Is Fixing Pediatric Nail Bed Injuries With Medical Adhesives as Effective as Suturing?

A Review of the Literature

Sarah Edwards, BMBS, PGCME, DMHSA† and Leesa Parkinson, PhD, FRCEM, MBBS, BSc (Hons)†*

Objectives: Nail bed injuries are common in children, with nail bed damage accounting for 15% to 24% of fingertip injuries. Our objective was to see whether medical adhesives, the cyanoacrylates including Histoacryl and Dermabond, could be used to fix nail bed lacerations as opposed to doing a primary repair with sutures, thus potentially being a quicker method for repair in the emergency department for these injuries.

Methods: We conducted a literature review using the search engines MEDLINE, PubMed, Web of Science, and Google Scholar, and the references within these articles were also integrated. All articles in English were searched. Search terms included "nail bed repair," "nail bed laceration repair," and "cyanoacrylate."

Results: A total of 6 articles were found using the previously mentioned search terms. Four articles using 2-octyl cyanoacrylate or Dermabond for the repair of nail bed injuries were found, with 2 additional articles describing the use of Histoacryl—n-butyl-2-cyanoacrylate—for nail injury repairs.

Conclusions: The 6 articles discussed in this article include approximately 118 patients' worth of data including a mix of adult and pediatric patients. Despite the small numbers and variety of types of study, it is encouraging that there are so many positive results. Cryoacrylates such as Dermabond or Histoacryl maybe useful to assist with nail injuries in children. Therefore, we feel that using a medical adhesive is as effective as suturing nail bed injuries in children.

Key Words: nail bed injuries, nail bed lacerations, nail bed repair, cryoacylates

(*Pediatr Emer Care* 2016;00: 00–00)

Nail bed injuries are common in children,[1] with nail bed damage accounting for 15% to 24% of fingertip injuries.[2–6] If nail beds are not repaired satisfactorily, the result can cause significant aesthetic and functional issues.[1–7]

The standard care has been to remove the nail plate for nail bed injuries and do a primary repair with sutures.[2,7,8] Alternatively, if the injury is small enough, you may not be required to do anything, and healing by secondary intention maybe sufficient.[1–7] However, recently, there has been increasing use of medical adhesives, in particular, 2-octyl cyanoacrylate (Dermabond), to repair nail bed injuries in both adults and children.[9–12] Histoacryl—n-butyl-2-cyanoacrylate—has also been discussed in the literature for use on nail bed injuries.[13–15]

Dermabond is a tissue adhesive that is intended to hold close together the approximated skin edges in a wound.[16] It is a sterile liquid adhesive containing a formulation of 2-octyl cyanoacrylate.[16] Once applied, it gains its maximum strength at 2.5 minutes and is flexible over the wound edges.[16] It is not absorbed by the wound but sloughs off for 5 to 10 days as the skin regenerates.[16] Histoacryl is also a tissue adhesive that is intended to hold together wound edges taking 1 minute to set.[15] It sloughs off the wound in 7 to 10 days, similar to that of Dermabond.[15]

METHODS

A literature search using MEDLINE, PubMed, Web of Science, and Google Scholar and the references within these articles integrated. All articles in English were searched. Search terms included "nail bed repair," "nail bed laceration repair," and "cyanoacrylate." There was no restriction on dates.

RESULTS

A total of 6 articles were found using the previously mentioned terms. Four articles using 2-octyl cyanoacrylate or Dermabond for the repair of nail bed injuries were found,[9–12,17] with 2 additional articles describing the use of Histoacryl—n-butyl-2-cyanoacrylate—for nail injury repairs.[13–15]

CONCLUSIONS

Stanislas and Waldram[14(pp507–508)] (1997) described the first likely use of a medical adhesive to keep the nail plate on with Histoacryl. This was a prospective study of 12 patients aged between 12 and 68 years, including 16 avulsed nails. They aimed to compare the use of Histoacryl in securing the avulsed nail plate as opposed to the standard technique of sutures. Patients were followed up between 4 and 22 months. After the nail fragments were removed and the nail bed was repaired, the Histoacryl was used to keep the nail fragments in place. Their results describe that all nail plates ended with an acceptable cosmetic appearance. This was a very small study, with no clear indication of what was defined as an acceptable cosmetic appearance. There is no record of the type of injuries that were repaired or whom they affected. Nonetheless, the article was useful in suggesting the idea of using a medical adhesive for nail injuries and did not find any adverse outcomes.

Richards et al[13(pp1983–1985)] (1999) is the second article discussing the use of Histoacryl. It describes a similar method as the one previously discussed as to how and when to use the Histoacryl. The article only discusses the 22 successes during the last year. Sadly, it does not give any further information as to the details of these patients and does not provide information about any outcomes, which were not perceived as successes. This article again has a small sample size, with no comparisons with the standard treatment. It is of limited value but does support the idea that using Histoacryl could be useful in managing nail injuries.

Hallock and Lutz[9(pp979–981)] (2000) wrote the first article to describe the technique of using 2-octyl cyanoacrylate (Dermabond) for nail plate restoration. It discusses the technique of using Dermabond to simply and rapidly bond the disrupted nail plate fragments as opposed to the standard approach of the time, of

From the *Betsi Cadwaladr University Health Board, Emergency Department, Wrexham Maelor Hospital, Wrexham; and †Betsi Cadwaladr University Health Board, Emergency Department, Ysbyty Gwynedd, Bangor, Wales, United Kingdom.

Disclosure: The authors declare no conflict of interest.

Reprints: Sarah Louise Edwards, Betsi Cadwaladr University Health Board, Emergency Department, Ysbyty Gwynedd, Bangor, LL57 2PW Wales, United Kingdom (e-mail: sarah.louise.edwards@wales.nhs.uk).

ISSN: 0749-5161

suturing the nail in place. The method involves using the appropriate analgesia and tourniquet control and removing the nail plate, assessing the injury of the nail bed, and repairing it appropriately. Next, the nail fragments are cleaned, dried, and replaced on the nail bed, with a thin layer of Dermabond being dripped or wiped between the adjoining fragments. This is in contrast to the more common method of suturing the nail fragments in place. Allowing 30 seconds to 1 minute, it can then be bandaged and followed up as appropriate. Hallock and Lutz discuss the many advantages of this technique including that the bonding of this adhesive is less brittle than other types of adhesives, with a breaking strength similar to 5-0 nylon suture. It mentions that they have had dozens of successes with their patients, with a good outcome. Again, this is a descriptive article, based on a very small sample size and limited information concerning outcomes. It does suggest that Dermabond maybe useful in managing this type of injury.

Strauss et al[11(pp250–253)] (2008) used a randomized controlled trial of Dermabond versus suture repair. The aim of their study was to compare the efficacy of Dermabond with that of the standard suture repair. Forty patients were recruited prospectively within 8 hours of injury. Inclusion criteria included all patients irrespective of age, those who had a nail plate avulsion with associated nail bed laceration, and those with greater than 50% subungual bed laceration with an intact nail plate. Patients who had nail injuries from bites were excluded. Patients were randomized using the last digit of their hospital number, with even numbers randomized to Dermabond and odd numbers randomized to suturing. Demographics, type of injury, and time taken to perform either technique were presented. Eighteen patients were randomized to Dermabond repair, and 22 were randomized to the suture group. The age range was 2 to 99 years. There were similar numbers of lacerations in each group, similar hand dominance affected (44% in the Dermabond group as opposed to 45% in the suture group), and similar associated fracture numbers (44% in the Dermabond group as opposed to 41% in the suture group).

Results showed overall that the Dermabond group required a mean time of 9.5 minutes to repair the wound, as opposed to 27.8 minutes in the suture group. There was no significant difference ($P > 0.05$) between patient- or physician-perceived pain, cosmetic, or ability to use the digit.[11] Some of the weaknesses include a small study group; therefore, the study may be underpowered. In addition, the people performing it were a heterogenous group of orthopedic surgeons, who either did suturing or used Dermabond. Therefore, differences may be at least in part due to the surgeon's ability and method chosen. Furthermore, these are surgeons, not emergency physicians; thus, the skill mix may be different. Overall, this article does suggest the use of Dermabond for nail injuries.

Yam et al[12(pp148e–149e)] (2008) conducted a small descriptive study of 10 consecutive simple nail bed repairs using Dermabond. Nail bed lacerations were repaired with sutures, and the nail plate was repaired with layers of Dermabond. The team developed a nail cosmesis score based on rigidity, sheen, splitting, deformity, and lifting of the new nail, with scores greater than 11 as excellent, 8 to 10 as good, 6 to 7 as fair, and less than 6 as poor. These were rated by hand surgeons using high-resolution photographs taken at the 6-month follow-up appointment. All the nails were given a score of 7 or higher. This was a small study, with no comparison made with other techniques and no outcomes from the patients' perspective.

Langlois et al[10(pp61–65)] (2009) conducted the only work looking at children's nail laceration repairs with Dermabond. They evaluated the use of Dermabond for the treatment for 30 consecutive pediatric patients with 31 nail bed injuries, less than 8 hours from the time of injury and not associated with displaced fractures. The study did not have a comparison group for other management techniques such as suturing. The patients were then followed up at 3 months, and only the cosmetic outcome was noted. Overall, the study found that the patients and their families felt they had an "excellent" result in 30 of 31 cases. This is in comparison with 25 "excellent" and 6 "good" outcomes when reviewed by the surgeons. The key limitation to this study is the lack of comparison group against the standard practice. Thus, the advantages and conveniences of this method against the standard practice are not known. Again, it has a small sample size, and follow-up was only at 3 months.

Finally, in 2015, a Best BET was published looking at whether nail bed injuries could be repaired by using a medical adhesive.[18] Best BETs "provide rapid evidence-based answers to real-life clinical questions, using a systematic approach to reviewing the literature."[19] Amphlett[18(pp1–3)] (2015) found 3 articles, all of which are included in this essay. The author suggested that using a medical adhesive was an advantageous option in particular for speed, but further evidence was needed.

Overall, it is likely that most articles have been found because the search strategy was broad. However, only articles in English were included. There is a possibility that a few articles may have been missed. The 6 articles discussed in this article include approximately 118 patients' worth of data including a mix of adult and pediatric patients. Despite the small numbers and variety of types of study, it is encouraging that there are so many positive results.

Reflecting on this information, Dermabond maybe useful to assist with nail injuries in children. It has many advantages including speed of method and suitability for emergency physicians in the emergency department. Currently available data suggest that a medical adhesive could be used on at least simple nail lacerations and maybe more complex ones. More work with a bigger sample size and tighter controls and comparison to confirm this early impression could be beneficial. However, despite this, we feel that using a medical adhesive is as effective as suturing nail bed injuries, especially in children. With this reduced time, this could limit distress and discomfort to children.

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