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Laceration repair in children

Background

Issues faced in the management of lacerations in children include control of pain and distress, wound cleaning and closure, referral decisions, awareness of potential associated injuries and strategies to prevent complications and optimise cosmetic outcome. The possibility of non-accidental injury may also require exploration.

Objective

This update will attempt to offer a current, evidence-informed approach to management of the most commonly seen lacerations, and discuss when specialist referral is appropriate.

Discussion

Successful laceration repair in children is a procedure that blends the arts of anaesthesia, distraction and reassurance with the mechanics of tissue repair itself. Although each laceration and each child deserves an individualised approach, certain principles remain consistent and provide the backbone of a decision-making structure in this therapeutic area.

Keywords

lacerations; wound closure techniques; pediatrics



Avoidance of pain and distress is key to successful completion of wound cleaning and repair in paediatric patients. This is as much an art as a science but a multifaceted approach is required. Optimal psychological support is dictated by the developmental stage of the child. A non-threatening explanation of the procedure in developmentally appropriate language can be valuable, as can distraction (bubbles, smartphones and books are particularly useful). Instruments are best kept out of the child's visual axis where possible.

Positive reinforcement of the child's bravery should be liberally provided. Children will take cues from their trusted adult caregivers so a calm and informed parent can be an invaluable asset and should be encouraged to remain with the child throughout the procedure. If it is not possible to gain the cooperation of the patient, which is common in preschoolers, then procedural sedation should be considered.

Any unexpected pain is likely to breach the child's trust in the practitioner so meticulous attention should be paid to local anaesthesia. Although the evidence base for topical anaesthetics remains weak,¹ in the authors' experience they provide effective analgesia with minimal distress on application and facilitate supplementation with injected local anaesthetics.

ALA (Laceraine) is a combination of 0.5% amethocaine, 4% lignocaine and 0.1% adrenaline, which is not approved by the Therapeutic Goods Administration (TGA) but is widely used in Australia for topical application (maximum dose 0.1 mL/kg). The risk profile of ALA is similar to that of other local anaesthetics and, as with all these agents, careful attention must be paid to the total dose received by a patient as, in smaller children or those with larger wounds, inadvertent overdosing is a real risk. EMLA is non-sterile and not approved for application to broken skin as there is insufficient data on absorption from these sites.

Where injection of local anaesthetic agents is required, several techniques have been described for minimising the associated discomfort associated.² Small gauge (25 gauge or smaller) needles should be inserted inside the wound, not through adjacent intact skin, to slowly administer the medication, which has been warmed to approximately body temperature and buffered. Increasing the pH of



lignocaine before injection has been well demonstrated to decrease pain on injection and increase patient comfort.³ This increase in pH is achievable by adding 1 mL of 8.4% sodium bicarbonate to 9 mL of 1% lignocaine.

It is often quoted, not evidence-based but true in the authors' experience, that the way in which a child tolerates the application of topical anaesthetics provides a reasonable indication of how they will tolerate closure of the wound once anaesthesia has been achieved. This can be taken into account along with the child's age, location of the wound and facilities available when determining the need for procedural sedation, detailed discussion of which is beyond the scope of this article.

Adequate cleaning is an essential part of wound care and this is usually achieved with irrigation. Many methods have been described but this can be effectively performed with a 19 gauge cannula attached to a 20-mL or larger syringe. Sterile saline is widely used as an irrigation fluid, although there is evidence to suggest potable tap water is non-inferior for this purpose.⁴ The authors do not favour the use of antiseptics for wound cleansing purposes because of the potential for toxicity to the healing tissue, but acknowledge this is not a consensus viewpoint at this time.

In the case of gravel rash-type abrasions, dirt can be ground into the skin with the potential for a tattooing effect. These wounds require scrubbing with a brush after appropriate anaesthesia. In such cases, anaesthesia can be difficult to achieve and may require that these wounds be managed in theatre despite the simplicity of the procedure itself.

Sharp debridement with a scalpel or sharp tissue scissors is required to remove non-viable or irreversibly contaminated tissue from the wound edge and should allow the clinician to repair a clean, even-edged wound, free of devitalised tissue. Given the importance of facial contours and symmetry to an acceptable cosmetic outcome, clinicians should have a low threshold for referral of facial lacerations requiring sharp debridement.

All wounds should be visibly clean at the time of closure. The decision to close a wound is based on many factors relating to the patient, the practitioner, the wound and the environment. Many practitioners would refer any wound in the region from the eyebrows to the clavicles because of the potential for complications in this area. Wounds that represent a particularly high risk include those around the medial canthus with associated proximity to the lacrimal apparatus, and those overlying the parotid or major branches of the facial nerve. The continuity of the lines of the eyebrow and the vermilion border are of particular cosmetic importance.

Other types of wounds that should be approached with caution include any laceration to the palm of the hand or other area with risk of underlying tendon or neurovascular injury. X-ray or ultrasound should be used if there is any possibility of glass in a wound. Those with suspicion of a retained foreign body, especially in the case of retained organic material, warrant careful consideration of referral as removal of these can be a technically difficult procedure.

Patients who are immunosuppressed have a higher risk of complications, as do those with heavily contaminated wounds. Any laceration or bruise in a non-mobile infant is highly suspicious for non-accidental injury.

The choice of suture material is affected by the site of the injury and by the comfort level of the child. Evidence suggests the cosmetic outcome of non-absorbable sutures (eg nylon) is marginally better than with absorbable materials (eg fast-absorbing catgut).⁵ This marginal gain, however, does not seem to translate to clinical significance and patient satisfaction scores tend to be higher with absorbable materials.⁵ Although the available data cannot be considered definitive, it does make either absorbable or non-absorbable materials reasonable options and thereby supports the discussion of these options with the child and/or parents, with the potential distress of suture removal taken into account.

Suture size is determined by the location of the wound: a size of 4.0 is ideal for deep sutures in many non-weight bearing areas; 3.0 is reasonable for most deep sutures on the trunk and limbs; and 5.0 is suitable for most facial and other superficial repairs, providing good opposition has been achieved in the deeper layer. Excessive tension on the superficial sutures will lead to poorer cosmetic outcomes, probably to more of a significant degree than the size of the sutures used. The choice of suture is multifactorial and these should be considered as suggestions only.

If the wound is deemed to necessitate transfer to hospital for closure then, if contaminated, it should be irrigated as far as patient comfort will allow, and covered with a non-adherent dressing (eg paraffin-soaked gauze) for transit. Avoid temporary closure with steri strips as they make wound assessment at the receiving centre very difficult without distressing the child. A photograph of the wound is helpful to minimise the need for invasive assessment at the receiving centre, but standard data protection concerns must be addressed in accordance with local policy.

Follow-up advice should routinely include signs of infection, but contaminated wounds warrant review within 3–5 days post repair regardless.

Tissue adhesives can achieve comparable outcomes to suturing in appropriately selected wounds.⁶ Ideal wounds for this method of repair are less than 4 cm long, clean and have well opposed edges that are not under tension. Wounds that are gaping, contaminated (including any bite wound) or extend through the subcutaneous tissue are not suitable for this method of closure. Rates of dehiscence are higher with tissue adhesives than with sutures, and dehiscence generally leads to a poorer cosmetic outcome. Adhesive tapes have a high rate of dehiscence and are not adequate for primary closure of wounds under tension;⁷ they usually, therefore, represent a suboptimal choice for wound closure given the available alternatives.

Anything other than a clean, minor wound is tetanus prone. The standard Australian immunisation schedule is considered protective throughout childhood so extra doses are not required at the time of injury, provided the child's immunisations are up to date. Tetanus



immunoglobulin (TIG) is required in any child with a tetanus-prone wound whose vaccination history is in doubt.⁸

Risk of infection is correlated with the degree of wound contamination and time to closure, and inversely correlated with the immune function of the patient and the vascularity of the wounded tissue. Antibiotics are generally not required for clean wounds in immunocompetent patients, but any of the above factors may alter the threshold for their use, recognising that antibiotic cover is of secondary importance to the meticulous cleaning of the wound itself. The clinical guidelines from Royal Children's Hospital, Melbourne, recommend intramuscular procaine penicillin 25–50 mg/kg once and oral augmentin (10–20 mg amoxicillin/kg) 8-hourly for 5 days,⁹ though local guidelines should be followed where available.

Evidence for the following guidelines comes from surgical rather than traumatic wounds¹⁰ but constitutes standard discharge advice from the authors' local specialist paediatric plastic surgical service:

- Scar management should commence as soon as a stable scar has formed.
- Scars must be kept well moisturised (twice daily massage/moisturiser) and protected with tape.
- Taping and covering scars avoids tension and scar-stretch, and provides protection from ultraviolet light. Ideally, scars should be taped for a minimum of 3 months. Micropore is suitable for this.
- Regular scar massage helps minimise a scar reaction, tender-scar formation and sensitive scarring.

Soft tissue wound management in children relies on careful use of local anaesthesia in conjunction with non-pharmacological anxiety management techniques. The optimal outcomes depend on meticulous irrigation, judicious referral and clear discharge instructions, in addition to adequate wound closure technique.

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