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Review Article

Facial burn in children: a review

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ABSTRACT

Burns are a common cause of injury among children. Children with facial burns often experience pain, regardless of the cause, size, or depth of the burn injury. Burns in the facial area may lead to fatal consequences because of the involvement of the upper airway and cosmetic deformity of the face. Major burn injury in the facial area remains a significant cause of morbidity and mortality in children. Burn scars on the face in children may disturb the self-image and psychosocial processes. Multi-disciplinary approaches and advances in burn care are often helpful to manage the burn injury in children and increase the survival of the patients. Pain has adverse emotional and physiological impacts, and adequate pain control is an important factor in improving outcomes. The goal of the treatment of facial burns in children is to achieve a good aesthetic outcome and also normal head movement with neck mobilization.

Keywords: Burn, Face, Children, Cosmetic deformity

INTRODUCTION

Although major advancement is happening in the area of burn management, burn injury still continues to be an important cause of morbidity and mortality in children. Burn injury in the facial area is devastating for affected children and results in several physical and psychological sequelae.[1] Facial burns followed by scar formation can drastically affect the growth potential of the face of the child. The face is prevalently prone to burn injury occurring by flame, scald, and caustic agents.[2] Burn injury to the facial area creates a technical challenge with airway management. Burns have been identified as one of the most devastating causes of child injury with respect to functional, social, and psychological impairment.[3] Pain and distress are usually associated with facial burns in children.[4] Reporting and monitoring facial burns in children has been often poor. Pain and cosmetic deformity have adverse physiological and emotional effects, and appropriate pain management is an important factor for improving outcomes. Facial and neck skin are prone for the development of burn scar contracture because of its thin nature. The objective of the treatment is to epidemiology, pathophysiology, clinical manifestations, and management of facial burn injury in children.

LITERATURE SEARCH

Multiple systematic methods were used to find current research publications on facial burns in children. We started by searching the Scopus, Pub Med, Medline, and Google Scholar databases online. This search strategy recognized the abstracts of published publications, while other papers were discovered manually from the citations. A search strategy using PRISMA (Preferred reporting items for systematic reviews and meta-analysis) guidelines was developed. Randomized controlled studies, observational studies, comparative studies, case series, and case reports were evaluated for eligibility. There were a total number of articles 54 (21 case reports; 22 cases series; 11 original articles). This paper focuses only on facial burns in children. The search articles with any manifestations other than facial burns in children are excluded from this review article. Review articles with no primary research data were also excluded. This paper

examines the epidemiology, etiopathogenesis, clinical manifestations, diagnosis, and treatment of facial burns in children. This analysis provides a foundation for future prospective trials for facial burns in children. It will also catalyze additional studies of facial burns in children.

EPIDEMIOLOGY

The fifth most common reason for unintentional mortality in children is burn injuries.[5] Due to the widespread use of fire detectors in homes and effective awareness efforts, the fatality rate from burn injuries has decreased dramatically over the past 20 years. Facial burn is the third most common cause of injury resulting in death after motor vehicle accidents and drowning. Facial burn injuries account for the greatest period of hospital stay for injuries and costs associated with care. Children of less than 10 years of age account for 36% of burns seen in accident and trauma departments.[6] Children account for almost 50% of burns and scalds found in European hospitals.[7] The incidence of burn injuries in the different age groups has a bimodal distribution with the pediatric age group of 0 to 4 years accounting for half the number of burn accidents and then the number of burn injuries rises again in the adolescent age group.[8] Boys are more affected by burn injuries than girls.[9]

PATHOPHYSIOLOGY

The response of the burn injury to the body is a complex and dynamic process that leads to local and systemic complications. In the majority of cases, burn injuries cause cellular damage by direct thermal energy. Burn injury affects the body as kinetic energy in the form of heat and spread through the skin. There are two factors responsible for the final degree of injury in burn such as the temperature of the stimulus and the duration of the exposure.[10] There are three different burn damage zones. The zone of coagulation is the term for the burn wound's center area. The main eschar is this area of homogeneous necrosis. The zone of stasis is the second section, and it is located far from the necrotic center. The zone of stasis typically experiences necrosis, which increases the amount of burn eschar that needs to be removed. Due to the loss of the zone of stasis, the practical thickness burn damage may become a full thickness injury. The zone of hyperemia is the third and outermost section. Inflammatory vasodilation increases blood flow to the third region, where the burn-injured cells are frequently able to survive in the absence of aggravating conditions.[11] The extent of the burn injury in the facial area is determined by the degree of heat and duration of exposure of the heat to the tissues.[12] There are three main types of burn depth such as superficial (Figure 2), partial thickness (Figure 3), and full thickness.[13] Superficial burns are painful and red color appearance involving the epidermis and usually heal within 7 days.[13] Superficial partial thickness injuries results in blister formation and, once debrided, appear as pinkish and wet with a brisk capillary refill. These lesions are also painful and usually heal within 14 days. Deep partial-thickness burn injuries are usually less painful, have a dry and fixed blotchy red appearance, and do not blanch under pressure. Deep partial-thickness burns may take a longer time to heal i.e. about 21 days or more. Full-thickness burn injuries appear as dry with a white or brown leathery appearance. These full-thickness burns are not painful and often need excision and skin grafting to allow healing.[14] The depth of the burn is directly related to the extent and severity of pain. The initial injury of the skin damages the nerve endings but this initial stimulation causes pain irrespective of the depth of burn.[15] Burn victims are often prone to a variety of infections which greatly increase the morbidity and mortality of the children. Increased burn surface area and depth of burn correlate with more infectious complications. The thinner skin of the children in comparison to the adults makes them more susceptible to burns.[16] Considering the types of burn injuries, scald burns are common in younger children. Children of age less than 5 years are prone to scald injury in the facial area. Scald injury is common in toddlers as they are more mobile.[17] The mechanism behind the scald injury includes spilled/splashed and pulled, and scalds are most commonly involved in cooking/kitchen appliances, and tables/counters appliances, hot water.

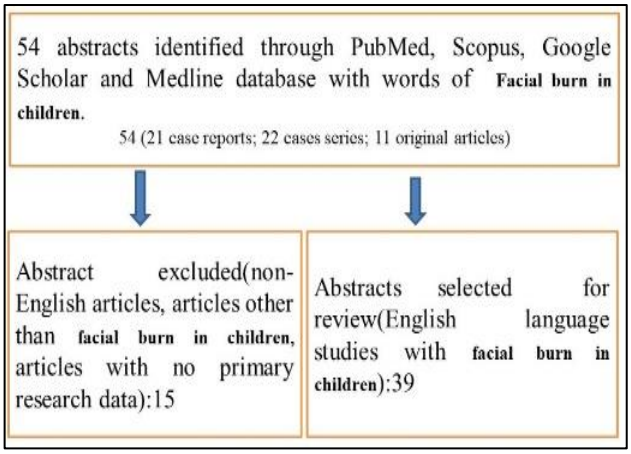

Figure 1: Methods of literature search.

Figure 2: Facial superficial burn injury on face.

Figure 3: Facial partial thickness burn injury at forehead.

RISK FACTORS

Burn to the facial area among children often occurs in the home environment, and mostly happens in the kitchen during food preparation and meal times. Winter month is a risk period for burn injury. Additional risk factors include low-socioeconomic status, low educational background of the parents or caregiver, crowded home environment, and psychosocial family stress.[18] Hospitalization of children with burns is only needed in 6% of cases and the majority of the children are treated by primary care and emergency medicine physicians.[19] Risk factors that increase the severity of the burns include younger age, increased size of burn injury, scalding injury, and presence of inhalation injury.[20]

CLINICAL MANIFESTATIONS

Facial burns in children are painful, potentially fatal, and carry a risk of lifelong scarring and cosmetic deformity of the face. It is often associated with physical, psychological consequences and long-term healthcare requirements. Contractures in the facial region due to chronic burn scars are often troublesome, both functionally and aesthetically. Contractures in the face and cervical region not only restrict neck movements but also distort the lower lip and limit jaw movements.[21] As facial scars are seen in the most exposed region of the body, these are easily seen and can cause much embarrassment to the patient.[22] Facial structures such as the nose and teeth may be deformed by post-burn contractures. There are certain serious complications such as occlusion amblyopia and microstomia must be anticipated and urgently addressed to reverse the permanent consequences. Proper evaluation of burn injuries in the facial area must be done with consideration as an emergency situation and need immediate resuscitation if need. Early assessment includes airway, breathing, and circulation in the pediatric age group. Features of hypovolemia such as low blood pressure and urine output are delayed manifestations in children and tachycardia is omnipresent.[23] Tachypnea, stridor, and hoarseness of voice suggest a compromised airway due to edema or inhalation injury.[24] A young child's growing visual axis is disrupted by periorbital burns, making them susceptible to developing occlusion amblyopia or vision loss. Infants who have their eyes closed for more than three days have a higher chance of going blind in the affected eye.[25] Reduced retinal stimulation from long-term scar contracture occlusion of the eye leads to impaired neuronal growth of the associated optic cortex. The stoppage of blinking and eyelid ectropion that can occur as a result of eyelid contractures can lead to chronic conjunctivitis. This might eventually cause the afflicted youngster to go blind and cause more ulceration.

PSYCHOSOCIAL IMPACT

Children with facial burns are challenged with a number of psychological issues. The face of the child is considered as part of the interpersonal and social interaction.[26] Disfigurement of the face due to burn can cause significant psychological, social, and cognitive impairment in the affected child. As young children are actively developing the concept of self, a severe variety of burn injuries to the face can alter the child's sense of identity and place the child at high risk for future emotional and psychological disturbances.[27] The face of the human being is central to identifying and is the primary tool for expression, emotion, and character. Burn scars on the face may significantly alter the self-image and psychosocial processes more than do burns to other areas of the body. Burn scars on the face usually limit the movements of the face, so disturb the expressions of children and make it difficult for others to read the feelings of facial expressions.[28] The level of residual disease after initial burn injury is more among children due to overlapping bio-psycho-social factors affecting this age group. Children affected by facial disfigurement due to burns may be teased, ignored, bullied, and ostracized.[29] Physically, the constitutive growth of the children often outpaces that of any non-physiologic scar tissue showing contractures as a far greater significant problem.[30] Psychologically, children are at different fragile stages of development with higher chances of body image issues influenced by their own self-esteem as well as acceptance from others that may be compromised by any facial disfigurement resulting due to burn injury.[31] Children with facial burn injuries those hospitalized for a long period may miss schooling for a long time and they are at risk of not developing vital social relationships and falling behind in study. Children recovering from facial burns make social stigmata that negatively affect the personal life. It severely affects self-identity. One study described the increased antisocial behavior, depressive and anxiety disorders as sequelae of facial burn in children.[32] The slightest burn injury on the face may manifest severe depression and social isolation which is further worsened by the presence of visible scars. Children with facial burns are more solitary and prone to fighting and lying.[33]

MANAGEMENT

Management of facial burns in children is a multidisciplinary approach involving a range of professional experts such as burn surgeons, pediatricians, otolaryngologists, pain specialists, nurses, psychologists, play therapists, and importantly, the parents of the children or caregivers. Although several principles for adult burn management is applied to pediatric patient with facial burns, the treating doctor must be cognizant of many important differences. The first aid for thermal burns includes running the burnt area under cold tap water for twenty minutes. Children should avoid hypothermia, so very cold water or ice should be avoided as these can result in vasoconstriction, making the depth of burn injury worse.[34] Fluid resuscitation should be commenced as early as possible if indicated and the requirement for this must be anticipated, so intravenous access should be done immediately. In order to get exact calculation fluid requirements, and for risk assessment, the total body surface affected with burn injury must be estimated. Areas of superficial burn injury should not be included in the surface area calculation as these do not contribute to the risk of intravascular fluid loss.[35] Blood investigations like full blood count, electrolytes with blood urea nitrogen and creatinine, and liver function tests should be done before starting fluid. In case of a minor burn, the injury should be cleaned and blisters debrided to allow full evaluation of the wound after appropriate analgesia if needed. Simple nonadherent dressing can be done in conjunction with antimicrobial agents.[36] Children with burn injuries usually experience pain regardless of the etiology, size, and depth of the burn. Undertreatment of pain may cause delayed healing of burns and also increase the chance of posttraumatic stress disorders. The attitude toward pain management should be presumptive and preemptive. A multidisciplinary approach is helpful to integrate pharmacological and psychological pain-relieving methods to reduce physical, emotional, and family distress. The fundamental aim of the surgical treatment of the facial scar due to burn is to replace this area with normal skin that is a good match in color, thickness, and texture.[37] Local flaps from the pectoral and shoulder area are good options for the reconstruction of facial and cervical scars. Tissue expanders can be used in these cases and give adequate surface area without compromising vascularity.[38] Surgical reconstruction of facial burns with scars and contractures should proceed only after thorough planning and may involve a variety of skin graft, flap, and tissue expansion techniques. The most popular treatment for significant skin defects caused by scar excision that cannot be initially closed with sutures is skin grafting. The epidermis and varying amounts of dermis make up the split-thickness skin graft. The benefit of split-thickness skin grafts is that donor sites can be of any size because healing occurs almost invariably completely by re-epithelization from skin appendages. As the propensity of split-thickness graft is to heal with some contracture, it should be used with caution in facial reconstruction. Parts of the face like the nose, chin, and forehead are suitable to receive split-thickness grafts and lead to satisfactory results because the underlying bony structures oppose the contraction. Children with facial burns and deformity display blunted emotional maturation and remain childish in behavior and appearance even in adolescent age.[39] These children need more parental support and guidance.[40]

CONCLUSION

Burn on the face in children has been established as one of the most traumatic injuries. Facial burns are often associated with increased medical and psychosocial morbidity among the affected children. Children with facial injuries not only experience physical injury but also emotional trauma because of hospitalization, medical procedures, and pain experiences that can affect lifelong functional disturbances. Children with facial burns are often associated with pain and anxiety. Children with facial burns remain a challenge to their parents and caregivers, and these children need long-term care by a multidisciplinary team. In burn injury, reconstruction of the facial scar or contracture is helpful to achieve a good aesthetic outcome.

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REFERENCES

1. Swain SK, Shajahan N. Managing the airway of acid burn contracture of the neck in a 12-year-old girl. J Scient Society. 2020;47(2):122-5.
2. Margulis A, Agam K, Icekson M, Dotan L, Yanko-Arzi R et al. The expanded supraclavicular flap, prefabricated with Thoracoacromial vessels, for Reconstruction of post burn anterior cervical contractures. Plastic Reconst Surg. 2007;119(7):2072-7.
3. Swain SK, Behera IC, Sahu MC. Unusually giant and aggressive earlobe keloids–Two clinical reports. Egyp J Ear Nose Throat Allied Sci. 2015;16(3):299-301.
4. Bazzi A, Ghazanfari MJ, Norouzi M, Mobayen M, Jafaraghaee F, Zeydi AE et al. Adherence to referral criteria for burn patients; a systematic review. Arch Academic Emergency Med. 2022;10(1):43.
5. Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System (WISQARS) Fatal Injury Reports. National Center for Injury Prevention and Control, Centers for Disease Control and Prevention (producer). 2000. Available at: www.cdc.gov/ncipc/wisqars. Accessed on April 1, 2023.
6. Khan AA, Rawlins J, Shenton AF, Sharpe DT. The Bradford Burn Study: the epidemiology of burns presenting to an inner city emergency department. Emergency Med J. 2007;24(8):564-6.

7. Brusselaers N, Monstrey S, Vogelaers D, Hoste E, Blot S. Severe burn injury in Europe: a systematic review of the incidence, etiology, morbidity, and mortality. Critical Care. 2010;14(5):1-2.
8. Hansbrough JF, Hansbrough W. Pediatric burns. Pediatr Rev. 1999;20(4):117-23.
9. D'Souza AL, Nelson NG, McKenzie LB. Pediatric burn injuries treated in US emergency departments between 1990 and 2006. Pediatrics. 2009;124(5):1424-30.
10. Jeschke MG, van Baar ME, Choudhry MA, Chung KK, Gibran NS, Logsetty S. Burn injury. Nature Rev Dis Primers. 2020;6(1):1-25.
11. Kung TA, Gosain AK. Pediatric facial burns. J Craniofacial Surg. 2008;19(4):951-9.
12. Bailey ME, Sagiraju HK, Mashreky SR. Epidemiology and outcomes of burn injuries at a tertiary burn care center in Bangladesh. Burns. 2019;45(4):957-63.
13. Papini R. Management of burn injuries of various depths. BMJ. 2004;329(7458):158-60.
14. Shpichka A, Butnaru D, Bezrukov EA, Sukhanov RB, Atala A, Burdukovskii V et al. Skin tissue regeneration for burn injury. Stem Cell Res Therapy. 2019;10:1-6.
15. Swain SK. Kite string injury to the head-and-neck region: A review. Ann Indian Academy Otorhinolaryngol Head Neck Surg. 2022;6(1):1-5.
16. Cagle KM, Davis JW, Dominic W, Ebright S, Gonzales W. Developing a focused scald-prevention program. J Burn Care Res. 2006;27(3):325-9.
17. Drago DA. Kitchen scalds and thermal burns in children five years and younger. Pediatrics. 2005;115:10-6.
18. Van Niekerk A, Rode H, Laflamme L. Incidence and patterns of childhood burn injuries in the Western Cape, South Africa. Burns. 2004;30(4):341-7.
19. O'Brien SP, Billmire DA. Prevention and management of outpatient pediatric burns. J Craniofac Surg. 2008;19(4):1034-9.
20. Williams FN, Herndon DN, Hawkins HK, Lee JO, Cox RA, Kulp GA et al. The leading causes of death after burn injury in a single pediatric burn center. Critical Care. 2009;13(6):1-7.
21. Swain SK. Kite string injury to the head-and-neck region: A review. Ann Indian Academy Otorhinolaryngol Head Neck Surg. 2022;6(1):1-5.
22. Ortiz CL, Carrasco AV, Torres AN, Sempere LN, Mendoza MM. Supraclavicular bilobed fasciocutaneous flap for postburn cervical contractures. Burns 2007;33(6):770-5.
23. Harish V, Tiwari N, Fisher OM, Li Z, Maitz PK. First aid improves clinical outcomes in burn injuries: evidence from a cohort study of 4918 patients. Burns 2019;45(2):433-9.
24. Swain SK, Das A, Behera IC, Bhattacharyya B. Tracheostomy among pediatric patients: A review. Indian Journal of Child Health 2018:557-61.
25. Donelan MB, Liao EC. Reconstruction of the head and neck. InTotal burn care.WB Saunders. 2012;597-615.
26. Swain SK, Lenka S, Das SR. Rhino-orbital mucormycosis-a dreaded clinical entity. Int J Cur Res Rev. 2020;12(24):197-203.
27. Swain SK. Age related hearing loss and cognitive impairment–A current perspective. Int J Res Med Sci. 2021;9(1):317-21.
28. Druery M, Brown TL, Muller M. Long term functional outcomes and quality of life following severe burn injury. Burns. 2005;31(6):692-5.
29. Swain SK, Acharya S, Lenka S. Radiation-induced dysphagia and life-threatening stridor in head and neck cancer: A review. Int J Curr Res Rev. 2021;13:157-62.
30. Fraser JF, Choo KL, Kimble RM, Sutch D. The morning after the night before: campfires revisited. Med J Aust. 2003;178(1):30.
31. Bayuo J, Wong FK. Issues and concerns of family members of burn patients: a scoping review. Burns. 2021;47(3):503-24.
32. Swain SK, Das A, Sahu MC, Das R. Neonatal hearing screening: Our experiences at a tertiary care teaching hospital of eastern India. Pediatria Polska. 2017;92(6):711-5.
33. Rivlin E, Faragher EB. The psychological sequelae on mothers of thermally injured children and adolescents: part 3. Dev Neurorehabil. 2007;10:183-90.
34. Benson A, Dickson WA, Boyce DE. ABC of wound healing: Burns. Brit Med J. 2006;332(7542):649-52.
35. Reed JL, Pomerantz WJ. Emergency management of pediatric burns. Pediatric emergency care 2005;21(2):118-29.
36. Jaspers ME, van Haasterecht L, van Zuijlen PP, Mokkink LB. A systematic review on the quality of measurement techniques for the assessment of burn wound depth or healing potential. Burns. 2019;45(2):261-81.
37. Motamed S, Davami B, Daghagheleh H. Trapezius musclo cutaneous flap in sever shoulder and neck burn. Burns. 2004;30(5):426-80.
38. Swain SK, Choudhury J. Pediatric airway diseases. Indian J Heal Sci Biomed Res Kleu. 2019;12(3):196-201.
39. Woolard A, Hill NT, McQueen M, Martin L, Milroy H, Wood FM et al. The psychological impact of paediatric burn injuries: a systematic review. BMC Publ Heal. 2021;21(1):1-27.
40. Swain SK, Sahu MC. An unusual complication of nasal foreign body in a pediatric patient: A case report. Pediatr Polska. 2017;92(1):111-3.

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