

Topical skin adhesives for laceration repair in children

Hajir Adl Erika Henkelman MD FRCSC Ran D. Goldman MD FRCPC

Abstract

Question A 4-year-old child presented to my office recently with a 2-cm forehead laceration. The child had needle phobia and was very upset, so suturing in the office might have been very challenging. The parents were also concerned about the use of suture. Can topical skin adhesives (TSAs) be used instead of sutures, and what factors should be considered?

Answer Lacerations in children are common and TSAs are useful alternatives to sutures. They achieve comparable outcomes to suturing in appropriately selected wounds. Appropriate lacerations are small, superficial, appropriately cleaned, and have well approximated edges that are not under tension. Complications such as wound dehiscence and infection are rare and cosmetic outcomes are comparable to sutures. Using TSAs can also save time, minimize patient anxiety, and eliminate the need for suture removal.

Les adhésifs cutanés topiques pour réparer les lacérations chez l'enfant

Résumé

Question Un enfant de 4 ans s'est récemment présenté à ma clinique avec une lacération de 2 cm sur le front. L'enfant avait une phobie des aiguilles et était très énervé, ce qui aurait grandement compliqué la tâche de faire une suture à la clinique. Les parents étaient aussi préoccupés par le recours à la suture. Les adhésifs cutanés topiques (ACT) peuvent-ils être utilisés au lieu des sutures, et de quels facteurs faut-il tenir compte?

Réponse Les lacérations sont fréquentes chez les enfants, et les ACT sont d'utiles solutions de rechange aux sutures. Ils produisent des résultats comparables à ceux des sutures dans le cas de certaines plaies sélectionnées de façon appropriée. Pour être appropriée, la lacération doit être petite, superficielle, adéquatement nettoyée, et ses bords doivent être bien rapprochés, sans tension. Les complications comme la déhiscence et l'infection de la plaie sont rares et, sur le plan esthétique, les résultats sont comparables à ceux des sutures. L'utilisation des ACT peut aussi épargner du temps, atténuer l'anxiété du patient et éliminer la nécessité d'enlever les points de suture.

About 13.8% of child primary care office visits in the United States are because of injuries, making it the fourth most common concern for children in primary care.¹ Open wounds are the most common presentation of these injuries¹ and choosing an appropriate repair method, such as sutures, staples, adhesive tape, or topical skin adhesives (TSAs), is essential.

A TSA is a liquid cyanoacrylate monomer that polymerizes into long chains in the presence of moisture, forming a film that adheres tissue edges together if approximated appropriately.² Two commonly used TSAs are butyl cyanoacrylate and octyl cyanoacrylate.² Octyl cyanoacrylate has been reported to be more flexible and to have 4 times the strength of butyl cyanoacrylate.² Application technique of TSAs is easy to learn, with first-time users having a similar procedure duration, ease of use, and post-repair cosmetic outcome comparable to more experienced users, based on physician self-reported

impression.³ Topical skin adhesives are commonly used in pediatric care; among 2044 children in a pediatric hospital in Montreal, Que, 88% of appropriately selected facial lacerations were repaired using TSAs.⁴

Benefits of TSAs

Topical skin adhesives have several potential benefits over sutures. They do not require an injection of local anesthetic (that might provoke anxiety in some patients), reduce the risk of needle injury, and eliminate the need for suture removal.^{2,5} With octyl cyanoacrylate, repaired lacerations can be wet briefly during a shower, although patients should avoid soaking the wound.² A multicentre randomized controlled trial (RCT) of 814 patients with 924 wounds found that the mean procedure time of 2.9 minutes (95% CI 2.5 to 3.4 minutes) with octyl cyanoacrylate was significantly faster than the mean procedure time of 5.2 minutes (95% CI 4.7 to 5.7 minutes) with

standard wound closure (331 suturing, 132 adhesive tape, and 6 staple procedures; $P < .001$).⁵ A systematic review of 8 trials reported that procedure time (weighted mean difference of -5.7 minutes; 95% CI -8.2 to -3.1 minutes) and pain based on a parent visual analogue scale (weighted mean difference of -15.7 mm; 95% CI -21.9 to -9.5 mm) significantly favoured TSAs compared with sutures.⁶ Another potential benefit of TSAs is the reduced risk of infection. An *in vitro* study revealed that octyl cyanoacrylate has bactericidal properties against Gram-positive bacteria⁷; however, this has not been proven in clinical trials.

Using TSAs

Topical skin adhesives are commonly used in lacerations 1 to 4 cm in length, with edges that are well approximated before application.^{4,5} Among 455 simple lacerations or surgical incisions closed with TSAs, the mean (SD) width of the wounds was 3.5 (3.9) mm.⁵ Topical skin adhesives are only appropriate for superficial lacerations no more than 4 to 8 mm deep and are not meant to replace subcutaneous or deep dermal sutures necessary for deeper wounds.⁵

In a retrospective study of 1804 patients with lacerations repaired with TSAs, most lacerations were on the forehead (29%), scalp (23%), and chin (18%).⁴ The authors did not recommend using TSAs for high mobility sites such as around the nose, mouth, and eyelids.⁴ Topical skin adhesives can be safely used for low-tension torso and extremity lacerations with a similar complication rate comparable to suturing.⁵ They should not be used in jagged or stellate lacerations, in high tension or mobile areas such as over joints (unless immobilized to avoid dehiscence), in wounds caused by animal or human bites, in crush injuries or punctures, in wounds with evidence of infection, or in patients with increased risk of infection (eg, insulin-dependent diabetes or immunodeficiency).^{2,4-6}

Nail-bed injuries are also common in children: in a prospective case series in 31 children, use of TSAs was not associated with any complications or functional impairment and had good cosmetic outcome based on a surgeon's evaluation.⁸ However, this study was done in children under general anesthesia with the wounds thoroughly debrided and aligned before application of a TSA.⁸ Other potential indications for using TSAs might include extraoral and perioral procedures.⁹ Octyl cyanoacrylate use in pediatric lip closure has been shown to be as effective as sutures, with equivalent cosmetic outcome as assessed by 3 blinded plastic surgeons using a visual analogue scale.¹⁰ However, caution should still be taken when using TSAs in moist areas to avoid sloughing the adhesive, which could require reapplication of the TSA.¹¹ Last, traumatic eyelid injuries, not involving the eyelid margin, had similar healing characteristics and complications with TSAs compared with sutures.¹²

Cosmetic outcome

Scar cosmetic appearance is an important outcome after wound closure and can be a concern for parents and children. Topical skin adhesives were found to have similar cosmetic outcome as sutures, adhesive tape, and staples at 3 months post injury.⁵ A prospective RCT compared closing the superficial layer of a surgical incision using TSA in 26 closures with closing the layer using subcuticular sutures in 33 closures.¹³ After 2 to 3 weeks there was no significant difference in parent satisfaction with wound cosmetic appearance as measured by a visual analogue scale.¹³ A systematic review of 9 RCTs looking at the use of TSAs in traumatic lacerations reported no difference in cosmetic outcome between TSAs and standard wound closure, based on a visual analogue scale.⁶ Cosmetic appearance at 3 months has been shown to be a good predictor of long-term outcome at 1-year follow-up.¹⁴ When comparing octyl cyanoacrylate to adhesive strips, 2 RCTs (total of 141 pediatric patients) reported no significant difference in cosmetic outcome; results were based on scores from a visual analogue scale completed blinded by plastic surgeons.^{15,16}


Complications

Skin closure with TSAs carries the same risks as suture closure, including poor scarring, infection, and dehiscence.^{4,6,15,16} In surgical procedures, there have been no significant differences in infection or dehiscence rates between TSAs and standard suture repair for closure of the superficial layer.^{5,13} In 2044 children with traumatic lacerations, TSA use did not have a greater risk than suture use for dehiscence (0.7% vs 0.5%, respectively) or infection (0.1% vs 0.5%, respectively).⁴ In treating chin lacerations, the risk of dehiscence was higher with TSA use than suture use, but this was not statistically significant (2.2% vs 0%, respectively; 95% CI -7.5% to 4.4%).⁴ The number needed to harm for wound dehiscence was 500 for all facial lacerations and 45 for chin lacerations.⁴ Another systematic review calculated the number needed to harm as 25.⁶ In 2 RCTs comparing octyl cyanoacrylate with adhesive strips, a total of 11 out of 68 children treated with octyl cyanoacrylate and 2 out of 73 children treated with adhesive strips had wound complications such as infection and dehiscence; however, this difference was not statistically significant.^{15,16}

Rare reports of contact dermatitis have been found,^{17,18} and caution should be exercised when using TSAs around the mouth and eyes of infants, as there have been reports of partial mouth closure or eyelid closure with associated corneal abrasions.^{19,20} Trendelenburg position or use of chloramphenicol 1% ointment as a barrier might help prevent inadvertent glue in the eyes.^{2,20}

Conclusion

Topical skin adhesives are easy to apply and are safe to use for closure of small, linear lacerations in areas of low

tension. They are faster and less painful than sutures and have similar cosmetic outcome. Complications such as dehiscence and infection are rare. Despite these risks, wound closure with TSAs is just a single step in wound management in children, but appropriate irrigation, debridement, and deep suturing might be required in cases of more complex lacerations 

Competing interests

None declared

Correspondence

Dr Ran D. Goldman; e-mail rgoldman@cw.bc.ca

References

- Hambidge SJ, Davidson AJ, Gonzales R, Steiner JF. Epidemiology of pediatric injury-related primary care office visits in the United States. *Pediatrics* 2002;109(4):559-65.
- Singer AJ, Quinn JV, Hollander JE. The cyanoacrylate topical skin adhesives. *Am J Emerg Med* 2008;26(4):490-6.
- Lin M, Coates WC, Lewis RJ. Tissue adhesive skills study: the physician learning curve. *Pediatr Emerg Care* 2004;20(4):219-23.
- Ste-Marie-Lestage C, Adler S, St-Jean G, Carrière B, Vincent M, Trottier ED, et al. Complications following chin laceration repair using tissue adhesive compared to suture in children. *Injury* 2019;50(4):903-7. Epub 2019 Mar 29.
- Singer AJ, Quinn JV, Clark RE, Hollander JE; TraumaSeal Study Group. Closure of lacerations and incisions with octylcyanoacrylate: a multicenter randomized controlled trial. *Surgery* 2002;131(3):270-6.
- Farion KJ, Osmond MH, Hartling L, Russell KF, Klassen TP, Crumley E, et al. Tissue adhesives for traumatic lacerations: a systematic review of randomized controlled trials. *Acad Emerg Med* 2003;10(2):110-8.
- Rushbrook JL, White G, Kidger L, Marsh P, Taggart TF. The antibacterial effect of 2-octyl cyanoacrylate (Dermabond®) skin adhesive. *J Infect Prev* 2014;15(6):236-9. Epub 2014 Nov 30.
- Langlois J, Thevenin-Lemoine C, Rogier A, Elkaim M, Abelin-Genevois K, Vialle R. The use of 2-octylcyanoacrylate (Dermabond®) for the treatment of nail bed injuries in children: results of a prospective series of 30 patients. *J Child Orthop* 2010;4(1):61-5. Epub 2009 Nov 13.
- Borie E, Rosas E, Kuramochi G, Etcheberry S, Olate S, Weber B. Oral applications of cyanoacrylate adhesives: a literature review. *Biomed Res Int* 2019;2019:8217602.
- Knott PD, Zins JE, Banbury J, Djohan R, Yetman RJ, Papay F. A comparison of Dermabond tissue adhesive and sutures in the primary repair of the congenital cleft lip. *Ann Plast Surg* 2007;58(2):121-5.
- Carleo C, Singer AJ, Thode HC Jr. Effect of frequent water immersion on the rate of tissue adhesive sloughing: a randomized study. *CJEM* 2005;7(6):391-5.
- Hartstein ME, Fink SR. Traumatic eyelid injuries. *Int Ophthalmol Clin* 2002;42(2):123-34.
- Ong CC, Jacobsen AS, Joseph VT. Comparing wound closure using tissue glue versus subcuticular suture for pediatric surgical incisions: a prospective, randomised trial. *Pediatr Surg Int* 2002;18(5-6):553-5. Epub 2002 Jun 14.
- Quinn J, Wells G, Sutcliffe T, Jarmuske M, Maw J, Stiell I, et al. Tissue adhesive versus suture wound repair at 1 year: randomized clinical trial correlating early, 3-month, and 1-year cosmetic outcome. *Ann Emerg Med* 1998;32(6):645-9.
- Mattick A, Clegg G, Beattie T, Ahmad T. A randomised, controlled trial comparing a tissue adhesive (2-octylcyanoacrylate) with adhesive strips (SteriStrips) for paediatric laceration repair. *Emerg Med J* 2002;19(5):405-7.
- Zempsky WT, Parrotti D, Grem C, Nichols J. Randomized controlled comparison of cosmetic outcomes of simple facial lacerations closed with Steri Strip Skin Closures or Dermabond tissue adhesive. *Pediatr Emerg Care* 2004;20(8):519-24.
- Gonzalo-Garjito MA, Pérez-Calderón R, Pérez-Rangel I, Sánchez-Vega S, Constantino JA, Zambonino MA. Contact dermatitis after orthopaedic surgery. *Contact Dermatitis* 2009;61(5):299-300.
- Liu T, Wan J, McKenna RA, Jackson OA, Treat JR. Allergic contact dermatitis caused by Dermabond in a paediatric patient undergoing skin surgery. *Contact Dermatitis* 2019;80(1):61-2. Epub 2018 Oct 10.
- Jagannathan N, Hallman M. Complications associated with 2-octyl cyanoacrylate (Dermabond): considerations for the anesthesiologist. *J Clin Anesth* 2010;22(1):71-2.
- Coutts SJ, Sandhu R, Geh VS. Tissue glue and iatrogenic eyelid gluing in children. *Pediatr Emerg Care* 2012;28(8):810-1.

Can Fam Physician 2021;67:260-2. DOI: 10.46747/cfp.6704260



Child Health Update is produced by the Pediatric Research in Emergency Therapeutics (PRETx) program (www.pretx.org) at the BC Children's Hospital in Vancouver, BC. **Ms Adl** and **Dr Henkelman** are members, and **Dr Goldman** is Director of the PRETx program. The mission of the PRETx program is to promote child health through evidence-based research in therapeutics in pediatric emergency medicine.

Do you have questions about the effects of drugs, chemicals, radiation, or infections in children? We invite you to submit them to the PRETx program by fax at 604 875-2414; they will be addressed in future **Child Health Updates**. Published **Child Health Updates** are available on the *Canadian Family Physician* website (www.cfp.ca).