Management of Soft Tissue Injuries in Children–A Comprehensive Review

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KEYWORDS

• Pediatric trauma • Soft tissue injuries • Avulsion • Animal bite • Sports injuries • Facial injuries

KEY POINTS

- Pediatric soft tissue injuries may be severe but often present without an underlying fracture because of the significant pliability of the growing facial skeleton.
- Pediatric facial nerve and salivary duct injuries are similarly common like adult penetrating soft tissue injuries.
- Ocular and lacrimal system injuries are to be suspected in children and injury severity is higher compared with adults.
- Animal bites in children have a propensity to cause injury in the periocular subsite, another common cause being motor vehicle accidents.
- Airway examination and evaluation in children especially in penetrating injuries should be similar to adults; literature is sparse but injury sequela are commonly seen.

INTRODUCTION

Soft tissue injuries to the head and neck area in children is particularly challenging to manage, because these injuries can significantly affect the child's overall health and development. The management of such injuries requires a multidisciplinary approach involving surgical and nonsurgical interventions and close collaboration between health care professionals, parents, and caregivers. In this article, we review the various causes of injuries, specific considerations for each region of the head and neck, and approaches to the surgical management of soft tissue injuries in pediatric patients, including pharmacologic and nonpharmacologic therapies.

This article focuses on soft tissue injuries, and reviews specific anatomic regions. These include the scalp/forehead, periorbital region (eg, eyebrows, globe, canaliculi, lacrimal system), nose, cheeks, lips, ears, and neck/airway.

General Principles of Wound Management

The mechanisms of injuries in the pediatric population mimic those of adults and include motor vehicle accidents, trauma, assault, accidental injuries, falls, and others. Although most facial injuries in the pediatric population present without an underlying fracture, soft tissue injuries may be more severe in the pediatric population. Incomplete ossification of children protects the pediatric facial bones from fracture,[1,2] suggesting that blunt trauma may produce more devastating soft tissue injuries but without an underlying fracture. With increasing age, however, the risk for fracture increases by 14% with each additional year.[1,2] Nevertheless, clinical judgment and cause of injury should dictate the need for further imaging.

Facial injuries involve critical functional and esthetic considerations. Careful inspection should

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assess the involvement of the dermis, subcutaneous fat, musculature, nerves, and ducts. Findings should be documented. All wounds should be generously irrigated to prevent local infection and poor wound healing. Generally, layered closure with attention to the alignment of skin edges, hairlines, creases (nasolabial folds), and so forth should be considered. Underlying structures involving nerves, lacrimal system, and so forth should be adequately reviewed before repair. *Advanced Trauma Life Support* principles on trauma management are followed in extensive facial injuries, because airway, brain, and cervical spine injuries are correlated with trauma patterns. Isolated and single subsite facial injuries may not mandate a comprehensive trauma survey.

For the pediatric patient, compliance with repairing injuries in the emergency department may be complex and require treatment in the operating room. For wounds less than 4 cm in length and 0.5 cm in width, tissue adhesives (eg, Dermabond) may be an equivocal alternative to repairing superficial linear lacerations.[3] Additionally, tissue adhesives in these wounds can result in similar cosmetic outcomes when compared with wounds closed by sutures.[3] This is favorable in fearful patients with minor wounds that do not necessarily require general anesthesia for management.

Antibiotic Therapy

Soft tissue injuries of the face are common in children, with most being minor and requiring no more than simple wound care. Small superficial wounds do not require systemic oral antibiotics. But systemic oral antibiotics should be used in high-risk wounds, such as those contaminated with dirt or other foreign bodies, or in children with compromised immune systems.[4] Additionally, tetanus prophylaxis should be administered for contaminated wounds according to local protocols. Even for clean wounds, however, tetanus toxoid should be administered if the patient has had three or fewer doses or it has been more than 10 years since the last immunization (**Figs. 1** and **2**).[5]

SCALP/FOREHEAD

Background and Anatomic Considerations

Head injuries are devastating and cause significant mortality. Pediatric head injuries can have a high case fatality rate of 3.74.[6] Injuries to the scalp may result in traumatic brain injury and excessive blood loss, leading to subsequent hypovolemic shock. Injuries range from superficial abrasions to avulsions, often accompanied by skull fractures.

Pediatric skulls have open suture lines until undergoing ossification beginning approximately at 2 years of age. This is crucial because bones are freely mobile and may offer less brain protection against impact forces. Even puncture wounds from dog bites can often penetrate the soft tissue mantle and the underlying bones leading to an open injury.[7]

Fig. 1. Human bite injury of left cheek.

Fig. 2. Human bite injury postrepair complicated by localized infection.

The cause of most head injuries mimics those of the adult population and is secondary to motor vehicle accidents and falls. The prevalence of isolated scalp injuries without underlying fractures is unclear, because isolated studies are few (Fig. 3).[8]

The scalp is thick in infants and young children. This protects against injuries but is more susceptible to increased bleeding and swelling. The scalp comprises five layers, including the skin, subcutaneous tissue, galea aponeurotica (a dense fibrous layer), loose connective tissue, and the periosteum of the skull.

Rich arterial supply is from the external carotid artery branches, namely the superficial temporal, occipital, and posterior auricular arteries. However, its robust vascularity can lead to significant blood loss and hypovolemic shock if not controlled. The main vessels run along the galea aponeurotica, contributing to extensive blood loss because it is often disrupted.

The scalp is highly innervated and is supplied by branches of the trigeminal and cervical nerves. These sensory nerves travel through the subcutaneous tissue, which, when disrupted, can cause significant pain.

Hair typically obscures lacerations, making it difficult to assess the injury's extent accurately. It also acts as a nidus for dirt and debris, increasing the risk of infection.

Management

As with any injury event, a focused examination and comprehensive history should be taken. Moreover, depending on the clinical presentation and cause of the injury, noncontrast computed tomography (CT) should be obtained to assess underlying fractures and intracranial injury.[9] It may be difficult to thoroughly assess scalp wounds because of excessive hemorrhage, patient management, and the presence of hair and foreign bodies. Therefore, a thorough examination is best performed under general anesthesia before definitive management.[10]

Fig. 3. Repair of scalp injuries with aligned borders of eyebrows.

Because of the scalp's highly vascular structure, uncontrolled hemorrhage can lead to hypovolemia and shock with more significant insults. Control of hemorrhage is crucial to prevent decompensation; arterial bleeds should be ligated timely, and compression should be applied through pressure dressings, and head wraps for hemostasis.

Simple lacerations may be repaired primarily in the emergency department under local anesthesia. However, most scalp wounds are difficult to examine because of the overlying hair and pain, so exploration may best be performed under general anesthesia. When exploring wounds and controlling bleeds, however, electrocautery should be used conservatively in the scalp to minimize damage to hair follicles and resultant alopecia.[9] Complex and avulsive lacerations require repair under general anesthesia and may require local flaps or skin grafts. Tissue expanders may be used for significant avulsive injuries. However, animal models have shown that pressure can cause deformation and erosion in growing facial bones, so we recommend avoiding its use in children younger than 3.[11]

AURICULAR

Background and Anatomic Considerations

Isolated ear injuries in the pediatric population are not well documented in the literature, although it accounts for 7% to 10% of emergency department visits yearly.[12] Injuries range from localized cellulitis, lacerations, and partial to avulsive injuries. A dread complication of auricular trauma is a postinjury or postoperative hematoma, leading to subsequent ear deformity, commonly called "cauliflower ear."

The ear canal is of external and internal contents. The external ear consists of elastic cartilage and acts as a hearing apparatus to direct acoustics through the middle ear for sound transmission by the inner ear. Blood supply to the ear is mainly from the superficial temporal artery and the posterior auricular artery, both arising from the external carotid artery. The neural sensation is from branches of the CN V, VII, and X and branches of spinal nerves C2 and C3.

Management

Auricles have excellent vascularity, and trauma can result in residual injuries with noticeable effects, even when it is hanging on a very thin pedicle if appropriately closed. Another consideration is that vascular tissue must cover all cartilage to avoid necrosis, which may be difficult in complex lacerations where devitalized tissue is removed. Local flaps or skin grafting from the

contralateral ear may be helpful in such situations. After inspection of cartilage involvement, a three-layer closure is performed of the posterior skin, cartilage, and anterior skin. Cartilage is closed with clear 4–0 PDS, posterior skin is closed with absorbable sutures, and anterior/visible skin is closed with 5–0 Prolene or nylon sutures and removed in 5 to 7 days along with the overlying bolster dressing.[12]

PERIORBITAL REGION (EYEBROWS, EYELIDS, CANALICULI, LACRIMAL SYSTEM)

Background

The periorbital region compromises vital substructures that demand careful consideration. This section is subdivided to address the eyebrows, eyelids/conjunctiva, orbital contents (globe, extraocular muscles, periorbital fat, neurovascular bundles), and canaliculi/lacrimal system. For this review, the nose is not considered part of the periorbital region and is discussed later in this review.

When fractures are present in the periorbital region, they are often accompanied by more severe soft tissue injuries when compared with those of adults.[13] A study showed that 30% of patients with orbital fractures had concurrent periorbital and globe injuries.[14] They were also more likely to suffer orbital roof fractures because of immature form of the frontal sinus.[14,15]

Additionally, the injury pattern in this region differs between pediatric and adult populations. According to Hurst and colleagues,[16] children were two times more likely to suffer a periorbital injury from dog attacks when compared with adults. Stature, safety habits, and often reckless play are attributable to the differences in injury patterns and mechanisms among the young. Moreover, compared with other regions of the face, injuries to the periorbital region were more likely to require surgical correction in the operating room.[16] Nevertheless, the cause of periorbital injuries is diverse and includes animal bites, falls, assault, Gun shot wounds, and sports, the most common being motor vehicle accidents.[14]

Orbital Contents Considerations and Management (Globe, Extraocular Muscles, Lacrimal Gland, Periorbital Fat)

Injuries can range from minor corneal abrasions to globe rupture, the most common cause of blindness from orbital trauma. Fractures are associated with ophthalmologic emergencies, such as retinal detachment, vitreous hemorrhage, and optic nerve compression. Open globe injuries are one of the most devastating but are fortunately rare. Generally, globe injury following orbital trauma ranges from 7.2% to 30%.[16] Given the significant morbidity, however, any suspicion of globe injury should warrant immediate ophthalmology consultation because it can lead to permanent vision loss.

It is well established that the most common reason for emergent surgical intervention in the orbital region is inferior rectus muscle entrapment secondary to orbital floor fracture.[14] Traumatic optic neuropathy can occur from any significant trauma to the orbits and is generally irreversible. Unfortunately, there is no substantial evidence that surgical intervention results in more favorable outcomes when compared with observation.[17–19]

Eyebrows Considerations and Management

If poorly managed, lacerations and avulsions of the eyebrows can have devastating esthetic results. The goal of repairing the eyebrows is to align the brows to the contralateral brow symmetrically. Although contamination and avulsions may obscure the eyebrows, it is recommended to avoid shaving if possible. The brows should be closed in layers, with the deeper orbicularis oculi addressed first. Superficially, the superior border should be aligned first, because alignment issues are more noticeable than those of the lower border.[20] If there are multiple injuries, it is advised to close the surrounding lacerations before closing the eyebrows to avoid tension that may distort the final esthetics.

Eyelids Considerations and Management

Special attention is needed in the management of eyelid injuries (**Fig. 4**). Poor wound management may lead to ptosis, lid retraction, scleral show, or persistent deformity that may persist or worsen through adolescent growth.[20] A retrospective review of eyelid lacerations in adults and children indicates that most complications are unrelated to the timing of repair, because many lacerations were repaired after 24 hours. Instead, complications, such as ptosis, lid retraction, and persistent deformity, were related to initial injury severity.[21] The most common cause of eyelid injuries is not well established. In patients with dog bite injuries, however, eyelids were the most commonly injured in the periorbital region.[16] As a general note, conjunctival injuries should be closed with knots away from the cornea to prevent irritation.[20]

Lacrimal/Canalicular Considerations and Management

The lacrimal duct apparatus is complex and merits a high degree of suspicion of injury whenever trauma involves the medial canthal region. Dog

Fig. 4. Laceration injury involving the eyelids.

bites are the most common cause for lacrimal injuries, but fortunately, lacrimal sac and nasolacrimal duct involvement is rare.[22] Murchison and Bilyk[23] reviewed 137 lacrimal system injuries and found that most were isolated lacrimal insults. Diagnosis is made by inspection and careful probing under general anesthesia. If the injury is suspected, the severed ends should be identified and realigned. They are repaired by using a silastic catheter or Crawford tube to align the proximal and distal ends. Severe complications include persistent epiphora, esthetic deformity, and dacrocystitis.

NASAL REGION

Background and Anatomic Considerations

Injuries to the nose range from simple lacerations to total avulsions and requires special consideration in the pediatric population. One such consideration is the two growth areas of cartilage-bony interfaces (eg, septal cartilage) to prevent halting or disruption of midface growth.[24,25] If injured, this could result in decreased projection or asymmetries during the two postnatal growth spurts: early childhood and puberty.

When compared with those of adults, the pediatric nose is supported by cartilage because the nasal bones have incomplete ossification and open sutures lines. The soft, compliant cartilage bends easily during blunt trauma, and the pliable nasal bones are more prone to greenstick fractures when compared with adults.[25] Given this pliability of the nasal structure, even in the absence of a fracture, there is an increased risk for soft tissue disruption and subsequent hematoma.[26] Therefore, septal hematomas were observed to be more common in the pediatric population compared with adults.[26] Septal hematoma is an untreated surgical emergency that can result in avascular necrosis.

Management

The overall goal in repair is to reestablish the premorbid shape and function while preventing subsequent revisions. It is common, however, for nose injuries in pediatric populations to require revisions because of the disruption of growth plates. Immerman and colleagues[27] recommended allowing complete healing before revision, and it was shown that the healing period could range from 6 to 24 months.

Nasal soft tissue injuries should be cleansed, irrigated, and primarily repaired. Full-thickness injuries should be repaired in a layered technique, starting deep and working superficial. Cartilage should be repaired first and done with permanent or slow-absorbing sutures. This reestablishes the proper framework to support the overlying soft tissue. Deep tissue should be repaired with sutures with prolonged absorption, and the nasal mucosa should be repaired with a fine, fast-absorbing suture. Finally, any skin defects should be closed with a fine, nonresorbable or absorbable suture or tissue adhesive, depending on the patient's age.

CHEEK

Background and Anatomic Considerations

The cheek is defined as the region below the eyes and between the nose and ears. This region comprises a large percentage of the face, because it is also bilateral. This region consists of eight muscles shown in **Fig. 5**. Lacerations and avulsive injuries are often caused by sharp, penetrating trauma.[28] It was shown by Hurst and colleagues[16] that this region was the most commonly injured subunit of the central target area (ie, lips, nose, cheeks) from traumatic dog bites.

The cheek comprises most of the facial fat pads and provides the most volume. Injury to these areas can cause significant asymmetry and lack of facial fullness.[29] Branches of the facial and trigeminal nerves innervate the skin and muscles of the cheek. After exiting the stylohyoid foramen, the facial nerve arises from the parotid gland to branch into five main branches to provide motor innervation to the facial muscles. The trigeminal nerve divides into three main branches, providing

Muscles located in the cheek region:

- Orbicularis oculi muscle (lower border)
- Levator labii superioris muscle
- Levator labii superioris alaeque nasi muscle
- Risorius muscle
- Levator anguli oris muscle
- Zygomaticus major and minor muscles
- Buccinator muscle
- Masseter muscle

Fig. 5. Muscles of the cheek.

sensation to the entire face and motor function to the masseter (Figs. 6–12).

Numerous muscles in this region are responsible for facial expression, mastication, and speaking. Lastly, the facial artery and subsequent branches provide a significant blood supply to this region.

The parotid duct facilitates the flow of saliva from the parotid salivary glands to the oral cavity. It originates at the gland, and travels superficially to the master before piercing through the buccinator and terminating intraorally. Clinicians should accurately assess and document parotid duct injuries, which are often not diagnosed during the initial evaluation.[30,31]

Fig. 6. Animal bite injury to oral structures and cheek.

Fig. 7. Extraoral and intraoral lacerations in continuity.

Management

Facial expression, asymmetry, and nerve sensation should be accurately documented before wound exploration and repair. Subsequently, management depends on the structures previously mentioned. Injuries can range from minor abrasions, convulsions, varying thickness of lacerations with often communication to the oral cavity, avulsive injuries, trigeminal (V1) and facial nerve injuries, and parotid salivary duct injuries.

As with other injuries, adequate removal of foreign bodies, debridement, and irrigation should be performed. Vascular injuries should be microsurgically repaired, and soft tissue injuries should be closed in layers with resorbable sutures. Care should be undertaken to avoid unnecessary removal of the facial fat pads to avoid poor cosmesis.

If injury to the parotid duct is suspected, the orifice of Stensen may be probed in the operating room under general anesthesia.[32] If an injury is missed and proper repair is not achieved, it may lead to debilitating facial fistulas or sialoceles.[32] Cannulation is safely performed with a lacrimal probe or an angiocatheter (20–22 gauge)

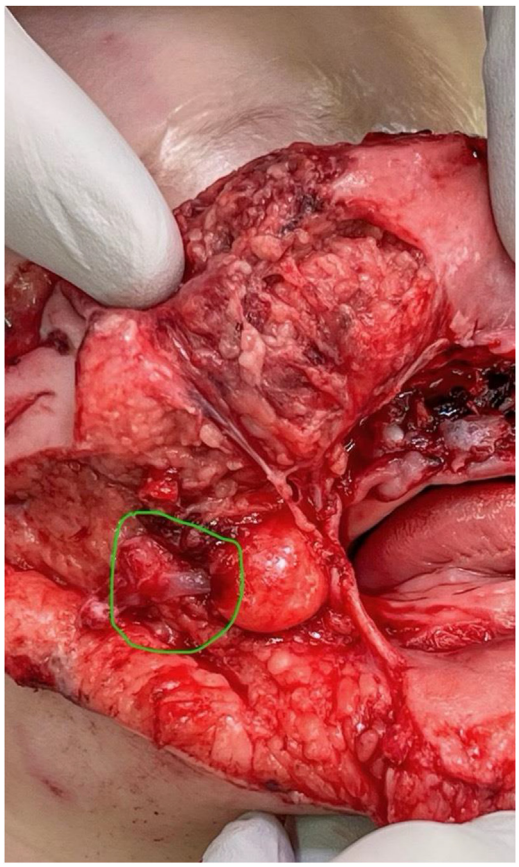

Fig. 8. Identification of parotid duct highlighted with the *green circular* marker

intraorally through the distal end of the Stensen orifice to assess for tract compromise. If saline can be transmitted through the catheter to the outer side, this would confirm an injury to the duct. The anastomosis is performed to reapproximate the severed portions of the duct, with the placement of an intraluminal stent to prevent stenosis, and it is removed after 10 to 14 days (Fig. 13).

Fig. 9. Final repair with primary closure.

Fig. 10. Scars healing well, complicated by cutaneous salivary fistula with continued salivary drainage.

Other options include autologous venous grafts.[33] In situations where the distal end cannot be located or is avulsed, diverting the proximal end to a new location intraorally may be necessary and sutured with 8–0 nylon. In severe injuries that require ligation of the remaining duct, symptomatic management should be pursued during the period in which the parotid gland atrophies. This is accomplished with warm compresses and antisialagogue medications. Postoperatively, sialography should be considered even with successful repair to assess long-term outcomes.

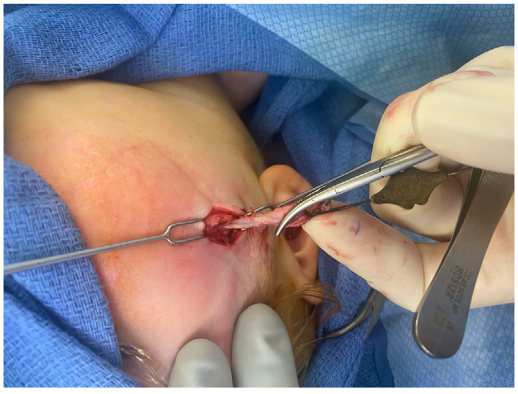

Fig. 11. Repair of postoperative complication of sialocele and cutaneous fistula.

Fig. 12. Fistulectomy and removal of ductal tract.

LIPS

Background and Anatomic Considerations

Lip and intraoral injuries are common in the pediatric population and can result from various trauma etiologies. Avulsive injuries are most common from animal bite injuries. The lips are divided into the upper and lower lips, with the underlying orbicularis oris muscle as the significant musculature. Blood supply is from the branches of the facial artery, and neural sensation is from V2 and V3 to the upper and lower lips, respectively. Motor innervation is from the buccal branch motor of the facial nerve and the marginal mandibular nerve to the upper and lower lips, respectively.

Fig. 13. Deep laceration with concern for facial nerve and parotid duct injury.

Management

Injuries to the lip require attention to proper alignment to prevent easily identifiable defects after repair, the most critical landmarks being the vermilion border, Cupid's bow, and philtral columns.[12]

Generally, injuries should be repaired from inside out and primary closure is achievable as long as only less than one-third of the lip is missing. Oral injuries (teeth, gingiva, mucosa) should be repaired as necessary first. Injuries involving the inner mucosa layer should be closed. A key stitch is then placed to reapproximate the vermilion to ensure proper alignment. Absorbable 4–0 braided sutures should reapproximate the underlying orbicularis, the mucosa is closed with 4–0 chromic gut sutures, and the skin is closed with 5–0 fast-absorbing monofilament or permanent sutures. Proper closure in layers is essential to provide proper function and prevent muscle bulging after recovery.[34]

Most lacerations are closed primarily or with local advancement flaps. Avulsive injuries that involved more than one-third of the lip may require more complex reconstruction, such as local, rotational flaps or free flaps, but is beyond the scope of this review and is rare in the pediatric population.

NECK/AIRWAY

Background and Anatomic Considerations

A penetrating neck injury is defined as one that breaches the platysma muscle, because underlying this layer are the major neck vessels. Multiple retrospective studies found that such injuries are uncommon in the pediatric population.[35–39] However, despite the rarity, the mortality rate is high (6%–40%) and suggests that such injuries can be devastating.[35,38,39] Other complications include airway emergencies, vascular and neurologic compromise, and aerodigestive injuries, all of which can worsen the acute and long-term postinsult course. To our knowledge, there is no comprehensive review of the literature regarding neck injuries in the pediatric population and, thus, no established algorithm for intervention workflow in penetrating neck injuries (**Fig. 14**).

The neck is classically divided into three zones. Zone I is bordered between the clavicles/sternum to the cricoid cartilage. Zone II is bordered by the cricoid cartilage to the angle of the mandible.

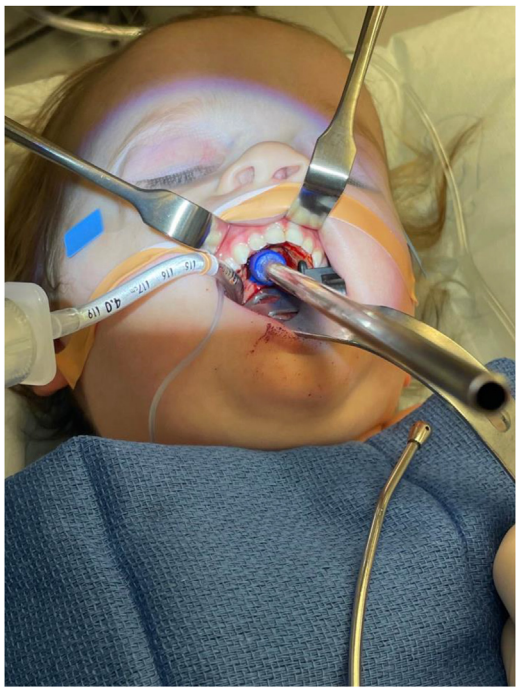

Fig. 14. Intubated patient with intraoral injuries.

Zone III spans from superior to the angle of the mandible to the skull base. Most injuries to the neck in the adult and pediatric population occur in zone II.[35,38,39] The mechanism of injuries varies in the literature but the most common are those secondary to Motor Vehicle Collisions or penetrating injuries.[35,38,40] Animal bites are disastrous but less common than those of assault. Unsurprisingly, projectile/missile wounds typically from foul play and assault occurs more often in older children, whereas animal bites are more common in younger children.[38,40]

Management

It is important to decide whether observation versus surgical exploration is warranted in the injured pediatric patient. The options for management include examination, laryngoscopy, barium swallow, CT with contrast, or CT angiogram. These diagnostic work-ups aid in determining the need for an invasive and traumatic surgical exploration, which have been shown to increase hospital length stay.[39,40] There is no general consensus, however, on which physical examination findings should prompt a mandatory versus selective exploration. Despite using penetration of the platysma as an indication for surgical exploration, most attempts resulted in negative findings.[40] In one study, 18 of 39 (46%) with platysma injury underwent exploration, but 15 of 18 (83.3%) had negative findings.[10,40]

The work-up for penetrating neck injuries remains erratic and varies depending on the

Table 1
Facial scar management in children and safety profile

Surgical Scar Interventions	Medical Therapy	Laser and Multimodal Therapy
Scar revision: Z- or W-plasty; morbidity of additional surgery	5-Fluorouracil efficacy and safety not established in children	CO_2 laser 500 nm
Scar excision: keloids and hypertrophic scars to increase range of facial animation; recurrence rate is high and additional procedures	Corticosteroids: direct injections in hypertrophic and keloid scars; triamcinolone acetonide 40 mg/mL; scar atrophy, recurrence, benzyl alcohol carrier-related toxicity for neonates	Pulsed dye laser 595 nm: hypervascular lesions
Fat transfers and grafting: atrophic scars; growth changes and additional procedures adds to children's distress	Matrix metalloproteinase-1	Laser-assisted drug delivery by fractional photothermolysis elimination and increased absorption
Dermabrasion: not advised in children, adolescents may tolerate well	Fibroblastic activity inhibitors, such as dipeptidyl-peptidase IV	Pigment elimination by Nd-YAG lasers
	Stem cell; interleukin-10; fibroblast growth factor	

Adapted from Krakowski AC, Totri CR, Donelan MB, Shumaker PR. Scar Management in the Pediatric and Adolescent Populations. Pediatrics. 2016;137(2):e20142065.

specialist or attending-on-call.[35] Generally, wound exploration is performed in deep lacerations, those near the major neck vessels, or those who exhibit hemodynamic instability.[35–39] Many authors advocate that the major indications for mandatory exploration should include (1) continued bleeding from a wound, hematoma, shock; (2) blood in the aerodigestive tract; (3) subcutaneous emphysema; (4) neurologic deficits; and (5) inability to accurately access the patient.[36,37,39] Unfortunately, no established guidelines exist for surgical exploration, which remains controversial among trauma surgeons (**Table 1**).

Pediatric patients generally heal well and thus scar revision is reserved if conservative measures fail or if the scar affects function and appearance. Revisions are typically needed if they involve delicate regions with thin tissues, such as the eyelids, and esthetics borders.[41,42]

Conservative therapy aims to reduce the appearance of scars, improve function, and prevent or minimize the risk of hypertrophic or keloid scarring. 5-Fluorouracil and Kenalog injections are typically used in the adult population for scar management, but generally not recommended for pediatric patients. Laser therapies tend to have better results in children when compared with adults because pigmented and vascular lesions become more resistant with age.[41] Generally, the pulsed dye laser is the preferred option. Other well-tolerated options include vitamin E–based petroleum, silicone-based patches, or dermabrasion. Dermabrasion has been studied in pediatric burn patients but has not been extensively studied in trauma patients.

CLINICS CARE POINTS

- During external ear repair in children, the base and projection of the ear should be in three dimensional symmetry to the contralateral side, and should not be advanced or rotated.
- Fluid management and volume resuscitation is critical in burns, soft tissue injury associated bleeds in scalp and perioral subsites of pediatric patients as volume associated shock can be acute.
- Review, repair and dressing in children may need some mild to moderate sedation for anxiolysis and compliance.
- Children had more severe soft tissue injuries Compared to adults with similar periorbital fractures, as Only 30% of children with orbital fractures had concurrent periorbital and globe injuries.
- Periorbital injury pattern facial region differs between pediatric and adult populations. With more severe injuries in children. As children were two times more likely to suffer a periorbital injury from dog attacks when compared to adults.
- Orbital and globe injury incidence is 7- 30% in children, lower than adults but inferior rectus entrapment is more common than direct globe penetrative injury due to green stick fracture of orbital floor.

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