A Comparison of 2-Octyl Cyanoacrylate Adhesives versus Conventional Suture Materials for Eyelid Wound Closure in Rabbits

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Purpose: To evaluate the clinical efficacy and histopathological tolerance of 2-octyl cyanoacrylate versus conventional suture materials for eyelid wound closure in rabbits.

Methods: We performed an experimental study on 16 eyes of eight New Zealand albino rabbits. Eyelid incisions of 15 mm were done 4 mm from the upper eyelid margin in both eyes. The eyes of the rabbits were divided into two groups: eyelid incisions of the right eye were closed by a 2-octyl cyanoacrylate adhesive (group A) and eyelid incisions of the left eye were closed by 7-0 nylon sutures (group B). At 1, 2, 4, and 8 weeks after surgery, the rabbits were macroscopically examined and then sacrificed. The specimens of their eyelid tissues were stained by a hematoxylin and eosin stain and Masson-trichrome stain, and were observed under microscope.

Results: Both eyelid surgical closure methods were found to be equally efficacious in fixing the eyelids of groups A and B, and their clinical efficacy was similar. Histopathological findings of the hematoxylin and eosin stain of group A showed less inflammatory infiltration than group B at 2 weeks. There were no significant histopathological differences between the two groups at 1, 4, and 8 weeks. The degree of fibrosis of the Masson-trichrome stain was similar between the two groups at 8 weeks.

Conclusions: The 2-octyl cyanoacrylate adhesive proved to be an effective eyelid closure method and was very well tolerated by the skin surface. 2-Octyl cyanoacrylate could be used as an alternative tissue adhesive for eyelid wound closure along with conventional suture materials.

Key Words: Eyelid wound closure, Octyl 2-cyanoacrylate
Administration in 1998, was developed for use in external wounds. Because it is a longer-chain derivative, it is slowly degraded in vivo. Therefore, it results in milder acute or chronic inflammation, clean absorption, and fewer tissue necroses [5]. In addition, because its flexibility is better than conventional cyanoacrylate, it can also be used on irregular surfaces as well [7]. Thanks to these benefits, the longer-chain derivative 2-octyl cyanoacrylate is now being used for treatment of skin lacerations of young patients, and is being researched and universally used as a new alternative closure method [7-9]. Accordingly, through this study, the authors wanted to investigate the clinical effects and biocompatibility of the 2-octyl cyanoacrylate tissue adhesive, a longer-chain derivative with lesser toxicity to tissue than conventional cyanoacrylate, through a comparison with conventional 7/0 nylon non-absorbable suture materials to examine the possibility of applying 2-octyl cyanoacrylate adhesives to oculoplastic and other ophthalmic areas.

Materials and Methods

Surgical method

The subjects in this study consisted of 16 eyes of eight New Zealand albino rabbits with weights ranging from 2-3 kg. For anesthesia, 50 mg each of ketamine hydrochloride and xylazine hydrochloride were injected into the muscles of the laboratory animals. The area around the upper eyelids of both eyes of the anesthetized rabbits was shaved to expose their skins, and a 15 mm skin incision was completed 4 mm from each eyelid margin (Fig. 1A). The epidermis was dissected and the tarsal plate was exposed to artificially bring about a condition that was similar to an actual blepharoplasty (Fig. 1B). The eyes of the rabbits were divided into two groups: eyelid incisions of the right eyes were closed by a 2-octyl cyanoacrylate adhesive (group A) and eyelid incisions of the left eye were attached again by 7-0 nylon sutures (group B) (Fig. 1C and 1D). After surgery, a tobramycin ophthalmic ointment was applied to the eyelids of the rabbits.

Fig. 1. Surgical technique. (A) A eyelid incision of approximately 15 mm was made. (B) The incision was blotted dry using cotton swabs. Subcutaneous tissue was dissected with the use of Wescott scissors. (C) In group A, a thin layer of 2-octylcyanoacrylate was applied along the edges of the incision. (D) In group B, 7-0 nylon sutures were used in the form of stitches that fixed the edges of the eyelid. Full-thickness biopsies including 2 mm above and below the the incision site were taken for blinded histopathological evaluation. In group A, full-thickness biopsies were also taken by the same method.