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Review Article

Beyond the Dental Decay – Facial Cellulitis from a Pediatric Dentist Perspective

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Abstract

Dental caries is the most prevalent oral disesase occurring in children leading to many consequences if left untreated. If dental caries is not treated at an early stage, it can transform to abscess formation and finally leading to head and neck odontogenic cellulitis, facial cellulitis and life threatening sequele requiring appropriate, immediate and multidisciplinary treatment. Facial cellulitis is more commonly observed in children and often require admission to a pediatric hospital as it is fast spreading and fatal. Hence multidisciplinary management between pediatric dentist, general dental practioners and pediatricians is highly essential. The present research paper enlightens about the occurrence of facial cellulitis in children encompassing its etiology, clinical characteristics and treatment strategies by pediatric dentist perspective.

Keywords: *Antibiotic regimen, Cellulitis, Dental caries, Inter-disciplinary treatment, Pediatric dentist.*

Introduction

World Health Organisation (WHO) defined dental caries as ‘a multifactorial non-communicable disease. The most common type of oral infection is an odontogenic infection caused by dental caries and is characterised by a polymicrobial and mixed infection constituting both aerobic and anaerobic bacteria. It is associated with various clinical conditions of different frequency and potential severity [1]. Facial cellulitis or odontogenic cellulitis is one of the most common complications of odontogenic infection afflicting children. Facial cellulitis of odontogenic origin is a diffuse inflammation of soft tissue that is not confined or limited to a specific location and tends to speard fast. It is an acute, deep and diffuse inflammation of the subcutaneous tissue [2,3]. Facial cellulitis arising from an odontogenic infection spreads through the spaces between tissue cells to tissue spaces and the entire aponeurosis plane. The most causative factor for iniation of odontogenic infection is a small carious lesion in a primary tooth or permanent tooth which is not managed by therapeutic intervention and finally leading to irreversiable pulpitis. From irreversible pulpitis, migration of bacteria from the infected pulp takes place through the apical foramen to the periapical tissues thereby leading to inflammation of the periapical tissues or submucosal abscesses and finally life-thretening phenomenon develops occupying head and neck space, osteomyelitis, meningitis or cavernous sinus thrombosis [4]. Inflammation of odontogenic origin spreads through the spaces between tissue cells to tissue spaces very fast because of the anatomical structure of the craniofacial region exhibiting lowest resistance in the tissue spaces necessitating faster spread. Another factor which contributes to the faster spread of infection is the fascial spaces which are connected to each other by loose connective tissue along the fascia, blood vessels, and nerve branches which facilitates the spread of inflammation upwards towards the base of the skull or downwards to the parapharyngeal space and mediastinum [6-8].

Occurrence of cellulitis in children has pathognomonic importance compared to adults. There is a significant difference in the pathophysiological, pharmacokinetic and anatomical differences between children and adults. Facial cellulitis in children is associated with staphylococci and streptococci causative species where as in adults the facial cellulitis of odontogenic origin represents a multimicrobial nature with predominant of anaerobic bacteria [7]. Therefore, neglected/untreated small dental caries in primary/permanent tooth in children can casuse fatal complications and life destroying scenario. Hence, early recognition and its appropriate management is very important for prevention of facial cellulitis and its sequele in young children. The aim of the current research paper is to shed light on development of facial cellulitis in children and pediatric dentist perspective in its diagnosis and management.

Discussion

It is evident in the scientific literature that dental caries leading to dental abscess is the main etiologic factor for development of facial cellulitis in children [8-15]. Children afflicted with facial cellulitis presents a red, swollen, puffy face with pain panicking parents or guardians. Abdul Satar et al [6] reported a case report showing development of orbital cellulits secondary to dental abscess in a 2-year-old female patient. Patient presented with a history of left periorbital swelling, preceded by left upper perioral swelling which extended upward to the left cheek and left lower lid in association with low-grade fever. Contrast-Enhanced Computed Tomography (CECT) scan of the orbit, paranasal and brain showed a left periosteal abscess collection extending to the inferomedial region of the orbit. Authors diagnosed the condition as left preseptal with facial cellulitis. The child was kept on administration of intravenous amoxicillin/clavulanic acid and chloramphenicol ointment application to the periorbital area. Tooth with suspected dental caries and dental abscess was extracted under general anesthesia. In follow up appointments, clinical improvement was noticed in the patient. Therefore, a small and neglected dental abscess can lead to fatal complications [6]. Orbital cellulitis is one of a potential sight and life-threatening condition seen in children. It is a serious condition occuring in children leading to significant other complications like brain abscess, subdural empyema, meningitis, cerebral venous sinus thrombosis, cavernous sinus thrombosis and blindness [6]. This clearly emphasizes the importance of primary tooth care at an early stage in children in order to avoid fatal complications. Therefore, parents should have enough knowledge about this condition and whom to consult for proper immediate treatment.

Abu-Ghazaleh et al [1] studied the factors influencing onset and course of odontogenic pediatric facial cellulitis, and reported that the different etiological factors responsible for occurrence of facial cellulitis were dental caries (73%), failed dental restorative treatment (22%), dental pathology (2.9%) and dental trauma (2%). Authors suggested that patients without history of first dental visit, patients without an established dental home, younger patients and patients with a special health care need required a more intensive course of care for facial cellulitis compared to the control group [1].

There is another case report [9] illustrating association of regional odontodysplasia with facial cellulitis in a 2-year-old patient. Regional odontodysplasia is a localized developmental anomaly involving primary and permanent dentition. The affected teeth in this condition exhibit unique ghost-like radiological characteristics, clinically manifesting as abnormal tooth morphology, recurrent swelling of gingiva and delayed tooth eruption. Hence, this case report provides a valuable insight for further research about inter-related indepth study between cellulitis and regional odontodysplasia [9]. However, there are other reasons for the occurrence of facial cellulitis mimicking odontogenic induced cellutilis that need to be ruled out. A 2015 published case report [10] showed development of a chemical facial necrotizing cellulitis following the accidental injection of formalin into oral tissue space in an 8-year-old child [10]. This clearly indicates the negligence by the dental assistant and the common practice of storing formalin in local anesthesia vials should be strictly avoided in dental clinics to prevent such unfortunate incidents. Every pediatric dentist should inspect the vial and confirm while withdrawing local anesthesia from a vial enquiring with dental assistant or sister.

Similar to the above case report, Wakhloo in 2023 [7] reported development of facial cellulitis as a complication arising from a type I talon cusp present in the maxillary lateral incisor in a female pediatric patient. This case report alarms all dental practioners about the importance of careful examination of the developing dentition for occlusal harmony in children associated with any dental anomaly [7]. This article also emphasizes the clinical significance, early diagnosis and prompt prophylactic management of the talon cusp in order to prevent the development of acute sequelae in children.
A Poland study [4] evaluated clinical symptoms and biochemical parameters in odontogenic cellulitis of the head and neck region in children. Authors conducted the study among 40 children aged 2 to 16 years. Results showed that there was a statistically significant difference observed in biochemical test results between the research and control group. A statistically significant positive relationship was observed between C-reactive protein levels and extraoral swelling. The neutrophil to lymphocytes ratio correlated significantly with extraoral swelling and the length of patient's hospitalization [4]. There was statistically significant association of D-dimer with extraoral swelling, number of anatomical spaces involved and trismus. Hence authors concluded that both neutrophil to lymphocytes ratio and C-reactive protein ratio are considered as an important prognostic marker of the course of infection and patient's hospitalization time [4].

Eliso Salleo et al from Australia [3] studied the characteristics, epidemiology and treatment of paediatric facial cellulitis using retrospective data retrived from a single centre paediatric tertiary hospital. The results of the study revealed that about 68% of children were admitted to the hospital and 31% were non-admitted [3]. The median age of children was 5 years consisting of 180 boys and 40 aboriginal. There was a highter proportion of facial cellulitis in admitted patients (27%) in comparision to non-admitted patients (5%). The most common microbiological investigation performed was wound swab (44%) which yielded positive cultures in the majority of the tested specimens. The most frequent organisms identified were staphylococcus aureus (86%), methicillin susceptible S. aureus (63%) and Streptococcus pyogenes (20%). In 14 specimens both S. aureus and S. pyogenes were identified [3].

Nagaveni et al from India [8] studied the causative micro-organisms and assessed the anatomic distribution of orofacial space infections of odontogenic origin in pediatric patients. Among the 25 patients studied, total of 23 bacterial strains was isolated (92%). In 2 children (8%) no growth from facial cellulitis was observed [8]. Among 23 isolates, 13 (56%) isolates were of mixed growth, 8 (34%) isolates of anerobic growth and only 2 (8%) isolates of aerobic growth. Most frequently isolated aerobic species was Streptococcus viridans (47%). Among anerobic species, Peptostreptococcous (48%) was the most commonly isolated species [8] [8]. The submandibular space was the most commonly involved space among single space infections. However, involvement of multiple spaces was not observed. Conclusions drawn from this study were: pediatric orofacial space infections of odontogenic origin are a polymicrobial, and mixed (both aerobic and anerobic) infection with predominance of anerobic bacteria.

A single-centre, cross-sectional, retrospective study [5] conducted on children with odontogenic cellulitis admitted to the paediatric emergency department of the Lille University Hospital evaluated the epidemiolgocal profile of admitted children and studied the impact of self-medication of anti-inflammatory drugs [5]. Authors suggested that 15% of children had taken nonsteroidal anti-inflammtory drugs before going to the emergency department. The frequency of pain and trismus was greater in children who had taken nonsteroidal anti-inflammatory drugs compared to children who had not taken. Frequency of hospitalization was higher in children who had not taken nonsteroidal anti-inflammatory drugs compared to children who had taken nonsteroidal anti-inflammtory drugs [5]. This first French epidemiological study performed on odontogenic cellulitis in children clearly indicates the necessity to develop multi/interdisciplinary prevention and patient education among all parents about the sequele of misuse and self medication of drugs [5].

One Indian retrospective study [11] investigated patient characteristics, treatment strategies like type of antibiotics given and route of administration, length of stay in the hospital and factors related to early treatment of facial cellulitis of odontogenic origin [11]. The data retrived from the records revealed that the mean age of admitted children ranged from 8 to 14 years. About 79% of patients received clindamycin compared to penicillin-based antibiotic (18%). The average hospital stay was 5 to 8 days. Children who received intravenous antibiotic or had a primary tooth involved received dental treatment sooner [11].

Management of cellulitis mainly focus on the elimination of the causative factor and immediate treatment of the symptoms to prevent the spread of infection through blood or lymphatic vessels to the distant vital organs [11]. As a first line of treatment, antibiotics are used to treat the odontogenic infection when the infection spreads and symptoms like extraoral swelling or fever develops. Among antibiotic therapy, amoxicillin or amoxicillin with clavulanic acid is the first antibiotic of choice. If patient is allergic to these drugs, clindamycin, azithromycin, moxifloxain are recommended [11]. A 2025 scoping review [12] identified evidence and guidelines pertaining to the use of antibiotics in the management of odontogenic facial swellings in children and adolescents. It was evident from this scoping review was that, high quality, robust research with clearly defined outcome measures and thorogh reporting is required to create comprehensive, evidence-based guidelines for children and adolescents with odontogenic facial swellings including facial cellulitis [12]. Authors also noticed inconsistencies identified between guidelines due to lack of evidence regarding the use of antibiotics in the pediatric group. It is highly essential for clinicians to compare the guideline recommendations, and understand the context of these guidelines and compare with existing local practices [12].

Kara et al [13] analysed the characteristics of odontogenic based facial cellulilis and its relationship to length of stay in the hospital. Length of stay was significantly shorter in children who had a tooth extracted within 48 hours compared to patients who had a tooth extracted at 48 hours or longer. Length of stay was significantly shorter in children with upper face and left face infections compared to lower face infections and right face infections. Children with a primary first molar infection showed the shorter length of stay and patients with a white blood cell count less than 10,000cells/mm3 also showed shorter length of stay [13].

Due to fatal nature and faster spread of facial cellulitis, a 2025 research article [12] suggested for the inclusion of dental home concept in every clinical practice set up. Therefore, interdisciplinary communication between the medical and dental professionals including pediatric dentist is strictly needed in each dental clinic with availability of inpatient stay to provide emergency treatment for facial cellulitis of odontogenic origin [14,15]. In addition, it is more essential to establish proper guidelines on the correct management of facial cellulitis in children.

Conclusion

As pediatric dentist is the first health care professional who sees children right from birth and treats the first tooth after its eruption, he/she should treat each and every small dental caries in children. Moreover, parents need to receive more information about the importance of primary teeth and their care by a pediatric dentist. It is also essential that a multidisciplinary interaction between a pediatric dentist, general dental practitioner and a pediatrician is warranted in every dental practice.

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