



**INTERNATIONAL JOURNAL OF
PHARMACEUTICAL SCIENCES**
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: <https://www.ijpsjournal.com>



Review Paper

A Comprehensive Case Analysis of Takayasu Arteritis: Unraveling the Complexity of Aortic and Carotid Artery Involvement

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ARTICLE INFO

Published: 27 Jan. 2025

Keywords:

Takayasu arteritis, Granulomatous inflammation, Mesenteric arteries, Subclavian arteries, Pulseless Disease, Large Vessel Vasculitis, Anisopoikilocytosis, carotid angiography, anemia, autoimmune disorder, immunosuppressive therapy.

DOI:

10.5281/zenodo.14748531

ABSTRACT

A 24-year-old female was hospitalized due to chest pain and discomfort. Her clinical examination was normal, with no abnormal heart, neurological, or respiratory findings. Laboratory tests revealed anemia (low hemoglobin and packed cell volume), elevated C-reactive protein (CRP), and a microcytic hypochromic anemia pattern, indicating iron deficiency. Carotid angiography identified inflammation in the carotid arteries, leading to a diagnosis of Takayasu arteritis, a rare autoimmune disorder that causes inflammation of large blood vessels. If left untreated, Takayasu arteritis can cause serious vascular complications, including ischemia and organ damage. The patient's elevated activated partial thromboplastin time (APTT) and abnormal blood counts suggested ongoing inflammation or vascular injury. Treatment typically involves immunosuppressive therapy and close monitoring for vascular complications to prevent long-term damage. This case underscores the importance of diagnosing Takayasu arteritis in young patients presenting with unexplained vascular inflammation and systemic signs of inflammation.


INTRODUCTION

Takayasu arteritis is a rare, chronic inflammatory disease that primarily targets the large arteries, particularly the aorta and its main branches^[4]. It is classified as a form of large vessel vasculitis and was first described by the Japanese ophthalmologist Mikito Takayasu in the early 20th century. This condition is characterized by inflammation of the arterial walls, which leads to

narrowing, stenosis, occlusion, or aneurysm formation in the affected vessels^[2, 20]. The disease typically affects young women, with a peak onset between the ages of 10 and 40 years^[1, 3, 7]. Takayasu arteritis primarily affects the aorta and its major branches, leading to a variety of complications. The aortic arch, which gives rise to vital arteries such as the brachiocephalic trunk, left common carotid, and left subclavian arteries, is

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Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.



often involved. Inflammation in this area can cause ischemia to the organs these arteries supply, resulting in symptoms like headaches, dizziness, visual disturbances, and potentially stroke or organ dysfunction [7]. The ascending aorta can also be affected, leading to aortic dilation or aneurysm formation, which carries the risk of rupture and life-threatening complications [9]. In the descending thoracic aorta, inflammation can cause stenosis or aneurysms, reducing blood flow and causing chest or back pain, as well as potential organ ischemia [9, 10]. Other major arteries that may be involved include the subclavian arteries (causing arm claudication or reduced pulses) [9], carotid arteries (leading to headaches or vision problems) [9], renal arteries (which can result in hypertension and impaired kidney function) [7, 19], pulmonary arteries (potentially causing pulmonary hypertension) [9], and mesenteric and iliac arteries (which can cause abdominal pain or leg claudication) [7, 9]. Early recognition and treatment are crucial to manage these vascular complications.

Patient Information

A 24-year-old female presented to the hospital with complaints of chest pain and discomfort. Her height is 156 cm, and her weight is 62 kg. The patient's primary concern was the chest pain, which prompted her to seek medical attention. Further details regarding the nature, onset, and duration of the pain were not specified at the time of admission, but chest pain in this age group warrants prompt evaluation to rule out both cardiac and non-cardiac causes. The patient has no significant past medical history and no known chronic illnesses or prior hospitalizations. Details regarding her social habits, lifestyle, and family history were not provided, but these may be important for further evaluation and understanding of potential risk factors. The patient exhibited normal findings across key systems. On cardiovascular examination, S1 and S2 heart

sounds were heard, indicating a normal heart rhythm with no murmurs. Neurologically, there were no focal deficits, suggesting intact brain function. Respiratory examination revealed bilateral air entry, indicating normal lung expansion and ventilation. These findings suggest stable function in the cardiovascular, neurological, and respiratory systems with no acute abnormalities. Upon examination, the patient's temperature was recorded at 98.5°F, which falls within the normal range, suggesting that there was no fever or signs of systemic infection at the time of admission. Her blood pressure was measured at 130/70 mmHg, which is considered within the normal range and indicates that her cardiovascular system is functioning without signs of hypertension or hypotension. The patient's pulse was 86 beats per minute, which is within the normal range for an adult and suggests that there was no indication of tachycardia or irregular heart rhythms. Finally, her respiratory rate was 19 breaths per minute, also within normal limits, indicating that her breathing was stable and unlabored, with no signs of respiratory distress or abnormal patterns. These vital signs reflect a stable and well-compensated physiological state at the time of her admission.

Investigations: The patient's hemoglobin (9.8 g/dL) and packed cell volume (32.1%) are low, indicating anemia. The total white blood cell count (7,400 cells/ μ L) is normal, suggesting no significant infection or leukopenia. Neutrophils are elevated at 75%, pointing to a possible inflammatory or infectious process, while lymphocytes (19%) and monocytes (2%) are within normal limits. These findings support the presence of anemia and an ongoing inflammatory response, which may be linked to the patient's diagnosis of Takayasu arteritis.

Urine Analysis: The presence of 3-4 pus cells per high power field (HPF) suggests mild infection or inflammation in the urinary tract. This could be



indicative of a urinary tract infection (UTI) or an inflammatory response, though the findings are not severe. The count of 1-2 white blood cells (WBCs) per HPF is within the normal range, indicating no significant leukocyturia, which would typically suggest active infection or inflammation.

Coagulation Profile: The APTT (activated partial thromboplastin time) is 20.6 seconds, which is prolonged. This suggests potential clotting abnormalities. Prolonged APTT can indicate issues with the clotting cascade, possibly due to inflammation, vascular damage, or underlying conditions like Takayasu arteritis, which can cause vascular endothelial damage and affect coagulation.

C-Reactive Protein (CRP): The CRP level is 15.7 mg/L, which is elevated. CRP is an acute-phase reactant, and its elevation is a marker of ongoing inflammation in the body. This supports the presence of an inflammatory condition, such as Takayasu arteritis, which involves large vessel vasculitis and can elevate CRP levels.

Serum Electrolytes: sodium was 141 mEq/L, potassium was 4.4 mEq/L, and chloride was 104 mEq/L. These values suggest that the patient's fluid balance and electrolyte levels are stable, with no evidence of dehydration, renal dysfunction, or acid-base imbalances. Normal electrolyte levels support proper renal function and overall metabolic stability, and there are no immediate concerns regarding the patient's fluid and electrolyte status.

Peripheral Smear: The peripheral smear revealed anisopoikilocytosis, which refers to abnormal variation in the size and shape of red blood cells, and microcytic hypochromic cells, indicative of iron deficiency anemia. These findings suggest that the patient may be experiencing chronic anemia, potentially contributing to her symptoms of chest pain and

discomfort, as anemia can lead to fatigue, reduced oxygen delivery to tissues, and heart strain.

Carotid Angiography: The angiography findings indicate inflammation or damage to the carotid arteries, which is suggestive of vasculitis. This is consistent with the diagnosis of Takayasu arteritis, a rare condition characterized by inflammation and narrowing of the large arteries, including the carotid artery. The inflammation in these vessels can lead to reduced blood flow, ischemia, and symptoms such as chest pain, which aligns with the patient's presenting complaints.

Diagnosis: The patient has been diagnosed with Takayasu arteritis, a rare form of large vessel vasculitis that typically affects the aorta and its major branches, including the carotid arteries. It is characterized by inflammation, thickening, and narrowing of the arterial walls, leading to reduced blood flow to organs, which can result in symptoms such as chest pain, discomfort, and potentially life-threatening complications.

Management

1. Pantoprazole 40mg is prescribed for acid-related issues given once a day for 6 days.
2. Azolet 10 contains Atorvastatin and Clopidogrel to be taken once in the morning and once at night for one day.
3. Omega-3 fatty acids, cod liver oil, and vitamin E to be taken once in the morning and once at night for 7 days, likely for cardiovascular or general health support.
4. Clopidogrel and aspirin combination to be taken once in the morning and once at night reduce clotting risk, taken for 6 days.
5. Atorvastatin, another cholesterol-lowering agent, taken once in the morning and night for 6 days.
6. Heparin, an anticoagulant, administered subcutaneously for 3 days to prevent clot formation.

7. Hydrocortisone injection, a steroid, used for inflammation control, given intravenously for 4 days.
8. Paracetamol, used for pain or fever relief, taken as needed for 2 days.
9. A multivitamin combination with iron, zinc, vitamin B12, and folic acid to support overall health and possibly address deficiencies.

Classifications

The Istanbul Classification of Takayasu arteritis categorizes the disease based on the extent of involvement of the aorta and its branches, aiding in the diagnosis and management of this condition [1,19]. Type I affects the aortic arch and its major branches, including the brachiocephalic trunk, left common carotid artery, and left subclavian artery. Patients often present with symptoms such as headaches, dizziness, arm claudication, and reduced pulses in the upper limbs [7, 9]. Type IIa includes Type I involvement plus the descending thoracic aorta, leading to additional symptoms like chest and back pain, as well as worsening symptoms from Type I [19]. Type IIb extends this further by involving the abdominal aorta, leading to symptoms like abdominal pain, lower limb claudication, and potential mesenteric ischemia [9, 10]. Type III is confined to the descending thoracic and abdominal aorta, without affecting the aortic arch, with symptoms typically localized to the lower body, such as claudication and abdominal pain. Each type of involvement reflects a different severity and pattern of symptoms, crucial for guiding treatment decisions [9, 10]. The Isenberg Classification system is another method for categorizing Takayasu arteritis based on the anatomic distribution of the disease: [23] The aortic arch types describe varying levels of involvement of the aorta and its branches. Type I affects only the aortic arch and its main branches. Type IIa extends this involvement to also include the descending thoracic aorta. Type IIb further broadens the scope by affecting both the

descending thoracic aorta and the abdominal aorta, incorporating the features of Type IIa. Lastly, Type III is limited to the descending thoracic aorta and the abdominal aorta, without involving the aortic arch. These classifications help in understanding the extent of aortic involvement, crucial for diagnosis and treatment planning. The American College of Rheumatology (ACR) Criteria are used to diagnose Takayasu arteritis, focusing on key clinical features and diagnostic finding [6, 17,19]. The criteria includes Disease onset occurs before age 40, typically in young adults. Claudication Pain in the arms or legs during exertion due to reduced blood flow.: Reduced or absent pulses in the extremities from narrowed or blocked arteries. A significant difference in blood pressure between the arms, indicating vascular involvement. Imaging shows arterial stenosis or occlusion, confirming vessel damage. These criteria help confirm the diagnosis but do not classify the disease's extent. They are crucial for identifying Takayasu arteritis based on symptoms and imaging results [6]. This modified Takayasu arteritis classification focuses on the severity of the disease and the degree of arterial involvement: Takayasu arteritis can be categorized into three stages based on the extent of arterial involvement and the severity of symptoms. In mild disease, only one or two arterial segments are affected, with minimal symptoms that do not significantly interfere with daily activities. Patients may experience mild claudication or subtle changes in pulses, and the prognosis is generally favorable with appropriate treatment. In moderate disease, multiple arterial segments are involved, leading to more pronounced symptoms such as claudication, blood pressure discrepancies between arms, and some impact on daily activities. Treatment is necessary to manage symptoms and prevent progression. Severe disease involves extensive arterial damage, including possible aneurysms, ischemic events, and organ damage, such as heart



failure or kidney dysfunction. Symptoms are significant, impairing quality of life, and aggressive treatment is required to manage complications and prevent life-threatening outcomes. Early diagnosis and management are crucial for improving prognosis and reducing the risk of severe complications [7, 8].

Histological examination plays a key role in understanding the pathophysiology of Takayasu arteritis. Two main histological features are commonly observed in the affected arteries:

1. **Granulomatous Inflammation:** This refers to the formation of granulomas, which are clusters of immune cells, particularly macrophages, that form in response to chronic inflammation. These granulomas accumulate in the arterial walls, contributing to the thickening and narrowing of the arteries, which can lead to stenosis or occlusion.
2. **Intimal Hyperplasia:** This is the thickening of the inner layer of the artery (the intima) due to prolonged inflammation. Intimal hyperplasia results from the proliferation of smooth muscle cells and extracellular matrix, which can further narrow the arterial lumen, limiting blood flow and contributing to symptoms such as claudication, ischemia, and organ damage.

Arterial Involvement and Implications

Arterial involvement through stenosis, occlusion, and aneurysms can lead to significant clinical consequences. Stenosis refers to the narrowing of arteries, typically due to plaque buildup or inflammation, which reduces blood flow and can cause symptoms such as pain, claudication, and hypertension, and potentially lead to heart attacks or strokes [9, 10]. Occlusion occurs when an artery is completely blocked, often by a blood clot or plaque rupture, resulting in ischemia (lack of blood flow) and organ dysfunction, with severe consequences such as heart attacks or strokes [3]. Aneurysms are abnormal dilations of the arterial walls, often due to hypertension or

atherosclerosis, and can be life-threatening if they rupture, leading to internal bleeding and organ failure. The clinical implications of these conditions include reduced blood flow, ischemia, organ damage, and the risk of aneurysm rupture, all of which can cause severe symptoms and complications. Early diagnosis and intervention are crucial to prevent permanent damage or fatal outcomes [9].

Clinical Implications

The involvement of arteries through stenosis, occlusion, or aneurysms can lead to a wide range of symptoms and complications, depending on the affected arteries and the severity of the condition. Reduced blood flow can cause symptoms such as pain or claudication in the limbs, hypertension, or abdominal pain. Ischemia, resulting from insufficient blood supply, can lead to organ dysfunction or damage in areas supplied by the affected arteries. Aneurysm formation, particularly in larger arteries, can be life-threatening if the aneurysm ruptures, leading to severe internal bleeding and organ failure. Early detection and treatment are essential to prevent these potentially dangerous outcomes [7, 9, 10].

Pathophysiology

Takayasu arteritis (TA) is a rare, chronic large-vessel vasculitis that primarily affects the aorta and its major branches, though smaller arteries may also be involved. The disease is characterized by granulomatous inflammation of the arterial walls, where immune cells such as T lymphocytes, macrophages, and dendritic cells form granulomas. This immune-mediated inflammation leads to thickening and narrowing (stenosis) of the affected arteries, impairing blood flow. Over time, it can progress to fibrosis, arterial occlusion, and aneurysm formation, further compromising vascular function and leading to ischemia (insufficient oxygen supply) to vital organs and tissues. The inflammation predominantly affects the aorta and its branches, including the



subclavian, carotid, renal, and vertebral arteries. As the walls of the arteries become thickened and fibrotic, they lose elasticity, causing further narrowing and reducing their ability to expand and contract with blood flow. This vascular remodeling results in ischemia, which can lead to complications like renal insufficiency, cerebral ischemia, and neurological symptoms such as dizziness or strokes. As the disease progresses, it can cause life-threatening complications, including aortic aneurysms, dissections, and ruptures due to weakening of the arterial walls. Symptoms of TA often include systemic inflammatory signs such as fever, fatigue, and weight loss, reflecting the ongoing immune response. As vascular insufficiency worsens, more specific signs such as pulse deficits, bruits, and signs of impaired circulation emerge. Takayasu arteritis is a chronic inflammatory condition that causes significant vascular damage, leading to arterial stenosis, occlusion, and ischemia. The disease affects large arteries, particularly the aorta and its branches, and can result in severe complications like aneurysms and organ dysfunction [9, 3, 7, 25].

Etiology

The etiology of Takayasu arteritis is complex and likely involves a combination of autoimmune mechanisms, genetic factors, environmental triggers, and hormonal influences.

1. **Autoimmune Mechanisms:**-Takayasu arteritis is considered a type of large vessel vasculitis, where the body's immune system mistakenly attacks its own arterial tissues, leading to chronic inflammation and damage to large arteries, especially the aorta. This abnormal immune response is believed to be driven by immune system dysregulation [12, 19]. A key feature of this inflammation is the formation of granulomas, which are clusters of immune cells that accumulate in the walls of affected arteries. While granulomatous

inflammation is a hallmark of the disease, the exact cause of immune activation remains unclear [9, 12].

2. **Genetic Factors:** - Genetic susceptibility also appears to play a role in the development of Takayasu arteritis. Certain genetic markers, such as specific alleles of the HLA (human leukocyte antigen) system, have been linked to an increased risk of the disease. For instance, the HLA-B*52 allele has been associated with a higher incidence of Takayasu arteritis in some studies, suggesting that genetics may predispose individuals to the condition [8, 19]. In addition, familial cases have been reported, further supporting the role of genetic factors in disease development, although such cases are rare [19, 21].
3. **Environmental Triggers:**- Environmental factors, such as infections or toxins, might also contribute to the onset of Takayasu arteritis. There is some speculation that infections may trigger the initial inflammatory process, though no specific infectious agents have been conclusively linked to the disease [7]. Similarly, exposure to environmental toxins or pollutants has been suggested as a potential trigger, although supporting evidence is limited [7].
4. **Hormonal Factors :** - Hormonal influences are another area of interest in understanding Takayasu arteritis, as the disease predominantly affects young women, particularly those between the ages of 10 and 40. This gender and age pattern suggests that hormonal factors might play a role in disease development. However, the exact relationship between hormones and Takayasu arteritis remains unclear [7, 8, 19].
5. **Inflammatory Response :** - The development of Takayasu arteritis often begins with an initial vascular injury, which could be caused by an autoimmune attack or other unknown factors. This injury triggers a cascade of



inflammatory responses that results in chronic inflammation, the formation of granulomas, and subsequent thickening and damage to the walls of the arteries [12, 13]. The ongoing inflammation further narrows or obstructs the affected vessels, leading to reduced blood flow and organ damage.

6. **Immune System Disorders:-** Takayasu arteritis is occasionally associated with other autoimmune or inflammatory conditions, although these associations are not well defined. The disease can overlap with other forms of vasculitis or systemic autoimmune diseases, which may suggest a broader underlying context of immune dysregulation [7].

Clinical Manifestations of Takayasu Arteritis

The clinical manifestations of Takayasu arteritis (TA) vary based on the stage of the disease and the arteries involved. The disease progresses in phases, beginning with nonspecific systemic symptoms and later developing more specific vascular and organ-related signs [15,16,23].

1. Early Symptoms

In the early stages, Takayasu arteritis often presents with systemic, nonspecific symptoms that reflect widespread inflammation. These constitutional symptoms may include:

- Fever
- Fatigue
- Weight loss
- Night sweats

These symptoms are common to many autoimmune conditions and may be misattributed to other causes. However, their presence can signal the onset of an underlying inflammatory process affecting the large arteries [1,15, 16].

2. Vascular Symptoms

As the disease advances, vascular symptoms emerge, resulting from inflammation, stenosis (narrowing), or occlusion (blockage) of the

affected arteries. Key vascular manifestations include:

- **Claudication:** Pain or cramping in the limbs, especially during physical activity, due to insufficient blood flow caused by narrowed arteries [2, 3].
- **Blood Pressure Differences:** A marked difference in blood pressure between the arms, which indicates stenosis or occlusion of large arteries like the subclavian or brachiocephalic arteries [3].
- **Pulses:** Reduced or absent pulses in the extremities, indicating compromised blood flow due to arterial damage [3,4].

3. Organ-Specific Symptoms

The clinical presentation can be influenced by which specific arteries are affected:

- **Headaches and Vision Problems:** Involvement of the carotid or ophthalmic arteries can lead to reduced blood flow to the brain and eyes, causing headaches, visual disturbances, and in severe cases, permanent vision loss [2].
- **Dizziness and Syncope:** When the arteries supplying the brain are affected, patients may experience dizziness, lightheadedness, or fainting due to reduced cerebral blood flow [3].
- **Renal Symptoms:** If the renal arteries are involved, it can lead to impaired kidney blood flow, resulting in secondary hypertension or kidney dysfunction. Over time, this can progress to more severe renal complications [3, 5, 25].

The variety of symptoms in Takayasu arteritis emphasizes the need for early diagnosis and intervention. Prompt recognition of both systemic and organ-specific symptoms is crucial for preventing long-term complications and managing the disease effectively [15, 16].

Diagnosis: The diagnosis of Takayasu arteritis (TA) involves a combination of clinical criteria, imaging studies, and laboratory tests. Due to the

heterogeneity of the disease and the fact that its symptoms can overlap with other conditions, the diagnosis is often challenging and requires a high index of suspicion ^[21, 23].

1. Clinical Criteria: The clinical diagnosis of Takayasu arteritis is typically guided by a set of established criteria, most notably the American College of Rheumatology (ACR) criteria. These criteria focus on both clinical presentation and imaging findings. The key elements of the ACR criteria include:

- **Age of onset under 40 years:** Takayasu arteritis predominantly affects younger individuals, with most cases occurring in individuals between 10 and 40 years of age ^[4].
- **Claudication of limbs:** Claudication, or pain and cramping in the limbs during physical activity, is a common symptom in Takayasu arteritis. This occurs due to the reduced blood flow caused by narrowing or occlusion of the affected arteries ^[4].
- **Decreased brachial artery pulse:** A hallmark sign of Takayasu arteritis is a decreased or absent pulse in one or both arms. This is often due to stenosis or occlusion of the subclavian artery or other large vessels ^[4].
- **Blood pressure discrepancy between arms:** A significant difference in blood pressure readings between the right and left arms is indicative of arterial stenosis or occlusion. This is a common and important diagnostic sign in Takayasu arteritis ^[4, 17].
- **Angiographic evidence of stenosis or occlusion in large arteries:** The presence of arterial narrowing (stenosis) or blockage (occlusion) in the aorta or its major branches is a critical diagnostic feature. This is often confirmed through imaging studies such as angiography ^[4, 14, 17].

2. Imaging Studies

Imaging is crucial for confirming the diagnosis of Takayasu arteritis, as it allows clinicians to

visualize the extent of arterial involvement, assess the severity of the disease, and rule out other conditions. The most commonly used imaging techniques include: Ultrasound is a non-invasive imaging modality that can be used to assess the arterial walls. In Takayasu arteritis, ultrasound may reveal thickening of the arterial walls and abnormal blood flow, which are indicative of the inflammatory changes occurring in the arteries ^[5]. It is particularly useful for assessing the subclavian and carotid arteries. CT Angiography (CTA) is a highly detailed imaging technique that provides cross-sectional images of the blood vessels. It is particularly useful for visualizing the stenosis, aneurysms, and occlusions in large arteries, such as the aorta and its branches. CTA can also help evaluate the extent of vascular remodeling and the presence of collateral circulation ^[5, 11]. MRA is a non-invasive imaging technique that uses magnetic fields and radio waves to produce detailed images of blood vessels. It is especially useful for assessing large vessel involvement, including the aorta and its branches, and for monitoring disease progression without the need for contrast agents. MRA can show vascular stenosis, aneurysms, and occlusions ^[5, 11]. Conventional Angiography is an invasive procedure provides a direct, detailed view of the blood vessels by injecting a contrast agent into the bloodstream. Conventional angiography is often used to confirm the findings of non-invasive imaging techniques, especially in cases where the diagnosis remains uncertain or when a more detailed examination of the arterial damage is required. It is particularly useful in assessing the degree of stenosis and occlusion in the large arteries ^[5, 11].

Prognosis: The prognosis of Takayasu arteritis can vary significantly depending on the severity of the disease, the extent of vascular involvement, and the organs affected. While some individuals may manage the disease with appropriate



treatment and regular monitoring, others may experience serious long-term complications [18].

- **Long-Term Management:** Takayasu arteritis is a chronic condition that requires continuous follow-up to monitor disease activity, assess the effectiveness of treatment, and manage potential complications. Given the progressive nature of the disease, particularly in cases with significant vascular damage, regular surveillance is critical. Patients need to be closely monitored for the development of complications such as aneurysms, arterial rupture, and organ dysfunction (e.g., renal failure or stroke). Managing these risks involves regular imaging studies and adjusting treatment protocols to prevent further damage or complications [7, 25].
- **Disease Course and Complications:** Patients diagnosed with Takayasu arteritis may live for many years, but those with extensive vascular involvement or multi-organ damage face higher risks of severe health complications. For example, renal failure due to renal artery stenosis, stroke from compromised cerebral blood flow, or aortic rupture in the case of aneurysm formation can significantly impact life expectancy and quality of life. If left untreated or inadequately managed, the disease can lead to progressive organ failure and disability. However, with proper treatment, many patients can achieve symptom control and disease remission [7].
- **Impact of Early Diagnosis:** Early diagnosis and prompt initiation of treatment are essential for improving outcomes. Steroid therapy and immunosuppressive agents can help control inflammation, while antihypertensive and antiplatelet treatments may be necessary to prevent complications. Early intervention can reduce the risk of irreversible damage to the arteries and the organs they supply,

significantly improving the long-term outlook for many patients.

Treatment: The management of Takayasu arteritis (TA) involves both pharmacologic and surgical approaches, aimed at controlling inflammation, preventing complications, and improving blood flow to affected organs and tissues. The specific treatment strategy depends on the disease's severity, progression, and the organs involved.

1. Medication: Medications play a crucial role in controlling inflammation, managing symptoms, and preventing long-term vascular damage. Corticosteroids, such as prednisone, are the first-line treatment for Takayasu arteritis. These drugs help reduce inflammation and suppress the immune system's activity, thereby alleviating symptoms like fever, fatigue, and pain. They are particularly effective during the acute phases of the disease. However, long-term use can lead to side effects such as osteoporosis, weight gain, and increased risk of infections. Therefore, corticosteroids are typically used in combination with other medications to minimize their long-term use [6]. Drugs like methotrexate or azathioprine may be prescribed in combination with corticosteroids to control inflammation more effectively. DMARDs are often used as steroid-sparing agents to reduce the need for long-term corticosteroid therapy and to manage persistent disease activity. They work by modulating the immune system and reducing the production of inflammatory cytokines [6]. For patients with Takayasu arteritis who are refractory to corticosteroids and DMARDs, biologic agents such as tumor necrosis factor (TNF) inhibitors (e.g., infliximab) or interleukin-6 (IL-6) inhibitors (e.g., tocilizumab) may be considered. These biologic therapies target specific pathways in the immune system to reduce inflammation and control the disease. TNF inhibitors block a key cytokine involved in inflammation, while IL-6



inhibitors target a cytokine that plays a major role in the inflammatory process in Takayasu arteritis. These medications are particularly useful for patients with more aggressive or refractory disease [6]. Surgical interventions are necessary when there is significant vascular damage or complications such as severe stenosis, occlusion, or aneurysms. Surgical options may include: Bypass surgery is used to reroute blood flow around blocked or narrowed arteries. In Takayasu arteritis, this can be necessary when there is severe stenosis (narrowing) or occlusion (blockage) of critical arteries such as the subclavian, renal, or carotid arteries. Bypass procedures involve grafting a vessel from another part of the body or using a synthetic graft to bypass the obstructed section and restore normal blood flow to the affected organs or limbs [6]. Angioplasty is a minimally invasive procedure used to open narrowed or occluded arteries. It involves the insertion of a balloon catheter into the affected artery, which is then inflated to widen the vessel and improve blood flow. Angioplasty may be used as a standalone procedure or in combination with stent placement to keep the artery open. This procedure is commonly used for patients with localized narrowing or blockage of large arteries and can be particularly useful in treating arterial stenosis associated with Takayasu arteritis [6].

Epidemiology: Takayasu arteritis is a rare condition, but it has a notable epidemiological profile. The disease predominantly affects young women, particularly those aged between 10 and 40 years. The onset of Takayasu arteritis often occurs in the second or third decade of life, with women accounting for approximately 80-90% of cases. This gender predilection suggests a possible hormonal or genetic component contributing to the disease's development [5,8,19, 22]. Takayasu arteritis is more common in certain geographic regions, particularly in Asia, with a higher incidence in countries like Japan, India, and Southeast Asia.

The disease is less common in Western populations, although cases have been reported worldwide. Genetic and environmental factors are believed to contribute to these regional differences. It can occur in individuals of any ethnic background, but its prevalence is significantly higher in Asian populations [8]. The prognosis of Takayasu arteritis can range from good to poor, depending on the extent of vascular damage and the organs involved. Early diagnosis and long-term management are essential to improving outcomes and minimizing complications. The disease most commonly affects young women, particularly in Asia, although it can occur in individuals of any ethnicity or region [7, 8,20,22].

Research and Advances

Ongoing research into Takayasu arteritis is focused on enhancing our understanding of the disease's underlying mechanisms, improving diagnostic methods, and developing more effective treatment options. Scientists are investigating the role of genetic, environmental, and hormonal factors in the disease's development and progression. Advances in genomics are helping identify potential genetic markers that could predict susceptibility or severity of the disease, while environmental and hormonal factors are being studied for their influence on the onset, especially in women, who are predominantly affected by the condition. Research is also exploring novel therapeutic approaches, including targeted biologic therapies, which may offer more precise and effective treatments with fewer side effects compared to traditional immunosuppressive drugs. These advances hold promise for improving patient outcomes, reducing disease progression, and minimizing complications such as aneurysms or vascular rupture [8, 24].

Complications: Takayasu arteritis can lead to several serious complications, particularly due to



the chronic inflammation and vascular damage that affect large arteries. These complications can be life-threatening and may impact multiple organ systems.

1. **Cardiovascular Complications:** Chronic inflammation can cause the aortic wall to weaken and dilate, forming an aneurysm. If the aneurysm ruptures, it can result in life-threatening hemorrhage ^[9]. Damage to the aortic valve can lead to regurgitation, where blood flows backward into the heart, potentially causing heart failure ^[9]. If the coronary arteries are affected, reduced blood flow to the heart can increase the risk of heart attacks ^[9].
2. **Hypertension:** Stenosis of the renal arteries due to Takayasu arteritis can impair kidney function and cause high blood pressure, which can be difficult to manage and may require aggressive treatment ^[10].
3. **Organ Ischemia:** Narrowing or occlusion of the renal arteries can reduce blood flow to the kidneys, leading to kidney dysfunction or even renal failure. [10]Reduced blood flow to the intestines due to mesenteric artery involvement can cause abdominal pain, digestive issues, and, in severe cases, bowel infarction ^[10, 25].
4. **Stroke and Transient Ischemic Attacks (TIAs):** If blood flow to the brain is compromised, particularly from the carotid or aortic arch involvement, there is an increased risk of strokes or TIAs, leading to neurological deficits such as dizziness, weakness, or loss of vision ^[9].
5. **Peripheral Artery Disease (PAD):** Narrowing of the subclavian or iliac arteries can lead to pain or cramping in the arms or legs, especially during physical activity. In severe cases, this can lead to ulcers or even gangrene ^[10].

6. **Aneurysm Formation:** Besides the aorta, Takayasu arteritis can cause aneurysms in other major arteries like the carotid or subclavian arteries, increasing the risk of rupture or thrombosis ^[9].
7. **Heart Failure:** Chronic involvement of the aorta, particularly if aortic regurgitation develops, can lead to heart failure over time. The heart has to work harder to compensate for reduced blood flow, eventually leading to failure ^[9].
8. **Complications from Treatment:** Long-term use of corticosteroids and immunosuppressive drugs to manage Takayasu arteritis can lead to side effects such as osteoporosis, diabetes, weight gain, and an increased risk of infections ^[6]. Surgical interventions to bypass blocked arteries or repair damaged vessels carry risks, including infection, bleeding, and restenosis (re-narrowing of the treated arteries) ^[6].
9. **Vision Problems:** Inflammation of the ophthalmic arteries can lead to visual disturbances such as blurred vision and, in severe cases, permanent vision loss ^[9].

Ethics approval and consent to participate

- Not applicable

Consent for publication

- Patient consent was taken for the publication

Availability of data and materials

- The data will not be shared completely because of confidentiality of the patient.

Competing Interests– Nil

Funding – Nil

Authors & contributions

Sk .Musheera, Sk. Aneesa collected the patient data, literature review was done by Sk .Musheera , Clinical Interpretation were performed by K. Siva Krishna. All authors read and accepted the manuscript for publication.

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HOW TO CITE: Konda Siva Krishna*, Shaik Musheera, Satheesh S. Gottipati, Shaik Aneesa, A Comprehensive Case Analysis of Takayasu Arteritis: Unraveling the Complexity of Aortic and Carotid Artery Involvement, *Int. J. of Pharm. Sci.*, 2025, Vol 3, Issue 1, 2253-2265. <https://doi.org/10.5281/zenodo.14748531>

