10. Bruising, abrasions and lacerations: minor injuries in children I

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Thorough assessment and adequate pain relief facilitates management of minor childhood injuries

ABSTRACT

- Minor injuries in children (those that could reasonably be expected to heal with minimal medical intervention) are extremely common. The possibility of more serious injuries should be considered and excluded early.
- Successful examination requires gaining the child's trust, relieving pain early, and using a flexible and creative examination technique.
- Bruising may suggest a more serious underlying injury, or the bruising pattern may indicate non-accidental injury or a bleeding disorder.
- Superficial abrasions and lacerations can be safely cleaned with good quality water, and all foreign material should be removed. Deeper wounds with suspected damage to nerves, tendons or circulation need formal exploration under a general anaesthetic.
- Good local anaesthesia can be produced by topical preparations, and many wounds can be closed with tissue adhesives with an excellent cosmetic result.
- Antibiotics should be prescribed for specific circumstances, such as wounds with extensive contamination or tissue damage, and all children with injuries should be checked for adequate tetanus cover for prophylaxis.

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Minor injuries in children are extremely common. The combination of a developing physical ability, lack of recognition of dangerous situations and a willingness to robustly explore their environment means that children are more likely than adults to injure themselves. Most of these injuries are managed by the child's parents or carers, or by the child alone, and do not come to medical attention; it is not known how frequently these injuries occur.

Among children of all ages who attend an emergency department, a fall is the commonest cause of injuries. The next most common cause is a strike or collision with a blunt object.[1] The most common types of injuries that children sustain are soft-tissue bruising, abrasions, lacerations, fractures and minor head injuries. The first three types of injuries will be dealt with here, and fractures and minor head injuries will be covered in the next article in the ***MJA* Practice Essentials Series – Paediatrics** (*Fractures and minor head injuries: minor injuries in children II. Med J Aust* 2005; 182 [20 June]).

Assessment of an injured child

"Major" or "minor" injury?

Injury severity in children obviously forms a continuum, with no precise definition of what distinguishes a major from a minor injury. For the purpose of this article, a minor injury is one that could reasonably be expected to heal with minimal medical intervention. Clearly, it is essential to recognise such injuries and exclude "major" injuries.

If the mechanism of injury suggests the possibility of a major injury (eg, a high-speed motor vehicle accident or a fall from a height of ≥ 2 m), assessment of the child should begin with a primary survey, including evaluation of airway, breathing, circulation and conscious state.

Assessment of minor injuries

Assessing minor injuries in children can be challenging. For many possible reasons, children may not cooperate with a physical examination as an adult would. The reasons include pain, fear, shyness or a lack of understanding of what the examiner is requesting.

To increase the chance of a successful examination, it is important to lay the groundwork. Useful strategies include:

- bobbing down to the child's eye level;
- leaving the child in the parent's arms;
- commenting on the toys the child may have brought in;
- gaining trust by talking to the child, as well as to the parents, and explaining what is happening in a manner appropriate for the child's age; and
- dealing with pain early by using analgesics, splinting and distraction.

It is important to minimise the amount of additional pain by handling limbs slowly and sensitively, soaking dressings off wounds and avoiding unnecessary movement. Make only simple requests to the child — ask them to copy a movement demonstrated by you or the parent, and encourage them to reach or grasp toys. Ultimately, a creative and flexible technique with careful observation is crucial in examining children's injuries, especially in determining whether the injury has affected important structures, such as a nerve or tendon.

Additionally, while conducting the examination make an assessment of the likelihood of the child being cooperative during a

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Case study — a 13-month-old boy with a laceration to the head

A mother brings her normal, healthy, 13-month-old son to you 1 hour after he has fallen and struck the left side of his forehead on the edge of a glass coffee table, sustaining a laceration (Figure a).

Management

- After establishing contact with the child by admiring the toy car he has brought with him, you gently clean the wound with saline and control the bleeding with pressure.
- Your clinical examination shows that the wound extends down to the aponeurosis over the frontalis muscle. The wound edges are easily apposed by creating traction along the line of the wound and applying a little digital pressure from the sides of the wound.
- You close the wound with cyanoacrylate tissue adhesive and reinforce the closure with adhesive strips, thus avoiding the need for sedation or local anaesthesia (Figure b).
- You instruct the boy's mother to keep the would clean and dry until the adhesive strips have lifted and the glue has peeled off.
- You discuss with the mother that there is likely to be a mark from the injury on her son's forehead but that this will diminish with time. You reassure her that more extensive surgery on the wound will not alter the outcome at this time.

a: An open laceration to the forehead.

b: Wound closed by tissue adhesive and adhesive tape.

procedure and the type of analgesia and sedation that may be necessary.

Finally, consider the child's vaccination status, allergies to antibiotics or dressings, and pre-existing medical conditions.

Soft-tissue bruising

The commonest sites of soft-tissue bruising in children are the head and lower legs. As bruising generally occurs at or near the site of trauma, the location can assist the clinical examination; for example, a large bruise to the occiput makes it necessary to exclude an intracranial injury; and, similarly, bruising of the fingers will raise suspicion of a fracture. The extent of the bruising, however, is not a particularly good indication of the amount of force sustained, as commonly there is impressive bruising and few, if any, other clinical signs.

It is important to consider the pattern of bruising and whether it is consistent with the history of trauma. Otherwise, it may raise the possibility of non-accidental injury. For example, multiple small rounded bruises occurring on the inner aspect of the upper arms are suggestive of the child being gripped by a hand in this area. Similarly, linear bruises across the buttocks may be caused by the child being struck with an object.

If bruising is extensive, has a typical pattern or occurs in the absence of trauma, or with only minor trauma, the child may have a condition such as idiopathic thrombocytopenic purpura, Henoch Schönlein purpura, or another bleeding disorder.

Management of bruising: A cool pack and oral analgesia are helpful in the first few hours after bruising; however, specific treatment is rarely necessary. Early mobilisation assists in a speedy recovery.

Abrasions

Abrasions commonly occur over the bony prominences of the knees, elbows and face. The epidermis is disrupted and dirt, gravel or bitumen is often ground into the wound.

Management of abrasions: The abrasion should be washed with clean tap water or saline and any foreign material removed by gentle scrubbing using gauze or a brush. This prevents "tattooing" occurring from retained material. During this process, topical anaesthesia, such as lignocaine gel, is useful for small areas, but for removing foreign material from larger areas referral to hospital for general anaesthesia may be necessary, as the maximal doses of local anaesthetics are easily reached. Abrasions are covered with a non-stick dressing, secured with tape or a bandage. The need for pain relief and tetanus prophylaxis should be considered.

Lacerations and incised wounds

Lacerations are caused by a blunt force tearing tissues. They commonly occur as a result of a fall and are often situated on the scalp or over the bony prominences of the face. Incised wounds, caused by a sharp object such as glass or a knife cutting the skin, tend to occur on the hands or feet.

Assessment of the wound

Firstly, ascertain the mechanism of injury and assess the likelihood of injuries other than the obvious laceration; for example, look for an eye injury in facial trauma or dental injury associated with a lip laceration. Consider the possibility of an underlying fracture especially in the hand. Children rarely spontaneously volunteer information about these associated injuries and they are easily missed.

Observe the wound, looking for the site, shape and size, the presence of a tissue flap and possible contamination by dirt or other foreign material. Decide what deeper structures may possibly be involved and specifically test for each. In children, testing the integrity of nerves and tendons needs to be done creatively and flexibly, using simple instructions relayed through parents, and may involve the use of mimicry, toys and playing. Assess the circulation locally and distally to the wound. If the wound is on the face, remember to check the integrity of the facial nerve and the parotid and lacrimal ducts.

Unfortunately, even despite good preparation and technique, not all examinations will be successful. If the wound is deep or there is any doubt as to the integrity of nerves, tendons or circulation, the wound must be formally explored, a procedure best done in the operating theatre under a general anaesthetic.

Wound management

After assessment of the wound and the child in general, a treatment strategy can be devised. This should include:

- whether the child needs analgesia and sedation;
- how the wound will be anaesthetised;
- how the wound will be closed; and
- whether any other treatment such as splinting, tetanus vaccination or antibiotics is needed.

Clearly, the expertise of the doctor and other treating staff, the availability of drugs and equipment and the wishes of the parents and child will all influence the treatments selected.

Pain management

Analgesia and sedation

A number of therapeutic options are possible.[2,3] Select the appropriate agent depending on the wound, the degree of pain, the experience of the staff, and the procedure that is likely to be performed. A summary of options are listed in Box 1.

Some agents such as morphine provide both analgesia and sedation. Be generous with the provision of analgesia and allow time for it to work, as poor pain control is one of the major causes of procedural failure in children.

Supplement pharmacological agents with distraction and guided imagery. Distract the child by focusing their attention on toys or objects, events such as sports or their favourite television program. Ask the child to imagine a pleasant place or event and encourage them to describe it to you.

Local anaesthesia

Local anaesthesia options are also listed in Box 1.

Topical anaesthesia is painless, easy to apply and has a similar efficacy to infiltrated lignocaine.[5] ALA (an adrenaline/lignocaine/amethocaine mixture) is a clear liquid that is applied topically by flooding directly into the wound. A cotton wool pledget inserted between the wound edges and soaked in ALA improves retention of the ALA fluid. It takes around 45 minutes to achieve maximal effect and has the added advantage of reducing bleeding. At present in Australia it is only available for use in hospitals.

EMLA (an eutectic mixture of lignocaine and prilocaine) is a cream that is usually applied to intact skin; however, it appears to be safe and effective for simple extremity lacerations even though it is not licensed for this use.[6,7]

Regional nerve blocks, such as digital, ulna or femoral nerve blocks, are very effective in children. A number of reference books are available that provide the anatomical knowledge and practical instruction necessary to perform them.[3]

Cleaning wounds

All dirt and foreign material in the wound must be located and removed before closure. Superficial wounds may be safely cleaned with good quality tap water.[8] Preparations such as aqueous chlorhexidine are painful to apply and of doubtful benefit. Irrigation with saline under pressure (using a 19-gauge needle on a 10–20 mL syringe) is a good way of dislodging and removing foreign material.

X-rays are helpful for detecting some foreign bodies, especially glass or metallic fragments. Wounds that require exploration should be anaesthetised first to allow more thorough examination and cleaning.

1 Pain management in children with minor injuries

Analgesia and sedation

The options include:

- Paracetamol 20 mg/kg orally as an initial dose (ongoing doses should be 15 mg/kg)
- Codeine 0.5 mg/kg orally
- Paracetamol / codeine mixtures (at doses given above) orally
- Morphine 0.05–0.1 mg/kg intravenously
- Midazolam 0.5 mg/kg orally
- Nitrous oxide / oxygen mixture inhaled, concentration of nitrous oxide up to 70%[4]

Supplement pharmacological agents with distraction and guided imagery

Local anaesthesia

Topical anaesthetics

- Lignocaine gel
- ALA solution* (amethocaine 0.5%, lignocaine 4% in adrenaline 1:1000) (1 mL/kg; maximum, 3 mL). *Note the dose is in mL/kg*
- EMLA (eutectic mixture of 2.5% lignocaine and 2.5% prilocaine)

Infiltrated local anaesthetics

- 1% lignocaine; maximum dose, 5 mg/kg (0.5 mL/kg)
- 1% lignocaine plus adrenaline; maximum dose, 7 mg/kg (0.7 mL/kg)

Regional nerve block

- 1% lignocaine; maximum dose, 5 mg/kg (0.5 mL/kg)
- 0.5% bupivacaine; maximum dose, 2 mg/kg (0.4 mL/kg)

* ALA solution is provided under Schedule 5A, under contract between the manufacturer (Pharmalab) and public and private hospitals. For further information, see <www.pharmalab.com.au>.

Wound closure

Small superficial wounds with opposed edges do not require closure and can be managed with dressings alone. Other wounds may be closed with tissue adhesives, adhesive strips, sutures or a combination of two or three of these.

Tissue adhesives

Tissue adhesives are most successful on wounds that are less than 3 cm long, have clean straight edges, do not require deep sutures and are not under tension when the edges are opposed. They do not require local anaesthesia and are quick and easy to apply. Parents are usually extremely relieved to learn that this is an option for their child's wound. The cosmetic result for a wound closed with tissue adhesives is the same as for wound closure achieved with sutures, staples or adhesive strips.[9] However, with tissue adhesives (compared with sutures), there is a small increase in the incidence of wound dehiscence, but all other wound complications appear to be the same for both wound closure methods.[9]

Any area of the skin may be glued; however, gluing in the vicinity of the eye requires extreme care to prevent any glue dripping into the eye or on to the eyelashes. If gluing the scalp, remove any hair from the wound but do not shave or cut the surrounding hair. Before gluing, the wound must be dry and not bleeding — applying ALA first may assist with this.

To apply tissue adhesive, position the child so the wound is uppermost to minimise the glue running. Ensure the operator is wearing gloves; this is not only for cleanliness, but to ensure that it

is the glove not the operator that is stuck to the child, if adhesive inadvertently runs on to the operator's fingers. The hand can then be removed from the glove, and the glove fingers cut close to the child's skin and left to spontaneously detach. The edges of the wound are brought together with the edges slightly everted, and a thin layer of adhesive is applied on each side of the wound, then the wound is bridged by applying a layer from side to side. Take care not to get adhesive in the wound. The child and parents should be informed that the adhesive will feel warm as it polymerises.

The wound should be kept clean and dry, but a dressing is usually not required, as the wound is covered by the adhesive. The adhesive does not require removal and comes off spontaneously in 1–2 weeks.

Adhesive strips

Adhesive strips are adequate for closing simple wounds that require opposition of slightly separated skin edges on non-hairy areas of the body. They are particularly useful for aligning small flaps of skin back over a wound. They do not remain in place for long periods, and should not be used if there is skin movement or tension across the wound. Make the strips as long as possible, and separate them with sufficient space between each to allow drainage of fluid from the wound. Dress the wound and ask the parents to keep it dry for 72 hours.

Sutures

The techniques of suture placement vary with the size, shape and position of the wound. Adequate analgesia and anaesthesia of the wound is essential before commencing suturing; this is often more difficult and time consuming than the suturing itself.

Scalp wounds can often be closed by the non-surgical techniques already described. However, deep wounds will often need to be sutured in two layers to prevent a cavity from forming in the tissues.

Forehead wounds should have minimal debridement and the eyebrow should not be shaved. Modern absorbable sutures should be used in small children.

Wounds on the chin are often much deeper than they first appear and are prone to scarring. Deep sutures are often necessary to prevent tension on the skin sutures.

2 Indications for tetanus prophylaxis[11]

History of tetanus vaccination		Type of wound	Tetanus vaccine booster	Tetanus immuno-globulin
3 or more doses	< 5 years since last dose	All wounds	NO	NO
	5–10 years since last dose	Clean minor wounds	NO	NO
		All other wounds	YES	NO
	> 10 years since last dose	All wounds	YES	NO
< 3 doses or uncertain		Clean minor wounds	YES	NO
		All other wounds	YES	YES

Evidence-based practice tips

- Topical anaesthetics are as effective as infiltrated lignocaine in children and are less painful to administer (I).[5]
- Tissue adhesives are an acceptable alternative to standard wound closure for repairing selected wounds in children (I).[9]

Levels of evidence (I–IV) are derived from the National Health and Medical Research Council's system for assessing evidence.[12]

Eyelid lacerations involving the lid margin or tarsal plate require accurate opposition and repair, and children with such injuries are best referred to an ophthalmologist or plastic surgeon. Other simple lacerations can be glued or sutured under low tension with fine absorbable sutures.

Wounds around the mouth need careful consideration. If the wound crosses the vermilion border, very accurate approximation of the edges is necessary to achieve a good cosmetic result. In young children, this is often best achieved under general anaesthesia. Wounds that pass completely through the lip need to be closed in layers. Lacerations of the inner lip rarely need any intervention. Children with lacerations of the gum margin (eg, degloving injury) need to be referred for debridement and repair under general anaesthesia.

Wounds of the palate and tongue heal exceptionally well with little or no intervention. They do not require suturing unless they are gaping widely, extending through the free margin or continuing to bleed.

Finger-tip wounds with or without skin loss are very common. Areas of skin loss up to 1 cm^2 are treated with tulle dressings and heal with good return of sensation. Children with any greater degree of tissue loss should be referred for plastic surgical opinion.

Partial amputation or crush injuries of the fingers or toes need to have the integrity of the nail bed assessed. If this is damaged, referring the child for plastic surgery repair is warranted. Fracture of the distal phalanx implies damage to the nail bed, so an x-ray may be warranted in some injuries. If the nail bed is intact, the wound may be closed using adhesive strips or sutures.

Hand wounds need to be carefully examined, as deeper structures are often involved. Lacerations through the dermis risk tendon injury. If any such structures are damaged or there is any doubt, refer for plastic surgical opinion. Neurological function should be tested before local anaesthetic infiltration.

Antibiotics and immunisation

For most lacerations, antibiotics are not indicated for prophylaxis against infection, but wound cleaning and decontamination are most important. Antibiotics should be prescribed for specific circumstances, such as animal or human bites, and wounds with extensive contamination or tissue damage.

Recommended antibiotics for animal or human bites are amoxicillin/clavulinic acid (22.5 mg amoxicillin component per kg up to a maximum of 875 mg) 12-hourly orally for 5 days. Procaine penicillin (50 mg/kg up to a maximum of 1.5 g) intramuscularly may be added if there is likely to be a delay in commencing oral antibiotic medication.[10]

All children should be checked for adequate tetanus cover for prophylaxis. The recommendations of the National Health and Medical Research Council should be followed in determining the need for additional vaccinations (Box 2).[11]

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