ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25sep499

Thromboangiitis Obliterans (Buerger's Disease)

Kiruthiga O. B.[1*]; Mahalakshmi M.[2]; Archana B.[3]; Senthilkumar N.[4]

[1]Pharm D Interns, Department of Pharmacy Practice, JKKMMRF'S Annai JKK Sampoorani Ammal College of Pharmacy, Komarapalayam

[2,3,4]The Tamil Nadu Dr. MGR Medical University

Corresponding Author: Kiruthiga O. B.[*]

Publication Date: 2025/09/20

Abstract: The rare, non-atherosclerotic, segmental inflammatory disease, Thromboangiitis obliterans (TAO), commonly referred to as Buerger's disease, mostly affects the medium and small arteries and veins in the extremities. Although recent epidemiological trends indicate an increase in instances among women due to rising smoking prevalence, it is strongly linked to tobacco use, especially among young male smokers. Distal extremity ischemia, rest pain, skin discoloration, ulceration, and gangrene are clinical manifestations of the condition, which frequently results in limb amputation if left untreated. The "corkscrew" collateral arteries shown on imaging are a crucial diagnostic feature, with illness preserving bigger vessels and visceral organs. Although the exact cause is unknown, environmental, genetic, and immunologic factors—particularly tobacco-induced endothelium dysfunction—play significant roles. In order to rule out mimicking illnesses, the diagnosis is made using clinical criteria, such as Shionoya's criteria, in conjunction with imaging and laboratory testing.

The only treatment that has been shown to stop the progression of the disease is quitting smoking. Analgesics, prostaglandin analogs, vasodilators, and antiplatelet medicines are examples of adjunctive medical therapy. In more advanced cases, surgical procedures such as sympathectomy, spinal cord stimulation, the Ilizavor's technique, and cell treatments employing bone marrow-derived mononuclear cells show promise. Mortality is still low despite the disease's severity, but ischemia agony and limb loss cause a high rate of morbidity. Improving patient outcomes still mostly depends on early diagnosis and rigorous smoke abstinence.

How to Cite: Kiruthiga O. B.; Mahalakshmi M.; Archana B.; Senthilkumar N. (2025) Thromboangiitis Obliterans (Buerger's Disease). *International Journal of Innovative Science and Research Technology*, 10 (9), 1040-1044. https://doi.org/10.38124/ijisrt/25sep499

I. INTRODUCTION

The development of segmental thrombotic occlusions of the medium and small arteries of the extremities is a hallmark of Buerger's disease, also known as thromboangiitis obliterans or TAO. It can be differentiated from necrotizing arteritis and arteriosclerosis both clinically and pathologically [1]. Due to its propensity to affect young male subjects, its strong correlation with tobacco use, the infrequency of systemic symptoms, its highly cellular thrombus with relative blood vessel wall sparing, and the lack of elevated acute-phase reactants and immunological markers, TAO can be differentiated from other forms of vasculitis [2].

Patients with distal extremity ischemia, ischemic ulcers, or frank gangrene of the toes or fingers are typically young, male, and experienced tobacco users. The cerebral, visceral, and coronary circulations, as well as large arteries, are usually unharmed. Although there is no increase in mortality, people with Buerger's disease frequently experience excruciating ischemia agony and tissue loss, which can lead to the amputation of both minor and major limbs [1].

Felix von Winiwarter, an Austrian surgeon and Theodor Billroth's partner, first identified thromboangiitis obliterans (TAO) in 1879 after publishing a single instance of what he called presenile spontaneous gangrene in the German Archives of Clinical Surgery [2]. Like von Winiwarter, Buerger explained the cellular character of arterial thrombosis and the lack of involvement of big vessels. Buerger gave the condition the term "thromboangiitis obliterans" and made just a passing reference to its connection to smoking. Buerger stated in 1924 that smoking was most likely a risk factor [2]. Acute ischemic or infectious acral lesions (ulcers, gangrenes, subungual infections, phlegmonous) and/or thrombophlebitic nodules are typically seen in patients with Buerger's disease. Skin discolorations such acrocyanosis, Raynaud's phenomenon, or livedo-like images are frequently observed [3]. The severity of dependent rubor or migratory thrombophlebitis appears to be a readily identifiable indicator of the escalation or reduction of disease activity [4].

In the final stages of Buerger's illness, the classic "corkscrew collaterals" are clearly visible. The only proven

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25sep499

treatment, is quitting smoking cigarettes or using tobacco products altogether.

There is specific pharmacotherapy and group therapy. Any detrimental interventional therapy must be avoided because many patients with Buerger's disease have a favorable natural course of life and limb [4].

The treatment of thromboangiitis obliterans include quitting tobacco, specific pharmacotherapy and group therapy will be provided.

II. SIGNS AND SYMPTOMS

- *Feeling Cold:*
  The affected area of the skin feels cool to touch.

- *Skin Discoloration:*
  The skin of the affected area can appear pale or purple.

- *Loss of Hair:*
  There may a loss of hair or slow hair growth on the affected limb.

- *Dry Skin:*
  The skin become dry, and exhibit decreased or no sweating.

- *Muscle Relaxation:*
  The affected limb muscle become relaxed, leading to decreased muscle mass, circumference, and strength.

- *Pain Occurs at Rest:*
  Severe blockages in the blood vessels, it is the indication or warning sign of gangrene in the extremities.

- *Ulcers and Gangrene:*
  Lack of blood flow (complete ischemia) leads to the development of ulcers and gangrene in the affected limb. Tissue death without the presence of exudate or pus refers to the Dry gangrene. The presence of exudate or pus with infection, edema indicates Wet gangrene. The pain is severe during this stage.

- *Colicky Sensation:*
  It's a common symptom of TAO, the pain particularly present in the calf it is known as knife-like or Colicky sensation and it usually occurs while walking and relieved by rest.

- *Abnormal Sensation:*
  The affected area may have numbness, tingling or a burning sensation [5].

- *Etiology*:
  Buerger's disease has a substantial correlation with tobacco smoking, despite the fact that its exact cause is still unknown. The disease's onset and course are significantly influenced by tobacco use or exposure [6]. Age, sex, race, hereditary variables (HLA phenotype), autoimmune processes, occupation, and blood changes (coagulability, anticardiolipin antibodies, homocysteine, and smoking are examples of secondary etiologic factors that positively impact the disease [7]. Few cases of Buerger's disease have been documented in nonsmokers, and the illness usually gets better after quitting smoking. It is said that smoking cigarettes has a synergistic [7].

- *Epidemiology:*
  Although thromboangiitis obliterans is a global disease, the Middle and Far East have the highest frequency. Among all individuals with peripheral arterial disease, the condition's prevalence varies from 0.5 to 5.6% in Western Europe to 45 to 63% in India, 16 to 66% in Korea and Japan, and 80% among Ashkenazi-descended Jews residing in Israel. It was once believed that TAO primarily affected men, however the most recent research showed that between 11 and 23 percent of patients were female [8]. Variability in diagnostic criteria may be partially to blame for this difference in illness prevalence [11]. Additionally, persons with poor socioeconomic level are typically affected by Buerger's disease [9]. The illness is very common in Bangladesh. However, its precise occurrence is unknown here, as is the case with many other disorders. But as tobacco use is acknowledged and discouraged nationwide due to its numerous negative consequences and lack of proven benefits, the incidence is declining [10]. It has been occurring usually in the age of 20 to 40, it more predominantly seen over the age of 50. It affects children with auto-immune phenomena [10]. Buerger's disease are most highly affected by the person using tobacco, particularly Cigarette smoking but in some cases the patient who smoke 'moderately' may also tend to affected by Buerger's disease [10]. Buerger's disease is a 'auto-immune' reaction triggered by the use of tobacco. The rise in tobacco abuse among women in Western nations over the past few decades is closely linked to this greater prevalence in women [11].

- *Diagnostic criteria:*
  A thorough history, physical examination, and any supplementary laboratory tests can frequently be used to make the diagnosis. Although a number of diagnostic standards have been proposed, there are currently no widely recognized standards. Among the most current criteria are the clinical standards proposed by Shionoya in 1998. A history of smoking, an onset before the age of fifty, infrapopliteal artery occlusive disease, either upper limb involvement or phlebitis migrans, and the lack of atherosclerotic risk factors other than smoking are the five criteria that Shionoya uses to diagnose TAO [13]. Although this is not generally agreed upon, a confident clinical diagnosis should only be made when all five of these criteria have been met because there is no specific diagnostic test and no positive serologic indicators. Patients who arrive with clinical involvement of only one leg should have all four limbs evaluated due to the possibility of involvement of other limbs. It is necessary to perform noninvasive vascular testing, laboratory tests to rule out hypercoagulable conditions, diabetes mellitus, and autoimmune diseases, as well as echocardiography and arteriography to rule out the proximal source of emboli [13]. Clinically involved and noninvolved limbs can be evaluated with conventional arteriography or computed tomographic

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25sep499

angiography. The medium and small arteries located distal to the elbow and/or knee are usually involved in the angiographic findings in patients with TAO. Although they are not pathognomonic, an abrupt occlusion, skip lesions, and segmental lesions are visible, and the distinctive "corkscrew," "spider legs," or "tree roots" are useful [13].

➢ *Pathogenesis:*

Although tobacco smoking undoubtedly contributed to the development of TAO, Leo Buerger did not characterize its pathophysiology, differentiate this type from atherosclerosis, or give it a name until 1908[12]. This robust correlation implies that tobacco misuse contributes to the disease's pathophysiology. It has been proposed that nicotine may contain an unknown substance [11]. TAO is always linked to smoking, especially cigarette smoking, as well as chewing or snuffing, even though the pathogenetic process is unknown [12]. For unknown reasons, smoking marijuana also contributes to the disease's progression and deterioration of the clinical condition, even if only two to three smokes are used daily. The development of TAO often happens well before the age of 40, however it can occasionally be seen in the teens and beyond. In many situations and nations, men are impacted 3:1–5:1 more often than women.

The greater number of female smokers may be the cause of the apparent rise in the number of female victims.Although TAO does not discriminate based on race, it is currently more common in the Middle East, the Indian subcontinent, the Far East, and North Africa [12]. It is rather uncommon in Western Europe and North America, but it is rising in some European nations, most likely as a result of immigration. Its prevalence can range from 0.5% to 5.6% in Western Europe, 45–63% in India, and 16–66% in Korea and Japan, on average. We cannot rule out the possibility that certain discrepancies result from the application of various diagnostic standards [12]. Thromboangiitis obliterans may have a pathophysiological component related to endothelial dysfunction. Ten patients in a row with acute lower limb ischemic ulcers with TAO. Furthermore, our research revealed that TAO is linked to an elevation in artery vasomotor tone that cannot be explained by endothelial dysfunction alone. Thus, a pharmacological reversal of this rise in vasomotor tone could account for the positive benefits of vasodilator therapies, particularly those using prostanoids[11]. Anticollagen or antielastin antibodies have been linked to hypersensitivity to type I and type III collagen, although these aberrant findings have been shown to be non-specific and linked to inflammatory changes rather than the underlying etiology of the vascular lesions. Patients with an active illness have been found to have higher levels of antiendothelial cell antibodies, although it is yet unknown how specific these findings are [11].

➢ *Treatment:*

A number of novel approaches to treating thromboangiitis obliterans have been proposed throughout the last three or four years. Anticoagulants, histidine and vitamin C, sympathectomy, tetraethyl ammonium chloride, and caudal anesthesia or lumbar sympathetic block have shown the most promise. These, however, should be considered solely as complements to the well-established concepts and procedures employed in the management of thromboangiitis obliterans, namely, elimination of tobacco, careful hygiene and care of the extremities, and correct physical therapy measures [14]. According to certain research, the amount of anticardiolipin antibody may predict both the risk of amputation and the age at which the disease will manifest [15].

The cornerstone of Buerger's disease treatment is quitting smoking [9]. Despite the importance of patient education, approximately 43–70% of patients are able to quit smoking [16]. In some situations, psychological support may be helpful, but patients should be encouraged that if they are able to quit smoking entirely, the disease will go into remission and amputation will not be necessary. Rimonabant is one example of a selective cannabinoid receptor antagonist that has had positive outcomes in aiding patients in quitting smoking [16]. However, quitting smoking by itself might not be sufficient to reduce discomfort and promote wound healing when ulcer or gangrene develops. Improving distal flow, reducing discomfort, curing the ulcer, avoiding amputation, and managing concurrent infections are among the therapeutic objectives. It is advised to provide oral drugs such analgesics, calcium channel blockers, folic acid supplements, and antiplatelets [9].

III. MEDICAL TREATMENT

➢ *Antiplatelets*

- *Aspirin:*

All PAD patients should take aspirin since it effectively prevents secondary events. However, aspirin is not currently recommended for the management of intermittent claudication symptoms.

- *Clopidogrel:*

It has been demonstrated that the antiplatelet medication clopidogrel is more effective than aspirin at lowering secondary events in people with atherosclerotic disease. However, there is no proof that long-term clopidogrel treatment lessens claudication symptoms.

➢ *Vasodilators*

Additionally, vasodilators can lower total systemic vascular resistance, which lowers perfusion pressure. The steal phenomenon and this drop in perfusion pressure exacerbate the ischemic insult to the under perfused extremity. This idea of systemically administering vasodilators to increase blood flow is most likely false. If vasospasm is present, a dihydropyridine calcium channel blocker, like amlodipine or nifedipine, appears to work well.

➢ *Verapamil:*

This work has led to the hypothesis that the calcium channel blocker alters the capacity for oxygen extraction and utilization as a secondary impact. Blockers of calcium channels may increase the extremities' oxygen consumption efficiency. As an adjuvant therapy, patients may get up to 480 milligrams of verapamil per day.

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25sep499

➢ *Pentoxyfylline:*

One methylxanthine derivative with a variety of effects is pentoxyfylline.

The main effect was believed to be an enhancement in the deformability of red blood cells. Reduced blood viscosity, suppression of platelet aggregation, and decreased fibrinogen levels are further effects.

➢ *Cilostazol:*

Cyclic adenosine monophosphate (cAMP) phosphodiesterase is inhibited by the phosphodiesterase type III inhibitor cilostazol (Pletal). Platelet aggregation is inhibited and smooth muscle cell relaxation is promoted by raising cAMP levels in platelets and blood vessels [16].

IV. SURGICAL MANAGEMENT

➢ *Surgical Revascularization:*

Because of the distant nature of the disease and the disseminated arterial damage, surgical revascularization is rarely feasible for patients with Buerger's disease revealed that 61 patients who underwent infrainguinal bypass had a primary patency rate of 49% and a secondary patency rate of 62% after five years. Those who stopped smoking had a 67% patency percentage, while those who kept smoking had a 35% patency rate [17].

➢ *Sympathectomy:*

In patients with Buerger's disease, a sympatheticectomy may be used to reduce arterial spasm. Additionally, a laparoscopic technique for sympathectomy has been employed. In certain patients with Buerger's disease, sympathectomy has been demonstrated to reduce pain temporarily and encourage ulcer healing; however, no long-term advantages have been verified [16].

➢ *Illizavor's Technique:*

The method used by Ilizavor to stimulate neoangiogenesis in TAO is highly successful. Ilizarov claims that applying light pressure to living tissues can promote and sustain tissue growth and regeneration (bone, muscle, fascia, nerve, arteries, skin, and its appendages). We refer to this as the "law of tension stress."

Buerger's disease can be effectively and affordably treated with Ilizavor's approach.

➢ *Spinal Cord Stimulation:*

A common treatment for refractory peripheral atherosclerotic disease is spinal cord stimulation (SCS). SCS can modify painful sensations in a number of ways. Peripheral microcirculation is improved by inhibiting sympathetic vasoconstriction. The spinal cords γ-aminobutyric acid and nitric oxide systems may play a significant role as mediators in the reduction of pain brought on by SCS.

➢ *Prostaglandin Analogues:*

Numerous studies have assessed prostacyclin derivatives and shown that they are more effective than a placebo in treating Buerger's disease. Analogs of prostaglandins are known to promote vascular smooth cell relaxation, prevent platelet aggregation, and stop cell proliferation and chemotaxis.

➢ *Endothelial Progenitor Cells (Epc):*

The immature cell population that gives rise to endothelial progenitor cells (EPCs) has the capacity to differentiate into mature endothelial cells. EPCs are more proliferative and migratory than terminally differentiated endothelial cells and are mostly found in bone marrow (BM) in adults. EPCs from adult BM or peripheral blood (PB) can be clinically separated as CD34þ or AC133þ mononuclear cells (MNCs).

➢ *Cell Therapies Using Bone Marrow Mononuclear Cells (Bm-Mncs):*

Patients with peripheral artery disease and TAO respond well to cell treatments that use bone marrow mononuclear cells (BM-MNCs) and peripheral blood mononuclear cells (PBMNCs). The human body contains a lot of adipose tissue, which is constantly being renewed. This tissue is therefore a perfect source of MSCs. Adipose tissue derived MSCs (ATMSCs) have been demonstrated to share traits with bone marrow stromal cells (BMSCs). In order to evaluate the long-term advantages of stem cell therapy, more extensive randomized trials are needed [16].

V. CONCLUSION

Buerger's disease, also known as thromboangiitis obliterans (TAO), is still a distinct, non-atherosclerotic vascular condition that is closely linked to tobacco smoking. Despite the low death rate, the illness, particularly in young adults, results in severe morbidity, including ischemia agony, ulceration, and limb amputation. Since quitting smoking is still the only proven way to stop the progression of the disease, early diagnosis is essential. Although surgical methods, new regenerative treatments, and complementary medicinal therapy may enhance limb salvage and relieve symptoms, their long-term effectiveness is still being studied. Strict smoking cessation, backed by patient education and counseling, remains the cornerstone of care. In order to enhance vascular regeneration, future research should concentrate on comprehending the immunological and genetic processes that underlie TAO and investigating cutting-edge cell-based treatments.

REFERENCE

[1]. Mills Sr, Joseph L. "Buerger's disease in the 21st century: diagnosis, clinical features, and therapy." *Seminars in vascular surgery*. Vol. 16. No. 3. WB Saunders, 2003

[2]. Vijayakumar, Abhishek, Rahul Tiwari, and Vinod Kumar Prabhuswamy. "Thromboangiitis obliterans (Buerger's disease)—current practices." *International journal of inflammation* 2013.1 (2013): 156905.

[3]. Klein-Weigel, Peter, et al. "Buerger's disease: providing integrated care." *Journal of multidisciplinary healthcare* (2016): 511-518.

ISSN No: -2456-2165 https://doi.org/10.38124/ijisrt/25sep499

[4]. Huh, Seung. "Buerger's Disease." *Korean J Vasc Endovasc Surg* 21.2 (2005): 200-205.
[5]. Zheng, Ping, and WanChao Wang. "Etiology and Pathogenesis of Buerger's Disease." *Probing Selected Autoimmune Diseases for Focused Perspectives*. IntechOpen, 2024.
[6]. Tanaka, Kenzo. "Pathology and pathogenesis of Buerger's disease." *International journal of cardiology* 66 (1998): S237-S242.
[7]. Tanaka, Kenzo. "Pathology and pathogenesis of Buerger's disease." *International journal of cardiology* 66 (1998): S237-S242.
[8]. Arkkila, Perttu ET. "Thromboangiitis obliterans (Buerger's disease)." *Orphanet journal of rare diseases* 1 (2006): 1-5.
[9]. Modaghegh, Mohammad-Hadi Saeed, and Shirin Saberianpour. "Buerger's Disease: A Bench-to-Bedside Review." *Iran J Vasc Surg Endovasc Ther http://ijvset. gums. ac. ir* 1.1 (2021).
[10]. Moniruddin, A. E. M., Hamida Begum, and Khairun Nahar. "Buerger's Disease (Thromboangitis obliterans): An Update." *Medicine Today* 23.1 (2011): 51-54.
[11]. Frank, Michael, and Jean-Noel Fiessinger. "Thromboangiitis obliterans (Buerger's disease)." *Oxford Textbook of*: 507.
[12]. Benedetti-Valentini, Fabrizio, et al. "Buerger's Disease of the Lower Extremities." *Vascular Surgery*. Berlin, Heidelberg: Springer Berlin Heidelberg, 2007. 471-478.
[13]. Park, Ui-Jun, and Dong-Ik Kim. "Thromoboagiitis obliterans (TAO)." *International Journal of Stem Cells* 3.1 (2010): 1-7.
[14]. LaTONA, S. R., and F. A. Y. LeFEVRE. "Thromboangiitis obliterans." *Cleveland Clinic Quarterly* 15 (1948): 12.
[15]. Qaja, Erion, Erind Muco, and Muhammad F. Hashmi. "Buerger disease." (2017).
[16]. Vijayakumar A, Tiwari R, Kumar Prabhuswamy V. Thromboangiitis Obliterans (Buerger's Disease)-Current Practices. Int J Inflam. 2013; 2013:156905. doi: 10.1155/2013/156905. Epub 2013 Sep 11. PMID: 24102033; PMCID: PMC3786473
[17]. T. Sasajima, Y. Kubo, M. Inaba, K. Goh, N. Azuma, "Role of infrainguinal bypass in Buerger's disease: An eighteen-year experience". European Journal of Vascular and Endovascular Surgery Volume 13, Issue 2, February 1997, Pages 186-192.