Scientific Research Publishing

Journal of Biosciences and Medicines, 2025, 13(9), 295-301
https://www.scirp.org/journal/jbm
ISSN Online: 2327-509X
ISSN Print: 2327-5081

Steroid Hepatotoxicity-Peliosis, Cholestasis, and Secondary Iron Overload?

Gurleen Kaur[1], Rahul Jain[2], Palak Grover[3], Bipneet Singh[3]

[1]Internal Medicine, Government Medical College, Amritsar, India
[2]Sri Manakula Vinayagar Medical College and Hospital, Puducherry, India
[3]Internal Medicine, Henry Ford Allegiance, Jackson, USA
Email: Rahul.jainmanohar@gmail.com

How to cite this paper: Kaur, G., Jain, R., Grover, P. and Singh, B. (2025) Steroid Hepatotoxicity-Peliosis, Cholestasis, and Secondary Iron Overload? *Journal of Biosciences and Medicines*, **13**, 295-301.
https://doi.org/10.4236/jbm.2025.139024

Received: July 17, 2025
Accepted: September 8, 2025
Published: September 11, 2025

Abstract

Anabolic steroid use continues to rise, especially among bodybuilders, bringing with it a wide range of liver complications. We present the case of a 34-year-old healthy male who developed jaundice, dark urine, and pale stools after taking unprescribed anabolic steroids for six weeks. His labs showed elevated bilirubin and alkaline phosphatase. While imaging revealed vascular liver lesions, a liver biopsy confirmed bland cholestasis, peliosis hepatis, and unexpectedly iron deposits, despite negative genetic testing for hemochromatosis. While cholestasis and peliosis are recognized effects of steroid use, the presence of iron buildup in the liver without a genetic cause suggests a possible new mechanism of injury. It may reflect inflammatory changes or altered iron metabolism in the setting of peliosis.

Keywords

The Patient Improved after Stopping Steroids, Further Suggesting the Association and Role of Early Discontinuation

1. Introduction

Anabolic steroids have been commonly used among men and women to maintain or improve their fitness, increase muscle mass in bodybuilders, and improve athletic performance. It is used in medical conditions like hypogonadism. An estimated global prevalence of approximately 3.3% of people using anabolic steroids, and the prevalence varies across different countries [1]. However, it is associated with multiple side effects across various organs, including the liver, skin, blood, muscles, bones, and heart.

Anabolic steroids can cause different levels of liver injury ranging from simple

temporary transaminase elevations, acute bland cholestasis, chronic vascular peliosis hepatis, and hepatocellular tumors [1].

Drug-induced cholestasis generally arises within 4 months of use with insidious onset of nausea, fatigue, and pruritus, followed by jaundice. Jaundice and pruritus linger despite prompt steroid cessation. Vascular changes called peliosis hepatis have blood filled throughout the liver. It commonly occurs in patients with tuberculosis or cancer. It is a mostly incidental finding found on imaging, rarely presenting with traumatic rupture. It is usually reversible with stopping therapy [2]. Lastly, hepatic tumors arise in patients on long-term use, typically 5 to 15 years of use. Nodular regenerative hyperplasia is a rare manifestation as well [3].

The androgens translocate steroid receptors to the nucleus and stimulate cell growth genes, causing unwarranted stimulus to hepatocytes, producing nodular regeneration and hepatic tumors, or endothelium, leading to peliosis. Cholestasis occurs due to a possible lack of bile salt transporters in such cells [1].

Treatment involves stopping the androgenic steroid, which should be the primary priority, or switching the formulation. It is possible for bodybuilders but more difficult for patients being treated for hypogonadism. Supplementing with fat-soluble vitamins and treating pruritus as a symptom may be helpful for patients with severe cholestasis [4].

We present a case of a bodybuilder on unapproved steroid supplements, presenting with jaundice. Upon investigation, steroid-induced cholestasis and peliosis were discovered. The patient was encouraged to discontinue steroids. Interestingly, the patient also had hemosiderin deposits in the liver but tested negative for hemochromatosis, indicating a possible new pattern of liver disease.

2. Case

A 34-year-old male presented with a 2-week history of progressive yellow discoloration in his eyes, dark urine, and pale stools for a week. He denied any nausea/vomiting, abdominal pain, blood in urine or stool, black stools, rashes, fever, or heavy drinking. He denied any history of similar illness in the past. He denies any outside food intake or travel to any international country. Further history revealed that he had been taking a new over-the-counter anabolic steroid for 6 weeks and denied any other medication intake. He denied any family history of liver diseases.

On admission, the patient was tachycardic with a heart rate of 110 beats per minute and hypotensive with a blood pressure of 96/56 mm of Hg. Thus, he was managed with intravenous fluid resuscitation, resulting in the normalization of the vital signs within 48 hours. Physical examination revealed visible icterus. Abdomen examination revealed tenderness over the right upper quadrant.

A laboratory study was done and was found to be significant for elevated total serum bilirubin (24 mg/dL, primarily direct), elevated alkaline phosphatase (160 IU/L), a negative acute hepatitis panel (hepatitis A, B, and C), and normal coagulation parameters with relatively preserved aminotransferases (aspartate transaminase 80 U/L, alanine transaminase 95 U/L). Autoimmune markers were negative,

and serum iron levels were found to be within normal limits.

A CT scan demonstrated ill-defined, poorly enhancing liver nodules. MRI clarified these to be vascular lesions resembling hemangiomas (**Figure 1**). He had a liver biopsy, which showed liver parenchyma with marked chronic cholestasis with scattered eosinophils and hemosiderosis, grade 2 (**Figure 2** and **Figure 3**). Some fields in the biopsies showed highly vascular areas resembling hemangiomas. C282Y and the H63D mutation were not identified in this patient, decreasing the risk of HFE-associated hereditary hemochromatosis [5].

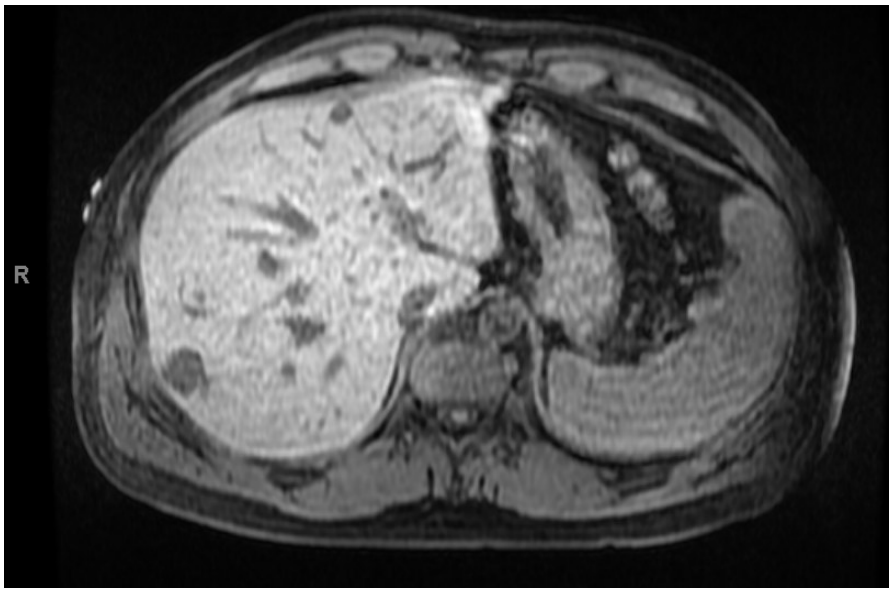

Figure 1. CT.

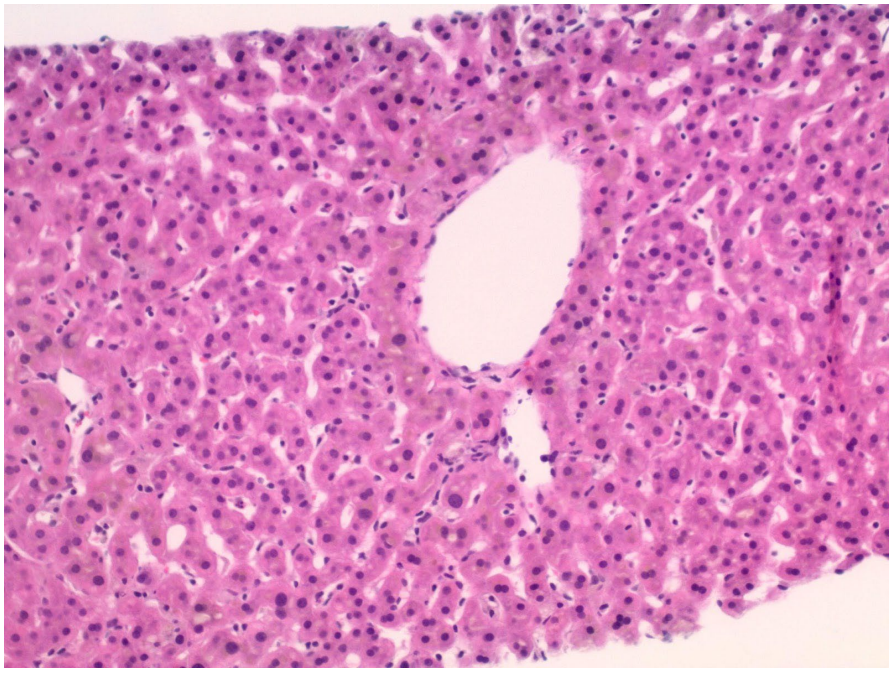

Figure 2. Biopsy depicting periportal cholestasis.

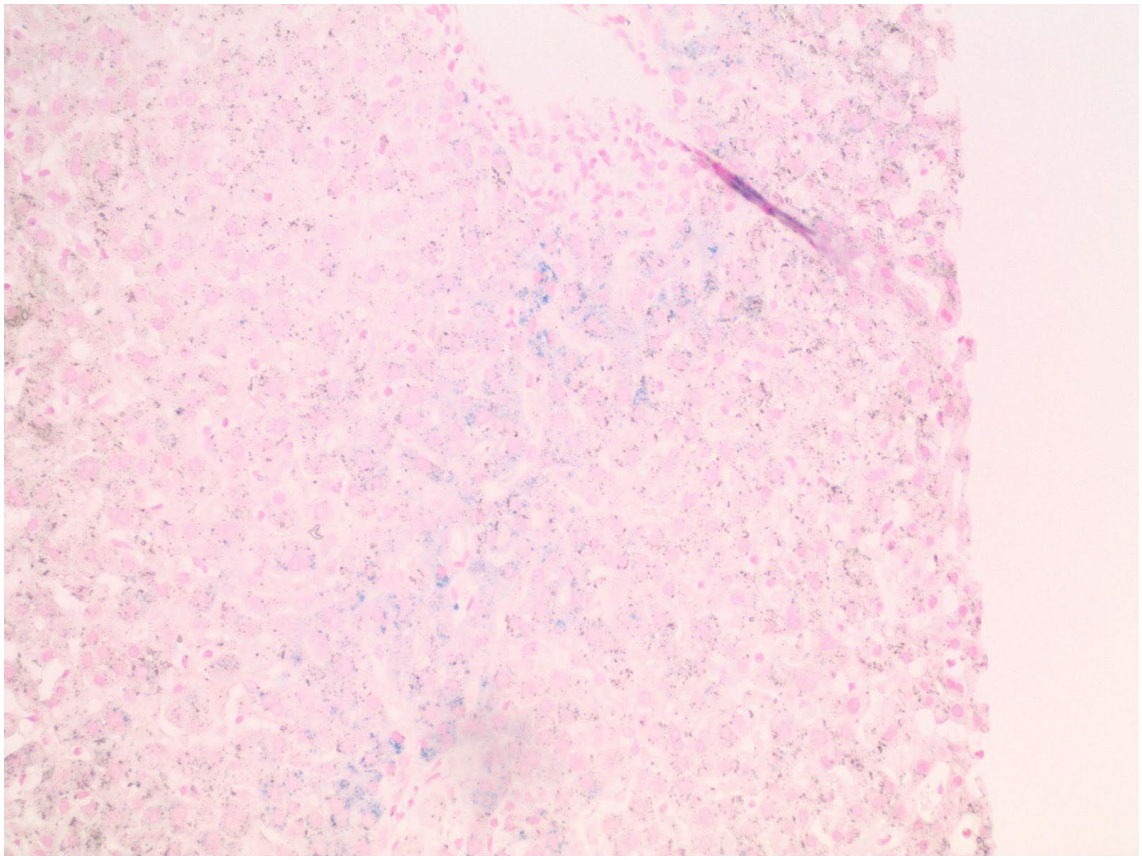

Figure 3. Hemosiderin deposits on Prussian blue stains.

It was hypothesized that the patient had bland cholestasis and peliosis hepatitis in the setting of anabolic steroid use. The patient was discharged on ursodiol with 3 monthly ultrasounds and weekly liver function test follow-up. The patient had an improvement in transaminase elevation.

3. Discussion

The patient complained of icterus and pale stool, and dark urine makes cholestasis a highly suspected differential diagnosis, as the bile is retained in the canaliculi with minimal inflammatory infiltrate or hepatocyte necrosis [6]. Further history on medication use would indicate liver injury as a commonly recognized complication of anabolic steroid use. Four different types of liver injury highlighting the spectrum of severity of anabolic steroid use can be seen in this patient, which include transient elevations in serum enzymes, bland cholestasis, peliosis hepatis, and hepatocellular iron deposition [1].

The general examination findings showing hypotension and tachycardia are more likely multifactorial. It could be secondary to dehydration associated with poor oral intake due to his acute illness. Its management and improvement with intravenous fluids helped to identify dehydration as the cause. Laboratory findings in this patient include enzyme elevation; this patient has a mild-to-moderate increase in serum transaminases. Alkaline phosphatase elevation indicates choles-

tatic injury. These findings correlate with little or no hepatocellular destruction, as evident by a minimal histopathological change [7].

Anabolic steroid intake is notorious for causing cholestatic reactions, rather than a hepatic pathology. Our patient had bland cholestasis, which is typical of anabolic steroid therapy and appears within four months, with few reports of cases as late as 2 years [1]. This is due to retained bile in the canaliculi causing minimal inflammatory infiltrate or hepatocyte necrosis. Usually, the symptoms appear slowly, starting with nonspecific weakness, nausea, vomiting, and itching, and progressing to jaundice, which persists for some time even after steroid cessation. This patient presented with features of jaundice like icterus, pale urine, and stools showing an unnoticed prodrome. While this patient may have cholestasis even upon drug cessation, that usually presents within 4 months of cessation and rarely 2 years later. Histopathological examination usually demonstrates non-inflammatory cholestasis (bland cholestasis), but this patient's histology demonstrated liver parenchyma with marked chronic cholestasis with scattered eosinophils and hemosiderosis [8].

Histopathological examination usually demonstrates not only non-inflammatory cholestasis (bland cholestasis) and iron deposits but also peliosis hepatis, focal hyperplasia, and hepatocellular carcinoma, while this patient demonstrates transaminitis, bland cholestasis, hemosiderin deposits, and peliosis hepatitis [9].

Peliosis hepatis, on the other hand, is an uncommon condition characterized by blood-filled, enlarged sinusoids and cysts either locally or throughout the liver, along with a lack of the usual endothelium barrier [2]. Serum enzyme levels are often normal or slightly increased, like bland cholestasis [4]. Presentation, however mostly incidental, can range from hepatomegaly and right upper quadrant pain to,in severe conditions, rupture of the vascular liver causing hemoperitoneum. CT findings in the patient described above showed liver nodules, which were found to be a vascular lesion forming a hemangioma. These are due to dilated sinusoids, which is otherwise known as peliosis hepatis. When treatment is stopped, peliosis linked to anabolic steroids typically reverses, at least partially [10].

The C282Y and H63D mutations in the HFE gene are linked to hereditary hemochromatosis, which characterizes iron deposition in the liver parenchyma [11]. It is not the case here, as it is not mutated. In contrast to the excessive iron deposition in hereditary hemochromatosis, the patient on anabolic steroid-induced iron deposition would show deposition of iron without excess iron in the blood [12]. Dilated sinusoids within the peliotic spaces release iron (possibly from the reticuloendothelial mobilization of iron) in the periportal regions. Coexisting cholestasis produced an inflammatory environment, leading to the processing of iron from peliosis and deposition in the stroma [13]. This leads to hemosiderin-laden hepatocytes in histopathological examination [14]. This case possibly represents a new manifestation of steroid use.

Cessation of steroids takes primary priority in management, as reducing the

dosage or switching to a different androgenic steroid formulation is inappropriate. Supportive care includes supplementation with fat-soluble vitamins (A, D, E, and K) to address vitamin deficiencies due to malabsorption, and symptomatic treatment of pruritus may benefit patients with severe cholestasis [15]. Patients should be monitored with serial liver function tests until normalization, with imaging as needed to assess resolution or detect complications such as peliosis rupture or chronic liver injury. Prognosis is generally favorable, with gradual recovery over weeks to months following steroid cessation; however, in rare cases, liver transplantation may be required if acute liver failure occurs [16].

4. Conclusion

This case demonstrated an unusual overlapping of findings like bland cholestasis, peliosis hepatis, and secondary iron overload. While secondary iron deposition indicates a mixture of inflammatory and mobilization changes, it could be recognized as a complication of anabolic steroid therapy, as the patient has a clinical improvement upon discontinuation of steroid use [17]. With an increasing trend toward bodybuilding, more studies are warranted to streamline diagnosis, treatment, and follow-up guidelines for steroid-induced hepatotoxicity. Public health initiatives targeting steroid users with education about the potential complications [18].

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Petrovic, A., Vukadin, S., Sikora, R., Bojanic, K., Smolic, R., Plavec, D., *et al.* (2022) Anabolic Androgenic Steroid-Induced Liver Injury: An Update. *World Journal of Gastroenterology*, **28**, 3071-3080. https://doi.org/10.3748/wjg.v28.i26.3071

[2] Bagheri, H., Azadeh, B. and Behrouzian, R. (2010 Peliosis Hepatis. In: *LiverTox*: *Clinical and Research Information on Drug-Induced Liver Injury*, National Institute of Diabetes and Digestive and Kidney Diseases. https://www.ncbi.nlm.nih.gov/books/NBK554470/

[3] Solimini, R., Rotolo, M.C., Mastrobattista, L., *et al.* (2017) Hepatotoxicity Associated with Illicit Use of Anabolic Androgenic Steroids in Doping. *European Review for Medical and Pharmacological Sciences*, **21**, 7-16.

[4] Paumgartner, G. and Beuers, U. (2004) Mechanisms of Action and Therapeutic Efficacy of Ursodeoxycholic Acid in Cholestatic Liver Disease. *Clinics in Liver Disease*, **8**, 67-81. https://doi.org/10.1016/s1089-3261(03)00135-1

[5] Steinberg, K.K., Cogswell, M.E., Chang, J.C., Caudill, S.P., McQuillan, G.M., Bowman, B.A., *et al.* (2001) Prevalence of C282Y and H63D Mutations in the Hemochromatosis (*HFE*) Gene in the United States. *JAMA*, **285**, 2216-2222. https://doi.org/10.1001/jama.285.17.2216

[6] Roma, M.G., Toledo, F.D., Boaglio, A.C., Basiglio, C.L., Crocenzi, F.A. and Sánchez Pozzi, E.J. (2011) Ursodeoxycholic Acid in Cholestasis: Linking Action Mechanisms to Therapeutic Applications. *Clinical Science*, **121**, 523-544. https://doi.org/10.1042/cs20110184

[7] Robles-Diaz, M., Gonzalez-Jimenez, A., Medina-Caliz, I., Stephens, C., García-Cortes, M., García-Muñoz, B., *et al.* (2014) Distinct Phenotype of Hepatotoxicity Associated with Illicit Use of Anabolic Androgenic Steroids. *Alimentary Pharmacology & Therapeutics*, **41**, 116-125. https://doi.org/10.1111/apt.13023

[8] Kleiner, D.E., Chalasani, N.P., Lee, W.M., Fontana, R.J., Bonkovsky, H.L., Watkins, P.B., *et al.* (2014) Hepatic Histological Findings in Suspected Drug-Induced Liver Injury: Systematic Evaluation and Clinical Associations. *Hepatology*, **59**, 661-670. https://doi.org/10.1002/hep.26709

[9] Nadell, J. and Kosek, J. (1977) Peliosis Hepatis. Twelve Cases Associated with Oral Androgen Therapy. *Archives of Pathology & Laboratory Medicine*, **101**, 405-410.

[10] Degott, C., Rueff, B., Kreis, H., Duboust, A., Potet, F. and Benhamou, J.P. (1978) Peliosis Hepatis in Recipients of Renal Transplants. *Gut*, **19**, 748-753. https://doi.org/10.1136/gut.19.8.748

[11] Merryweather-Clarke, A.T., Pointon, J.J., Shearman, J.D. and Robson, K.J. (1997) Global Prevalence of Putative Haemochromatosis Mutations. *Journal of Medical Genetics*, **34**, 275-278. https://doi.org/10.1136/jmg.34.4.275

[12] Porto, G., Brissot, P., Swinkels, D.W., *et al.* (2020) EASL Clinical Practice Guidelines on Haemochromatosis. *Journal of Hepatology*, **72**, 1113-1140.

[13] Bassett, M.L., Halliday, J.W. and Powell, L.W. (1986) Value of Hepatic Iron Measurements in Early Hemochromatosis and Determination of the Critical Iron Level Associated with Fibrosis. *Hepatology*, **6**, 24-29. https://doi.org/10.1002/hep.1840060106

[14] Crawford, D.H., Murphy, T.L., Ramm, L.E., *et al.* (2002) Serum Hyaluronic Acid with Serum Ferritin Accurately Predicts Cirrhosis in Hereditary Haemochromatosis. *European Journal of Gastroenterology & Hepatology*, **14**, 319-324.

[15] Sokol, R.J., Heubi, J.E., Iannaccone, S., Bove, K.E. and Balistreri, W.F. (1983) Mechanism Causing Vitamin E Deficiency during Chronic Childhood Cholestasis. *Gastroenterology*, **85**, 1172-1182. https://doi.org/10.1016/s0016-5085(83)80087-0

[16] Zimmerman, H.J. (1999) Hepatotoxicity: The Adverse Effects of Drugs and Other Chemicals on the Liver. 2nd Edition, Lippincott Williams & Wilkins.

[17] Sánchez-Osorio, M., Duarte-Rojo, A., Martínez-Benítez, B., Torre, A. and Uribe, M. (2007) Anabolic-Androgenic Steroids and Liver Injury. *Liver International*, **28**, 278-282. https://doi.org/10.1111/j.1478-3231.2007.01579.x

[18] Brower, K.J. (2002) Anabolic Steroid Abuse and Dependence. *Current Psychiatry Reports*, **4**, 377-387. https://doi.org/10.1007/s11920-002-0086-6