Diagnosis and antimicrobial therapy of neonatal conjunctivitis: a mini review

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Abstract

Background: Neonatal conjunctivitis is an infection of the neonatal conjunctiva that often occurs within the first month of life after delivery. The commonest cause of neonatal conjunctivitis is virus, others include chemicals and bacteria. The disease is often associated with some complications when not diagnosed and treated early. The aim of this review is to present an update in the diagnosis and antimicrobial therapy of neonatal conjunctivitis.

Methods: Literatures were reviewed using various search engines from internet until relevant information related to the diagnosis and the antimicrobial therapy of neonatal conjunctivitis were obtained and included in this review.

Results: The diagnosis of neonatal conjunctivitis is based on both clinical and laboratory findings. Clinical diagnosis is by noting the features of the disease and these include redness, pain, fever, swelling and discharge of the affected eye/eyes. The laboratory diagnosis is based on the findings from eye swab microscopy, culture and sensitivity, serological tests and nucleic acid amplification tests. The antimicrobial therapy is based on the identified cause . For examples erythromycin or povidone-iodine for chlamydia-associated conjunctivitis, ceftriaxone for gonococcal conjunctivitis, and aciclovir and virdarabine for viral (herpetic) conjunctivitis. It is important to diagnose and treat neonatal conjunctivitis early to prevent complications like visual impairment and subsequent blindness.

Conclusion: Neonatal Conjunctivitis whendiagnosed late or poorly treated can lead to blindness. This has social implications as it can affect the babies' wellbeing.

Keywords: Neonatal, Conjunctivitis, Diagnosis, Antimicrobial, Therapy

Introduction

Neonatal conjunctivitis is one of the neonatal infections of the newborns that is mainly acquired during delivery.[1] It is also known as Ophthalmia neonatorum. The disease is characterized by inflammation of the eye with swelling of the eyelid(s) and discharge from the affected eye(s). The infection may start in one eye and then progress to the contralateral eye. If left untreated, or if standard treatment fails, the infection can cause corneal scarring or corneal perforation, which might result in blindness. [2] The disease is caused by

transfer of infectious agents from the mother to the eyes of the neonate during passage though the birth canal. [3] The two most common etiological agents are *Neisseria gonorrhoeae* and *Chlamydia trachomatis*. However, other bacteria apart from these ones may also cause the disease. Gonococcal neonatal conjunctivitis occurs faster than *Ctrachomatis* neonatal conjunctivitis and is usually more aggressive. [4] The expectant mother may not know that she harbours *N. gonorrhoeae*. [5] The aim of this review is to present an update in diagnosis and antimicrobial therapy of neonatal conjunctivitis. Numerous literatures were reviewed using various search engines from internet until relevant information related to diagnosis and antimicrobial therapy of neonatal conjunctivitis were obtained and included in this review. Information from other literatures not relevant to the title were not included.

Epidemiology of Neonatal Conjunctivitis

It was estimated that in developed countries, the overall infectious conjunctivitis occurs in 12% of neonates, but 23% of neonates are suffering with this condition in developing nations. [7] Neonatal conjunctivitis remains a problem to neonates due to inadequate use of prophylactic treatment to prevent infections immediately after delivery. [6] Shi-Xiao, *et al*. [8] reported that 51.2% of neonatal conjunctivitis in Chinese infants. Abdulsalam *et al.* [7] reported that about 1-5% of newborns globally are at risk of neonatal conjunctivitis particularly gonococcal type.

Aetiopathogenesis

Neonatal conjunctivitis can be septic and aseptic. The aseptic type is the chemical conjunctivitis, which is mostly secondary to the application of silver nitrate drops for ocular prophylaxis whereas bacterial and viral infectious agents mainly cause the Septic neonatal conjunctivitis. The bacteria causing opthalmia neonatorum are *Neisseria gonorrhoeae,Chlamydia trachomatis, Group B beta-haemolytic streptococci, Staphylococcus aureus, Pseudomonas aeruginosa, Staphylococcus epidermidis, Escherichia coli, Klebsiella pneumoniae* etc. Bacterial conjunctivitis make up to 30-50% of all cases of neonatal conjunctivitis. *Herpes Simplex Virus (HSV)* is the common viral cause of opthalmia neonatorum. [9]

C. trachomatis and N. *gonorrhoea* are most common cause of bacterial neonatal conjunctivitis.[24] The transmission rate from an infected mother to the newborn ranges from 30-45% for *N.gonorrhea* and 30% for *C.trachomatis*. [6] Traumatic delivery or

premature rupture of maternal membranes may increase the risk of infection. However, the risk of transmission in cases of recently acquired genital herpes may be as high as 48%. [10]*Staphylococcusaureus* is one of the commonly detected bacteria in some countries according to some studies. [11] The differences in results may be due to epidemiological variations in different countries and be a reflection of the spectrum of sexually transmitted diseases prevalent in a particular community. [3]

Chlamydial neonatal conjunctivitis is due to *C. trachomatis*. Neonates acquire the organism from the maternal cervix during delivery. [12] Neisseria gonorrhoea is causes gonococcal conjunctivitis. Its incubation period may be as short as 1-7 days. [11] The organism also known to colonize other systems leading to septicaemia in the neonate. [14]Once new blood vessels invade the cornea, scarring of the cornea may result, ulceration and perforation may ensue. This occurs in untreated cases around the 3rd week of the infection. Gonococci attack mucous membranes of the eye and genital tract, producing acute suppuration within 1-3 days that may lead to tissue invasion by polymorpho-nuclear leucocytes. This may result in chronic inflammation and fibrosis. [12] Gonococcal bacteraemia may lead to skin lesions especially haemorrhagic papules and pustules. [14] Lifelong immunity does not seem to develop in the course of these infections, although IgA antibodies occur on mucous membranes. [12]

Clinical Features

The clinical manifestations of neonatal conjunctivitis include redness of one or both eyes, periorbital swelling and purulent discharge, which manifest within the first 28 days of life (Figure 1, 2 & 3). [15]Although a self-limiting infection, but has the potential to have serious consequences including severe keratopathy and serious systemic involvement if left untreated. [15, 16] Pseudomembrane or true membrane may occur and can lead to scarring. [10] Visual loss is usually due to eyelid scarring. Systemic involvement may cause pneumonitis and pharyngitis especially in chlamydial conjunctivitis. [17]

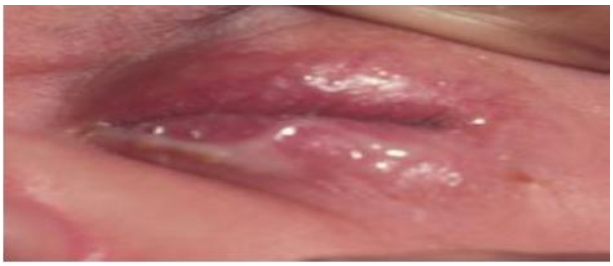

Figure 1: Bacterial (*Gonococcal)* neonatal conjunctivitis.[18]

Figure 2: Viral (herpetic) neonatal conjunctivitis. [18]

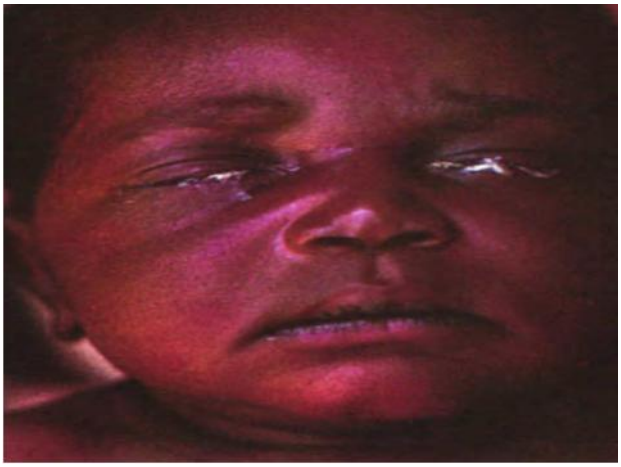

Figure 3: A baby with bilateral gonococcal conjunctivitis. [13]

Laboratory Diagnosis

The laboratory diagnosis of neonatal conjunctivitis include microscopy culture and sensitivity. The criteria for the identification of the organisms include microscopic appearance involving the Gram staining properties which can be Gram‑positive or negative; culture methods to isolate the causative organism and biochemical tests such as catalase, coagulase, urease, citrate, triple sugar inhibition as well as sugar fermentation tests. Antibiotic sensitivity test is performed to identify the suitable antibiotic for effective treatment of the infection. [19]Serological tests are used for detection of immunological response to infective agents. Detection of IgM antibodies or a fourfold increase in the patient's antibody titre is diagnostic of current infection. [7]Other techniques include direct fluorescent antibody and antigen immunochromatographictest. [20, 21] .The immunochromatographic test has beenfound to have an acceptable sensitivity (83.15%) and goodspecificity (98.9%) compared to molecular testing.Nucleic acid amplification test (NAAT) is one of the standard methods for detection of chlamydial DNA where facilities are available. [21]

Complications

Some of the complications of neonatal conjunctivitis include pseudomembrane formation, corneal oedema, thickened palpebral conjunctiva, corneal opacification, corneal perforation and finally blindness. Systemic complications of neonatal conjunctivitis include pneumonitis and pharyngitis. [22]

Treatment

Chlamydial conjunctivitis responds to both oral and topical erythromycin for two weeks. Gonococcal conjunctivitis responds to ceftriaxone. It is administered either intravenously or intramuscularly for 1 week. Herpetic conjunctivitis responds to parenteral aciclovir. Herpetic conjunctivitis with keratitis can be managed with 3% virdarabine ointment and 1% trifluridine drops. In the past, silver nitrate was used for prophylaxis against gonococcal conjunctivitis but ineffective against chlamydial conjunctivitis. Nowadays, povidone-iodine drops was found to be more effective against both chlamydial and gonococcal conjunctivitis and less toxic. [18]Solution of silver nitrate (1%) was used for prophylaxis of neonatal conjunctivitis. Its application is immediately after birth. A bactericidal chemical that acts by binding to bacterial surface protein. Nonetheless, majority of babies develop features of chemical conjunctivitis as silver nitrate irritates the conjunctiva. In view of this, tetracycline and erythromycin ointments and solutions are used for prophylaxis as single topical application immediately after birth as another alternatives. [13, 23]

Prognosis

Prognosis of neonatal conjunctivitis is generally good as long as early diagnosis is made and prompt medical therapy is initiated. Most cases of infectious conjunctivitis respond to treatment. However, morbidity and mortality increases in cases of systemic involvement. [22]

Prevention

Infective conjunctivitis can be prevented through good personal hygiene, which include handwashing and eye care. Frequent Health education helps in reducing the spread of the infection to other neonates or children. [13] It is important to observe aseptic techniques during delivery.

Conclusion

Conjunctivitis can be a very frustrating condition in neonates and even in older children. It has social implications as it can affect child's wellbeing. Early detection and specific treatment are therefore of paramount importance to prevent complications in the affected babies. General practitioners should remain vigilant when differentiating viral from bacterial

conjunctivitis. Mother's awareness about the condition should be at optimum level to limit the spread of the disease.

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Conflict of interest: Nil