	-
FEF50	3	5	-	-

In untrained subjects measurements show that bronchoconstriction phenomena occurs during exercise, and did not disappear after 30 minutes standing. These values remain under normal physiological values.

In Group III, were examined subjects with known obstructive respiratory diseases who are taking specific treatment. Twenty four hours before assessment, no corticoid substance or bronchodilators were administered. Results were as follows, illustrated by the graphs below:

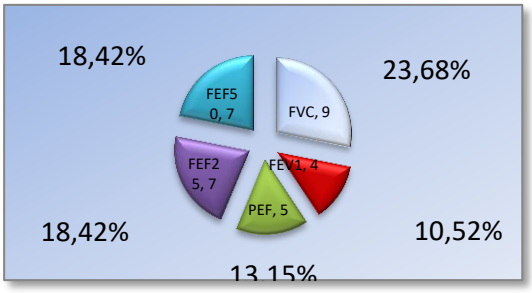


Fig. 7 – the third group, normal statistics before starting the effort

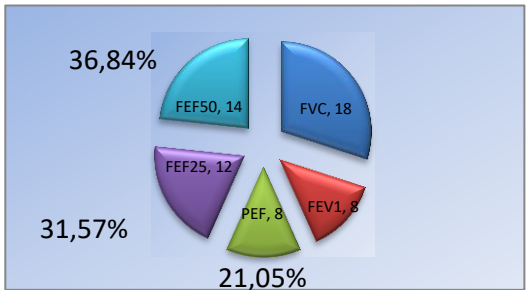


Fig. 8 – Normal statistics after 10 minutes of effort (no. of patients)

As you can see, the number of subjects with values in the normal range significantly decreased due to bronchoconstriction effect it had on motricity bronchial effort.

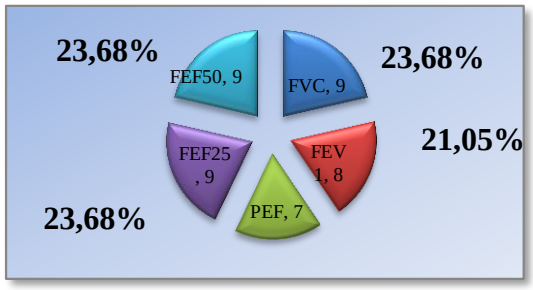


Fig.9 – the third group, normal statistics, 30 minutes after ceasing the effort

After cessation of exercise, bronchoconstriction occurs, maintain a high percentage of cases, recovery is insignificant. After analyzing data from tests effectuate the subjects of the three groups was decided to introduce a program of kinesiology a total of 9 subjects in group I and 30 subjects in Group III.

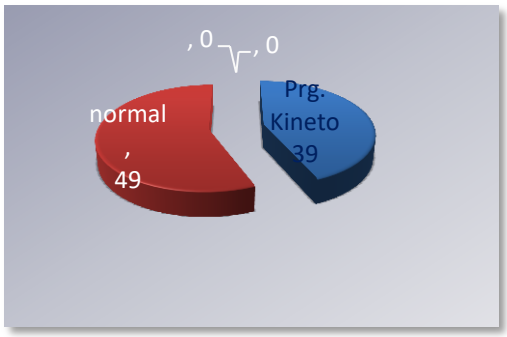


Fig.10 – subjects recorded into the physical therapy program

Prospective study measurements were made in three stages: before exercise, 10 minutes after starting exercise and 20 minutes after cessation of exercise.

Exercise-induced asthma is a fundamental problem for athletes and from a pathophysiology point of view, it was demonstrated particular role of thermal and fluid loss from the bronchial mucosa by hyperventilation in the development of exercise-induced bronchoconstriction (Chavannes NH, Huibers MJH, Schermer TRJ, Hendriks A, van Weel C, Wouters EFM, et al., 2005; Anticevich SZ, et al., 1996). Dehydration bronchial tree is responsible for the appearance of a hyperosmolar bronchial mucosa which has as a consequence increase the release of inflammatory mediators and bronchial smooth muscle contraction (Anticevich SZ, et al., 1996). Thus, thermal losses related to inhalation of cold air will result in initial vasoconstriction followed by vasodilation flare compensation bronchial obstruction secondary to a parietal blood flow and edema particularly after cessation effort. (Cockcroft DW, Davis BE., 2006)
Were measured and interpreted these flows and volumes:

• FVC FEF 25/75;
• FEV1 FEF 25 + NO determination;
• FEV1/FVC FEF 50;
• PEF FEF 75.

For the measurements use the following machines in laboratory research for advanced studies on normal and pathological function of the respiratory system within UCB . ETTLER Ergocycle complex 2010 model for measuring speed), PaO2 EKG pulse effort (time, energy, speed), EKG pulse PaO2 (img. 1,2,3).

Img 1 Kettler Ergocycle

Img 2 The control panel

Img 3 The control panel

Proposed physical therapy program, has a duration of 90 days for all participants.

The targets: coach after a careful screening and in collaboration with your person will develop a customized program based on common concepts:

- Heating is essential, even if it is very intense for 10 minutes
- Activity interlaced: is to increase the short-term dynamics and intensity, 20-30 seconds, alternating with phases of recovery equivalent in time.
- Exercises with "loading" exercise in highs for average age and shape: proposed program will increase capacity, increase anaerobic threshold, resizing level of lung ventilation: a 2/3 times a week over 15 '-45 'intensity of 70-80% max.
- Use your nose as a filter, focus breathing from the nose, ready to heat and humidifying the air, essential to prevent EIA (Exercise-Induced Asthma). (Cockcroft DW, Davis BE., 2006; Di Marco F, Verga M, Reggente M, Casanova FM, Santus P. Blasi F, et al. 2006). Mask use can be recommended.
- Coach must pay maximum attention and possible disease plus asthma: obesity, heart disease, anemia, or iron deficiency.
- Careful assessment of environment: an environment saturated with allergens or characterized by inappropriate temperature or humidity can make ineffective even an activity considered as an indicator for asthma: swimming and Aqua gym, walking, table tennis, riding a bike light, etc.
- Coach must ensure that his client is equipped with an inhaler for emergency cases (Feny M. Ahx E. Broker P. Constans 7, Lesourri B. Mirrhlitii D., 2007; Hynniiien KM, Breitue MH. Wibourg AB. Pallesen S., 2006).

Physical therapy in the three groups of subjects is particularly taking into account the characteristics of each group. Thus, subjects group athletes, physical therapy manifests as primary type, having a similar general training and specific training, which is done through accident prevention, overload, chronic fatigue etc.

For the group of subjects who do not practice organized sport in conditions, physical therapy takes the form of primary and secondary preventive medicine depending on individual characteristics, physiological features and/or pathological subjects investigated.

- Physical therapy and asthma COPD patients is a complex process that must take into account several aspects such as:
- Manifestation and severity disease (the density and intensity of crises, triggers, duration and severity of crises, etc.);
- The training and the degree of exercise tolerance;
- Somatic biotype;
- Age, sex, occupation, etc.

Objectives
1. respiratory gymnastics;
2. general physical condition influenced and external parameters determined by the size of the effort, that: length, volume, intensity and complexity of the effort;
3. conducting exercises with high coaching;
4. stable, comfortable fundamental position, providing respiratory function and dynamic optimal chest (Rinderu Et, Ilinca I., 2005).

Physical therapy is recommended in an environment environmentally friendly by avoiding hiperexcitability respiratory system (dust, cold, high humidity, avoid strong smells, smoke, dark and unventilated spaces, etc.).
Systematically, the goals of physical therapy are:
1. Respiratory reeducation through training the chest muscles, abdomen and diaphragm;
2. Optimal muscle formation of year for dynamic active life;
3. Learning relaxation exercises the mental dynamics and control of respiratory regulation of intake of O2;
4. Engaging in activities free time ("leisure"), branches and outdoor sports with moderate stress, Increasing self-confidence and quality of life of These Subjects;
5. Growth potential of biometric and Ability to Provide effort;
6. Physiological effects and induce body adjustments arising from the practice exercise at the cardiovascular, neuromuscular and respiratory systems.

Operational objectives
• Control ventilation with emphasis on inhale deeply and exhale slowly active;
• Stimulating the diaphragm;
• Respiratory muscle toning and abdominal;
• Reduction of respiratory frequency;
• Increased respiration amplitude;
• Increased exercise capacity;
• Improve constrictive syndrome.
As kinetic-therapeutic methods used in the recovery program of subjects enrolled were:
- Drainage of posture;
- Education cough;
- Respiratory Gymnastics cost and abdominal muscles with the aim of developing and educating accessories (diaphragm);
- Cycling with monitoring feedback.

Depending on the severity of the disease (stage from mild to severe), the causes episodes of asthma and other diseases associated finding, each subject will recommend personalized training program that includes mandatory heating, then depending on the case: breathing exercises, cycling, squat without overload, inclined bench crunch 15grade, jog on this tape moving, global stretching (not the floor) etc.

During exercise is very important to hydrate constantly subject as bronchoconstriction induced motor activity could be a mechanism for saving water resources to ensure its contribution to vital organs training methodology (RINDERU ET, ILINCA I., 2005; Weiler JM, et al., 2007; Wilson J., 2006).

Of course, it is necessary to perfect knowledge of the disease and keep it under control by following personal medical advice.
The workout at the gym and management of an asthma attack

If an asthma attack occurs, it is important to act quickly to stop the episode. Asthma attacks can occur very suddenly and dramatically and may disappear as if the subject is turned action triggers (triggers), or if the drug was indicated. Here are the steps to treat an asthma attack:
1. Stop all physical activity.
2. Get away from any source that is liable to be triggered crisis (smoke, dust, cold, smells, etc.).

3. Get emergency medication.
4. Try to control your breathing irregular.
5. If symptoms continue, going up to the first hospital to receive medical care or call 112 quickly (Wilson J., 2006; Weiler JM, et al., 2007).

Discussions

Why were these groups chosen athletes because physiopathology = Respiratory effort. great for a long time, humidity, temperature, etc. In contrast, the level of exhalation of nitric oxide (Eno), reflecting generally airway inflammation, do not appear to be correlated with the development or severity of EIB. Physical exercise is one of the most common precipitating factors of asthma. This stimulus triggers differ from other natural agents such as antigens or viral infection and does not produce prolonged sequels or change airway reactivity. Exercise may cause bronchoconstriction some degree in all patients with asthma and is only a few trigger mechanisms.

However, when such patients are followed for periods sufficiently large, we find that they often develop recurrent episodes of airway obstruction independent of effort, thus triggering frequent first manifestation of this problem is completely asthmatic syndrome. There is a significant interaction between ventilation resulting in a response effort, temperature and humidity, inspired air and magnitude of obstruction after exercise.

Thus, for the same air inspired, running will produce a more severe asthma attack than walking, however, the same effort, inhalation of cold air while performing potency response effort, while warm air, moist air will tend to diminish bronchoconstriction effect. Consequently, activities such as ice hockey, cross-country skiing or ice skating are more risky in this regard than swimming in a pool covered and heated.

The mechanism by which effort produces obstruction may be related to hyperemia and congestion small circulation bronchial wall, heat-induced, and muscle contraction appears to involve emotional feelings. There are many objective data demonstrations emphasizing that psychological factors can interfere asthmatic voice to improve or worsen the disease.

Table no.7 – Results of physical therapy

GRUP BENEFICIARIES	**INCLUDED**		**RECUPERATION %**	
GRUP I	9		9 (100%)	
GRUP III	ASTM	BPOC	ASTM	BPOC
	14	16	control = 3 (18%)	constant 15%

For some of the subjects with asthma, physical activity may be an important factor triggering or aggravation of symptoms. In some cases (asthma exercise), physical activity may be the only determining factor. Airflow obstruction that develops after an effort, often resolve spontaneously after 30-45 minutes. Right-inflammatory treatment will generally symptoms have stopped. If the condition persists, the most effective treatment is the administration by inhalation of short-acting bronchodilators (pre-dose at the physician), a few minutes before exercise.

Results of the physical therapy and respiratory recovery were encouraging. Thus, all subjects who practiced sports performance from this program were recovered, constant values and preserving breathing became normal.

Among subjects with known obstructive respiratory diseases, asthma sufferers - have become a well-controlled asthma at a rate of 18%, the rest going into a stage III or II of GINA

Subjects diagnosed with COPD, who were part of the program of physical therapy and respiratory rehabilitation, respiratory constant values increased by 15% from baseline.

Although years ago, doctors took counsel their patients with asthma do not do any exercise, now all they are the ones who say that regular exercise and well dosed is very useful, especially in mild or moderate asthma. That and because physical activity increases body resistance in general and the physically help the person concerned not to make an obsession of that suffering. The only important thing is to choose a sport that does not involve strenuous and prolonged physical effort and everything to be done under the watchful eye of the doctor supervise you.

Conclusions

❖ Effort can trigger reflex, or combined factor, bronchospasm, can reach up to exercise asthma attack.

❖ Standardized measurements of respiratory volumes and flows in children and adolescents, especially those in endurance sports special conditions, can in infancy broncho-motricity sharp and can take such measures, not reach-onset asthma disabling disease even today.

❖ Respiratory measurement values both in athletes and in patients with known bronchoconstriction diseases - asthma and COPD, shows exercise tolerance, and according to this, we can design customized workouts and recoveries beginning chiropractic.

❖ Respiratory physical therapy has a great potential recuperation, especially in diseases characterized by bronchial spasm unfortunately, very few health centers, hospitals, and so on, use it.

❖ Combined with drug therapy, respiratory physiotherapy leads to remarkable results in terms of increased effort tolerance and even return to a normal life of patients, sometimes considered unrecoverable.

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