

Case report

Immune-mediated Arthritis after Treatment with Nivolumab in a Patient with Malignant Melanoma

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Abstract

Malignant melanoma is an aggressive skin tumor that accounts for 1% of all skin tumors. Immunotherapy is a new therapeutic approach for the treatment of melanoma neoplasms. Nivolumab is an immunotherapeutic product that belongs to the so-called checkpoint inhibitors. Nivolumab therapy has demonstrated a good effect in terms of overall survival and progression-free survival in patients with malignant melanoma. Nivolumab treatment is used both for therapy in patients in the metastatic stage and in the adjuvant aspect in patients with a high risk of disease recurrence. The interaction between the ligand of the programmed cell death receptor (PD-L1) and the programmed cell death receptor (PD-1) leads to suppression of autoimmune manifestations. Blocking this interaction carries a risk of various autoimmune reactions, which are expressed to varying degrees, and can sometimes be life-threatening and require prolonged immunosuppression or discontinuation of treatment with checkpoint inhibitors. Immune-related adverse reactions of varying degrees and severity have been described with the use of anti-PD-1 antibodies, such as

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pneumonitis, hepatitis, endocrinopathies, immune-mediated colitis, dermatitis, etc. Rheumatic immune-mediated complications such as myositis, myalgia, arthritis, arthralgia, vasculitis, scleroderma are rare with Nivolumab treatment. Most often, patients report arthritis that starts after several cycles of Nivolumab administration. The mechanism of occurrence of immune-mediated arthritis has not yet been established. A clinical case of an 84-year-old patient who developed immune-related arthritis after treatment with Nivolumab is presented. After treatment with corticosteroids and immunosuppressants led to the control of the immune-related arthritis, reinitiation of immunotherapy is being evaluated for the management of the oncological disease.

Keywords: checkpoint inhibitors, immune-mediated arthritis, immunotherapy, malignant melanoma, Nivolumab

1. Introduction

Malignant melanoma is an aggressive skin tumor that accounts for 1% of all skin tumors. It is characterized by an aggressive course and a low 5-year survival rate [1]. Patients with melanoma and distant metastasis show a 5-year survival rate of 23%, making metastasis the leading cause of melanoma-related death [2]. Even after radical resection of patients with local disease, an increased risk of local recurrence and distant metastasis is observed [3].

Immunotherapy is a new approach for the treatment of malignant melanoma even in advanced disease [4-6]. The high immunogenicity of melanoma is the basis of the relationship between this neoplasm and the immune system, which is a prerequisite for the use of immunotherapy in a therapeutic aspect through the so-called checkpoint inhibitors [3, 7-12].

Nivolumab is a fully human IgG4 monoclonal antibody directed against the programmed cell death receptor 1 (PD-1). PD1 is expressed on the surface of T lymphocytes, while its ligand (PD-L1) is expressed on both immune and non-immune cells [13]. The interaction of PD-1 with PD-L1 results in reduced T-cell activity, promoting self-tolerance [14]. PD-L1 is overexpressed on a wide variety of tumors, including melanoma, leading to immune evasion by tumor cells. Inhibition of PD-1 restores standard immune recognition of malignant cells and subsequent immune-mediated tumor destruction [13]. Nivolumab inhibits the interaction between PD-1 and PD-L1 thereby allowing the immune system to recognize and attack tumor cells.

Approximately 50% of patients receiving immunotherapy experience immune-related adverse events, ranging from severe and potentially life-threatening pneumonitis and colitis to autoimmune thyroid disease, hypophysitis, and vitiligo. The incidence of events varies depending on the type of drug and tumor type, requiring prolonged immunosuppression or discontinuation of checkpoint inhibitor therapy [15,16].

Rheumatological immune-induced reactions occur in 5%–20% of cases [17–19]. Rheumatic and musculoskeletal immune-related adverse events are usually unrecognized. Rheumatic immune-mediated complications such as myositis, myalgia, arthritis, arthralgia, vasculitis, and scleroderma are rare with Nivolumab treatment. Most often, patients report arthritis that begins after several cycles of Nivolumab. The mechanism of the appearance of immune-mediated arthritis during treatment with checkpoint inhibitors is still unclear, but a number of authors have found an association between the expression of PD-1 in the synovial fluid and the development of arthritis of the autoimmune type [20].

Immune-related rheumatological events, due to their low frequency and insufficient research, represent a serious challenge and diagnostic difficulty among medical specialists. Recognition of rheumatological immune-related events following immunotherapy treatment, which resemble autoimmune diseases, is increasingly important for both oncologists and rheumatologists. A multidisciplinary approach allows for the management of these immune-related reactions and the continuation of antitumor therapy.

2. Case Presentation

We present a case of an 84-year-old female patient in good general health (ECOG PS 0) and physically active, with a history of nodular malignant melanoma of the left gluteal region diagnosed in 2022. Postoperatively, the patient was staged as T2N0M0. No lymphatic dissection was performed, and she remained under active surveillance. Her medical history included COPD, a 20-year history of well-controlled arterial hypertension, and a cholecystectomy in 2000. In 2024, restaging via PET-CT revealed disease progression, characterized by multiple inguinal lymph nodes and pulmonary metastases. Although the patient was referred for BRAF testing to evaluate eligibility for targeted therapy, no BRAF mutation was identified. Following a multidisciplinary team review, treatment with Nivolumab (240 mg i.v. every 14 days) was initiated in October 2024.

Evaluation after six cycles demonstrated a complete response of the lung metastases and a partial response of the lymph nodes.

In January 2025, the patient was admitted for another cycle of immunotherapy with complaints of persistent pain, difficulty moving the knee, ankle and wrist joints, especially pronounced soreness and stiffness of the interphalangeal joints (Figure 1). There was no swelling of the knee and ankle joints. Mild swelling, thickening of the palms, severe soreness and stiffness (Figure 2).



Figure 1. Swelling of the interphalangeal joints and palmar thickening with associated skin induration.



Figure 2. Diffuse palmar induration and mild soft-tissue edema of the digits.

The patient was assessed for manifestation of immune-mediated arthritis and was referred to a rheumatologist, who prescribed therapy with methylprednisolone 8 mg daily for 2 weeks. The Nivolumab treatment was temporarily discontinued. After the prescribed therapy with

methylprednisolone, the patient's condition improved, the pain and stiffness decreased and she decided to discontinue the methylprednisolone therapy by herself. She refused a new examination with a rheumatologist in order not to delay her oncological treatment.

After reducing the complaints, the patient decided to reinitiate therapy with Nivolumab. After 2 applications of the medication, a month after, the complaints worsened again - pain and stiffness in the knee and ankle joints, mild edema and slight redness of the ankle joints, persistent tightness of the palms and severe soreness in the interphalangeal joints.

The therapy was discontinued again and the patient was referred for hospitalization for diagnostic clarification at the Rheumatology Clinic. Musculoskeletal evaluation revealed arthritis in the wrist, knee and ankle joints. Laboratory tests revealed positive values for anti-MCV, RF IgM, elevated levels of C-reactive protein (CRP 112mg/L) and erythrocyte sedimentation rate (ESR 82 mm/h), thrombocytosis ($578 \times 10^9/L$) (Table 1).

Table 1. Laboratory tests before starting Nivolumab treatment, at diagnosis of immune-mediated arthritis, and after treatment for arthritis

Laboratory tests	Reference range	10.10.2024	04.04.2025	08.12.2025
CRP (mg/L)	0–5	6	112	18
WBC ($10^9/L$)	3.50–10.50	5.10	10.40	5.70
Uric acid ($\mu\text{mol/L}$)	140–410	228	400	280
PLT ($10^9/L$)	130–360	278	578	326
ESR (mm/h)	<30*	21	82	25
Immunology				
Anti-CCP (IgG+IgA), U/mL	<20	Neg (-)	26	20
RF (IU/mL)	<30	<30	<30	<30
Anti-MCV, U/mL	<20	Neg (-)	65	18
RF IgM, U/mL	<20	Neg (-)	44	20

Abbreviations: Anti-CCP, anti-cyclic citrullinated peptide; Anti-MCV, anti-mutated citrullinated vimentin; CRP, C-reactive protein; ESR, erythrocyte sedimentation rate; Neg, negative; PLT, platelet count; RF, rheumatoid factor; RF IgM, rheumatoid factor immunoglobulin M; WBC, white blood cell count. Asterisk (*) denotes age-adjusted or laboratory-specific upper limit for ESR.

The performed knee radiography revealed cystic effusions in the distal part of the diaphysis of the right femur and osteophytes bilaterally. Less pronounced changes in the left knee joint.

An ultrasound examination of the right and left knee joint was performed with data on mild hydrops, synovial proliferation, degenerative changes in

the lateral and medial meniscus. After a multidisciplinary meeting, it was concluded that the patient had Grade 2 immune-mediated arthritis, probably as a result of the treatment with Nivolumab [21]. A follow-up PET-CT scan was performed to assess the current oncological status, demonstrating stable disease.

Treatment was initiated with methotrexate 10 mg weekly, methylprednisolone 4 mg daily with a gradual tapering to 2 mg daily and folic acid 1200 µg daily. Etodolac 400 mg daily for two weeks was prescribed to suppress the pain symptoms. At the eight-month follow-up, the patient showed no evidence of joint involvement and remained symptom-free. Baseline parameters before treatment, at diagnosis of arthritis and after treatment are presented in Table 1.

A multidisciplinary meeting is to be held to discuss the reintroduction of Nivolumab in dynamic follow-up by a rheumatologist.

3. Discussion

PD-1 expression on T-cells in synovial fluid is significantly increased in inflammatory joint disease. Higher levels of PD-1+ T-cells are often observed in active synovitis, reflecting the intensity of the local immune response. This increase reflects the body's desire to suppress autoimmune inflammation, although it is often not sufficient to completely control the synovitis. The PD-1/PD-L1 pathway functions as a negative regulator of the immune response, attempting to limit the autoaggression in the joint environment. Nivolumab blocks PD1, which activates inflammatory cytokines, disrupts autoimmunity and leads to immune-mediated toxicity. Immune-mediated arthritis is not yet well studied, but the idea of impaired immune tolerance and autoimmunity is supported. The PD1 axis is involved in the maintenance of peripheral tissue tolerance, and its dysregulation has been implicated in the development of autoimmune diseases. PD-1 expression has increased on synovial lymphocytes of patients with various types of autoimmune diseases. Although the exact mechanism of immune-related arthritis remains unclear, the checkpoint inhibitors block negative signals on activated T-cells, leading to increased autoreactive T-cells and inflammatory cytokines such as tumor necrosis factor- α (TNF- α), IL-6, and IL-17 [21-23] (Figure 3). This gives grounds for targeted inhibition of these cytokines for the treatment of rheumatic immune-related adverse events (irAEs) [24, 25]. Checkpoint inhibitors prevent B-cell apoptosis, allowing for longer cell survival and increased autoantibody burden [21].

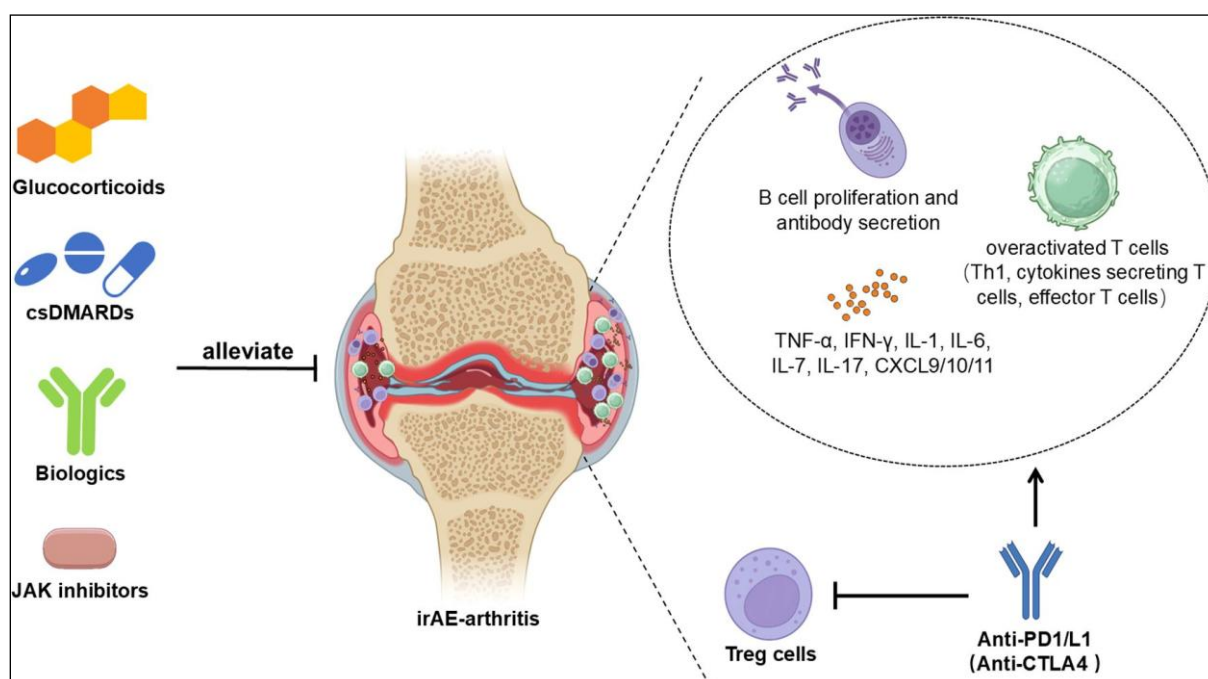


Figure 3. The pathogenesis of irAE-arthritis is characterized by the accumulation of overactivated T cells and inflammatory cytokines, coupled with B-cell proliferation and increased autoantibody secretion and current therapeutic strategies.

The presented clinical case is an example of de novo immune-mediated toxicity during treatment with a checkpoint inhibitor. Before starting therapy with Nivolumab, the patient had no history or laboratory evidence of arthritis. The coincidence of the complaints with the start of immunotherapy, as well as the effect of corticosteroid administration, support the diagnosis of immune-mediated arthritis due to Nivolumab administration.

The patient developed immune-mediated arthritis with persistent arthritis of the wrist, knee, and ankle joints, severe pain and stiffness of the interphalangeal joints, and palmar thickening, elevated markers of inflammatory activity - ESR, CRP, and the presence of RA-specific autoantibodies, anti-MCV, and RF IgM.

The management of immune-mediated arthritis is based on shared decision-making between the patient, treating oncologist, and rheumatologist [26]. The role of the rheumatologist is to support the oncologist and to alleviate the immune-mediated arthritis, allowing patients to maintain effective immunotherapy for their oncological disease. Currently, algorithms for the management of irAEs are based on the severity/grade of the irAE according to the Common Terminology Criteria for Adverse Events (CTCAE v5.0) [26]. Referral to a rheumatologist is

recommended before initiating treatment for immune-mediated arthritis. In the absence of contraindications, symptomatic treatment, including nonsteroidal anti-inflammatory drugs and/or analgesics, should be the initial treatment for mild to moderate rheumatic manifestations [26]. Intra-articular glucocorticoids should be considered in the context of monoarthritis or oligoarthritis, combined with synovial fluid analysis whenever possible. If symptomatic treatment is insufficient and tissue inflammation is still present, systemic glucocorticoids should be considered in immune-related arthritis. Because of the potential for corticosteroids to compromise the antitumor response, the use of pulse therapy with methylprednisolone or high-dose per os glucocorticoids is not recommended in the absence of life-threatening complications. In addition, gradual tapering of corticosteroids to the lowest effective dose over a period of weeks or as soon as improvement is achieved is recommended. The goal is to achieve a dose of less than or equal to 10 mg daily prednisone equivalent. The dosage regimen and route of administration should be determined according to the clinical form and activity [26].

Following the discontinuation of Nivolumab, the patient was started on immunosuppressive therapy with corticosteroids and methotrexate in accordance with EULAR recommendations. Based on the National Cancer Institute CTCAE v5.0 grading, clinical improvement was subsequently observed [27,28]. The treatment of this patient is undoubtedly a challenge for medical professionals, due to the need to control the immune-mediated arthritis on one hand, and the oncological disease on the other. Re-initiation of Nivolumab is supported by international and national guidelines [27], with clinical benefit from continuing therapy and managing complaints in immune-mediated arthritis, while assessing the risk of new manifestation of immune-mediated toxicity [29].

4. Conclusions

Metastatic melanoma is a malignant disease with a poor prognosis. The introduction of immunotherapy has significantly changed the approach to this tumor. Unfortunately, immunotherapy has a specific toxicity, characterized by adverse reactions, such as immune-mediated arthritis. In the case reported, the patient responded to corticosteroids and immunosuppressive therapy, suggesting that the PD1/PDL1 axis plays a role in the pathophysiology of arthritis. With coordinated collaboration between medical specialists - oncologists, immunologists and rheumatologists - and a multidisciplinary approach to the patient, irAEs can

be successfully controlled; patients can continue their treatment and maintain their quality of life.

Author Contributions

Conceptualization: I.I.; Methodology: I.I.; Formal analysis: I.I.; Investigation: I.I.; Writing—original draft: I.I.; Writing—review & editing: author.

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Declaration

The case report was conducted in accordance with the Declaration of Helsinki.

Informed Consent Statement

Informed consent was obtained from the patient involved in the study.

Data Availability Statement

The data presented in this study are available on reasonable request from the corresponding author.

Conflicts of Interest

The author declares no conflict of interest.

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Имуномедиран артрит след лечение с Nivolumab при пациент с малигнен меланом

Резюме

Малигниеният меланом е агресивен кожен тумор, който представлява 1% от всички новообразувания на кожата. Имуноterapia е нов терапевтичен подход за лечение на меланомните неоплазии. Nivolumab е имунотерапевтичен продукт, който принадлежи към т.нар. чекпойнт инхибитори (контролни точки). Терапията с Nivolumab демонстрира добър ефект по отношение на общата преживяемост и преживяемостта без прогресия при пациенти с малигнен меланом. Лечението с Nivolumab се прилага както за терапия при пациенти в метастатичен стадий, така и в адювантен аспект при пациенти с висок риск от рецидив на заболяването. Взаимодействието между лиганда на рецептора за програмирана клетъчна смърт (PD-L1) и самия рецептор за програмирана клетъчна смърт (PD-1) води до потискане на автоимунните прояви. Блокирането на това взаимодействие крие риск от различни автоимунни реакции, които се изразяват в различна степен, а понякога могат да бъдат животозастрашаващи и да изискват продължителна имunosупресия или преустановяване на лечението с чекпойнт инхибитори. При употребата на анти-PD-1 антитела са описани имуносвързани нежелани реакции с различна тежест, като пневмонит, хепатит, ендокринопатии, имуномедиран колит, дерматит и др. Ревматичните имуномедиирани усложнения, като миозит, миалгия, артрит, артралгия, васкулит и склеродермия, се срещат рядко при лечение с Nivolumab. Най-често пациентите съобщават за артрит, който започва след няколко цикъла на приложение на Nivolumab. Механизмът на възникване на имуномедиирания артрит все още не е установен. Представен е клиничен случай на 84-годишен пациент, развил имуносвързан артрит след лечение с Nivolumab. След като лечението с кортикостероиди и имunosупресори довежда до контрол на имуномедиирания артрит, се прави оценка за повторно инициране на имуноterapia с цел овладяване на онкологичното заболяване.

Ключови думи: чекпойнт инхибитори, имуномедиран артрит, имуноterapia, малигнен меланом, Nivolumab