

## **Evidence-Based Medicine: Are Tissue Adhesives Better than Traditional Suturing for Minor Lacerations?**

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### **Abstract**

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### **Objective**

To summarize the best available evidence for the effects of tissue adhesives on the healing of traumatic lacerations in children and adults.

### **Search Strategy**

The primary source was the Cochrane Wounds Specialised Trials Register and the Cochrane Central Register of Controlled Trials (until September 2003). A broad search for studies was also carried out using CENTRAL, MEDLINE, EMBASE, Web of Science- Science Citation Index and reference lists of articles. Manufacturers and researchers in the field were contacted for any unpublished data.

### **Study Selection**

Randomized-controlled trials (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 (emergency department, outpatient clinic, walk-in clinic). Studies included patients of any age with acute linear laceration of any length or depth that occurred within 12 hours, resulting from blunt or sharp trauma. Studies were excluded if they included stellate lacerations, puncture wounds and mammalian bites. Patients with chronic illness that could impair healing and history keloid formation were excluded. Also eliminated were lacerations that were

infected, heavily contaminated, devitalized, hair-bearing or crossed a joint or mucocutaneous junctions. The primary outcome was cosmesis using the Cosmetic Visual Analogue Scale (CVAS) or Wound Evaluation (WE). Secondary outcomes included pain, time and ease needed to complete procedure and complications (i.e. infection, erythema, and dehiscence).

### Data extraction

Two reviewers independently assessed all selected studies. Each study was evaluated using previously validated scales. A standard form was used to collect the following: characteristics of the study, study participants, intervention, comparison intervention, primary and secondary outcomes and results. Continuous data was reported as weighted mean difference (WMD) and dichotomous data was expressed as relative risk (RR) both with 95 % CI. Complications were reported as risk difference (RD) and number needed to harm was used when the results were significant.

Two comparisons were established a priori:

- 1) Tissue adhesive versus standard wound closure (SWC)
- 2) Tissue adhesive versus tissue adhesive.

Statistical heterogeneity was quantified using the  $I^2$  statistics [1]. Subgroup and sensitivity analysis were calculated using both primary, secondary outcomes and statistical models (fixed versus random effects).

### Main results

From a total of 39 articles, 11 were selected for inclusion in this review. Ten of these studies compared tissue adhesive versus SWC (5 butylcyanoacrylate and 5 octylcyanoacrylate) and one compared two tissue adhesives. All studies were conducted in an ED setting and none were double-blinded due to the nature of the intervention.

#### *Tissue adhesive versus standard wound closure*

Cosmetic scores: Eight studies with 565 lacerations compared tissue adhesives with standard wound closure at 1 to 3 months and 9 to 12 months; CVAS WMD was 1.7 mm (95% CI -3.3 to 6.7; 521 lacerations) and 2.5 mm (95%

CI -3.6 to 8.6; 153 lacerations) respectively. In four studies and 364 lacerations the WES RR at 1 to 3 months and 9 to 12 months was 0.99 (95% CI 0.92 to 1.07; 364 lacerations) and 1.08 (95% CI 0.89 to 1.30; 140 lacerations) respectively.

Secondary outcomes: VAS pain scores were measured in six studies with 570 lacerations which significantly favored the tissue adhesive interventions. The parent-reported pain VAS in 434 lacerations had a WMD of -13.4 mm (95% CI -20.0 to -6.9) and patient reported VAS WMD in one study was -10.8 mm (95% CI -17.1 to -4.5).

Complications were recorded on 727 lacerations. Using the random-effects (RE) model all complications were insignificant, except for the incidence of erythema. Fewer incidences of erythema occurred when using tissue adhesives with a risk difference (RD) of -10%, (95% CI -19 to -0.4). Tissue dehiscence disfavors tissue adhesive with a RD of 4% (95% CI 1 to 7) using a fixed effect model.

#### *Tissue adhesive versus tissue adhesive*

Only one study compared butylcyanoacrylate (Histoacryl™) with octylcyanoacrylate (Dermabond™).

Cosmetic scores: There was no significant difference between butylcyanoacrylate and octylcyanoacrylate using CVAS at 1 to 3 months.

Secondary outcomes: There was no statistically significant differences in the combined patient and parent-reported pain scores (VAS WMD 0.9 mm, 95% CI -8.0 to 9.7) or in the time required to complete the procedure (WMD 0.2 min, -1.1 to 1.5).

Complications: No significant difference in either dehiscence or rate of infection

### Conclusions

Tissue adhesives are an acceptable alternative to standard wound closure for repairing simple traumatic lacerations. They offer the benefit of decreased procedure time and less pain, compared to standard wound closure with similar cosmetic outcome. A small but statistically significant increased rate of dehiscence with tissue adhesives is observed. Further research is

needed to determine the characteristics (patient, wound, product, operator) that result in an increased rate of dehiscence and whether dehiscence results in poor cosmetic outcome.

### **Commentary: Clinical Implication**

Each year, more than 12 million wounds are treated in emergency departments across the United States [2]. Conventionally, wound repair was performed using sutures. Tissue adhesives were approved for use in the US in 1998 although their use has been more widespread in Europe and Canada for a greater length of time [3]. Only Octyl-2-cyanoacrylate (Dermabond) is available under FDA approval as of 2001. Tissue adhesive such as Dermabond should only be used for superficial skin closure and should not be implanted subcutaneously. Studies have shown that they provide a quicker, less painful and more cost effective alternative to suturing while achieving comparable or superior cosmetic results.

Cyanoacrylate tissue adhesives work by undergoing a chemical reaction when applied to the skin surface forming a strong tissue bond. When applied to a laceration, the polymer binds the wound edges together to allow normal healing of tissue. Maximum bonding strength is achieved within 2.5 minutes of application [4]. The strength of the bond is weaker than that provided by sutures for the first few days following administration but equalizes within one week after repair [5].

Most tissue adhesives are cyanoacrylate polymers such as Octyl-2-cyanoacrylate (Dermabond) and although other types exist, (butylcyanoacrylate (BCA), octylcyanoacrylate (OCA), only one study was included in this review which compared them directly with no difference between the two.

The review summarizes a number comparisons, and space does not permit a full discussion of all of these. The main question for emergency physicians will be reviewed: what is the evidence for or against using tissue adhesive instead of sutures on acute linear lacerations. Typically, the most important outcome most physicians are concerned about is cosmesis, followed by rate of infection, pain of the procedure and dehiscence

of the wound. Overall there was no difference found in 929 lacerations regarding cosmetic results using two different measures (CVAS and WES) between sutures and adhesives during any follow up time period. All subgroup analysis including age and site of laceration were also statistically insignificant. Pain scores using VAS were significant and favored tissue adhesive intervention.

There is no study that demonstrated a significant difference in adverse outcome between closure with tissue adhesives and standard laceration. Nevertheless, pooling of data in the systematic review found a small but significant increased risk of wound dehiscence with use of tissue adhesives. Perhaps this is due to day to day tension on the wound while the tissue bond is weakest, during the first week and patient education may correct this and ultimately result in better cosmetic results. The risk of dehiscence was significantly increased with tissue adhesives with a risk difference of 4% and number needed to harm (NNH) of 25. Erythema was found more often with tissue adhesives with a risk difference of -10% and NNH of 10. It is difficult to determine the clinical significance of this finding since there was no data on how this early complication correlates with long-term cosmetic outcome. In 584 lacerations using tissue adhesive is faster by 4.7 minutes on average.

Whether proper wound preparation was done was not mentioned as a parameter for cosmetic outcome in the study. No mention of inter-operator variability is mentioned in the study. A person with more experience using adhesives or suturing is more likely to achieve better cosmetic results.

Comparing costs of both tissue adhesives versus traditional suturing shows that both are very similar. Dermabond costs approximately \$24 per vial, while sutures cost \$5 per package. When the time of the procedure, follow-up appointment for suture removal, and cost of suture kit and suture removal kits are factored in, the cost is approximately the same [4].

### **Take-Home Message**

Tissue adhesives provide results that are comparable with traditional suturing of surface, linear, and low-tension lacerations. The cosmetic outcome and cost of the entire

treatment, including follow-up is similar. Wound closure of superficial lacerations by tissue adhesives is quicker, less painful, does not require topical anesthetic and the rate of infection is similar. Therefore, it may be a more comfortable alternative to wound closure for both patient and physician compared to conventional suturing.

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