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CASE STUDY

A Case Report on Management of Chronic Adverse Drug Reaction: Steroid Induced Diabetes Mellitus in Takayasu Arteritis

V. SaiVaishnavi*, Mahadevamma. Lingaiah[1], Shreya Pandith[2], Vishwajeeth Desai[2], UdayaShekar K C[2]

*Assistant Professor, Department of Pharmacy Practice, College of Pharmaceutical Sciences
[1]Associate Professor, Department of Pharmacy Practice, College of Pharmaceutical Sciences
[2]Pharm. D Protege, Department of Pharmacy Practice, College of Pharmaceutical Sciences
Dayananda Sagar University, Bengaluru-560111

ABSTRACT

Takayasu arteritis is a rare autoimmune disorder characterized by inflammation of intermediate and large arteries, leading to stenosis, thrombus formation, and complications such as retinopathy and congestive heart failure. The most common treatment for Takayasu arteritis involves immunosuppressive drugs such as corticosteroids, cyclophosphamide, azathioprine, and methotrexate. We present a case of a 56-year-old patient with a 12-year history of Takayasu arteritis who developed steroid-induced diabetes mellitus while on a long-term course of prednisolone and methotrexate therapy. The patient's glucose levels were closely monitored, and insulin therapy was initiated as needed to maintain adequate glycemic control. This case highlights the importance of monitoring patients on long-term immunosuppressive therapy for potential adverse effects, including chronic steroid-induced diabetes mellitus.
Keywords:*Takayasu arteritis, autoimmune disorder, inflammation, immunosuppressive drugs, steroid-induced diabetes mellitus, long-term therapy.*

INTRODUCTION

Takayasu arteritis (TA) is a rare autoimmune disorder characterized by chronic inflammation of large and medium-sized arteries, primarily the aorta and its branches. It is named after the Japanese ophthalmologist, MikitoTakayasu (1, 2, 3), who first described the condition in 1908. TA is also known as "pulseless disease" because one of the hallmark features of the disease is a weakened or absent pulse in the upper extremities due to stenosis or occlusion of the arteries.

The prevalence of TA is highest in Asia, particularly in Japan and India, and the condition is more common in females than males (4, 5). The disease typically presents in young adults between the ages of 15 and 40 years, although it can occur at any age.

The pathogenesis of TA is not well understood, but it is thought to be an autoimmune disorder in which the immune system attacks the cells of the arterial walls, leading to inflammation and thickening of the vessel wall (7, 8, 9). This can result in stenosis or occlusion of the arteries, reducing blood flow to vital organs and tissues. The inflammation can also cause fibrosis and aneurysm formation, which can lead to further complications.

Diagnosis of TA can be challenging, and it requires a combination of clinical findings, imaging studies, and laboratory tests. The gold standard for diagnosis is angiography, which can demonstrate arterial stenosis or occlusion, aneurysm formation, and collateral vessel formation.

The treatment of TA is aimed at suppressing the immune system to reduce inflammation and prevent further damage to the arterial walls (10, 11, 12, 13). Corticosteroids are the mainstay of therapy, and immunosuppressive agents, such as methotrexate and azathioprine, may be added in refractory cases.

Surgical interventions, such as angioplasty or bypass surgery, may be necessary in cases of severe arterial stenosis or occlusion.

The use of corticosteroids in the treatment of various autoimmune diseases has revolutionized the management of these conditions. However, the long-term use of these drugs is associated with various adverse effects, including steroid-induced diabetes mellitus (DM). Steroid-induced DM is a potentially serious complication that can lead to significant morbidity and mortality if left untreated (14, 15). It is essential for healthcare professionals to be aware of this complication and to monitor patients on long-term steroid therapy regularly.

In this article, we present a comprehensive review of steroid-induced diabetes mellitus, including its epidemiology (16), pathophysiology (17), diagnosis (18), and management (19). We will discuss the risk factors associated with steroid-induced DM (20, 21), the mechanisms underlying the development of this condition, and the clinical features that distinguish it from other types of diabetes.

We will also review the diagnostic criteria and screening methods used to identify steroid-induced DM, including the use of oral glucose tolerance tests and HbA1c levels (22, 23, 24, 25). We will discuss the potential pitfalls of these tests and the limitations of their use in the diagnosis of steroid-induced DM.

The management of steroid-induced DM will be discussed in detail, including the role of lifestyle modifications, insulin therapy, and other pharmacological agents in the management of this condition (26, 27). We will also review the evidence supporting the use of different treatment strategies, including the use of insulin sensitizers (28, 29, 30, 31) and incretin-based therapies (32, 33).

Finally, we will discuss the potential implications of steroid-induced DM on the management of autoimmune diseases, including the use of alternative immunosuppressive agents and the role of close monitoring (34, 35, 36) and early intervention in preventing the development of this condition.

Steroid-induced diabetes mellitus is a potentially serious complication associated with long-term steroid therapy (37, 38, 39, 40). Healthcare professionals need to be aware of this complication and to monitor patients on long-term steroid therapy regularly (41, 42, 43). Early diagnosis and management of steroid-induced DM are crucial to prevent complications and to ensure optimal outcomes for patients with autoimmune diseases (44, 45, 46, 47).

CASE PRESENTATION

Our patient was a 56-year-old woman with a 12-year history of Takayasu arteritis. She had been on long-term therapy with T. WYSOLONE (prednisolone) 5 mg OD, T. Methotrexate 10 mg, and Tab. Ecospirin. She was hospitalized with complaints of frequent urination, weight loss, excessive sweating, and fatigue. On examination, the patient had a weakened or absent pulse in her upper extremities, consistent with the diagnosis of Takayasu arteritis.

Laboratory tests showed elevated blood glucose levels, and the patient was suspected of having steroid-induced diabetes mellitus. Her glucose levels were closely monitored, and intermittent doses of steroids and insulin were administered according to a sliding scale as a part of de-challenge and re-challenge. The patient's glucose levels were found to fluctuate with minor changes in the steroid doses, confirming the diagnosis of chronic adverse drug reaction of SIDM.

DISCUSSION

In the case presented, the patient with Takayasu arteritis was being treated with long-term corticosteroid therapy, which can lead to the development of steroid-induced diabetes mellitus (SIDM). The patient was admitted to the hospital with complaints of frequent urination, weight loss, excessive sweating, and fatigue. Upon examination, the patient had weakened or absent pulses in her upper extremities, which is a characteristic finding in Takayasu arteritis (48).

Laboratory tests showed elevated blood glucose levels, and the patient was suspected of having SIDM (49). As a part of the de-challenge and re-challenge process, the patient's glucose levels were closely monitored, and intermittent doses of steroids and insulin were administered according to a sliding scale (50). The patient's glucose levels were found to fluctuate with minor changes in the steroid doses, confirming the diagnosis of chronic adverse drug reaction of SIDM (51, 52).

These fluctuations in glucose levels can be attributed to the effects of steroids on glucose metabolism. Steroids can cause insulin resistance (53), which means that the body's cells become less responsive to insulin, leading to an increase in blood glucose levels. Steroids can also impair glucose tolerance (54, 55), which means that the body has a reduced ability to regulate blood glucose levels. Additionally, steroids can decrease insulin secretion, leading to further increases in blood glucose levels.

The management of SIDM involves tight glycemic control through a combination of lifestyle modifications, oral hypoglycemic agents, and insulin therapy as needed. In this case, the patient's glucose

levels were managed with intermittent doses of insulin according to a sliding scale, which was adjusted based on her glucose levels (56). The patient was also likely advised to make lifestyle modifications, such as following a healthy diet and engaging in regular physical activity, to help manage her glucose levels and prevent the development of diabetic complications.

Pharmacists play an essential role in the management of patients with Takayasu arteritis who are on long-term corticosteroid therapy and may be at risk of developing steroid-induced diabetes mellitus (SIDM). In the case presented, the patient had a history of Takayasu arteritis and had been on long-term therapy with prednisolone and methotrexate. The patient was admitted to the hospital with complaints of frequent urination, weight loss, excessive sweating, and fatigue, and was diagnosed with SIDM (57, 58).

The Role of the Pharmacist in this case would include:

Ensuring accurate medication dispensing: The pharmacist would be responsible for dispensing the correct medications at the appropriate doses and ensuring that the patient understands how to take the medications.

Providing drug information: The pharmacist would provide information to the patient about the medications being taken, including their indications, side effects, and potential drug interactions (59).

Monitoring for drug interactions: The patient in this case was on multiple medications, including prednisolone, methotrexate, and ecospirin. The pharmacist would monitor for potential drug interactions between these medications and any new medications that may be prescribed.

Monitoring for adverse effects: The pharmacist would monitor the patient for any adverse effects associated with the medications being taken, such as gastrointestinal upset, liver or kidney dysfunction, or other complications (60).

Providing education on lifestyle modifications: The pharmacist would educate the patient on lifestyle modifications that may help manage blood glucose levels, such as a healthy diet and regular physical activity.

Collaborating with the healthcare team: The pharmacist would collaborate with other members of the healthcare team, including the physician, nurse, and dietitian, to ensure that the patient is receiving appropriate care and that any potential drug interactions or adverse effects are addressed promptly.

Role of Patient:

Following their prescribed medication regimen: The patient should take their medications exactly as prescribed by their healthcare provider, including any medications prescribed to manage their Takayasu arteritis or SIDM.

Monitoring their symptoms: The patient should monitor their symptoms closely and report any changes to their healthcare provider. This includes symptoms of both Takayasu arteritis, such as weakened or absent pulses in the upper extremities, and SIDM, such as frequent urination, weight loss, and excessive sweating.

Keeping appointments with their healthcare provider: The patient should keep all appointments with their healthcare provider, including follow-up visits to monitor their condition and adjust their medication regimen as needed.

Communicating with their healthcare provider: The patient should communicate openly with their healthcare provider about any concerns or questions they may have about their condition or treatment. This includes discussing any potential side effects of their medications and any lifestyle changes that may be recommended to manage their condition (62).

CONCLUSION

Steroid-induced diabetes mellitus (SIDM) is a common adverse drug reaction of corticosteroid therapy, which is commonly used in the treatment of many autoimmune diseases, including Takayasu arteritis (TA). TA is a rare autoimmune disorder characterized by chronic inflammation of large and medium-sized arteries, primarily the aorta and its branches. The disease is treated with corticosteroids, which are known to cause various metabolic and endocrine disturbances, including hyperglycemia and diabetes mellitus.

The use of corticosteroids is essential in the management of TA, as they suppress inflammation and prevent further damage to the arterial walls. However, long-term use of corticosteroids is associated with numerous adverse effects, including glucose intolerance, insulin resistance, and the development of SIDM. The incidence of SIDM varies widely, depending on the dose, duration, and type of corticosteroid therapy used.

SIDM is characterized by impaired glucose metabolism, which can range from mild glucose intolerance to overt diabetes mellitus. The pathophysiology of SIDM is multifactorial and is thought to be due to the direct effect of corticosteroids on insulin secretion and action, as well as their effects on glucose

metabolism and hepatic gluconeogenesis. The risk factors for the development of SIDM include older age, obesity, pre-existing glucose intolerance, and family history of diabetes.

The diagnosis of SIDM is based on the American Diabetes Association criteria, which include fasting plasma glucose levels, oral glucose tolerance test, and hemoglobinA1c levels. The management of SIDM involves a multidisciplinary approach, including lifestyle modifications, pharmacological therapy, and close monitoring of blood glucose levels. The pharmacist plays a crucial role in ensuring accurate medication dispensing, providing drug information, monitoring for drug interactions and adverse effects, providing education on lifestyle modifications, and collaborating with the healthcare team to provide optimal patient care. The patient should work with their healthcare provider to develop a plan that includes appropriate physical activity and a healthy diet that takes into account their condition and medication regimen.

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