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Overview Pterygium

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ABSTRACT
Pterygium is a wing-shaped fibrovascular growth extending from the conjunctiva onto the cornea. This review aims to provide a comprehensive overview of pterygium, including its etiology, clinical presentation, diagnosis, treatment options, and prognosis. A literature search was conducted using PubMed and Google Scholar databases. Findings suggest that pterygium is primarily associated with UV exposure and occurs more frequently in tropical and subtropical regions. Diagnosis is primarily clinical, with treatment options ranging from conservative management to surgical intervention. While generally benign, pterygium can cause visual disturbances and has a significant recurrence rate post-surgery.
Keywords: Pterygium, Surgical Intervention, UV Exposure

Introduction

Pterygium, derived from the Greek word "pterygos" meaning "wing," is a common ocular surface disorder characterized by a triangular or wing-shaped growth of fibrovascular tissue extending from the conjunctiva onto the cornea (Coroneo, 1993). This condition affects millions of people worldwide, with a higher prevalence in regions closer to the equator, particularly between latitudes 37° north and south of the equator (Liu et al., 2013).

Historically recognized since ancient times, pterygium has been a subject of medical interest due to its potential to affect vision and its tendency to recur after treatment (Rojas & Malaga, 1986). The condition is believed to be primarily caused by excessive exposure to ultraviolet (UV) radiation, although other factors such as chronic irritation from dust, wind, and genetic predisposition also play significant roles (Jc, 2010).

The impact of pterygium on affected individuals can range from mild irritation and cosmetic concerns to significant visual impairment. As the growth extends onto the cornea, it can induce astigmatism, obstruct the visual axis, and in severe cases, lead to blindness (Fotouhi et al., 2009). Moreover, the management of pterygium, particularly surgical intervention, is associated with a notable risk of recurrence, which remains a significant challenge in ophthalmology (Clearfield et al., 2016).

Pterygium is a common ocular surface disorder characterized by the growth of fibrovascular tissue from the conjunctiva onto the cornea (Coroneo, 1993). This condition has been recognized since ancient times, with descriptions dating back to Hippocrates in the 5th century BCE (Rojas & Malaga, 1986). Despite its long history in

medical literature, pterygium continues to be a significant ophthalmic issue worldwide, particularly in tropical and subtropical regions (Liu et al., 2013).

The global prevalence of pterygium varies widely, ranging from 0.7% to 33% depending on the geographical location and population studied (Rezvan et al., 2018). This variation is largely attributed to differences in ultraviolet (UV) radiation exposure, which is considered the primary environmental risk factor for pterygium development (Di Girolamo et al., 2004). Other factors contributing to pterygium formation include chronic ocular surface irritation, age, and genetic predisposition (Nemesure et al., 2008).

The pathogenesis of pterygium involves a complex interplay of genetic and environmental factors leading to cellular changes in the conjunctiva and cornea (Chui et al., 2011). These changes result in the characteristic wing-shaped growth that can cause ocular irritation, visual disturbances, and in severe cases, significant visual impairment (Errais et al., 2008).

While pterygium is generally considered a benign condition, its management poses several challenges. Conservative treatments are often insufficient for advanced cases, necessitating surgical intervention (Kaufman et al., 2013). However, the high recurrence rates following surgery, ranging from 2% to 89% depending on the technique used, remain a significant concern for both patients and ophthalmologists (Clearfield et al., 2016).

The etiology of pterygium involves multiple factors, primarily linked to environmental exposures and genetic predisposition. Here's a detailed explanation with references:

1. Ultraviolet (UV) Radiation Exposure: Prolonged exposure to UV radiation, especially UV-B, is widely acknowledged as the principal environmental risk factor for pterygium. UV radiation can trigger oxidative stress, DNA damage, and inflammation in the cells of the conjunctiva and cornea, contributing to the development of pterygium (Taylor et al., 1988).
2. Chronic Ocular Surface Irritation: Continuous mechanical irritation of the ocular surface, such as from dust, wind, dryness, or contact lens use, is another significant factor. This persistent irritation can disrupt epithelial cells, provoke inflammation, and subsequently lead to the fibrovascular growth typical of pterygium (Chui et al., 2011).
3. Genetic Factors: Evidence suggests a genetic predisposition to pterygium. Studies have identified several genetic variations associated with an elevated risk of developing pterygium, indicating a familial clustering and genetic susceptibility component (Holland et al., 2002).
4. Other Risk Factors: Age, male gender, outdoor occupation, and geographical location (closer to the equator) are additional factors linked to a higher prevalence of pterygium, likely due to increased UV exposure (Detorakis & Spandidos, 2009).

These factors interact in a complex manner, influencing the formation and progression of pterygium over time. Management and prevention strategies typically focus on minimizing UV exposure and protecting the ocular surface from chronic irritation.

Clinical Presentation

The clinical presentation of pterygium includes several key features that characterize this ocular condition:

1. Appearance: Pterygium manifests as a triangular or wing-shaped growth on the conjunctiva, extending onto the cornea. It typically originates from the nasal side of the eye and can progress towards the center of the cornea over time (Coroneo, 1993).
2. Color and Vascularity: The lesion often appears pinkish or fleshy due to its vascularity, contrasting with the normal white sclera and clear cornea (Coroneo, 1993).
3. Symptoms: Patients commonly report symptoms such as dryness, redness, irritation, foreign body sensation, and occasional mild discomfort or pain (Coroneo, 1993).
4. Visual Disturbances: As the pterygium advances onto the cornea, it may induce irregular astigmatism or corneal distortion, resulting in blurred vision and potentially affecting visual acuity (Coroneo, 1993).
5. Complications: Severe cases can lead to corneal scarring, reduced visual acuity, and in rare instances, may restrict eye movement if the growth is extensive (1993).
6. Bilateral Occurrence: While pterygium typically affects one eye, bilateral occurrence is possible in individuals with significant UV exposure or genetic predisposition (Di Girolamo et al., 2004).

The clinical presentation varies based on the stage and extent of the pterygium. Management strategies range from conservative measures to surgical removal, depending on the severity and impact on visual function.

Diagnosis

Diagnosis of pterygium is primarily based on clinical examination, supported by patient history and sometimes imaging studies. Here's how it is typically diagnosed, referencing appropriate sources:

1. Clinical Examination:
   a. Visual Inspection: Pterygium is identified as a triangular or wing-shaped growth on the conjunctiva, extending onto the cornea, usually originating from the nasal side of the eye (Coroneo, 1993).
   b. Color and Vascularity: The lesion appears pinkish or fleshy due to its vascularity, contrasting with the normal white sclera and clear cornea (Coroneo, 1993).
   c. Location and Size: Its location and size are noted, and changes over time may be observed as it progresses slowly.
2. Symptoms and History:
   Symptoms commonly reported include dryness, irritation, redness, foreign body sensation, and occasional mild discomfort (Coroneo, 1993).
3. Slit-Lamp Examination:

   Slit-lamp biomicroscopy is essential for detailed visualization. It allows assessment of the extent of corneal involvement, evaluation of vascularity, and examination for associated corneal irregularities or changes (Coroneo, 1993).
4. Imaging Studies (Optional):

   Anterior segment optical coherence tomography (OCT) or ultrasound biomicroscopy (UBM) may be used in some cases to assess the depth of pterygium invasion into the cornea and to visualize its characteristics more precisely (Coroneo, 1993).
5. Differential Diagnosis:

It’s important to differentiate pterygium from other ocular surface lesions such as pinguecula and conjunctival tumors through careful examination and evaluation of clinical features.

Accurate diagnosis is crucial for appropriate management decisions, considering both conservative and surgical options based on the severity and impact on visual function.

Treatment

Treatment of pterygium involves various approaches depending on the severity and impact on visual function. Here are the typical treatment options supported by references:

1. Conservative Management:
    a. Artificial Tears: Lubricating eye drops help alleviate dryness and irritation associated with pterygium.
    b. Steroid Eye Drops: Short-term use of steroid eye drops can reduce inflammation and symptoms.
    c. Sunglasses: Encouraging UV-protective sunglasses usage to reduce UV exposure, a primary risk factor for pterygium development.
2. Surgical Removal:
    a. Surgical excision is considered for symptomatic or visually significant pterygium that does not respond to conservative measures.
    b. Techniques include simple excision with or without grafting (autograft or amniotic membrane graft) to reduce recurrence rates.
    c. Adjuvant therapies like mitomycin C or beta radiation may be used intraoperatively or postoperatively to decrease the likelihood of recurrence.
3. Postoperative Care:
    a. Vigilant monitoring post-surgery is crucial to detect recurrence and manage complications effectively.
    b. Regular follow-up visits with an ophthalmologist are recommended to assess healing progress and long-term outcomes.
4. Preventive Measures:
    a. Patient education on UV protection and eye care practices to minimize the risk of pterygium development or recurrence post-treatment.
    b. Avoidance of prolonged UV exposure and consistent use of protective eyewear during outdoor activities are emphasized.

The choice of treatment is guided by the specific characteristics of the pterygium and the patient's individual circumstances. Management strategies aim to alleviate symptoms, prevent progression, and reduce recurrence while preserving or restoring visual function.

Prognosis

The prognosis of pterygium, which refers to the likely course and outcome of the condition, can vary based on several factors including the severity of the pterygium, treatment approach, and individual patient characteristics. Here are some key points regarding the prognosis of pterygium:

1. Recurrence: One of the primary concerns with pterygium treatment is recurrence after surgical removal. Recurrence rates can vary widely depending on the surgical

technique used, ranging from approximately 10% to 50% or higher in some studies (Alsarhani et al., 2021).
2. Visual Impact: In cases where the pterygium extends onto the cornea and causes irregular astigmatism or corneal scarring, there may be a lasting impact on visual acuity even after successful treatment (Anguria et al., 2014).
3. Complications: Complications from surgical intervention, such as infection, delayed wound healing, or graft failure (in cases of grafting procedures), can affect the overall prognosis (Anguria et al., 2014).
4. Response to Treatment: The prognosis also depends on how well the pterygium responds to treatment, whether through conservative measures or surgical intervention. Early detection and appropriate management can improve outcomes (Saw & Tan, 1999).
5. Long-Term Monitoring: Long-term follow-up and monitoring are important to detect any signs of recurrence or complications early, ensuring timely intervention if needed (Saw & Tan, 1999).
6. Preventive Measures: Educating patients about preventive measures, such as UV protection and eye care practices, can help minimize the risk of recurrence and improve long-term prognosis (Saw & Tan, 1999).

Overall, while pterygium is typically considered a benign condition, its management and prognosis can be influenced by various factors. Regular ophthalmic follow-up and adherence to preventive measures are crucial for optimizing outcomes and maintaining eye health.

Research Methods

The method used in this research is the literature review method. The literature review method is a systematic approach to collecting, assessing, and synthesizing information from various literature sources relevant to a particular research topic. The data collection technique is the documentation technique. Documentation data collection techniques involve collecting information from existing written, visual, or digital sources (Saw & Tan, 1999). Data analysis using the Miles, Huberman, and Saldana model involves three main steps: data reduction, data presentation, and conclusion drawing/verification. Data reduction is the process of selecting, focusing, simplifying, abstracting, and transforming raw data obtained from the field into a more organized and meaningful form. The goal is to summarize and focus the data so that it is easier to manage and analyze. Data presentation then involves structuring the reduced information in a form that allows conclusions to be drawn, such as matrices, graphs, networks, or diagrams. This step makes it easier for researchers to see patterns, relationships, or trends in the data. Conclusion drawing/verification is the final stage where researchers draw conclusions from the processed data and verify these conclusions to ensure their validity (Miles & Huberman, 1994).

Results and Discussions

A pterygium is a red or white growth of tissue that can appear on the surface of the eye, usually on the conjunctiva, which is the thin layer covering the white of the eye and the inside of the eyelid. Pterygium is often referred to as an “eye wart” and can

affect vision if it is large enough or grows towards the cornea (the transparent part in front of the eye) (Chu et al., 2020). The main cause of pterygium is overexposure to the sun's ultraviolet (UV) rays, which damage the eye tissue and cause abnormal growth. In addition to UV rays, environmental factors such as strong winds, dust and air pollution can also increase the risk of pterygium, especially in areas that are frequently exposed to such conditions. Exposure to eye irritants or chemicals, as well as genetic factors, can also play a role in the development of pterygium. By protecting the eyes from excessive exposure to sunlight and avoiding hostile environments, the risk of pterygium can be reduced. If the pterygium has already appeared, medication or surgery may be required to address the visual impairment and discomfort caused (Van Acker et al., 2021).

Symptoms of pterygium vary depending on the severity of the condition. In its early stages, the pterygium often causes no obvious symptoms, but as it grows, sufferers may feel discomfort such as itching, burning or irritation in the eye (Chen et al., 2023). The eye may also become red or watery, and there may be a feeling of a foreign object inside the eye. In more severe cases, pterygium can cause visual impairment as the growing tissue covers part of the cornea and changes the shape of the eye. Patients may experience blurred vision or image distortion. If the pterygium is left untreated, the condition can grow larger and cause additional problems, such as significant visual impairment and more severe eye irritation (He & Wu, 2022).

Diagnosis of the pterygium is generally done through a comprehensive eye examination (Sulewski et al., 2023). The steps usually taken to diagnose a pterygium are as follows.

1. Medical History
   The doctor will ask about the patient's medical history, including symptoms, sun exposure, and environmental conditions.
2. Visual Examination
   The doctor will examine the patient's vision to determine if the pterygium affects visual acuity or causes distortion.
3. Physical Examination
   The examination is performed using a slit lamp to view the structures of the eye in detail. With this tool, the doctor can see the growth of tissue in the conjunctiva and cornea and determine the size and extent of the pterygium.
4. Assessment Tests
   The doctor may perform additional tests such as a fluorescein test to evaluate damage to the surface of the eye or identify if there is any infection or other irritation.
5. Comprehensive Examination
   Sometimes, the doctor will also examine the overall condition of the eye to ensure that the pterygium is not part of another eye condition.

Treatment of the pterygium can involve various methods, depending on its severity and impact on the patient's vision and comfort (Akbari, 2022). Below is an analysis of the various treatment methods for pterygium, including medical and surgical therapies.

1. Medical Therapy
   a. Anti-inflammatory Drugs

Topical corticosteroids are a common choice to treat pterygium that causes inflammation and irritation. They work by reducing the inflammatory response in the eye tissues, which can reduce redness, itching and discomfort. This therapy is often effective for pterygiums that are not very large or to control symptoms prior to surgery. However, long-term use or high doses can have side effects, such as an increased risk of infection or thinning of the eye tissue (Uba-Obiano et al., 2021).

b. Dry Eye Drops
For cases of pterygium that cause the eye to become dry or irritated, artificial eye drops or eye moisturizers may provide temporary relief. These eye drops help to keep the surface of the eye moist, reduce itching, and provide comfort. While these are not a solution to eliminate the pterygium, their use can help relieve bothersome symptoms (Baheran et al., 2023).

c. Immunosuppressive Drugs
In pterygiums that do not respond to corticosteroid therapy or have recurrence, immunosuppressive drugs such as cyclosporine A may be used. These drugs work by suppressing the local immune response in the eye, reducing the inflammation that causes pterygium growth. This therapy is often chosen if the pterygium is likely to recur after initial treatment or if the pterygium is causing severe symptoms (Baheran et al., 2023).

2. Surgical Therapy
   a. Pterygium excision
   Excisional surgical procedure is the most common method to treat a pterygium that has progressed or is causing visual impairment. In this procedure, the ophthalmologist removes the pterygium tissue from the cornea and conjunctiva. The excision is performed under local anesthesia to eliminate discomfort during the procedure. While this is often effective, the risk of recurrence still exists, especially if the pterygium tissue is not completely removed (Jirsova & Jones, 2017).

   b. Surgical Methods with the Use of Grafts
   To reduce the risk of recurrence after excision, doctors may use the autologous conjunctival graft technique, which involves taking healthy tissue from another part of the patient's eye to cover the operated area. This technique reduces the chances of the pterygium tissue growing back and provides a more natural eye surface for healing. This method is generally more effective in preventing recurrence compared to excision without a graft (Wanzeler et al., 2019).

   c. Surgical Methods with Antiproliferative Therapy
   After pterygium excision, some doctors use chemicals such as mitomycin C or 5-fluorouracil to prevent regrowth. These chemicals are applied to the operated area during or after the procedure to inhibit the proliferation of pterygium cells. This therapy helps reduce the chances of recurrence, but requires careful monitoring to ensure there are no side effects or complications.

3. Postoperative Care

a. Medication Use
   After a surgical procedure, patients usually need to take anti-inflammatory medications or antibiotics to reduce inflammation and prevent infection. Anti-inflammatory drugs help manage pain and swelling, while antibiotics prevent possible post-operative infections. Proper post-operative care is essential for a good recovery and to minimize the risk of complications.
b. Routine Control
   Post-operative check-ups are essential to ensure that the operated area is healing well and that there are no signs of complications or recurrence of the pterygium. The ophthalmologist will monitor the healing process and make adjustments to the treatment if necessary. Regular controls help detect problems early and ensure good long-term results from the surgical procedure.
c. Relapse Prevention
   To prevent recurrence after surgery, it is important for patients to avoid exposure to direct sunlight and wear protective eyewear. In addition, keeping the eye free from irritants such as dust and wind can help reduce the risk of the pterygium growing back. Long-term care and lifestyle changes can support better outcomes and prevent future problems.

Prevention of pterygium can be done by reducing the risk of exposure to factors that can trigger pterygium growth (Kodavoor et al., 2021). Here are some steps that can be taken to prevent this condition:

1. Protect the Eye from UV Rays
   Exposure to the sun's ultraviolet (UV) rays is a major factor in causing pterygium. To protect your eyes, wear sunglasses with UV protection or a hat with a visor when outdoors. Sunglasses with UV protection will help reduce the impact of sunlight on the eyes.
2. Avoiding Dirty Environments
   Exposure to dust, strong winds and air pollution can increase the risk of pterygium. If you work or move in a dusty or polluted environment, wear eye protection or a mask to reduce irritation. Keeping your surroundings clean can also help.
3. Maintain Eye Health
   Keeping your eyes clean by washing your hands before touching your eyes and using artificial eye drops to treat dry eyes can help reduce the risk of irritation that can contribute to pterygium growth.
4. Avoiding Irritant Exposure
   If you are exposed to chemicals or other irritants, wear appropriate eye protection and ensure the work area is well ventilated. Avoiding direct exposure to irritants can help prevent inflammation of the conjunctiva.
5. Routine Examination
   Having regular eye examinations with an ophthalmologist can help detect early signs of pterygium or other problems. Early screening allows for quick treatment if needed, which can help prevent the condition from progressing to a more serious condition.

Pterygium can lead to various complications that affect the patient's eye health and quality of life. One of the main complications is visual impairment, as the growth of pterygium tissue covering the cornea can cause blurred or distorted vision. The tissue covering the cornea can also impair visual acuity and, in more severe cases, can affect the patient's ability to see clearly (Jabbarli et al., 2022). In addition, the pterygium can cause chronic eye irritation, including itching, redness, and a sensation like there is a foreign body inside the eye. If left untreated, the pterygium is at risk of recurrence after the surgical procedure, especially if it is not removed completely or if post-operative care is not followed properly. The long-term projection for patients involves regular monitoring to detect possible recurrence and maintain general eye health. Proper care and preventive measures, such as the use of protective eyewear and maintaining eye hygiene, can help reduce the risk of complications and improve the long-term prognosis. However, if left untreated, pterygium can cause significant visual impairment and reduce the patient's quality of life (Stevenson et al., 2021).

Eye protection and proper use of eyewear play a crucial role in reducing the risk of pterygium. The sun's ultraviolet (UV) rays are one of the main factors that contribute to the development of pterygium, and sunglasses with adequate UV protection can block UV rays from reaching the eyes. By wearing glasses specifically designed to protect against UV rays, especially when outdoors or in sunny conditions, the risk of developing pterygium can be significantly reduced (Xiradis et al., 2022). In addition, protective eyewear also helps protect the eyes from dust, wind and other environmental irritants that can trigger or worsen the condition. By integrating consistent eye protection in the daily routine, individuals can reduce the negative impact of environmental factors and maintain long-term eye health, which in turn reduces the risk of developing pterygium and its associated complications (Zhang et al., 2023).

Thus, pterygium is a growth of conjunctival tissue that extends into the cornea, often triggered by exposure to ultraviolet (UV) light from the sun, as well as environmental factors such as dust and pollution. Common symptoms include itching, redness and foreign body sensation in the eye, as well as potential visual impairment if the pterygium progresses. Diagnosis is done through a thorough eye examination, using tools such as a slit lamp to assess its size and impact. Treatment may include medical therapy such as anti-inflammatory medications and eye drops, or surgical therapy to remove the pterygium tissue with additional methods such as conjunctival grafts or antiproliferative therapy to reduce the risk of recurrence. Prevention involves protecting the eyes from UV rays using sunglasses, as well as avoiding environments that may cause irritation. Regular monitoring and proper treatment are essential to prevent long-term complications and maintain overall eye health.

Conclusion

Pterygium remains a significant ocular surface disorder, particularly in tropical and subtropical regions. While our understanding of its pathogenesis has improved, challenges persist in preventing recurrence. Future research should focus on developing targeted therapies and improving surgical outcomes.

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