Clinical Evidence for Histoacryl®
<table>
<thead>
<tr>
<th>Content</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rationale</td>
<td>3</td>
</tr>
<tr>
<td>Clinical Evidence</td>
<td>6</td>
</tr>
<tr>
<td>Key Messages</td>
<td>14</td>
</tr>
<tr>
<td>Abstracts</td>
<td>16</td>
</tr>
<tr>
<td>References</td>
<td>26</td>
</tr>
</tbody>
</table>
Rationale

Histoacryl® is a n-butyl-2-cyanoacrylate tissue adhesive. Applied to the skin, the monomer hardens almost immediately in contact with physiological liquids. Histoacryl is widely used in many medical disciplines, including emergency care, internal medicine, ophthalmology and dentistry.

The most frequent indications for use of Histoacryl are:
- Surgical incision closure
- Laceration closure

For all these indications several reviews and clinical trials have been published to describe the individual technical approach, benefits and risks. Different reviews were published in previous years regarding the use of tissue adhesive for haemostasis in active bleeding of gastrointestinal varices, concerning the treatment of lacerations and incisions with tissue glues two systematic reviews are available (1, 2).

**Histoacryl for laceration closure**

The management of lacerations requires keeping the cleaned wound edges together until natural healing occurs. Traditionally, sutures either absorbable or non-absorbable are applied for this purpose. Sutures often cause postoperative pain that is associated with the procedure by stitches, which also needs the application of local analgesics. Furthermore, for the removal of non-absorbable suture material patients have to come back to the physician. Tissue adhesives are a good alternative to sutures as the liquid monomer is applied over the wound and forms a strong bond over the approximated wound edges. Elmasalme et al. (3) described the method of skin closure with tissue adhesives as follows: ‘The edges of the wound have to be approximated leaving no gap between them and kept together with fingers or forceps. A thin layer of Histoacryl is then applied to the wound. If reposition is necessary, the glue has to be wiped off immediately. The edges are kept together for 60 – 90 seconds until polymerization is finished. No further care is needed as Histoacryl film disappears after approximately one week.’ The use of tissue adhesives is limited to small wounds without tensile strength. The main target of most published clinical trials comparing tissue glues versus sutures for wound closure, is the postoperative cosmetic outcome, postoperative pain and costs.
**Rationale**

Figure 1: Application of tissue glues for laceration closure.

**Histoacryl® for incision closure**
Tissue adhesives have become more and more standard for closing small lacerations and it is now also used for incision closure. The premises are equal for both situations, because both indications need the approximation of wound edges and must keep together until wound healing. The technical approach is similar, Yulevich et al. (4) described the method as follows: 'Two skin hooks are placed in the corners of the incision, the skin is lifted and with the tip of a small surgical forceps, eventual appearing subcutaneous material is pushed back into the wound. Then, the hooks are pulled away and pushed down lightly. By this a good aesthetic appearance can be achieved and Histoacryl is prevented from leaking into the wound. A thin white line indicates a good wound approximation. Histoacryl is then applied to the wound in a thin layer with long movements. It is essential that a film of Histoacryl is formed that will keep the edges together in the postoperative course'. The crucial difference between incisions and lacerations is that pain as outcome measure is irrelevant as patients received anaesthesia for the incision anyway. The other concerns like cosmetic result, time for procedure and costs are also relevant for this indication.
N-butyl-2-cyanoacrylate glue for laceration closure

Farion et al. (1) summarized in their Systematic Review the best available clinical evidence for tissue adhesive for laceration closure in children and adults. Randomized controlled trials comparing tissue adhesive versus standard wound closure procedures (suture, strips or staples) for laceration in children and adults in emergency settings and primary care setting were included. As parameters the cosmetic result, pain, procedure time and the complication rate were assessed. The cosmetic outcome was evaluated as a primary outcome by a blinded plastic surgeon using different cosmetic scores.

Eight trials compared tissue adhesive versus suture or strips and there was one study comparing two different tissue adhesives. There was no significant difference regarding the cosmetic result between the two different closing treatments (tissue adhesive versus standard wound closure). The pain rate was significantly lower and time to performed the closure was significantly faster with tissue adhesive. Using standard wound closure methods the rate of dehiscence was significantly lower compared to tissue glue, in contrast erythema was rarely seen with tissue adhesive than with standard wound closure procedures. Other complications were not recorded. There was one study comparing two different tissue glues (Histoacryl® versus octyl-cyanoacrylate). No difference was observed in regard to cosmesis, pain, complications and time for procedure. One study also analyzed the economic effect of sutures versus tissue adhesive for closing lacerations. They found that the use of absorbable suture increased cost of 2.4 times and non-absorbable sutures of 8.8 times in comparison to tissue adhesives.

The authors described the use of tissue adhesives as a suitable alternative in comparison to standard wound closure materials like sutures, staples and strips for simple traumatic laceration closure. Tissue adhesives offer the advantage of a lower pain rate and a faster procedure time, whereas the complications rate is more or less comparable with both treatments (sutures and adhesive glues).

Elmasalme et al. (3) treated over 2,600 small lacerations in the emergency rooms using Histoacryl. They indicated in their publication that the use of this tissue adhesive has the advantages that it does not require local anaesthesia, gloves or suturing. Furthermore, this method is simple, fast, inexpensive and can be perfected with minimal training. The success rate was very high.
Göktas and colleagues (5) compared tissue adhesives and suturing for the repair of lacerations in the emergency department. Histoacryl® was analyzed in comparison to non-absorbable polypropylene suture material in regard to the cosmetic outcome, costs, patient, and physician satisfaction. In total 92 patients with lacerations equal or shorter than 5 cm were enrolled in the investigation. Patients were randomly allocated to one of the different treatment groups and examined for 3 months. The groups were comparable in respect to the cosmetic appearance at 10 days and 3 months postoperatively using the Visual Analogue Scale (VAS). Application of Histoacryl resulted in a greater satisfaction of the patient and the blinded surgeon. Also costs were significantly reduced when Histoacryl was applied in comparison to the suture.

The authors concluded that the use of Histoacryl is cheaper than sutures for the repair of lacerations and that it results in a greater satisfaction of the patient and the surgeon. The cosmetic result is similar with both treatments. Their results indicated that Histoacryl is a cost-effective alternative to suture repair for selected laceration in emergency settings.

Several clinical studies have been performed which compared the use of Histoacryl versus octyl-cyanoacrylate glue (Osmond et al.) or versus suture material for the closure of pediatric lacerations (7 - 11). In these studies it has been reported that the use of Histoacryl is faster and less painful than suture repair for laceration closure. The complication rate as well as the cosmetic result were similar and comparable. The butyl-cyanoacrylate glue was described as an acceptable alternative to conventional suturing which prevents suture removal and leads to a more efficient use of physician time.

The comparison with octyl-cyanoacrylate glue showed that both glues are comparable in regard to pain rate, complication rate, cosmetic outcome and time to perform the wound repair.

CONCLUSION: The use of butyl-cyanoacrylate glue such as Histoacryl is a good alternative to conventional suturing for closure of low tension lacerations. Tissue adhesive glue is significantly faster and less painful than suturing. Tissue adhesive glue has the same cosmetic outcome as suturing when used for the repair of simple lacerations, but the need for suture removal is eliminated. In comparison to suture repair the application of tissue adhesive glue is less expensive and leads to a higher satisfaction of the patient and of the surgeon.

Charters et al. (6) compared butyl-cyanoacrylate and octylcyanoacrylate glue for the closure of lacerations in children. In total, 63 lacerations located in the scalp, ear and face area were closed. Patients were equally distributed to the different used products and were treated consecutive. The pain rate, the bonding time, the application and wound closure were assessed. The data showed that the use of butyl-cyanoacrylate resulted in lower pain than octyl-cyanoacrylate glue. Regarding the bonding time all used devices achieved high scores in terms of bonding but comments were made to the prolonged bonding time of octylcyanoacrylate. The nurses who applied the glues commented that butyl-cyanoacrylate was easier to apply and was the best glue in terms of wound closure.

Octyl-cyanoacrylate was found to be less successful in the closure of scalp wounds although good results were obtained on small facial lacerations. In conclusion, all glues lead to a satisfied result in terms of wound closure and easy use, however the use of butyl-cyanoacrylate leads to the more consistent result and to higher scores.
Table 1: Trials comparing tissue adhesives versus standard wound closure procedures for laceration.

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>No. Patient</th>
<th>Product</th>
<th>Cosmesis</th>
<th>Pain/Satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charters et al.</td>
<td>2000</td>
<td>63</td>
<td>Butyl-cyanoacrylate vs. octyl-cyanoacrylate</td>
<td>NR</td>
<td>Pain: BCA &lt; OCA Satisfaction: BCA &gt; OCA</td>
</tr>
<tr>
<td>Simon et al.</td>
<td>1997</td>
<td>61</td>
<td>Histoacryl: 30 Suture: 31</td>
<td>H = S</td>
<td>NR</td>
</tr>
<tr>
<td>Bruns et al.</td>
<td>1996</td>
<td>61</td>
<td>Histoacryl: 30 Suture: 30</td>
<td>H ≥ S</td>
<td>Pain: H &lt; S       Satisfaction: H &gt; S</td>
</tr>
<tr>
<td>Quinn et al.</td>
<td>1993</td>
<td>81</td>
<td>Histoacryl: 41 Suture: 40</td>
<td>H = S</td>
<td>Pain: H &lt; S</td>
</tr>
</tbody>
</table>

NR: Not recorded; = equal, > significant better for cosmesis or significant higher for satisfaction; < significant lower for pain and complication or significant faster for procedure time, H: Histoacryl, S: Suture, BCA: Butyl-cyanoacrylate, OCA: Octyl-cyanoacrylate, Ad: Adhesive tissue glue, SWC: Standard wound closure
<table>
<thead>
<tr>
<th>Procedure Time</th>
<th>Complication</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ad &lt; SWC</td>
<td>Dehiscence: SWC &lt; Ad</td>
<td>Ad &lt; SWC</td>
</tr>
<tr>
<td></td>
<td>Erythema: Ad &lt; SWC</td>
<td></td>
</tr>
<tr>
<td>NR</td>
<td>NR</td>
<td>H &lt; S</td>
</tr>
<tr>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>H = OCA</td>
<td>H = OCA</td>
<td>H = OCA</td>
</tr>
<tr>
<td>H &lt; S</td>
<td>H = S</td>
<td>NR</td>
</tr>
<tr>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>H &lt; S</td>
<td>H = S</td>
<td>NR</td>
</tr>
<tr>
<td>H &lt; S</td>
<td>H = S</td>
<td>NR</td>
</tr>
</tbody>
</table>
N-butyl-2-cyanoacrylate glue for incision closure

A Systematic Review (SR) was performed by Coulthard et al. (2) to determine the effect of various tissue adhesives versus conventional skin closure techniques (suture, staples, tapes) on the wound healing of surgical skin incisions.

In total eight randomized controlled trials including 630 patients were eligible for this SR. These trials compared tissue adhesive glues versus suture and two of these trials also analyzed tissue adhesives versus tapes. The primary parameter was the proportion of dehiscence. As secondary endpoints wound infection, patient and surgeon satisfaction, the cosmetic appearance of the wound rated by the patient and the surgeon and costs were evaluated. Butyl and octyl-cyanoacrylate were used as a tissue adhesive glue in 4 trials. Catgut, Dexon™, polypropylene, nylon and poliglecaprone were applied as suture material for wound closure.

In regard to dehiscence, infections and satisfaction with the cosmetic result (rated by the patient and the surgeons) no significant differences were found between tissue adhesives glues and suture material. Also, no differences could be observed for infection, satisfaction and the cosmetic outcome rated by the patient when tissue adhesive glues were compared with tapes; however, a significant difference was recorded for this comparison in respect to the cosmetic result rated by the surgeon obtaining a better rating for tissue adhesive glues.

The authors concluded that there is no difference in the rate of dehiscence, wound infection, satisfaction or the cosmetic outcome after surgical wound closure with tissue adhesive glues or sutures. Further trials should be conducted investigating the efficacy of tissue adhesive glues in areas with high tissue tension or in patients with impaired wound healing.

In 2011, this Systematic Review was updated by Coulthard et al. (12). Six additional randomized controlled trials were included. In total, 1152 patients were enrolled in 14 RCTs. The data showed that suture material was significantly better in regard to dehiscence. In contrast, to tissue adhesives the suture was faster to apply but the incidence of infection was comparable with both devices. No differences could be found regarding patient’s and surgeon satisfaction or costs. The authors concluded that the use of suture is faster in comparison to tissue adhesive glues and that the application of suture leads to a lower dehiscence rate than tissue adhesive glues. Although tissue adhesive glues present an alternative to conventional wound closure methods the surgeon must be aware of the fact that if higher tension is needed upon an incision the use of these glues may increase the dehiscence rate in comparison to suture material.
Therefore, more randomized clinical trial should be performed to investigate the outcome of tissue adhesives glues in comparison to conventional closing methods in patients with surgical site of high tension.

Bozkurt et al. (13) compared butyl-cyanoacrylate glue with interrupted non-absorbable suture for closing wound after head and neck surgery. Eighty patients undergoing different head and neck surgical procedures received either suture material (N = 32) or cyanoacrylate glue (N = 48) for wound closure. Patients were examined after 2 weeks, 1 and 3 months postoperatively. The complication rate, the cosmetic result and the satisfaction were assessed.

The length of the incision was comparable in both groups. Wound closure with cyanoacrylate glue was significantly faster than with suture (33.39 ± 9.77 vs. 504.38 ± 169.27 sec.; p = 0.001). The cosmetic result was rated good in the cyanoacrylate group. Complications were not observed in any treatment group. After three months no wound dehiscence, wound infection and hypertrophic scar was seen. An excellent closure of the wound with butyl-cyanoacrylate was obtained. Patients were satisfied with the result in the glue group. Cosmetic outcome was rated equal or better than suture closure because of the absence of suture marks and a lesser degree of scar formation. The study indicated that wound closure with cyanoacrylate glue is easy and fast and results in a good cosmetic outcome with a low complication rate.

Ozturan and colleagues (14) investigated the outcome of butylcyanoacrylate glue in patients scheduled for an elective rhino plastic surgery. The skin closure was performed by the application of non-absorbable suture material polypropylene or cyanoacrylate glue. Patients were allocated to the different treatment groups by randomization. The cosmetic outcome was rated by two blinded surgeons. Patients were examined once a week until the first month and thereafter once a month until 3 months postoperatively. In total 101 patients were enrolled. No dehiscence, hematoma or seroma was seen in either treatment group. The closure with suture material took more time to perform as the procedure with tissue adhesive glue (155 ± 25 sec vs. 55 ± 10 sec; p < 0.01). Also the cost for the glue was lower than for the suture material.

The cosmetic outcome rated by the surgeon was comparable in both groups.

This randomized controlled trial showed that the application of cyanoacrylate glue is a safe and efficient alternative to suturing for wound closure. The use of cyanoacrylate glue eliminates the need for suture removal and related distress.

Amiel et al. (15) performed a study to evaluate the performance of butyl-cyanoacrylate glue for the closure of tension free incisions in children. The cosmetic outcome and the complication rate were assessed. Children (N = 1,098) undergoing different surgical procedures obtained Histoacryl for wound closure. Cosmetic outcome was rated by the parents using a scale from 0 - 5. Redness was seen in 5.5 %, wound dehiscence was observed in 1.1 % and discharge from the wound in 1.9 % of the cases. The cosmetic outcome obtained very good score (4.73 of max. 5; 95 %).

The authors concluded that butyl-cyanoacrylate is a successful alternative to sutures for the closure of low tension incisions in pediatric population. The application of the glue was safe and effective with a low complication rate and with a excellent cosmetic result.

CONCLUSION: Cyanoacrylate glues is an effective alternative for the closure of surgical wounds. Application of these glues is safe, quick and leads to excellent cosmetic results. Infection rate is extremely low and patient satisfaction is high because no sutures have to be removed (13, 15). These glues are recommended for skin closure in almost all pediatric inguinal incisions, thoracoscopic and laparoscopic incisions as well as minor trauma and other carefully selected incisions under low tension (4).
### Table 2: Trials comparing tissue adhesive glues versus standard wound closure for incisions.

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Patient</th>
<th>Product</th>
<th>Cosmetic Outcome</th>
<th>Dehiscence Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coulthard et al.</td>
<td>2010</td>
<td>1152</td>
<td>Tissue adhesive glue vs. suture</td>
<td>TAG = S</td>
<td>S &lt; TAG</td>
</tr>
<tr>
<td>Bozkurt et al.</td>
<td>2008</td>
<td>80</td>
<td>Butyl-cyanoacrylate vs. polypropylene suture</td>
<td>BCA ≥ S</td>
<td>0 % vs. 0 %</td>
</tr>
<tr>
<td>Dowson et al.</td>
<td>2006</td>
<td>168</td>
<td>Butyl-cyanoacrylate vs. non-absorbable suture</td>
<td>BCA = S</td>
<td>BCA = S</td>
</tr>
<tr>
<td>Coulthard et al.</td>
<td>2004</td>
<td>630</td>
<td>Tissue adhesive glues vs. suture</td>
<td>TAG = S</td>
<td>TAG = S</td>
</tr>
<tr>
<td>Ozturan et al.</td>
<td>2001</td>
<td>101</td>
<td>Butyl-cyanoacrylate vs. polypropylene suture</td>
<td>BCA = S</td>
<td>No dehiscence</td>
</tr>
<tr>
<td>Sinha et al.</td>
<td>2001</td>
<td>50</td>
<td>Butyl-cyanoacrylate vs. suture</td>
<td>BCA = S</td>
<td>BCA = S</td>
</tr>
<tr>
<td>Cheng et al.</td>
<td>1997</td>
<td>86</td>
<td>Histoacryl® vs. catgut suture</td>
<td>H = CS</td>
<td>H = CS</td>
</tr>
<tr>
<td>Keng et al.</td>
<td>1989</td>
<td>43</td>
<td>Histoacryl® vs. Dexon™ suture</td>
<td>H &gt; S</td>
<td>NR</td>
</tr>
</tbody>
</table>

NR: Not recorded, TGA: Tissue adhesive glue; S: Suture, BCA: Butyl-cyanoacrylate; H: Histoacryl; CS: Catgut suture, = equal; < significant faster or lower; > significant longer
<table>
<thead>
<tr>
<th>Infection Rate</th>
<th>Satisfaction</th>
<th>Procedure Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAG = S</td>
<td>TAG = S</td>
<td>S &lt; TAG</td>
</tr>
<tr>
<td>0 % vs. 0 %</td>
<td>BCA = S</td>
<td>BCA &lt; S</td>
</tr>
<tr>
<td>BCA = S</td>
<td>BCA = S</td>
<td>BCA &gt; S</td>
</tr>
<tr>
<td>TAG = S</td>
<td>TAG = S</td>
<td>NR</td>
</tr>
<tr>
<td>No infection</td>
<td>BCA = S</td>
<td>BCA &lt; S</td>
</tr>
<tr>
<td>No infection</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>H = CS</td>
<td>NR</td>
<td>H &gt; CS</td>
</tr>
<tr>
<td>No infection</td>
<td>NR</td>
<td>H &lt; S</td>
</tr>
</tbody>
</table>
Key Messages

■ Histoacryl® consists of monomeric n-butyl-2-cyanoacrylate, which polymerizes quickly in connection with tissue fluids.

■ Histoacryl is available in two colors, translucent for facial application and blue which enables an easy control over the quantity applied.

■ Histoacryl is indicated for the closure of smooth and fresh skin wounds, for closure of skin in endoscopic incisions, sclerosation therapy of large oesophageal and fundus varices and for mesh fixation.

Laceration Closure:

■ Closure of lacerations with cyanoacrylate glues is a simple and fast method (3).

■ Cyanoacrylate glue is a suitable alternative to conventional wound closure like staples and sutures for simple traumatic laceration closure (1, 3).

■ Cyanoacrylate glues offer the advantage of a lower pain rate and faster procedure in comparison to sutures, whereas the complication rate is comparable with other treatment methods (1, 8 – 11).

■ Histoacryl is a cost-effective alternative to suture repair for selected laceration in emergency settings. Cosmetic result is comparable with both techniques but patient and surgeon satisfaction is higher after cyanoacrylate glue application in comparison to suture material (5).

■ In comparison to suture repair the use of cyanoacrylate glue is atraumatic and eliminates the need for suture removal.

■ Comparison between butyl-cyanoacrylate glue and octyl-cyanoacrylate glue showed that both glues are comparable in regard to pain rate, complication rate, cosmetic result and time to perform the wound repair, but butyl-cyanoacrylate glue was more cost-effective than octylcyanoacrylate glue (7).

■ Cyanoacrylate glues form a protective barrier against microbiological organisms (11).
Incision Closure:

- Wound closure of incision with cyanoacrylate glues is easy, fast and results in a good cosmetic outcome with a low complication rate (13, 15).

- Application of cyanoacrylate glue is an effective alternative to suturing for wound closure of low tension incisions. The use of cyanoacrylate glues eliminates the need for suture removal and related distress (13, 14, 17 - 20).

- Although tissue adhesive glues present an alternative to conventional wound closure the surgeon must be aware of the fact that if higher tension is needed upon an incision the use of cyanoacrylate glue can increase the dehiscence rate in comparison to suture material (12). For wounds under high tension intracutaneous sutures should be applied in addition to the use of glues (21).
Abstracts

Tissue adhesives for traumatic lacerations in children and adults.

Farion K, Osmond MH, Hartling L, Russell K, Klassen T, Crumley E, Wiebe N. Departments of Pediatrics and Medicine, University of Ottawa, Emergency Medicine, Children’s Hospital of Eastern Ontario, 401 Smyth Road, Ottawa, Ontario, Canada, K1H 8L1. farion@cheo.on.ca

BACKGROUND: Tissue adhesives have been used for many years to close simple lacerations as an alternative to standard wound closure (sutures, staples, adhesive strips). They offer many potential advantages over standard wound closure, including ease of use, decrease in pain and time to apply, as well as not requiring a follow-up visit for removal. Many studies have compared tissue adhesives and standard wound closure to determine the cosmetic outcome as well as these other secondary outcomes in their respective study populations. However, due to the wide variation in study parameters, there are no generalizable, definitive answers about the effectiveness of tissue adhesives. No study has been adequately powered to assess differences in complications, which are rare.

OBJECTIVES: To summarize the best available evidence for the effect of tissue adhesives in the management of traumatic lacerations in children and adults.

SEARCH STRATEGY: We searched the Cochrane Controlled Trials Register (CD ROM 2001 Issue 4), the Cochrane Wounds Group Specialized Trials Register (Nov 2001), MEDLINE (1966 to Oct 1, 2001), and EMBASE (1988 to Sept 1, 2001) for relevant randomized controlled trials (RCTs). We also searched the citations of selected studies, and we contacted relevant authors and manufacturers of tissue adhesives to inquire about other published and unpublished trials.

SELECTION CRITERIA: We included RCTs comparing tissue adhesives versus standard wound closure or tissue adhesive versus tissue adhesive for acute, linear, low tension, traumatic lacerations in an emergency or primary care setting. Trials evaluating tissue adhesives for surgical incisions or other types of wounds were not considered.

DATA COLLECTION AND ANALYSIS: Data from eligible studies were extracted by one reviewer and checked for accuracy by a second reviewer. Two reviewers independently assessed masked copies for quality. Outcomes of cosmesis (subgroups of age, wound location and need for deep sutures), pain, procedure time, ease of use and complications were analyzed separately for two comparisons: 1) tissue adhesive versus standard wound care; and 2) tissue adhesive versus tissue adhesive.
MAIN RESULTS: Eight studies compared a tissue adhesive with standard wound care. No significant difference was found for cosmesis at any of the time points examined, using either Cosmetic Visual Analogue Scale (CVAS) or Wound Evaluation Score (WES). Data were only available for subgroup analysis for age; no significant differences were found. Pain scores (Parent VAS WMD -15.7 mm; 95 % CI -21.9, -9.5) and procedure time (WMD -5.6 minutes; 95 % CI -8.2, -3.1) significantly favoured tissue adhesives. No studies reported on ease of use. Small but statistically significant risk differences were found for dehiscence (favouring standard wound care NNH 25 95 % CI 14, 100) and erythema (favouring tissue adhesive NNH 8 95 % CI 4, 100). Other complications were not significantly different between treatment groups. Only one study was identified that compared two tissue adhesives (butylcyanoacrylate (Histoacryl® TM) versus octylcyanoacrylate (Dermabond TM)) for pediatric facial lacerations. No significant difference was found for cosmesis using CVAS at 1 - 3 months, or using WES at 5 - 14 days and 1 - 3 months. Similarly, no significant difference was found in pain, procedure time or complications. Results for ease of use were incomplete as reported.

REVIEWER'S CONCLUSIONS: Tissue adhesives are an acceptable alternative to standard wound closure for repairing simple traumatic lacerations. There is no significant difference in cosmetic outcome between tissue adhesives and standard wound closure, or between different tissue adhesives. They offer the benefit of decreased procedure time and less pain, compared to standard wound closure. A small but statistically significant increased rate of dehiscence with tissue adhesives must be considered when choosing the closure method (NNH 25).

Use of tissue adhesive in the closure of small incisions and lacerations.

Elmasalme FN, Matbouli SA, Zuberi MS.
Department of Pediatric Surgery, Maternity and Children Hospital,
Jeddah, Saudi Arabia

Over the last 10 years, in the operating rooms of Maternity and Children Hospital, Jeddah, more than 3,200 surgical incisions of skin made for minor surgical operations were closed without suturing by using tissue adhesive Histoacryl Blue. In addition to this, in the emergency rooms over 2,600 small lacerations of skin on various parts of the body were also repaired by the same technique. The method has certain distinct advantages over conventional suturing. The success rate was very high.
Abstracts

Comparison of tissue adhesive and suturing in the repair of lacerations in the emergency department.

Göktas N, Karcioglu O, Coskun F, Karaduman S, Menderes A. Dokuz Eylül University Medical School, Department of Emergency Medicine, Izmir, Turkey.

The objective of this study was to compare the applications of Histoacryl® Blue (HAB) and suturing regarding cosmetic outcome, cost and patient and physician satisfaction in the emergency department (ED). A total of 92 consecutive adult patients with lacerations equal to or shorter than 5 cm were enrolled in the study. Patients were randomized to either HAB or suturing. Ten-day and three-month cosmetic outcomes were evaluated via visual analogue scale (VAS) by a blinded surgeon. Cosmetic outcome, cost and patient and physician satisfaction of both groups were compared. Only 52 patients completed the follow-up at three months. Twenty-eight had been repaired with sutures and 24 with HAB. The differences regarding ten-day and three-month cosmetic outcome scales between the patients repaired with HAB and sutures were not statistically significant. Application of HAB resulted in greater satisfaction of the patient and the physician (p = 0.007 and p = 0.0001, respectively). Costs of HAB were significantly lower than sutures (p = 0.0001). It is concluded that HAB is a cheaper method of laceration repair and results in greater satisfaction of both patients and physicians, while cosmetic outcomes were comparable. These results suggest that HAB is a viable alternative to suturing for selected lacerations in the ED.
Wound glue: a comparative study of tissue adhesives.

Charters A.
School of Nursing & Midwifery, University of Sheffield, Winter Street, Sheffield S3 7ND, UK.

The purpose of this study was to determine which single-use wound adhesive is the most appropriate in terms of ease of use, minimal pain on application, adequate bonding time and wound closure. The three wound adhesives audited were Indermil (n-butyl cyanoacrylate), Liquiband (n-butyl cyanoacrylate) and Dermabond (octylcyanoacrylate).

SAMPLE AND SETTING: The study was conducted in an urban pediatric emergency department treating over 39,000 patients annually. The sample was taken from the client population presenting with lacerations requiring tissue adhesive closure, within the limitations of the study (n = 63).

METHODOLOGY: A non-blinded comparative study was performed. Children presenting with an appropriate laceration were assigned to receive either Indermil, Dermabond or Liquiband. The wounds were closed following the guidelines stated by the individual manufacturers. The nurses administering the tissue adhesive were asked to complete the audit form post closure and to comment on the procedure in descriptive terms.

RESULTS: Scalp wounds accounted for 79 % (n = 50) of all the lacerations closed in the study. None of the glues were reported to be completely pain-free. However, the Liquiband tissue adhesive produced an average pain score of only 0.1, whereas the Dermabond tissue adhesive scored the highest at 0.97. The nurses using the tissue adhesives reported that Liquiband was the best tissue adhesive in terms of wound closure and ease of use. However, the only tissue adhesive to report a 100 % success rate was Indermil.

DISCUSSION AND RECOMMENDATIONS: All of the tissue adhesives examined produced satisfactory results in terms of wound closure and ease of use. However, the Liquiband tissue adhesive produced the most consistent results, scoring higher in most of the categories when compared with the other tissue adhesives.
Coulthard P, Worthington H, Esposito M, Elst M, Waes OJ.
Oral and Maxillofacial Surgery, University Dental Hospital of Manchester,
Higher Cambridge Street, Manchester, UK, M15 6FH.

BACKGROUND: Sutures, staples and adhesive tapes are the traditional methods of wound closure, whilst tissue adhesives have entered clinical practice more recently. Closure of wounds with sutures enables meticulous closure, but sutures may induce tissue reactivity and they usually require removal. Tissue adhesives offer the advantages there are no sutures to remove later for the patient and no risk of needlestick injury to the surgeon. Tissue adhesives have been used primarily in emergency rooms but this review looks at the use of tissue adhesives in the operating room where surgeons are increasingly using these for the closure of surgical skin incisions.

OBJECTIVES: To determine the relative effects of various tissue adhesives and conventional skin closure techniques on the healing of surgical wounds.

SEARCH STRATEGY: The Cochrane Wounds Group Specialized Trials Register, The Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE and EMBASE were searched. Bibliographies of review articles were checked for studies outside the hand searched journals and wound care product manufacturers were contacted.

SELECTION CRITERIA: Randomized controlled clinical trials only.

DATA COLLECTION AND ANALYSIS: Screening of eligible studies and data extraction was conducted independently and in triplicate whilst assessment of the methodological quality of the trials was conducted independently and in duplicate. Results were expressed as random effect models using weighted mean differences for continuous outcomes and relative risk with 95 % confidence intervals for dichotomous outcomes. Heterogeneity was investigated including both clinical and methodological factors.

MAIN RESULTS: Eight RCTs were included (630 patients). No statistically significant differences were found between various tissue adhesives and sutures (8 trials) for dehiscence, infection, satisfaction with cosmetic appearance when assessed by patients’ or surgeons’ general satisfaction. Nor were differences found between a tissue adhesive and tapes (2 trials) for infection, patients’ assessment of cosmetic appearance, patient satisfaction or surgeon satisfaction. However a statistically significant difference was found for surgeons’ assessment of cosmetic appearance with mean difference 13 (95 % CI 5 to 21), the higher mean rating for the tissue adhesive group.
REVIEWERS’ CONCLUSIONS: Surgeons may consider the use of tissue adhesives as an alternative to sutures or adhesive tape for the closure of incisions in the operating room. There is a need for trials in all areas but in particular to include patients that require incision closure in areas of high tension and patients of general health that may impair wound healing.


Tissue adhesives for closure of surgical incisions.

Coulthard P, Esposito M, Worthington HV, van der Elst M, van Waes OJ, Darcey J.
Department of Oral and Maxillofacial Surgery, School of Dentistry, The University of Manchester, Higher Cambridge Street, Manchester, UK, M15 6FH


BACKGROUND: Sutures, staples and adhesive tapes are the traditional methods of wound closure, whilst tissue adhesives have entered clinical practice more recently. Closure of wounds with sutures enables meticulous closure, but they may show tissue reactivity and can require removal. Tissue adhesives offer the advantages of no risk of needlestick injury and no requirement to remove sutures later. Tissue adhesives have been used primarily in emergency rooms but this review looks at the use of tissue adhesives in the operating room where surgeons are increasingly using these for the closure of surgical skin incisions.

OBJECTIVES: To determine the relative effects of various tissue adhesives and conventional skin closure techniques on the healing of surgical wounds.

SEARCH STRATEGY: For this update we searched (Search 11/17/09); the Cochrane Wounds Group Specialized Register The Cochrane Central Register of Controlled Trials (CENTRAL) – The Cochrane Library Issue 4 2009; Ovid MEDLINE –1950 to November Week 1 2009; Ovid EMBASE –1980 to 2009 Week 46; EBSCO CINAHL –1982 to 17 November 2009. No date or language restrictions were applied.

SELECTION CRITERIA: Only randomized controlled clinical trials were eligible for inclusion.

DATA COLLECTION AND ANALYSIS: Screening of eligible studies and data extraction were conducted independently and in triplicate whilst assessment of the methodological quality of the trials was conducted independently and in duplicate. Results were expressed as random effects models using mean difference for continuous outcomes and relative risks with 95% confidence intervals for dichotomous outcomes. Heterogeneity was investigated including both clinical and methodological factors.
MAIN RESULTS: This update identified an additional six trials resulting in a total of fourteen RCTs (1152 patients) which met the inclusion criteria. Sutures were significantly better than tissue adhesives for minimizing dehiscence (10 trials). Sutures were also found to be significantly faster to use. For all other analyses of infection, patient and operator satisfaction and cost there was no significant difference between sutures and tissue adhesives. No differences were found between tissue adhesives and tapes (2 trials) for minimizing dehiscence, infection, patient assessment of cosmetic appearance, patient satisfaction or surgeon satisfaction. However a statistically significant difference in favour of using tape was found for surgeons’ assessment of cosmetic appearance (mean difference 13, 95% CI 5 to 21). Tapes were also demonstrated to be significantly faster to use than tissue adhesives as were staples (1 trial). No other outcome measures were analyzed in this group. One trial compared tissue adhesives with a variety of methods of wound closure and found both patients and clinicians were significantly more satisfied with the alternative closure methods than the adhesives. In this same trial tissue adhesives were significantly less time consuming to use. For the remaining outcomes of dehiscence and infection no difference was observed between groups. This trial also compared high viscosity with low viscosity adhesives and found that high viscosity adhesives were less time consuming to use than low viscosity tissue adhesives. For all other outcomes of dehiscence, infection, patient satisfaction and operator satisfaction there was no statistically significant difference between high and low viscosity adhesives.

AUTHORS’ CONCLUSIONS: Sutures were significantly better than tissue adhesives for minimizing dehiscence and were found to be significantly faster to use. Although surgeons may consider the use of tissue adhesives as an alternative to other methods of surgical site closure in the operating theatre they must be aware that adhesives may take more time to apply and that if higher tension is needed upon an incision, sutures may minimize dehiscence. There is a need for more well designed randomized controlled trials comparing tissue adhesives and alternative methods of closure. These trials should include people whose health may interfere with wound healing and surgical sites of high tension.
Eur Arch Otorhinolaryngol. 2008 Mar;265(3):331-5.
The use of cyanoacrylates for wound closure in head and neck surgery.

Bozkurt MK, Saydam L.
Department of Otolaryngology, Bayindir Hospital, Sogutozu, 06520 Ankara, Turkey.
bozkurtmetekaan@hotmail.com

The purpose of this study was to compare the mean duration and complication rates of cyanoacrylate application in head and neck incision closures to those performed with conventional sutures. Eighty patients who underwent head and neck surgical operations (20 thyroidectomies, 13 submandibular gland resections, 9 parotidectomies, 6 neck dissections in conjunction with other surgical procedures, 1 lateral rhinotomy, 1 thyroglossal cyst resection and 30 open neck biopsies) were included in the study. The incisions were closed either with interrupted suture technique (32 patients) or cyanoacrylate (48 patients). The duration of skin closure time was compared between the two groups with nonparametric Mann-Whitney U test and a P value < 0.05 was considered as statistically significant. The patients were followed up for complications at 2 weeks, 1 and 3 months after surgery. The two treatment groups were similar with respect to age, gender, and wound lengths (P = 0.27, 0.22 and 0.99, respectively). The mean wound length was 7.21 + 3.15 cm in the cyanoacrylate group and 7.22 + 2.99 cm in the suture group within a range of 5 – 15 cm. The mean closure time was 33.69 + 9.77 s in the cyanoacrylate group and 504.38 + 169.27 s in the suture group (P < 0.001). The patients in the cyanoacrylate group were satisfied with their scar appearances. No complication was observed in either of the groups. Cyanoacrylates provide an easy and convenient application resulting in a faster wound closure as compared to the interrupted suture technique.

Butylcyanoacrylate tissue adhesive for columellar incision closure.

Ozturan O, Miman MC, Aktas D, Oncel S.
Department of Otolaryngology, Inonu University, Medical Faculty, Malatya, Turkey
orhanent@yahoo.com

Cosmetic outcome of the columellar incision closure in external rhinoplasty patients has been a subject of discussion. This study was conducted to assess whether tissue adhesives provide an alternative option for sutureless closure of columellar skin incisions for cases utilizing open technique rhinoplasty surgery. One hundred and one patients undergoing external rhinoplasty were randomized to either topical application of butylcyanoacrylate or polypropylene sutures for columellar skin closure. The majority of tension on the wound edges was taken up using 5 – 0 chromic catgut. Cosmetic outcomes were evaluated by two otolaryngologists independently using visual analogue and Hollander wound evaluation scales in a blinded manner. There was no statistically significant difference in cosmesis between the surgeons’ evaluation scores for either type or repair of the columellar incision. Since the tissue adhesive forms its own protective barrier, post-operative care is simplified. Closure with adhesives eliminates the need for post-operative suture removal requiring an extra visit that should lead to more efficient use of physician and patient time. Butylcyanoacrylate performs cosmetically as well as standard suture closure of columellar skin incision used for external rhinoplasty.
Amiel GE, Sukhotnik I, Kawar B, Siplovich L.
Department of Urology, Bnai Zion Medical Center, Bruce Rappaport Faculty of Medicine, Technion Institute of Technology, Haifa, Israel

BACKGROUND: Histoacryl® Blue (N-butyl-2-cyanoacrylate) is a tissue adhesive that has been used clinically for more than 20 years. In the last decade, N-butyl-2-cyanoacrylate has been used for cutaneous closure of low-tension lacerations in children and adults and has become a preferred method for closure of pediatric facial lacerations in many emergency rooms outside the United States. Many pediatric elective surgical procedures are performed in tension-free areas and may be suitable for closure with a tissue adhesive. In order to assess this approach, a retrospective study was conducted to evaluate the cosmetic outcomes and complications of the application of N-butyl-2-cyanoacrylate for the approximation of elective surgical incisions in a pediatric population.

STUDY DESIGN: Records of 1,098 patients, ages 1 month to 16 years, who, between January 1995 and December 1996, underwent one of the following: orchidopexy, inguinal hernia, umbilical hernia, or hydrocele repair were analyzed. In all patients, N-butyl-2-cyanoacrylate was applied to close the surgical incision. A 12-item questionnaire was created to assess the presence of complications and to determine short term and long term cosmetic outcomes of the incision. Data were collected by conducting telephone interviews of family members.

RESULTS: Among the 1,033 children who were treated, 66 % had inguinal hernias, 15 % hydroceles, 15 % undescended testis, and 4 % umbilical hernias. Redness or tenderness at the incision site (5.5 %), discharge from the surgical wound (1.9 %), and wound dehiscence (1.1 %) were the main immediate complications after surgery. Overall satisfaction with the cosmetic outcomes of the surgical scar was high, with an average score of 4.73 out of 5 (94.6 %).

CONCLUSIONS: Our results demonstrate that administration of N-butyl-2-cyanoacrylate for the closure of small low-tension surgical incisions in the pediatric population is safe, has a low complication rate, and produces excellent cosmetic outcomes.


