



A Case Report of Anabolic Steroid-Induced Diffuse Alveolar Haemorrhage

Dr Aiswarya Mathiyalagan, Dr Prasanth Gururaj, Dr Anbumaran parivakkam mani, Dr Gangadharan Vadivelu.

Department of Pulmonary Medicine Saveetha Medical College and Hospital Tamil Nadu, India

Corresponding Author Email id: aiswaryaabi20@gmail.com

Article History

Volume 6, Issue Si4, 2024

Received: 01 June 2024

Accepted : 29 June 2024

Doi:

10.48047/AFJBS.6.Si4.2024.1792-1803

Abstract:

Immune system disorders, infections, and medication side effects are among the rare but severe causes of diffuse alveolar hemorrhage (DAH), a potentially fatal lung consequence. A 32-year-old male bodybuilder is the subject of the current study, that after abusing anabolic steroids for a long time, suffered from hemoptysis and severe respiratory distress. When admitted to the emergency room, the patient showed symptoms of hypoxemia and respiratory distress. Radiographs of the chest showed infiltrates that were spread out on both sides, which is a hallmark of pulmonary bleeding. A diagnosis of widespread alveolar hemorrhage was supported by bronchoscopy, which verified the presence of blood in the alveolar spaces. He confessed to using anabolic steroids for muscular augmentation on a chronic basis throughout additional history taking. Radiographic results and respiratory symptoms improved gradually when steroid usage was discontinued and supportive treatments, such as oxygen therapy and corticosteroids, were initiated. Case studies like this one highlight the need to rule out anabolic steroid use as a cause of diffuse alveolar hemorrhage in people who show up with sudden breathing problems, especially if they have a history of addiction. Controlling this illness and avoiding its potentially deadly consequences requires early diagnosis and rapid discontinuation of steroid usage. Timely management and prevention of such situations in the future need increasing awareness among healthcare practitioners and people about the detrimental consequences of anabolic steroids.

Keywords: Diffuse alveolar haemorrhage; Anabolic steroids; Adverse effects; Radiographic images.

1. Introduction:

Though the alveolar-capillary basement membrane is ruptured, bleeding into the lung's alveolar spaces occurs, the most common presenting symptom is hemoptysis, that is caused with Diffuse Alveolar Hemorrhage (DAH) syndrome. Despite steroids seldom induce DAH, people hope that the case can bring more attention to the serious and periodically fatal lung problems that can result from using anabolic steroids [1,2]. Anabolic steroid abuse can result to pulmonary bleeding, a potentially fatal complication. if a athletic patient develops with respiratory problems, that can be regarded a significant differential diagnosis [3]. Damage to the arterioles, venules, and alveolar capillaries causes a clinical status considered with DAH, in that red blood cells accumulate in the gaps concerning the lungs. Clinical manifestations include bleeding, anemia, and worsening hypoxemia, and collectively form the diagnostic triad [4]. Clinical and radiological evidence can be utilized into unless evaluating the possibility of pulmonary bleeding as an immediate consequence of anabolic drug usage. If

assuming that can be drug-related, prove sure illness lacks due to an autoimmune disease like an infection [5]. Testosterone acetate, cypionate, decanoate, propionate, phenylpropionate, enanthate, and isocaproate has been regarding the anabolic androgenic steroid combinations that harvey admitted to injecting the politician with in a period of several decades. [6].DAH is a strongly hazardous and rare effect caused with the antiphospholipid syndrome. Improving outcomes requires early diagnosis, treatment with immunosuppressive drugs and steroids, hemostasis, and hemodynamic stability [7,8]. Despite receiving appropriate medical therapy, the patient developed tachycardia and was eventually fitted with a infused cardioverter defibrillator. Physicians can variously remain aware of the risk of using anabolic androgenic drugs in fresh, physically active patients [9]. Steroids are a rare cause of DAH, and, using the case, people desire to improve awareness of the acute and life-threatening pulmonary consequences of anabolic use of steroids [10]. An inhaled steroid inhibits and lowers swelling in the airways, making them less sensitive. It may also cause a reduction in mucus production. Inhaled steroids can exceeding provide instant help from breathing symptoms. Inhaled steroids can further alleviate symptoms of various chronic lung conditions [11,12].With mimicking the effects of testosterone, the body's natural male hormone, anabolic steroids promote muscular development and increased body mass. Despite that, performance-enhancing substances can really bring out the best in athletes. Athlete potential is affected through a number of factors, including as heredity, physical stature, age, diet, and training intensity [13]. Effective therapy for DAH has neither established grew, like with systemic autoimmune illnesses, and the pathophysiology is rather efficiently recognized with most scenarios. DAH can be a result of several unique systemic diseases. Plasmapheresis, immunosuppressants, high-dose corticosteroids, ventilator support, hemodynamic instability correction, and coagulopathy therapy were are a role of the supportive care regimen [14,15]. To mimic the effects of the male hormone testosterone, anabolic steroids are created synthetically. Though anabolic steroids are most often associated with athletes and bodybuilders, steroids can be utilized by non-athletes to enhance performance, promote muscle development, and heighten male characteristics. personal attributes related to desire [16].

Objectives

- Collecting chest radiographic images to identify a rare adverse effect of anabolic steroid-induced diffuse alveolar haemorrhage.
- The case report helps medical practitioners identify and diagnose anabolic steroid-induced diffuse alveolar hemorrhage by detailing the patient's symptoms, test results, and treatment plan.
- This case study highlights the need to gather a thorough patient history while dealing with pulmonary symptoms, particularly information on drug consumption.

The remainders of the study are as follows: section 2 covers the operation of the present approach, section 3 suggests the DAH methodology, section 4 examines the experimental findings, and section 5 finishes with the research's effect.

2. Literature Survey:

Mohammad Abdi et al. (2022) detailed the case report, people describe a patient with several complications, including DAH, acute respiratory distress syndrome (ARDS), pericardial effusion, gastrointestinal hemorrhage, and severe renal impairment [17]. Analyses of the literature on Anabolic-androgenic steroids patients indicate essentially cutaneous, renal, and hepatic problems. With the potential for fatal side effects and the implications of ethical, civil, and criminal laws, it seems that certain rules can be established in place for the use of drugs used for bodybuilding. The ARDS and unreported adverse effects in previous research can be examined with experts. Abuse of anabolic-androgenic steroids puts everyone in danger for a variety of results.

Jessica G Y Luc et al. (2018) discussed the case involves a patient that got the HeartMate II Left Ventricular Assist Device (LVAD) procedure for hemodynamic compromise and fast worsening heart failure during a diagnosis of severe cardiomyopathy, probably due to anabolic-androgenic steroid usage [18]. Excellent ventricular function recovery allowed for LVAD cessation with 18 months of maintenance. Heart transplantation is rather a decision for people with AAS-induced heart failure that active drug usage is a contraindication. The scenario illustrates the potential significance of LVAD treatment providing a bridge to candidacy, recovery, and destination therapy.

Leo Meller et al. (2023) illustrated the rare cases, arterial thoracic outlet syndrome may coexist with subclavian artery occlusion (SAO), a condition affecting peripheral arteries [19]. The clinical appearance of subclavian arterial and venous occlusions is typically perplexing and leads to first misdiagnosis, especially in bodybuilding athletes that utilize anabolic steroids with enhanced vascularity. Patients medical history includes a history of hypertensive cardiomyopathy, a kidney donation that created a fistula in the left upper extremity and had to be removed, narrowing of the spinal canal in the cervical spine, surgery to fix the left rotator cuff, and testosterone injections for decades. Despite the proven relationship between anabolic steroids and artery thrombosis, the audience seems oblivious to any prior reports of SAO in weightlifters.

Alexandre Hohl et al. (2023) examined the growing environmental health problem is the abuse anabolic-androgenic steroids, which are used by guys to boost their strength and muscular growth [20]. The dosage and kind of anabolic-androgenic steroids used determine the severity, that can be long-lasting and even permanent. The effect is hypogonadism upon withdrawal related to suppression of the Hypothalamic Pituitary Gonadal (HPG) axis. Several research remains required to solve the gaps in the understanding of anabolic-androgenic steroid usage and various components thereby that people can implement effective preventative measures and handle adverse effects effectively.

Sameeha Khalid et al. (2023) prepared the cases of Hepato Cellular Carcinoma (HCC) and cholangiocarcinoma developing in people on continuous androgen treatment and anabolic androgenic steroids usage are quite scarce, further the association between androgens and hepatocellular tumor growth has been documented [21]. Here report several instances of patients from the tertiary referral hospital that acquired hepatic and bile duct cancers while using anabolic androgenic steroids and using testosterone supplements. People likewise take a look during the potential pathways through that cancer tumors in the liver and bile ducts can undergo a malignant transformation due to androgens.

Mohammad Atari et al. (2022) discussed the case shows a rare and difficult instance of Collapsing glomerulopathy accompanied with Mixed Connective Tissue Disease (MCTD), that improved after steroid and mycophenolate treatment. patients with MCTD and autoimmune connective tissue disorders that develop collapsing glomerulopathy [22]. Black individuals and females has a higher risk of developing collapsing glomerulopathy and dealing with autoimmune connective tissue illnesses. A difficult-to-manage kind of podocytopathy is collapsing glomerulopathy. Idiopathic and co-occurring disorders, like autoimmune connective tissue diseases, can result in collapsing glomerulopathy.

Marco Torrisi et al. (2020) detailed the greatest medical cause of mortality among sportsmen is Sudden Cardiac mortality (SCD) [23]. A class of synthetic compounds identified with anabolic-androgenic steroids is based on testosterone and the related analogues. Teenagers, sportsmen, and bodybuilders in particular engage in the number of illicit uses for anabolic-androgenic steroids of reasons, including improving appearance and performance. Drugs are harmful to health and can result in diseases impacting several functions if utilized illegally. Athletes that utilize performance-enhancing drugs are further more likely to suffer from SCD. Athletes' naturally occurring heart remodeling can develop into pathological cardiac

hypertrophy during patients use anabolic-androgenic steroids, putting patients with a higher risk of potentially fatal arrhythmias.

A few disadvantages of the patient report of widespread alveolar hemorrhage due to anabolic steroids in the modern day. Systemic autoimmune diseases are a contributing factor in a number of DAH patients like lupus erythematosus, anti-glomerular basement membrane disease, or capillaritis. However, coagulation abnormalities, certain drugs, or inhaled toxins can likewise trigger the syndrome. ARDS can solve the disadvantages of LVAD, SAO and HPG if compared to the proposed approach DAH.

3. Proposed method for diffuse alveolar hemorrhage caused by anabolic steroids a case report

Though essentially the entire cases of DAH are treatable, unless symptoms are due to severe diffuse alveolar injury, determining the origin is crucial. Immunosuppressant medicine, entire plasma exchange, and steroids are effective therapies that strive to address the main problem. Periods can grow further heavy, longer, and irregular and using steroids like prednisolone. The rise in respiration rate can be caused by prednisone stimulating the breathing center after passing across the blood-brain barrier, resulting in the most likely explanation. Hyperventilation caused the psychological repercussions is a further hypothesis offered devour to illuminate the shortness of breath.

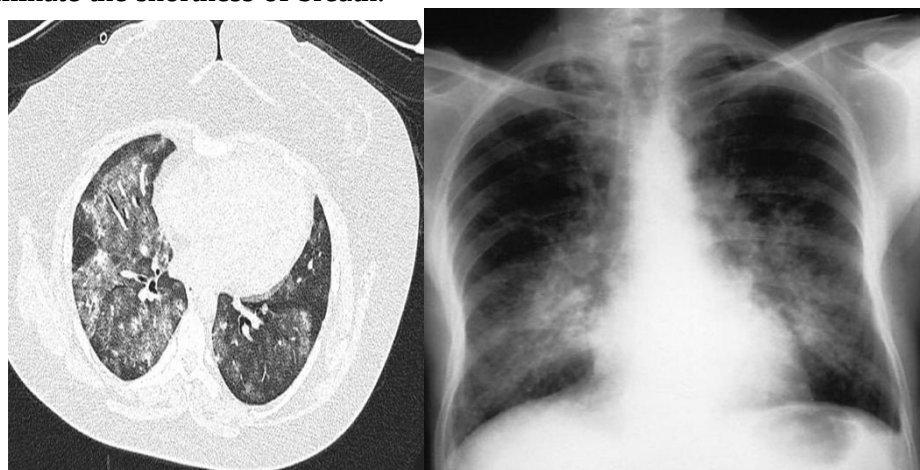


Figure 1 (a) Sample diagram of DAH

b) Alveolar hemoechhage

Figure 1 shown in (a, b) the lung parenchyma, rather than the airways, is the site of genesis of diffuse alveolar hemorrhage, which manifests as chronic or recurrent pulmonary bleeding. Autoimmune diseases are the most prevalent of several possible causes. Chest imaging often shows new alveolar infiltrates in addition to dyspnea, cough, and hemoptysis in the majority of patients. The presumed reason is the target of diagnostic tests. For individuals affected by autoimmune diseases, the recommended course of treatment is immunosuppressants, along with respiratory support if necessary. DAH is greater of a syndrome than a disease; hence, needs a tailored approach to diagnosis and testing. Glomerulonephritis is a comorbidity of many diseases that may lead to widespread alveolar bleeding. Blood collects in the alveoli, causing diffuse alveolar hemorrhage, if the tiny pulmonary arteries are damaged all throughout. Gas exchange is interrupted if a sufficient number of alveoli are impacted. The underlying cause determines the particular pathophysiology and symptoms. As an example, alveolar bleeding is the only symptom of human-primarily isolated pauci-immune pulmonary capillaritis is a kind of small-vessel vasculitis. Dyspnea, coughing, and fever are symptoms and indications of less severe diffuse alveolar hemorrhage. Up to one-third of patients can lack possess hemoptysis, despite how prevalent illness is. A low hematocrit is the result of most patients' anemia and persistent bleeding. Acute respiratory failure is a common symptom, and can be fatal for some people. The diagnostic criteria include dyspnea,

coughing, and hemoptysis, plus chest x-rays revealing extensive bilateral alveolar infiltrates and a probable diagnosis of diffuse alveolar hemorrhage. A bronchoscopy with bronchoalveolar lavage can be done to confirm the diagnosis if the symptoms are atypical and a potential airway source of bleeding has never been ruled confirmed. Lavage fluid usually stays hemorrhagic and has greater hemorrhagic following consecutive sampling; specimens reveal blood filled with erythrocytes and siderophages.

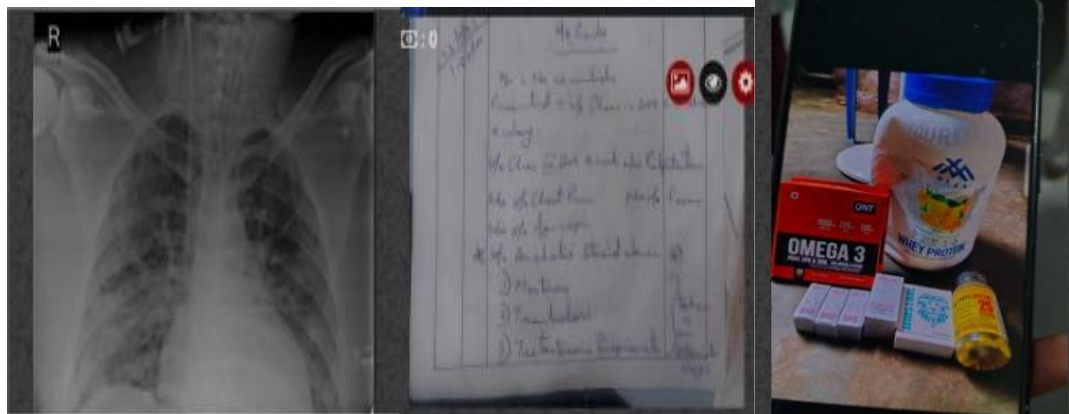


Figure 2 a) Sample digram of diffuse heroeעהage prescription

b) Body Building using Steroids



Figure 2 c) Broncho alveolar lavage fluid

Figure 2 (a,b,c) shown in plasmapheresis, immunosuppressants, high-dose corticosteroids, ventilatory support, hemodynamic instability correction, and coagulopathy therapy are all part of the supportive care regimen. The scenario strives to raise awareness of the acute and potentially fatal pulmonary consequences of anabolic steroid use, since steroids are a rare cause of DAH. Anabolic steroid users often report a dramatic and rapid improvement in their muscular strength. The upshot is usually better recuperation and the ability to workout more often and for longer durations. Lean muscle tissue can typically grow rapidly as a result of exercise. Broncho alveolar lavage is a technique that is sometimes performed during a bronchoscope. It is also known as broncho-alveolar cleaning. Bronchoalveolar lavage is performed to extract a sample from the lungs for examination. During the operation, a saline solution is inserted via the bronchoscope to clean the airways and collect a fluid sample. A fiber-optic bronchoscope, sterile collection traps for test specimens, a sterile saline supply, a suction device, and suction tubing are the essential pieces of equipment utilized in bronchoalveolar lavage.

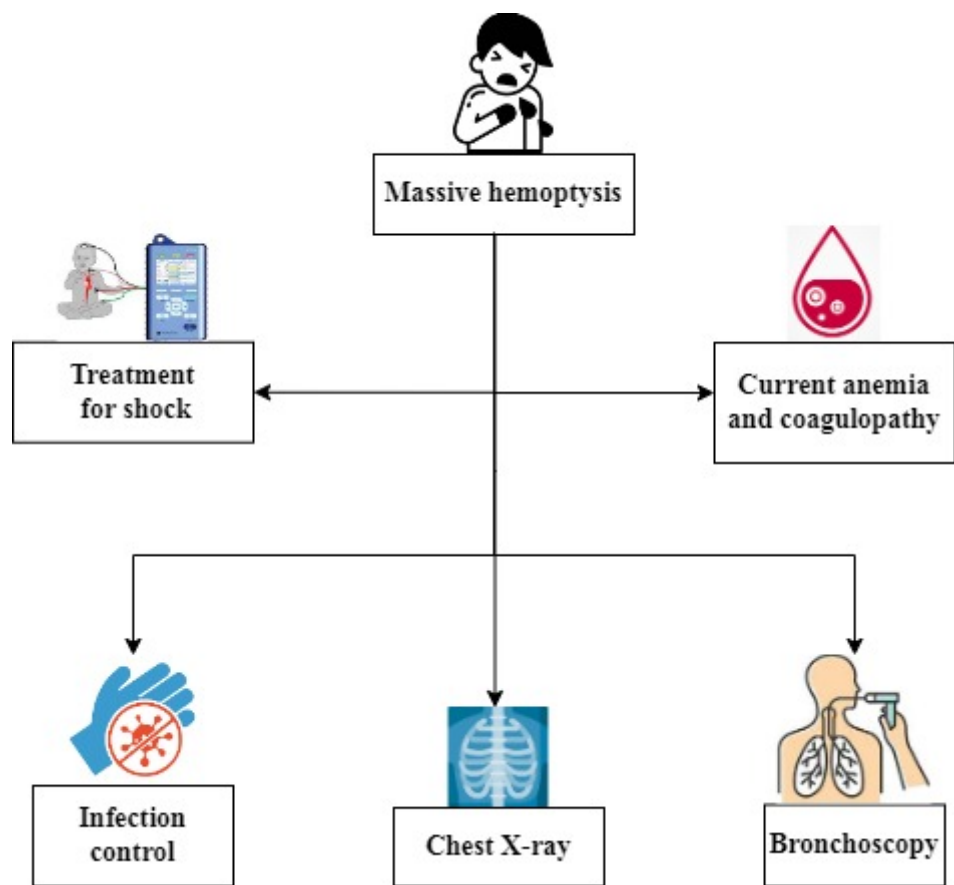


Figure 3 Diffuse Alveolar Hemorrhage

Figure 3 shown in The survival rate for diffuse alveolar hemorrhage (DAH) is extremely low when it leads to acute catastrophic hemoptysis with impairment in oxygenation, ventilation, and hemodynamic instability, despite a recent report of seven cases of pediatric systemic lupus erythematosus with pulmonary hemorrhage showed a survival rate. Her condition was diagnosed as right lower lobe pneumonia, and she was prescribed antibiotics orally. An rising global public health problem has been worsened by the extensive use of anabolic androgenic steroids. During the process, there was seen that the whole right lung seemed hemorrhagic and heavily compacted. Under the microscope, the tissue showed extensive destruction to the interseptal capillary walls, along with neutrophil infiltration and large amounts of bleeding inside the alveoli. Additionally, macrophages loaded with hemosiderin were seen in every lobe of the right lung. The pathology report indicates that there is widespread parenchymal bleeding and pulmonary neutrophilic capillaritis. Massive pulmonary bleeding was confirmed by the presence of copious bright red blood after intubation. Identifying and, if necessary, embolizing, the site of the bleeding is the responsibility of the catheterization laboratory. According to the results of the selective angiography, the right bronchial artery was shown to be the bleeding vessel. Nevertheless, it was discovered that the anterior spinal artery diverged from the right bronchial artery just next to the site of the hemorrhage. Because of the possibility of paraplegia, embolization was postponed. Unfortunately, the patient possessed worsening hypoxic respiratory failure throughout the surgery, which necessitated the transition to a high-frequency oscillating ventilator for support. The efficacy of any treatment option for this illness can be better determined with data collected from several institutions.

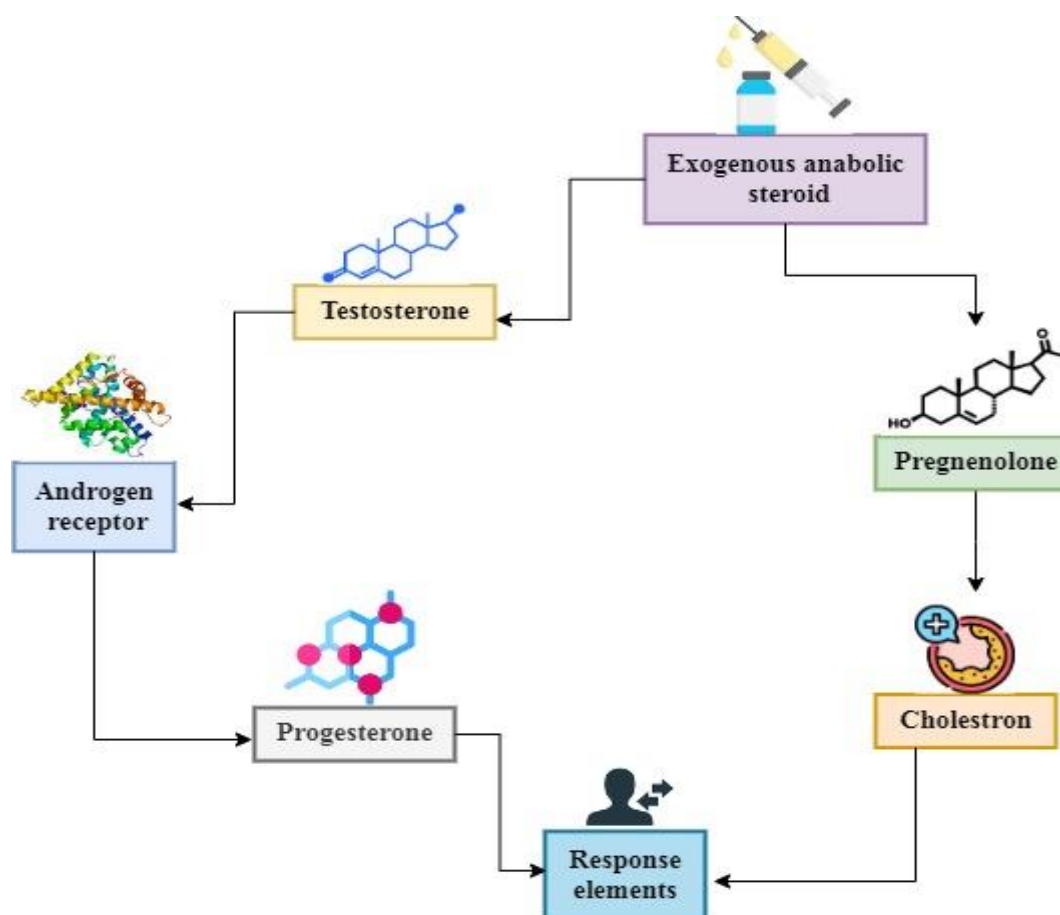


Figure 4 Mecanism of action of exogenous anabolic steroids

Figure 4 shown in the anabolic steroid is either reduced by the cytoplasmic enzyme 5-alpha reductase or bound to the androgen receptor once that reaches the cytoplasm of the target tissue cell. In order to enter the cell nucleus and bind to certain nucleotide sequences in chromosomal DNA, the N-receptor complex goes through a structural transformation. The manufactured DNA impedes the body's natural testosterone production. Androgen receptor signaling activation is the mechanism by which anabolic steroids produce their effects. Androgen receptors are found in several tissues, which means that many different areas of the body are implicated. Androgen receptors are saturated at physiologically relevant testosterone levels, suggesting that the effects of anabolic steroids may not be due to androgen receptor activation per se but rather to other processes. Antagonizing glucocorticoid receptors, as may happen when testosterone levels are high, could prevent glucose production and protein catabolism. Indeed, anabolic steroids may inhibit protein breakdown in muscles, improve muscular growth and strength, and displace glucocorticoids from their receptors at high doses. In addition, aromatase converts testosterone to estradiol and estrone, which impact sexual development, bone and muscle growth, puberty, and other sexual processes. Because they compete with estrogens for receptor space and down-regulate androgen receptors, anabolic steroids at high dosages have an antiestrogenic impact. Thus, the physiological effects of anabolic steroids are due to the amplified effects of testosterone and estrogen. The impact of testosterone and anabolic steroid dosage and concentration on their effects was shown in several human experimental trials.

4. Result and discussion:

Abuse of anabolic androgenic drugs is quite common among male recreational sportsmen. Doctors hoped to learn more regarding how anabolic androgenic misuse affects reproductive hormone levels and hypogonadism symptoms in those who abuse these substances now and

in the past. Currently, there is no medication that specifically targets the pathophysiology of DAH. Typical pathologic features of human DAH, such as systemic autoimmunity and lung hemorrhage, are induced in mice by pristane treatment. In order to conduct a high-dimensional investigation of lung immune cells in DAH, individuals used the field test model and used mass cytometry and single cell RNA sequencing.

Dataset description: Bleeding from small alveolar capillaries is a symptom of a lung illness whose cause is unclear. Lung biopsies reveal many siderophages in the alveoli, and testing of sputum and bronchoalveolar lavage fluid may reveal macrophages loaded with hemosiderin. Characteristics of alveolar hemorrhage include hemoptysis, dyspnea, chest radiograph showing alveolar infiltrates, and varying degrees of anemia. The alveolar macrophages change the iron in hemoglobin into hemosiderin once a hemorrhage has occurred. Systemic lupus erythematosus and other autoimmune disorders can result in DAH a potentially fatal lung consequence.

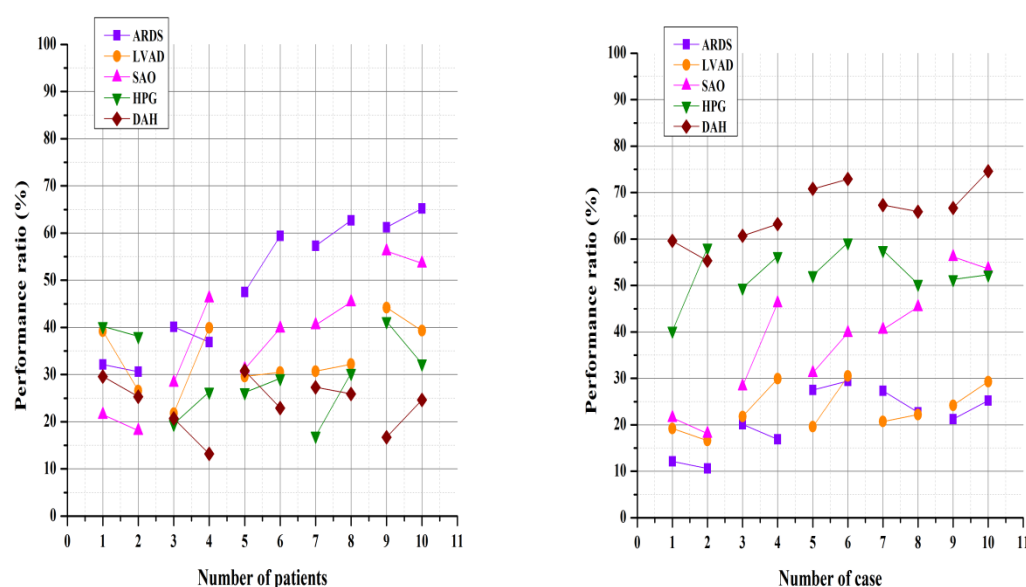


Figure 5 (a, b) Performance of anabolic steroid-induced diffuse alveolar haemorrhage

Figure 5 (a, b) shown in The alveolar capillaries, arterioles, and venules resulting in up the pulmonary microcirculation are the sites of origin for DAH, a distinct clinical and pathologic entity of pulmonary hemorrhage. Extensive hemorrhage in the lungs is a hallmark of disease. The signs and symptoms include bleeding, low red blood cell count, air bubbles in the lungs, and sudden difficulty breathing, that are present in the condition. Abuse of anabolic steroids, in overall, causes a rise in the production of coagulation factors, inhibitors, and fibrinolytic proteins, resulting in to an increase in the total coagulation rate and a increase in the stimulation of fibrinolysis. In entirety, the usage of anabolic steroids is linked to an increased risk of thrombosis, that is supported with a variety of case reports and a few epidemiological studies. A diffuse alveolar hemorrhage is an unexpected occurrence that poses a significant risk to one's life. There is a high death rate of 46% during the acute phase, and throughout the acute episode, merely 20% of survivors recover. The possibility is possible that a recurrence of DAH is the initial symptom of the illness among and few and 50 % cent of individuals. The therapy consists of supportive care, that includes the correction of hemodynamic instability or coagulopathy, including ventilatory support, high-dose corticosteroids, immunosuppressants, and plasmapheresis.

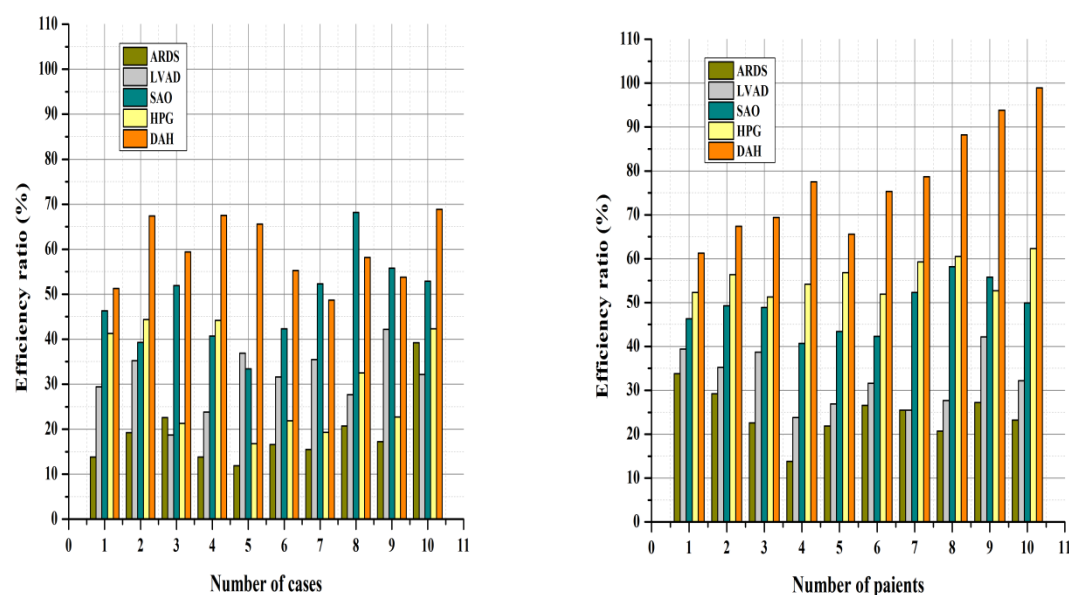


Figure 6 (a, b) Efficiency of case report for diffuse alveolar haemorrhage

Figure 6 (a, b) shown in hemoptysis, anemia, and diffuse alveolar infiltrates are the symptoms that are associated with DAH, a condition that is a medical emergency that poses a significant risk to the patient's life and poses a medical emergency. The confirmation of the diagnosis and the elimination of the possibility of infection often need an early bronchoscopy with bronchoalveolar lavage. Several immunological and nonimmune illnesses have the characteristic of DAH. There is a terrible prognosis that has been reported, with in-hospital death rates ranging from 20% through a 100 %. The surface of the lung, a patient with widespread alveolar injury has a gross appearance that is characterized by beefy red, congested, and edematous parenchyma. The pathologic appearance of widespread alveolar injury reveals airspaces that are bordered by hyaline membranes and alveolar septa that have enlarged and contain inflammatory exudate from the area. Red blood cell buildup in the distal air gaps is the hallmark of a clinical illness known as distal airway hypertension (DAH), which is caused by damage to the arterioles, venules, and alveolar capillaries. The symptoms of hemoptysis include anemia, and increasing hypoxemia are the clinical triad that is used to describe this condition. Since almost all instances of DAH are theoretically reversible, with the exception of those linked with devastating diffuse alveolar destruction, that is essential to determine the etiology of the condition. Corticosteroids, complete plasma exchange, and immunosuppressant therapy are the main treatments that are used in order to treat the underlying etiology of the condition.

5. Conclusion:

Alveolar hemorrhage is an uncommon a fatal consequence of the condition, posing a significant challenge. Tuberculosis can be detected as soon as possible if the red cell count drops and new infiltrates appear on a chest radiograph. That develops in an outbreak of active disease. DAH is chronic and recurring pulmonary bleeding that originates in the lung parenchyma rather than the airways. There are several reasons, however autoimmune illnesses are the main prevalent. Immunosuppressants are used to treat people with autoimmune diseases, and respiratory support is provided as required. DAH is a single condition, rather a syndrome with a unique differential diagnosis and testing protocol. The most of DAH cases are resulting due to capillaritis in clotting problems, anti-neutrophil cytoplasmic antibody-associated vasculitis, systemic lupus erythematosus, and anti-

glomerular basement membrane disease are all examples of systemic autoimmune illnesses. Drugs and breathed pollutants, however, may potentially induce DAH. The ability to gain muscular mass is enhanced indefinitely by anabolic drugs. Consistent with this, research shows that mice exposed to testosterone develop new myonuclei that remain long after the steroid treatment stops. Users of androgenic anabolic steroids are more likely to be hospitalized and have a higher risk of death compared to nonusers. It was common for androgenic anabolic steroids and their byproducts to cause unwanted side effects. There is a public health worry about these adverse effects due to the high prevalence of androgenic anabolic steroid misuse. The goal of abusing anabolic steroids—which are synthetic versions of the naturally occurring male hormone testosterone—is to increase muscular mass, improve one's athletic or other physical performance, or even one's physical attractiveness.

Overview

There are multiple probable causes of diffuse alveolar hemorrhage (DAH), a rare but potentially lethal lung disease. One of the less prevalent yet less important causes is the abuse of anabolic steroids. In this case report, the author describes the symptoms, diagnosis, treatment options, and final result of DAH caused by anabolic steroids. Adverse effects like intraabdominal hemorrhage, cerebral hemorrhagic infarction, thromboembolic issues, and heart problems are common among anabolic agent abusers. As a 32-year-old male bodybuilder started to cough up blood out of the blue, he made an emergency room consultation. According to his disclosure, he used anabolic steroids for muscle gain on a long-term basis. While being examined, the patient showed signs of tachypnea and hypoxia. The auscultator's touch detected crackles across the chest on both sides. A study of arterial blood gas levels revealed hypoxemia. Radiographs of the chest showed widespread infiltrates on both sides, and CT scans of the chest verified ground-glass opacities that were consistent with pulmonary bleeding. Blood was seen in the alveolar gaps during the bronchoscopic examination, confirming the DAH diagnosis. Since the patient's long history of anabolic steroid abuse was discovered throughout the history taking, the possibility of steroid-induced DAH was considered. Users were encouraged to stop using anabolic steroids immediately. Intravenous corticosteroids and high-flow oxygen treatment were initiated to alleviate pulmonary inflammation and hemostasis. The careful monitoring of hemodynamics, respiratory status, and oxygen saturation was commenced. The patient's breathing became easier in the following days, and the bleeding stopped. Pulmonary infiltrates gradually disappeared, as seen by serial chest X-rays.

Following the patient's release from the hospital, they were advised not to use steroids again and to schedule appointments with respiratory and addiction medicine experts. In rare cases, anabolic steroids may cause DAH, which can be lethal if left untreated. People with a history of steroid usage who arrive with respiratory symptoms should be treated with a high index of suspicion to ensure proper recognition of this illness. To improve results, it is crucial to start supporting measures and stop using steroids quickly. Misuse of anabolic steroids should be considered a possible cause of DAH, as this example shows. It is essential to take a thorough patient history, diagnose steroid-induced DAH promptly, and start treating it properly to control it efficiently. For prompt management and to avoid negative consequences, healthcare practitioners should be on the lookout for this condition, particularly in patients who have abused steroids in the past.

The Outcome of this Case Report

Identification of a Rare Adverse Effect: Diffuse alveolar hemorrhage is an uncommon side effect of anabolic steroids, and this case report adds to the medical literature by describing it. Such contributions are critical for advancing our knowledge of the side effects of steroid use.

Clinical Recognition and Diagnosis: The case report helps medical practitioners identify and diagnose anabolic steroid-induced diffuse alveolar hemorrhage by detailing the patient's

symptoms, tests performed, and treatment plan. Because of this, afflicted persons may be managed appropriately, and interventions can begin sooner.

Highlighting the Importance of History Taking: Patients presenting with pulmonary symptoms should always have a thorough medical history taken, but this example demonstrates the critical need to ask about drug addiction in particular. Because anabolic steroid usage may not be easily acknowledged but might be critical for correct diagnosis and treatment, it stresses the significance of healthcare practitioners asking about it.

Treatment Strategies and Outcome: The report details the patient's clinical progress and the treatment modalities used to manage the illness, including supportive measures and the discontinuation of steroid therapy. That sheds light on how well these treatments work to stop the spread of steroid-induced diffuse alveolar hemorrhage.

Implications for Public Health and Prevention: The case report helps with preventive efforts by bringing attention to the possible pulmonary consequences linked to anabolic steroid abuse. This example highlights the need for more steroid usage education and intervention programs to help prevent future occurrences of this type. In the end, the case report adds to the medical literature by providing an uncommon but serious side effect of anabolic steroids, making it easier to spot and treat promptly, and highlighting the need for precautions.

Reference:

1. Makkar, P., Mehta, V., & Vander Els, N. (2018). A case of steroid-induced diffuse alveolar hemorrhage. *Lung India*, 35(6), 532-533.
2. Nomura, S., Tavakoli, H., & Lu, B. S. (2023). ANDROGEN ATTACK: A CASE OF ANABOLIC ANDROGENIC-STEROID-INDUCED DIFFUSE ALVEOLAR HEMORRHAGE. *CHEST*, 164(4), A3165-A3166.
3. Park, J. A. (2021). Treatment of diffuse alveolar hemorrhage: controlling inflammation and obtaining rapid and effective hemostasis. *International journal of molecular sciences*, 22(2), 793.
4. Rodríguez, G. B., & Portal, J. A. R. (2018). Diffuse Alveolar Hemorrhage after Anabolic Steroid Use: A Case Report. *J Pulm Respir Med*, 8(473), 2.
5. Singh, A., Kaur, A., Stephens, C., Fekete, I., Nelson, J., & Kodwani, N. (2023). Pulmonary haemorrhage and extensive arterial thrombosis with anabolic steroid abuse. *BMJ Case Reports CP*, 16(8), e254817.
6. Ruzdija, D., Bertolo, A., Pandya, S. K., & Amaraneni, A. (2023). A Case Report of Refractory Diffuse Alveolar Hemorrhage as a Complication of Antiphospholipid Syndrome and Review of Its Management. *Cureus*, 15(10).
7. Albano, G. D., Amico, F., Cocimano, G., Liberto, A., Maglietta, F., Esposito, M., ... & Montana, A. (2021, January). Adverse effects of anabolic-androgenic steroids: A literature review. In *Healthcare* (Vol. 9, No. 1, p. 97). MDPI.
8. Alrabadi, N., Jarrah, M. I., & Alzoubi, K. H. (2020). Acute myocardial infarction with cardiogenic shock in a young physically active physician concurrently using the anabolic steroid sustanon: A case report. *Biomedical Reports*, 13(3), 1-1.
9. de Ronde, W., & Smit, D. L. (2020). Anabolic androgenic steroid abuse in young males. *Endocrine connections*, 9(4), R102-R111.
10. Hox, V., Lourijen, E., Jordens, A., Aasbjerg, K., Agache, I., Alobid, I., ... & Gevaert, P. (2020). Benefits and harm of systemic steroids for short-and long-term use in rhinitis and rhinosinusitis: an EAACI position paper. *Clinical and translational allergy*, 10, 1-27.
11. Zaami, S., Minutillo, A., Sirignano, A., & Marinelli, E. (2021). Effects of appearance-and performance-enhancing drugs on personality traits. *Frontiers in Psychiatry*, 12, 730167.
12. Piacentino, D., Sani, G., Kotzalidis, G. D., Cappelletti, S., Longo, L., Rizzato, S., ... & Leggio, L. (2022). Anabolic androgenic steroids used as performance and image

- enhancing drugs in professional and amateur athletes: Toxicological and psychopathological findings. *Human Psychopharmacology: Clinical and Experimental*, 37(1), e2815.
13. Sivalokanathan, S., Małek, Ł. A., & Malhotra, A. (2021). The cardiac effects of performance-enhancing medications: caffeine vs. anabolic androgenic steroids. *Diagnostics*, 11(2), 324.
 14. Nagata, J. M., McGuire, F. H., Lavender, J. M., Brown, T. A., Murray, S. B., Compton, E. J., ... & Lunn, M. R. (2022). Appearance and performance-enhancing drugs and supplements (APEDS): Lifetime use and associations with eating disorder and muscle dysmorphia symptoms among cisgender sexual minority people. *Eating behaviors*, 44, 101595.
 15. Reyes-Vallejo, L. (2020). Current use and abuse of anabolic steroids. *Actas Urológicas Españolas (English Edition)*, 44(5), 309-313.
 16. Grandperrin, A., Schuster, I., Moronval, P., Izem, O., Rupp, T., Obert, P., & Nottin, S. (2021). Anabolic Steroids Use Is Associated with Impairments in Atrial and Ventricular Cardiac Structure and Performance in Athletes. *Medicine and Science in Sports and Exercise*.
 17. Abdi, M., Lotfolahi, Z., Zareie, M., Saeidi, M., Amini, K., Torkmandi, H., & Ghodrati, S. (2022). ARDS, Diffuse Alveolar Hemorrhage and Pericardial Effusion due to Anabolic-Androgenic Steroids Consumption: Legal and Ethical Policy in Medical Education. *Tanaffos*, 21(2), 239.
 18. Luc, J. G., Buchholz, H., Kim, D. H., & MacArthur, R. G. (2018). Left ventricular assist device for ventricular recovery of anabolic steroid-induced cardiomyopathy. *Journal of surgical case reports*, 2018(8), rjy221.
 19. Meller, L., Wilson, K., Huang, B., Kalavacherla, S., & Vitale, K. (2023). Underlying Subclavian Artery Occlusion Initially Misdiagnosed in Weightlifter Using Anabolic Steroids: A Case Report and Review of Literature. *Cureus*, 15(4).
 20. Hohl, A., van de Sande Lee, S., & Ronsoni, M. F. (2023). Anabolic Steroid-Induced Hypogonadism. In *Testosterone: From Basic to Clinical Aspects* (pp. 267-279). Cham: Springer International Publishing.
 21. Khalid, S., Laput, G., Khorfan, K., & Roytman, M. (2023). Development of Liver Cancers as an Unexpected Consequence of Anabolic Androgenic Steroid Use. *Cureus*, 15(1).
 22. Atari, M., Ambruzs, J. M., Saqqa, O., & Simon, E. E. (2022). Collapsing glomerulopathy in a patient with mixed connective tissue disease. *The American Journal of the Medical Sciences*, 364(1), 99-105.
 23. Torrisi, M., Pennisi, G., Russo, I., Amico, F., Esposito, M., Liberto, A., ... & Montana, A. (2020). Sudden cardiac death in anabolic-androgenic steroid users: a literature review. *Medicina*, 56(11), 587.
 24. <https://datasetsearch.research.google.com/search?src=0&query=diffuse%20alveolar%20haemorrhage%20&docid=L2cvMTFxcDJxX3l0bg%3D%3D>