

Cardiovascular Disease And Takayasu Arteritis

Avi Sharma, Dr. Sanket Shrikar Kunde

Abstract:

Takayasu arteritis is a cardiovascular disease that is recognized as being widely uncommon. Takayasu arteritis is a disease that manifests within the human anatomy in the form of inflammation. Beyond the inflammatory aspect of the disease, however, Takayasu arteritis is also characterized by conditions such as fibrosis of the body's arteries, as well as the stenosis of those vessels. Additionally, conditions like heart disease, heart failure, and stroke are some of the most common causes of death across the world. Thus, any additional conditions that relate to those conditions can potentially pose additional threats to the lives of patients with Takayasu arteritis. Within this literature piece, the relationship between Takayasu arteritis and various other cardiovascular diseases will be explored, as well as the computational analyses that have been performed regarding Takayasu arteritis, such as the use of software like PyRx and Stanford University's Tetralogy software to analyze how various medications interact with the vascular system of patients with Takayasu arteritis, and how those interactions may impact the forces that relate to those patients' cardiovascular systems.

Date of Submission: 14-07-2026

Date of Acceptance: 24-07-2026

I. Introduction:

Takayasu arteritis is a condition that is characterized by the granulomatous inflammation of the aorta and its branches. Consequently, thickening of the arterial wall develops as a result of the condition, as well as conditions like fibrosis, stenosis, and aneurysms of those arteries. Conditions like coronary artery disease, heart failure, and cerebrovascular diseases are some of the most common forms of mortality across the planet.

As a condition that exists in conjunction with cardiovascular diseases, it is likely that the inflammatory nature of Takayasu arteritis may worsen the condition of those cardiovascular diseases of the patient. The immunity of the patient's body to its own vessels can lead to the development of atherosclerosis, as well as the detrimental effects upon the circulation of the patient's blood. Furthermore, the medications that are used to treat Takayasu arteritis may also have some effect upon the circulation of the patient's blood and their cardiovascular system.

Nevertheless, there have been a few research studies that have investigated the impact that Takayasu Arteritis can have upon the cardiovascular systems of patients with Takayasu arteritis. One of the main purposes of this paper is to investigate the link between Takayasu arteritis and cardiovascular diseases, as well as to investigate the computer simulations that have been used to determine the impact of various medications upon patients with Takayasu arteritis.

II. Review Of Literature:

Various studies have been performed regarding the link between Takayasu arteritis and cardiovascular-related issues. Takayasu arteritis is recognized as a disease that manifests as inflammation to the endothelium of the arteries. Additionally, the arterial walls of patients with Takayasu arteritis have been shown to have increased thickness, indicating the presence of both atherosclerosis and inflammation of those vessels. Furthermore, patients with Takayasu arthritis have been found to have cardiovascular issues at higher rates than those without the condition. However, the majority of research regarding Takayasu arteritis has performed without regard to whether the patients have cardiovascular issues or not. Thus, there are limited studies regarding the efficacy of various treatments for cardiovascular issues for patients with Takayasu arteritis.

III. Methodology:

A review of the scientific literature has been performed as a means of investigating the relationship of Takayasu arteritis and cardiovascular disease. The scientific journal articles, review articles and studies related to Takayasu arteritis were reviewed with the intention of determining whether or not there are any cardiovascular complications associated with such a condition. Specifically targeted were scientific studies published upon the inflammatory components of Takayasu arteritis and how those inflammatory components may impact the cardiovascular system of patients with such a disease.

The software package PyRx was employed as an educational tool to review various computational approaches utilized in relation to inflammatory diseases, such as Takayasu arteritis. The protein structures relating to the inflammatory components of Takayasu arteritis were obtained from publicly available databases.

Such structures were loaded into PyRx for visualization within the software. The docking functions contained within PyRx were reviewed with particular emphasis upon those medications utilized to treat Takayasu arteritis. Thus, this computational tool was utilized to review the potential use of such computational modeling techniques to determine the mechanisms of the medications used to treat Takayasu arteritis.

Lastly, Stanford University's Tetralogy software platform and Vascular Model Repository were explored in regard to determining the use of computational models to simulate vascular diseases. Models of the aorta and its branches within patients with Takayasu arteritis were reviewed. Those computational models and simulations published in relation to these patients and their conditions were explored to determine their findings relevant to the impact of Takayasu arteritis upon the cardiovascular system of those patients.

IV. Discussion:

Through reviewing the various research studies that have been performed regarding Takayasu arteritis and the cardiovascular systems of patients with Takayasu arteritis, it becomes evident that Takayasu arteritis is not a common disease in relation to the development of cardiovascular diseases. Instead, however, the inflammatory nature of the disease contributes to the destruction of the arterial walls of patients with Takayasu arteritis. Consequently, patients with Takayasu arteritis and cardiovascular issues are at an increased susceptibility to experiencing ischemia due to those cardiovascular issues. Additionally, software like PyRx has been utilized to reveal the potential interaction between medications used to treat Takayasu arteritis with the inflammatory system of patients with Takayasu arteritis. For instance, medications like corticosteroids are often used to treat the arteritis; however, they are also associated with cardiovascular issues due to their impact upon the body's metabolism. Although statins are not a primary treatment for Takayasu arteritis in itself, they may be used to reduce cholesterol levels which ultimately decreases the risk of cardiovascular complications.

Additionally, procedures like angioplasty or cardiac bypass procedures are performed on patients with Takayasu arteritis that experience cardiovascular issues; however, those patients are likely to experience the failure of those grafts or the development of restenosis of those blood vessels. Finally, the reasons for the failure of those cardiovascular procedures for patients with Takayasu arteritis has been revealed through the use of software like Stanford University's Tetralogy software.

V. Results:

A literature review of Takayasu arteritis reveals the cardiovascular complications that are associated with such a condition. Takayasu arteritis can lead to thickening and narrowing of arterial walls which are aspects that can subsequently lead to cardiovascular complications.

An examination of the molecular visualization processes illustrated through PyRx reveal the interactions between therapeutic agents and targets of inflammation associated with Takayasu arteritis. Additionally, the vascular models available through Stanford Tetralogy illustrate the thickening and narrowing of blood vessels associated with Takayasu arteritis.

The findings of these research studies indicate that the inflammation associated with Takayasu arteritis can indeed lead to cardiovascular complications as a result of such thickening and narrowing of arterial walls.

VI. Conclusion:

Takayasu arteritis exacerbates cardiac events in subjects with underlying cardiac diseases via chronic inflammation, vascular changes, and hemodynamics. The present study leverages simulations and modeling of blood vessels to offer insights ranging from molecular to cardiovascular levels. Early identification of Takayasu arteritis, strict management of inflammation, and comprehensive management are critical in lowering morbidity and mortality rates among high-risk subjects. Further prospective research is also required to design standard treatment approaches for cardiac diseases among subjects with Takayasu arteritis.

References:

- [1] Johnston SL, Lock RJ, Gompels MM. Takayasu Arteritis: A Review. *Journal Of Clinical Pathology*. 2002;55(7):481-486.
- [2] Terao C. Revisited HLA And Non-HLA Genetics Of Takayasu Arteritis—Where Are We? *Journal Of Human Genetics*. 2016;61(1):27-32.
- [3] Mason JC. Takayasu Arteritis—Advances In Diagnosis And Management. *Nature Reviews Rheumatology*. 2010;6(7):406-415.
- [4] Keser G, Direskeneli H, Aksu K. Management Of Takayasu Arteritis: A Systematic Review. *Rheumatology*. 2014;53(5):793-801.
- [6] Tso E, Flamm SD, White RD, Schwartzman PR, Mascha EJ, Hoffman GS. Takayasu Arteritis: Utility And Limitations Of Magnetic Resonance Imaging In Diagnosis And Treatment. *Arthritis & Rheumatism*. 2002;46(6):1634-1642.
- [7] Comarmond C, Biard L, Lambert M, Et Al. Long-Term Outcomes And Prognostic Factors Of Complications In Takayasu Arteritis. *Circulation*. 2017;136(12):1114-1122.
- [8] Saadoun D, Lambert M, Mirault T, Et Al. Retrospective Analysis Of Surgery Versus Endovascular Intervention In Takayasu Arteritis. *Circulation*. 2012;125(6):813-819.
- [9] Cong XL, Dai SM, Feng X, Et Al. Takayasu's Arteritis: Clinical Features And Outcomes Of 125 Patients In China. *Clinical Rheumatology*. 2010;29(9):973-981.
- [10] Misra DP, Wakhlu A, Agarwal V, Danda D. Recent Advances In The Management Of Takayasu Arteritis. *International Journal Of*

- Rheumatic Diseases. 2019;22(S1):60-68.
- [11] Dua AB, Kalot MA, Husainat NM, Et Al. Takayasu Arteritis: A Systematic Review And Meta-Analysis Of Test Accuracy And Benefits And Harms Of Common Treatments. *ACR Open Rheumatology*. 2021;3(2):80-90.
- [13] Zhu Y, Xu XY, Mason J, Mirsadraee S. Irregular Anatomical Features Can Alter Hemodynamics In Takayasu Arteritis. *JVS–Vascular Science*. 2023;4:100125.
- [14] Svensson C, Bjarnegård N, Eriksson P, Et Al. Affected Microcirculation And Vascular Hemodynamics In Takayasu Arteritis. *Frontiers In Physiology*. 2022;13:926940.