International Journal of Pharmaceutical Research and Applications
Volume 9, Issue 3 May-June 2024, pp: 1733-1737 www.ijprajournal.com ISSN: 2456-4494

Cavernous Sinus Thrombosis- Rehash

R Deepika

Date of Submission: 01-06-2024 Date of Acceptance: 10-06-2024

I. INTRODUCTION

Cavernous sinus thrombosis is an uncommon but serious medical condition that can be caused by numerous factors, such as sinus, head, or face infections, sepsis, trauma, or even dental infections. The condition occurs when a blood clot develops in the cavernous sinus, a sizable venous structure at the base of the brain that drains blood from the face and brain. If left untreated CST can be fatal, and symptoms of this illness include severe headache, fever, swelling and redness of the eye and its surrounding tissues, visual disturbances, seizures, or even coma [1][2]. Initially, this condition is diagnosed by debilitated cranial nerves III, IV, and V, and the most common clinical signs include cavernous sinus syndrome is distinguished by ophthalmoplegia and sensory deficits over the head caused by a combination of deficits in the three cranial which are responsible for eye movements and pupil function [3]. isolated intracranial pressure syndrome, and localized neurological deficits. However, significant decreases in morbidity from 61% to 31% and mortality from 40% to 14% have been made due to therapeutic breakthroughs. Early detection, intensive treatment, and usage of antibiotics and anticoagulation provide the highest chances for recovery [4][5][6].

TYPES OF CAVERNOUS SINUS THROMBOSIS

Cavernous sinus thrombosis (CST) can be classified as either septic or aseptic.

- Septic CST: This type of CST happens when an infection has spread to the cavernous sinus from the face, sinuses, or other areas of the body. Numerous bacteria, including Streptococcus, Staphylococcus, and anaerobic organisms, are capable of causing the infection. The more frequent type of CST is septic, and it carries a higher risk of mortality and complications.
- Aseptic CST: This type of CST occurs without an underlying infection and is typically brought on by a number of non-infectious conditions, such as autoimmune disorders, malignancies, or hypercoagulable states. Aseptic CST is uncommon and only makes up a small portion of all cases [7].

SYMPTOMS

There are numerous symptoms that can be brought on by CST, and they can range in intensity and duration. Common CST signs and symptoms include:

- Severe headache that is frequently accompanied by a head pressure sensation.
- Swelling and pain in the tissues around the eye can occasionally cause the eye to protrude.
- Warmth and redness in the affected area.
- Other visual disturbances, such as blurry vision or vision loss, or double vision.
- The possibility of facial paralysis, weakness, or numbness on one side of the face.
- Chills and fever.
- Symptoms include nausea and vomiting.
- Seizures may occur in severe cases [8].

EPIDEMIOLOGY

The epidemiology of CST is not well-defined, but it is generally considered a rare condition. CST is more common in adults than children, with a higher incidence in females. It is most commonly associated with infections of the face, sinuses, and ears, with the most common etiologic agents being Staphylococcus aureus, Streptococcus species, and anaerobic bacteria. Other risk factors include head and neck infections, trauma to the head or face, dental infections, and facial surgery. CST is a rare but serious condition that can lead to significant morbidity and mortality if not diagnosed and treated promptly. The exact incidence of CST is difficult to estimate, as it is often underdiagnosed or misdiagnosed. However, some studies suggest that the annual incidence of CST is approximately 0.2 to 0.3 cases per million population.

ETIOLOGY

CST can be brought on by a wide range of infectious agents, the majority of which are bacteria. The most frequent pathogen,

International Journal of Pharmaceutical Research and Applications
Volume 9, Issue 3 May-June 2024, pp: 1733-1737 www.ijprajournal.com ISSN: 2456-4494

Staphylococcus aureus, accounts for almost 70% of all reported cases [9]. This highlights the role of this pathogen in acute sphenoid sinusitis and skin infections [10]. Rarely occurring acute sphenoid sinusitis is distinguished by crucial headaches, most common is the temporal or frontal headaches or even thunderclap headaches [6][11]. Numerous neurologic consequences from disease spread in the cerebral and orbital cavities can result from sinusitis. In patients with cerebral complications of sinusitis, the fatality was historically around 80%, subsequently, it fluctuates from 5-42%, with the elevated studies ranging from approximately 30% [12].

In distressing situations, at the extreme, in which the thrombosis is typically isolated, CST might develop. This can also be caused as a result of trauma, such as assault on the head, a severe concussion, or during the brain is being probed. The latter species is normally hygienic as well [13].

One of the most common places to cause trauma is the retroorbital zone. The pain was typically severe and worsened in intensity over time. This sign frequently indicated a sphenoid sinus infection [14].

PATHOPHYSIOLOGY

The cavernous sinus drains blood from the face and brain, and its blockage can lead to a variety of neurological and ophthalmological symptoms. The pathophysiology of CST is complex and multifactorial, with numerous contributing factors that can lead to the formation of a blood clot in the cavernous sinus. The most common cause of CST is the spread of infection from the face, sinuses, or teeth. Infection can lead to the formation of a blood clot by causing inflammation, damage to the vessel wall, and activation of the coagulation system. Bacterial infections, especially those caused by Staphylococcus aureus, Streptococcus species, and anaerobic organisms, are the most common etiologies of CST. Trauma to the head or face can also cause CST by disrupting the vessel wall and activating the coagulation system. In addition, certain medical conditions such as malignancies, autoimmune disorders, and hypercoagulable states can increase the risk of CST by altering the coagulation system or causing damage to the vessel wall. Once a blood clot forms in the cavernous sinus, it can cause a variety of pathophysiological effects. The clot can impede blood flow out of the sinus, leading to congestion and edema of the surrounding tissues. This can cause pressure on nearby structures, including the optic nerve, cranial nerves, and brainstem, leading to neurological and ophthalmological symptoms. In addition, the clot can release inflammatory mediators and bacterial toxins into the bloodstream, leading to sepsis and other systemic effects [15].

DIAGNOSIS

- Magnetic Resonance Imaging (MRI): MRI is a diagnostic test that uses the radiologic images to identify bulging of the cavernous sinus, increased dural enhancement, and absent flow void is seen
- Ophthalmologic examination: An ophthalmologic examination can help to identify any changes in vision or other eye-related symptoms that may be indicative of CST [16].
- Lumbar Puncture: A lumbar puncture is a procedure in which a needle is inserted into the lower back to collect a sample of cerebrospinal fluid (CSF). This test can help to identify an infection in the brain or the presence of blood in the CSF, which may indicate CST.
- Blood tests: Blood tests can be used to check for signs of infection, inflammation, and clotting disorders, which may contribute to the development of CST.
- Ultrasonography: Ultrasonography is a non-invasive diagnostic technique that uses high-frequency sound waves to create images of the blood vessels. It may be used to evaluate blood flow in the affected area and identify any blood clots or abnormalities.
- Angiography: Angiography is a diagnostic test that uses contrast dye and X-rays to create images of the blood vessels. It can be used to identify the location and extent of the clot, as well as any other abnormalities in the blood vessels [17].

DRUGS USED FOR THE TREATMENT OF CST

Cavernous sinus thrombosis (CST) is a serious condition that occurs when a blood clot forms in the cavernous sinus, a cavity at the base of the brain. It can lead to severe complications, including brain abscesses and meningitis, and requires urgent medical attention.

The treatment of CST typically involves a combination of antibiotics to treat the underlying infection and anticoagulant therapy to prevent the blood clot from growing or spreading. In some

International Journal of Pharmaceutical Research and Applications
Volume 9, Issue 3 May-June 2024, pp: 1733-1737 www.ijprajournal.com ISSN: 2456-4494

cases, surgery may also be necessary to drain abscesses or relieve pressure on the brain.
Antibiotic therapy: The choice of antibiotics will depend on the type of infection that caused the CST. Broad-spectrum antibiotics such as vancomycin and ceftriaxone are commonly used initially, while the results of blood cultures and other tests are awaited. Once the specific organism causing the infection is identified, the antibiotic regimen can be adjusted accordingly [18].

Antibiotics: A combination of broad-spectrum antibiotics is often used initially until the causative organism is identified. Antibiotics commonly used for CST include:

- Vancomycin: This is a glycopeptide antibiotic used to treat serious bacterial infections, including those caused by methicillin-resistant Staphylococcus aureus (MRSA).
- Ceftriaxone: This is a third-generation cephalosporin antibiotic used to treat a wide range of bacterial infections.
- Clindamycin: This is a lincosamide antibiotic used to treat infections caused by anaerobic bacteria and some Gram-positive bacteria.
- Penicillin G and methicillin: This is a beta-lactam antibiotic used to treat various bacterial infections. It is particularly effective against Streptococcus species.
- Metronidazole: This is an antibiotic used to treat infections caused by anaerobic bacteria and protozoa.
- Linezolid: This is an oxazolidinone antibiotic used to treat infections caused by Gram-positive bacteria, including methicillin-resistant Staphylococcus aureus (MRSA).
- Meropenem: This is a broad-spectrum carbapenem antibiotic used to treat serious bacterial infections, including those caused by multidrug-resistant organisms [19].Even some anti-fungal drugs like amphotericin B are used for the treatment of CST.

Anticoagulants: Anticoagulants are medications used to prevent the formation or growth of blood clots. The most commonly used anticoagulants for CST are:

- Heparin: This is a fast-acting anticoagulant used to prevent blood clots from forming or growing. It is usually given intravenously.
- Warfarin: This is an oral anticoagulant that is used to prevent the formation of blood clots. It is usually started after the patient stabilizes and is able to take oral medications [20].
- Direct oral anticoagulants (DOACs): DOACs are a newer class of anticoagulants that can be used instead of warfarin. Examples include apixaban, rivaroxaban, and dabigatran [21].
- Low molecular weight heparin (LMWH): LMWH is a type of heparin that is often used in the treatment of deep vein thrombosis (DVT) and pulmonary embolism (PE), but it may also be used for CST [22].
- Corticosteroids: These drugs can be used to reduce inflammation in the affected area and alleviate symptoms. Dexamethasone is a commonly used corticosteroid in the treatment of CST [23].
- Anticonvulsants: If the patient develops seizures, anticonvulsants such as phenytoin may be prescribed to manage the seizures [24].

CONTRAINDICATIONS

Thrombolytics can increase the risk of bleeding when taken with anticoagulants, antiplatelet agents, NSAIDs, or herbal supplements.

Drugs that may interact with antibiotics may reduce their effectiveness, such as antacids, iron supplements, or probenecid, and may also increase the risk of side effects from antibiotics, like warfarin.

- Corticosteroids: drugs that may increase the risk of infection when taken with corticosteroids, such as immunosuppressants, live vaccines, or antifungal agents. Drugs that may cause adverse effects when taken with corticosteroids, such as insulin, diuretics, or digoxin [25].
- Patients who are taking warfarin and are also prescribed high-risk antibiotics are more susceptible to experiencing severe bleeding events [26].
- vancomycin can decrease the excretion of methotrexate, leading to an increased concentration of the medication in the body. This increase in concentration can result in methotrexate toxicity, which can cause serious side effects [27].
- The significant increase in the risk of haemorrhagic peptic ulcer disease in patients who are concurrently using oral anticoagulants and NSAIDs highlights the need for careful consideration and monitoring when prescribing NSAIDs to individuals undergoing anticoagulation therapy [28].
- anticoagulant medications and iron supplements that can increase the risk of

International Journal of Pharmaceutical Research and Applications
Volume 9, Issue 3 May-June 2024, pp: 1733-1737 www.ijprajournal.com ISSN: 2456-4494

bleeding. Iron supplements can interfere with the body's ability to form blood clots, which can be problematic for patients who are taking anticoagulants to prevent blood clots. The combination of these two medications can increase the risk of serious bleeding events, such as gastrointestinal bleeding and haemorrhage [29].

- Rifampicin can increase the rate at which warfarin is eliminated from the body, thereby reducing the anticoagulant effect of warfarin. This reduction in anticoagulant effect can increase the risk of blood clots.

PROGNOSIS

The prognosis of CST is variable and depends on a number of factors, including the severity of the clot, the extent of the damage to the surrounding tissues, and the promptness of treatment. With early diagnosis and treatment, the prognosis for CST is generally good. However, if the clot is not treated, the risk of serious complications, such as brain abscess, meningitis, and death, is high.

The following factors are associated with a poor prognosis for CST:

- Delay in diagnosis and treatment
- Severe infection
- Extensive damage to the surrounding tissues
- Older age
- Other medical conditions, such as diabetes or cancer

PREVENTION

There are a number of things that can be done to help prevent CST, including:

- Treating any underlying infections promptly
- Avoiding trauma to the head and face
- Practicing good oral hygiene
- Getting regular vaccinations, such as the pneumococcal vaccine [6][30].

II. CONCLUSION

This comprehensive review article sheds light on the intricate aspects of cavernous sinus thrombosis, encompassing its diverse dimensions from the classification of types and the manifestation of symptoms to the accurate diagnosis, effective treatment strategies, prognosis, and preventive measures. The detailed exploration of CST in this article equips healthcare professionals with valuable insights into this rare condition, enabling them to promptly recognize its occurrence and facilitate timely interventions. By emphasizing the significance of early diagnosis and appropriate treatment,Overall, this review article serves as a valuable resource, enhancing the understanding of CST and empowering healthcare professionals to effectively manage and address this potentially life-threatening condition.

ACKNOWLEDGEMENT:

The authors are grateful to the management of Sri Ramachandra Institute of Higher Education and Research for their support and encouragement towards the successful completion of the work.

REFERENCE

[1]. Desa V, Green R. Cavernous sinus thrombosis: current therapy. J Oral Maxillofac Surg. 2012;70(9):2085–91.
[2]. Kim JM, Kang KW, Kim H, Lee SH, Kim TS, Park MS. Septic cavernous sinus thrombosis after minor head trauma: A case report. Medicine. 2022 Mar 3;101(10).
[3]. Nambiar R, Nair SG. Cavernous sinus syndrome. Proc (Bayl Univ Med Cent). 2017;30(4):455–6.
[4]. Ali S. Cavernous Sinus Thrombosis: Efficiently Recognizing and Treating a Life-Threatening Condition. Cureus. 2021 Aug 20;13(8).
[5]. Karlin RJ, Robinson WA. Septic cavernous sinus thrombosis. Annals of emergency medicine. 1984 Jun 1;13(6):449-55.
[6]. Plewa MC, Tadi P, Gupta M. Cavernous Sinus Thrombosis. StatPearls Publishing; 2022.
[7]. DiNubile MJ. Septic thrombosis of the cavernous sinuses. Arch Neurol. 1988 May;45(5):567-72
[8]. Odabaşi AO, Akgül A. Cavernous sinus thrombosis: a rare complication of sinusitis. Int J Pediatr Otorhinolaryngol. 1997;39(1):77–83.
[9]. Caranfa JT, Yoon MK. Septic cavernous sinus thrombosis: a review. Survey of Ophthalmology. 2021 Nov 1;66(6):1021-30
[10]. Ebright JR, Pace MT, Niazi AF. Septic thrombosis of the cavernous sinuses. Archives of Internal medicine. 2001 Dec 10;161(22):2671-6.

International Journal of Pharmaceutical Research and Applications
Volume 9, Issue 3 May-June 2024, pp: 1733-1737 www.ijprajournal.com ISSN: 2456-4494

[11]. Dyer SR, Thottam PJ, Saraiya S, Haupert M. Acute sphenoid sinusitis leading to contralateral cavernous sinus thrombosis: a case report. The Journal of Laryngology & Otology. 2013 Aug;127(8):814-6.
[12]. Ziegler A, Patadia M, Stankiewicz J. Neurological complications of acute and chronic sinusitis. Current neurology and neuroscience reports. 2018 Feb; 18:1-8.
[13]. Ogundiya DA, Keith DA, Mirowski J. Cavernous sinus thrombosis and blindness as complications of an odontogenic infection: report of a case and review of literature. Journal of oral and maxillofacial surgery. 1989 Dec 1;47(12):1317-21.
[14]. Southwick FS, Richardson Jr EP, Swartz MN. Septic thrombosis of the dural venous sinuses. Medicine. 1986 Mar 1;65(2):82-106.
[15]. Saman M, Akheel M, Singh S. Cavernous Sinus Thrombosis–A Succinct Outlook. Journal of Head & Neck Physicians and Surgeons. 2014 Jul 26;2(1):67-72.
[16]. Desa V, Green R. Cavernous sinus thrombosis: current therapy. Journal of oral and maxillofacial surgery. 2012 Sep 1;70(9):2085-91.
[17]. Fernández S, Godino O, Martínez-Yélamos S, Mesa E, Arruga J, Ramón JM, et al. cavernous sinus syndrome: A series of 126 patients. Medicine (Baltimore). 2007 ;86(5):278–81.
[18]. Weerasinghe D, Lueck CJ. Septic cavernous sinus thrombosis: Case report and review of the literature. Neuroophthalmology. 2016;40(6):263–76.
[19]. Weerasinghe D, Lueck CJ. Septic cavernous sinus thrombosis: case report and review of the literature. Neuro-ophthalmology. 2016 Nov 1;40(6):263-76.
[20]. Levine SR, Twyman RE, Gilman S. The role of anticoagulation in cavernous sinus thrombosis. Neurology. 1988;38(4):517–22.
[21]. Afridi SM, Noe M, Raja A, Jain AG. Cavernous sinus thrombosis due to chronic bacterial sinusitis. Cureus. 2019;11(5): e4712.
[22]. Afshari D, Moradian N, Nasiri F, Razazian N, Bostani A, Sariaslani P. The efficacy and safety of low-molecular-weight heparin and unfractionated heparin in the treatment of cerebral venous sinus thrombosis. Neurosciences (Riyadh). 2015;20(4):357–61.
[23]. Ali S. Cavernous sinus thrombosis: Efficiently recognizing and treating a life-threatening condition. Cureus. 2021;13(8): e17339.
[24]. Patil VC, Choraria K, Desai N, Agrawal S. Clinical profile and outcome of cerebral venous sinus thrombosis at tertiary care center. J Neurosci Rural Pract. 2014;5(3):218–24.
[25]. Hodgens A, Sharman T. Corticosteroids. StatPearls Publishing; 2022.
[26]. Lane MA, Zeringue A, McDonald JR. Serious bleeding events due to warfarin and antibiotic co-prescription in a cohort of veterans. Am J Med. 2014;127(7):657-663.e2.
[27]. Blum R, Seymour JF, Toner G. Significant impairment of high-dose methotrexate clearance following vancomycin administration in the absence of overt renal impairment. Ann Oncol. 2002;13(2):327–30.
[28]. Shorr RI. Concurrent use of nonsteroidal anti-inflammatory drugs and oral anticoagulants places elderly persons at high risk for hemorrhagic peptic ulcer disease. Arch Intern Med. 1993;153(14):1665.
[29]. Song D, Ying G-S, Dunaief JL, Bhuyan R, Li Y, Maguire MG, et al. Association between oral iron supplementation and retinal or subretinal hemorrhage in the comparison of age-related macular degeneration treatment trials. Retina. 2019 ;39(10):1965–72.
[30]. Hu Y-N, Zhou B-T, Yang H-R, Peng Q-L, Gu X-R, Sun S-S. Effect of rifampicin on anticoagulation of warfarin: A case report. World J Clin Cases. 2021; 9(5):1087–95.