

## Does Hyperbaric Oxygen Therapy (HBOT) Combined with Irrational Abuse of Stacking Anabolic Steroids by Recreational Bodybuilder Supporting Anaerobes Strength Improvement and Offer Cardiovascular Protection? (Pilot study)

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### Abstract

**Aim:** Underground Farmakology of Black Market such as are Anabolic steroids which are irrationally abused by young recreational bodybuilders are in hidden epidemic connection with fast muscle gain and increased cardiovascular risk. Many young recreational bodybuilders besides synthetic testosterone derivatives, different testosterone esters and supplements search for alternative methods to improve effects of muscle gain. Effects of Hyperbaric Oxygen Therapy (HBOT) with connection of abuse of stacking anabolic steroids in recreational bodybuilders still stay generally and worldwide unexplored leaving lots of unfilled gaps.

**Methodology:** This study was conducted from beginning of May, 2018 till end of December 2018 at the Clinic of cardiovascular Surgery, department for vascular and endovascular surgery, Clinical Center University of Sarajevo, Special Hospital dr.Solakovic Department for Hyperbaric medicine (BIH) Head of Center for Hyperbaric medicine and chronic wound treatment Banja Luka (BIH), Private Hyperbaric and General Practice Therapy Center Split and faculty Physical education and Sport Sarajevo included 72 subjects age 20-30 (36 of them went to hyperbaric chamber and used anabolic supplements while, 36 don't went to hyperbaric chamber only used anabolic steroids). Potential Cardiovascular Side Effects are investigated For the testing of statistical significance of differences between the examined groups parameter tests were used. The difference at a level of  $p < 0,05$  was statistically significant.

**Results:** In all tested subjects we investigated increasing potential damage of cardiovascular parameters age 20-30 years after two years study. Analysis shows the no statistically significant influence of recovery and strength improvement in (HBOT) Treat acetate group, compared to non Trenbolone acetate abuser group ( $p < 0,005$ ).

**Conclusion:** Anabolic steroid stacking have generally effective potential abusing impact on skeletomuscular system it is insignificant that oxygen therapy can provide such benefit in strength like anabolic steroids but certainly can improve recovery after hard working effort in a gym.

**Keywords:** Anabolic Steroids, Hyperbaric Oxygen Therapy, Recreational Bodybuilder, Recovery, Muscle gain, Strength, Healing Injury (Regeneration)

### Introduction

Athleticism, sex appeal, narcissism and the impression which bodybuilders leave on the female gender with the application of irrational illicit pharmacological substances (anabolic steroids) for recovery in the recreational cardio-population group with the aim of reaching ideal muscular proportions at all costs, are at great risk [1]. In order to achieve the desired effect as quickly and efficiently as

possible, the narcissistic motivation group infected with the Addison Complex is a new cardio-risk population of the modern age, which eventually takes on a form of sports uncontrolled doping drug abuse that is beyond all control, especially among younger users [1,2].

Hyperbaric medicine has a recognizable impact, all with the aim of shortening the time to accelerate muscular hypertrophy and

improve general superior anthropomotor performance without taking a serious attitude toward potential cardiovascular damage, as well as damage to other organ systems. The effects of the underground anabolic steroids of the old Soviet bloc combined with individual supplementation seem and act promisingly to the young, giving the desired potential of symmetry and speed of athleticism development that the young recreational bodybuilding population craves unreasonably [3]. The cardiovascular epidemic, the underground of the pharmacological distribution of anabolic products, is on the rise in the young bodybuilding population worldwide. Although it is over-saturated, the black market has undergone a medical transformation with promising various underground pharmaceutical companies, products of various synthetic testosterone esters as well as synthetic testosterone derivatives (anabolic steroids) with an epidemiological tendency to spread and realize economic benefits even in recreational sports. Limited scientific studies on the effects of isolated anabolic products today are in constant correlation due to the subjective effect of Stacking (at younger ages), black market saturation with many preparations, differences and query quality of products in many pharmacological manufacturers, as well as the inability of long-term monitoring of consumers which limits the access to adequate data on the damage or benefits of anabolic staking. However, the subjective and objective efficacy of the benefits of abusing anabolic steroids is of questionable benefit in young bodybuilders. In muscular proportions and in the quality of achieving performance strength, definition and endurance it is not questionable, but it leaves a long-lasting, quiet and permanent trace of cardiovascular destruction as serious consequences of damage and the musculoskeletal system. One of the most important and serious consequences of long-term (decades long) consumption of anabolic steroids is, in addition to damage to the futuristic cardiovascular system, the direct damage with muscle ruptures and tDOMuscular junctions, as well as ligaments and many other side effects. All these changes are caused by anabolic stacking combined with maximum and submaximal loads (weights). Although anabolic steroids provide promising results in proteosynthesis as well as a potential shortening of recovery, a treatment with un-doped recreationalists would have a similar effect using 100% oxygen-treated hyperbaric therapy (HBOT) but it would be without anabolic effects [4,5].

Achieving performance advancement of maximal and submaximal stress as a quality of muscular hypertrophy with minimal and quality recovery in the prosperity of advancement in bodybuilding has attracted the attention of many recreational athletes who want the quality benefits of bodybuilding. This manifests itself as less of a benefit of circulation than oxygen and more in the form of erythropoiesis in the blood, an objective and subjective sense of recovery, which is the purpose and ability of some anabolic products in combinations, since prevention of health is not an option for them. The anabolic steroids in the cutting phase are at a definite advantage over the potential of hyperbaric therapy. However, the ability of the therapeutic effect of regeneration elevation, as well as the lipotropic potency that hyperbaric therapy (HBOT) provides, leaves a trail

of noteworthy observation as well as the pure curiosity about the benefits of a combination of anabolic and hyperbaric oxygen therapy. This is especially evident in young bodybuilding recreational athletes at strength levels, achieving better individual training effects, as well as loss of subcutaneous fat, in order to better emphasize symmetry, muscle definition and muscle fiber contraction. Although science has a lack of information on the subject, a scientific disagreement and scientific enigma in the relevant data related to the topic remains.

However, with the subjectivity of improvement after exhaustion of high training intensities, although natural regeneration (depending on injury or extent of destruction of muscle fibres) caused by overtraining or inhibiting excessive water-muscle ratio is a process, the use of hyperbaric therapy (HBOT) would produce promising results in all the breaks of damage regeneration and muscle tissue remodelling as well as the benefits of neoangiogenesis due to the lack of cardio exercises associated with the data limitation problem, and the potential protection against myodestruction of anabolic steroids [6-9]. From this point of view, the question that remains redundant is, would recreationalists applying anabolic steroids really profit from hyperbaric therapy (HBOT) treatments alone or in addition to the stacking application of various anabolic steroids. On the other hand, amateur and Olympic sports without the use of illicit pharmacological agents are an absolutely justified indication for hyperbaric treatment (HBOT) for a number of crucial reasons. This is manifested in the form of improving sports performance, accelerated and high-quality recovery, prevention and healing of the skeletal muscle system (tDOMuscular junctions), a quality process of erythropoiesis, neoangiogenesis and immune benefits, especially in insufficiency of cardio-training and collateral circulation, lipid effect on central fatness, mental status and finally constant improvement of the specific physical and technical improvements that the amateur or professional athlete performs.

The primary aim of the study is to try to determine the efficacy of the hyperbaric chamber in improving of the exercises with load in the form of an indicative dosage of 2.4-3.0 ATA (80min) with twenty treatments. The first two treatments at 2.2-2.4 (ATA), the other 18 treatments at 2.5-3.0 (80min) in combination with staking of anabolic steroids and the impact of improvement, as well as the length of exercise with loads (dumbbell thrust, bench press, squat, triceps machine extension, death lift)

### Limitation of the Study

Different cycles and different application doses and combinations of (stacking) substances and companies in the underground market limit the more precise determination of the correlation between the benefits of hyperbaric treatment in young recreational bodybuilders who apply anabolic steroids as well as the influence of certain substances.

### Ethical Research Consideration

Although the pathway of this cardiovascular risk group of modern times is unpredictable in the cardio-protective sense, the physicians'

cautionary alternative measures from the etiologic side, in the form of cessation of anabolic drug application use in young bodybuilding recreation going by ethical principles of professional medical, sports, sociological and psychological vocation have been conducted multiple times. Multidisciplinary conversations were conducted with each of the individuals, self-initiated subjects, about the consequences of the health damage of the self-initiated application of anabolic steroids in the pharmaceutical underground without consultation and supervision of physicians and about the direction to which it leads, as well as about the decades-long consequences of the abuse of black market pharmacological agents.

## Methodology

### Participants and Design

This 6-month study included 72 subjects, ranging in age from 20 to 30. 36 of these patients met the criteria for control and 36 met the requirements for inclusion in the study group. The data were collected between May 2018 and the end of December 2018 at the Department of Hyperbaric Medicine of the Special Hospital Dr Solakovic, Centre for Hyperbaric Medicine Banja Luka, Private Hyperbaric and General Practice Therapy Centre Split, Faculty of Sport and Physical Education in Sarajevo. All patients completed the study and there were no lost to follow up patients. It is important to note that no patients had oncologic diseases, coagulopathies, haemophilia, or any other cardiovascular disease (angina pectoris/arrhythmia/venous and arterial thrombosis of the lower and upper extremities/coagulopathy) in the background. The concept of freedom of nutrition and supplementation was the base for all subjects, which also includes the occasional traditional Balkan cuisine with the freedom to use nutritional supplements of one's choice in the form of daily, weekly or monthly dietary implementation of diet style with periodic calorie intake and dietary restriction. The aerobic (cardio) training concept during the 6 month test was not recorded for the test and control group.

a) Study group of 36 participants on anabolic steroids (first two treatments 2.2-2,4 (ATA) (80min) remaining 18 treatments on 2.8-3.0 (80min) overall 20 treatments.

b) Control group of 36 participants on anabolic steroids (without hyperbaric treatment (HBOT))

## Results

In total 72 subjects were analyzed, from which 36 of them went to hyperbaric chamber and used anabolic supplements while, 36 more used only anabolic supplements. Characteristics of subjects, and type of supplements that they used is shown on Table 1. In both groups all subjects were males, and cycles lasted from 4 to 6 weeks. In both groups

subjects were longer than 4 years in training process. Also biggest number of subjects were on cleaning period under 6 months before this study.

**Table 1:** Characteristics of subjects and supplementation.

Variable	Group	
	With HBOT	Without HBOT
N subjects	36	36
Male	36	36
Cycles 4 to 6 weeks	25	
Methandrostenolone 25 to 50 mg	25	23
Nandrolone Decanoate 300 to 400 mg	4	3
Stenozolol 35 & 50 mg	12	2
Testosterone Cypionate 250 to 500 mg	2	28
Cycles 4 to 6 weeks	25	31
Methandrostenolone 25 to 50 mg	33	1
Testosterone Propionate 250 to 500 mg	29	33
Testosterone Enanthate 250 to 500 mg 2-3 ml per week i.m.	4	21
Oxymetholone 50 to 100 mg	6	
Cycles 4 to 6 weeks	10	6
Methandrostenolone 25 to 50 mg	7	4
Trenbolone acetate 75 to 100 mg	4	3
Sustanon 250 to 300 mg i.m.	21	11
Drostanolone propionate 300 to 400 mg i.m.	6	6
Oxymetholone 50 to 100 mg per day	3	
Cycles 4 to 6 weeks	4	14
Sustanon 250 to 450 mg i.m.	6	2
Testosterone Propionate 250 to 500 mg	4	18
Tamoxifen Citrate 10 do 20 mg	3	6
Anastrozol 0,5 to 1 mg	1	
Average years of training experience in the gym	5,12±0,13	4,12±,0,51
Cleaning period before study - under 6 months per year	28	27
Cleaning period before study - over 6 months per year	5	3

No statistically difference was found between subjects mass before treatment ( $p=0,174$ ), also after all cycles, there wasn't any statistically difference. On bench press there was significant difference between groups ( $p<0,001$ ), furthermore significant difference was found after treatment. On dumbbell bench group that would go to HBOT before treatment had significantly better results with Dumbbel bench, but after treatment there was decrees in used mass. Also with Dumbbel bench. More observed values are shown on Table 2.

**Table 2:** Exercise mass and repetitions.

Exercise values	Without HBOT BT	HBOT group BT	Without HBOT AT	HBOT group AT
Person mass	100 ± 12,5 kg	118±28 kg	101±6 kg	104±12 kg
Bench press	125±13,3 kg	102±18 kg	100±12 kg	97±8 kg

Dumbbell bench	134±12,1 kg	145±9 kg	144±12kg	141±14 kg
Triceps pushdown on cable machine	65±10,2 kg	45±12 kg	45±12 kg	24±3 kg
Triceps extension on cable machine	45±9,3 kg	65±10kg	55±10 kg	45±3 kg
Classical Back Squat	185±18,4 kg	188±21 kg	195±5 kg	195±18 kg
Dead lift	225±12,3 kg	231±24 kg	245±10 kg	240±19 kg
Bench press repetitions	24±3	25±3	24±5	23±9
Dumbbell bench repetitions	45±3	45±3	45±8	45±8
Triceps e pushdown on cable machine repetitions	21±3	22±3	22±4	23±4
Triceps Extension on cable machine repetitions	25±3	24±6	26±3	25±2
Classical Back Squat repetitions	15±4	16±3	19±7	21±8
Dead lift repetitions	21±2	20±4	24±8	23±6

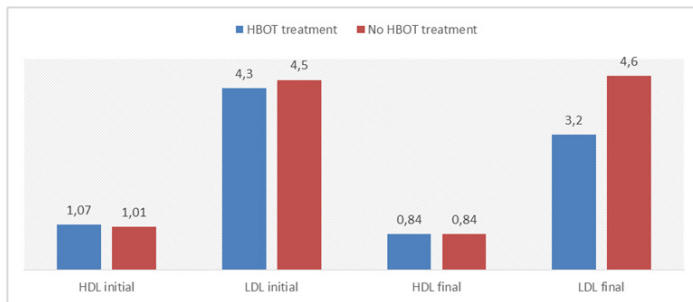
BT - Before treatment, AT - After treatment

With blood test we wanted to compare levels of cholesterol during period of 6 months. Results are shown on Table 3 and Figure 1. HDL cholesterol in group that used supplements with Hyperbaric chamber had value of  $1,07 \pm 0,2$  mmol/l after one month of following, while in group that didn't go to HBOT had value of  $1,01 \pm 0,18$ . With significant difference on level of  $p < 0,001$ . After period of 6 months HDL level had decreases in both groups, resulting that on the end of sixth month HDL value was  $0,85 \pm 0,12$  mmol/l while in other group it was  $0,84 \pm 0,11$  mmol/l,  $p = 0,733$ . In other way LDL cholesterol had decreases values in group that used hyperbaric chamber, while in group that used only supplements LDL values were increasing. At the end of first month there wasn't significant difference in LDL values between groups, but from the end of second month further there is significant difference (at the end of second month  $p = 0,048$ , from end of third month  $p < 0,001$ ).

**Table 3:** Levels of cholesterol during period of 6 months.

Variable	Period	Value		P
		With HBOT	Without HBOT	
				104±12 kg
HDL cholesterol	1 month	1,07±0,2	1,01±0,18	<0,001
	2 months	0,95±0,13	0,93±0,12	0,513
	3 months	0,91±0,18	0,91±0,14	-
	4 months	0,90±0,09	0,89±0,15	0,736
	5 months	0,89±0,13	0,88±0,09	0,7168
	6 months	0,85±0,12	0,84±0,11	0,733
LDL cholesterol	1 month	4,3±0,32	4,4±0,42	0,27
	2 months	4,2±0,46	4,4±0,38	0,048
	3 months	4,05±0,22	4,3±0,23	<0,001
	4 months	3,5±0,13	4,4±0,27	<0,001
	5 months	3,4±0,25	4,5±0,33	<0,001
	6 months	3,2±0,33	4,6±0,43	<0,001
Systolic blood pressure	6 months	142,3	133,7	0,007
Diastolic blood pressure	6 months	85,3	84,7	0,623

Systolic blood pressure at the end of 6<sup>th</sup> month had significantly higher values in group that used HBOT and supplements, comparing to group that used only HBOT.



**Figure 1:** LDL and HDL values at the beginning and the end of treatment.

## Discussion

The real tragedy of this modern young epidemiological cardiovascular population is that they have no health benefit from manifesting an anaerobic training concept with the irrational use of anabolic steroids. In principle, this modern cardiovascular population group has no relation to treatments of hyperbaric cardio-protective therapy, in the form of a medically established and protocolled therapeutic concept. But due to the lack of neoangiogenesis of the distal parts of the vascular systems, it somewhat compensates for the lack of an aerobic (cardio) concept of exercise and thus could have a potential therapeutic cardio-protective profit.

The trend is in the dramatic unprecedented rise in new cardiovascular risk groups of young recreational athletes in gyms around the world. As a masked problem of the modern age of today, it is becoming increasingly recognizable through scientific case reports, despite the subjectivity of optical deception and the subjective sense of negation of masked symptoms of patients most likely to lead to the progression of atherosclerosis with elastin destruction of elastic arteries. This leads to a decrease in the functionality of the vascular systems of coronary symptomatology, as well as the symptomatology of peripheral and cerebral artery disease after decades of use, as a disease of sports recreation, which with forbidden irrational pharmacological application becomes cardio-protectively counterproductive. The participants prone to irrational use of various modifications of synthetic testosterone esters (cypionate, propionate, enantate) as well as obsolete black market testosterone derivatives (Methandrostenolone) and dehydrotestosterone (Stanozolol) leave a strong effective potential for repetitive power after applications of hyperbaric treatment of irrational abuse of young recreational bodybuilders, after the study group as opposed to the group which was not under application treatments, although both groups did different stacking combinations. Therefore, the study is limited to a wide range of different applications of black market anabolic steroids and different subjective cycles.

Respondents do not stop on one product. They use different drugs, by losing control of insight into application cycles, adding one at a time, and creating dependency for which there have to be detailed studies conducted, leaving a large scientific void of the cause itself [1-3]. Despite the different cycles and substances of the black market that the respondents did, the benefits of hyperbaric treatment are not only recognizable in applications of different levels of training processes

and progress, but are also required for cardio-protection as well as neo-angiogenesis that recreational athletes do not obtain through anaerobic training and the side effect of preventing hypertension is just one pathological complication caused by anabolic steroids. Therefore, subjects belonging to the new cardiovascular population represent a high risk factor for many other diseases related to the domino effect of anabolic steroids of different symptoms of vital organ functions. The problem of uncontrolled rise in elevation of arterial hypertension (systolic and diastolic pressure) is also pathologically elevated in athletes who insist on high strains (maximal and submaximal stresses). The question that arises is what would force young users without the motivation to compete to stop consuming anabolic steroid cycle applications besides the late cardiovascular and other consequences that accompany an individual in later life. This represents a limited scientific field from the socio-psychological point of view, due to the lack of studies done on the subject. There are hints, but not statistically proven claims, that if a user has been administering steroids for over a year they are most likely to use them throughout their whole life in any type and form, and users are often potential participants in criminal acts, and further testing is needed to accept this claim from the scientific side [10,11]. Although modulating medical therapeutic benefits for various inflammations (diabetic foot) have been properly reported therapeutically as well as healing processes for fractures of different sexes, predominantly menopausal, andropausal and osteoporosis patients, hyperbaric treatment has a positive effect on raising total testosterone levels in people with as low level as well as in people with normal overall testosterone levels [12]. The question that arises is what would force young users without the motivation to compete to stop consuming anabolic steroid cycle applications besides the late cardiovascular and other consequences that accompany an individual in later life. This represents a limited scientific field from the socio-psychological point of view, due to the lack of studies done on the subject. There are hints, but not statistically proven claims, that if a user has been administering steroids for over a year they are most likely to use them all their life in any type and form, and users are often potential participants in criminal acts, and further testing is needed to accept the claim from the scientific side [10,11]. Although modulating medical therapeutic benefits for various inflammations (diabetic foot) and healing processes for fractures of different sexes, predominantly menopausal and andropausal patients and osteoporosis, have been properly noted, hyperbaric treatment has a positive effect on raising total testosterone levels in people with as low as in people with normal total testosterone levels [12].

Despite the fact that Hyperbaric Chamber Indication treatment (HBOT) for this type of young recreational athletes is still a scientific enigma, benefits of 100% oxygen in the form of neovascularization would be the focus of the attention of the application imperative due to the aerobic training deficits and devastating effect caused by anabolic steroids. Although they were developed as medicines for use, today the irrational use itself is becoming increasingly noticeable. Indications of the Hyperbaric Chamber itself (HBOT) would be to perpetuate injuries resulting from water ingress and muscle overload, and to improve the

regenerative effect of muscle and tendon tissue destruction. (HBOT) in the case of a preventive strategy did not give enhanced oscillations of systolic and diastolic pressure to the circulation itself due to elevated vagal activation and sinus bradycardia and with the final result of elevated blood pressure, where even recreationalists received a positive response. Certain authors [13,14] in their studies prove that hyperbaric medicine has the potential of systolic and diastolic pressure deletion, especially in patients with primary etiological type of hypertension as well as in genetically induced hypertension on animal samples (mouse sample) with significant success of systolic and diastolic therapeutic deletion of pressure. However, pathological high doses of anabolic products carry a high risk of increased haematocrit and increased haemoglobin in the blood. The antihypertensive effect of hyperbaric chamber in young population which is abusing pharmacologic products for recovery was not observed after 20 (HBOT) treatments, and we can say that hyperbaric treatment had no significant effect of reducing systolic and diastolic pressure after HBOT treatment. It has been scientifically proven that in addition to professional and amateur athletes in various fields, regenerative improvements in the form of bone and skeletal system destruction provide satisfactory therapeutic benefits of recovery and reduction of the anticatabolic state, as well as improving the objectivity of recovery in patients who are not sports active, while on the other hand athletes far better therapeutically profited [15-18].

Some studies [19] indicate an important connection of 100% treatment and antiatherogenic changes at the level of LDL and HDL, and even promising protective potential in the diabetic population, significant therapeutic results at the level of LDL reduction and elevation of HDL could not be proven. We can only conclude that irrational stacking exerts a metabolic imbalance of HDL and LDL increasing systolic and diastolic pressure, in the form of worsening cardiovascular pathology of anabolic steroid users themselves. Although this young recreational population, after many years of use, has a significant potential problem, due to excessive anaerobic maximal and submaximal loads, force that in the form of overstretching of the tendon-muscular junctions and muscle adhesions can lead to severe traumatic myofibril damage with myotendinous ruptures of individual and combined muscle adhesions [20-26]. The indicative field of application of Hyperbaric Therapy (HBOT) of this population group still leaves a trail of enigmatic scientific observation. The very potential of hyperbaric therapy is the futuristically promising need for hyperbaric intermittent treatments due to long-term musculoskeletal system load. Many more studies with more samples of this modern cardiovascular population are needed to scientifically unravel or elucidate a therapeutic cardio-protective step in the right direction, or possibly stimulate the very concept of cardiovascular protection, excluding potential perennial cardiovascular surgical treatments.

Also, irrational stacking of anabolic steroids of questionable quality is being considered due to the additional deterioration of the cardiovascular system, which will only manifest potential symptomatology after decades of abuse, leaving a trail of apparent strong individual with the progression of the pathology of atheromatosis and atherosclerosis of the cardiovascular system.

## Conclusion

We concluded that the cardio-protective benefits of hyperbaric treatment could bring a promising protective cardiovascular therapeutic potential to a young recreational bodybuilding group using black market anabolic steroids, as well as therapeutic benefits recognizable in the form of improved training and improved circulation, while the effect of the influence of the correction of systolic and diastolic arterial pressure has not proved to be a promising therapeutic concept

Hyperbaric therapy (HBOT) is potentially recommended for young addicts on anabolic steroids and could be considered as one of the preventive cardio-protective indications for neoangiogenesis and general physical recovery. On applications of longer treatments it could be dispense hypertension caused by anabolic steroids, however, the abstinence of anabolic steroids alone would have far better benefits of cardiovascular prevention and protection. Although Hyperbaric Therapy (HBOT) is futuristically promising therapeutically, many more studies are needed for this population in order to scientifically solve the enigma or to make the therapeutic cardio-protective step in the right direction to stop this silent bodybuilding epidemic.

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