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Tissumend II Sterile Absorbable Tissue Adhesive

Introduction

While cyanoacrylates have been used for decades to close skin wounds, their internal use has been limited because most forms of the compound are not absorbable and cause significant inflammation and foreign body reactions. Tissumend II Sterile Absorbable Tissue Adhesive (Veterinary Products Laboratories, www.vpl.com), a copolyester blend of ethyl and methoxypropyl cyanoacrylate, is now available for internal as well as external use. This compound is hydrolyzed and absorbed by tissues within 60 to 90 days after application. The adhesive is supplied in individualized, pre-filled 0.2 ml pipettes that are separately packaged in nitrogen-flooded pouches. The boxed product is sterilized with gamma radiation and, when stored under refrigeration (35° to 40°F), the shelf life is one year.

Indications

While cyanoacrylates are recommended for closure of declaw, tail docking, other incisional and laser surgical wounds, and for apposition of clean, debrided, traumatic wounds, absorbable versions may be useful for closing internal traumatic lacerations and surgical incisions. However, peer-reviewed reports of such uses in common internal surgical repairs are rare.¹

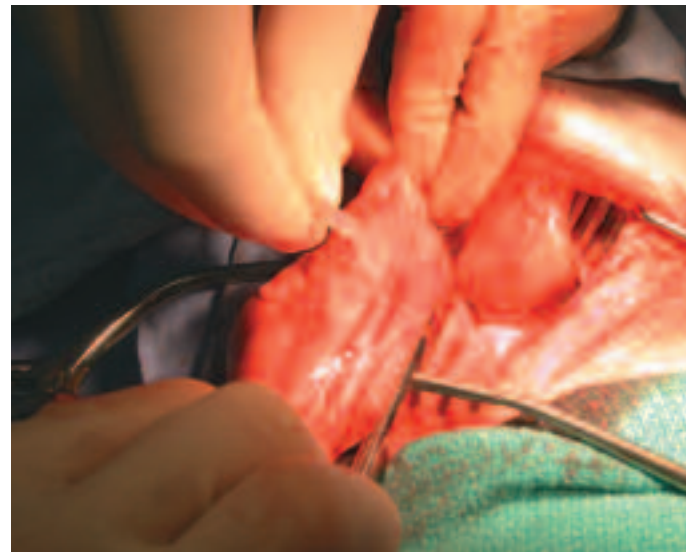
Experimentally, methoxypropyl cyanoacrylate has been used to appose renal lacerations in rabbits.² A rapid seal was noted at the incision site, and only single applications were needed despite presence of some hemorrhage in the area. The adhesive seemed to provide a degree of hemostasis. Application was much quicker than suturing and eliminated the risk of suture pull-through and subsequent increased parenchymal damage, which was noted with 38% of sutured repairs. On postmortem evaluation, no adhesions were seen with Tissumend II repairs, while 50% of the sutured repairs had

notable adhesions. Histologically, tissue healing was similar for sutured and glued closures.²

Tissumend II Sterile Absorbable Adhesive is also effective for closure of lung lobe lacerations.^{1,3} When the adhesive was applied properly to experimental lung lobe incisions in cats and dogs, the wounds developed airtight seals within 8 to 11 seconds. Because hemorrhage and movement from lung expansion can dislodge the adhesive, compression of the lobe above the wound with an atraumatic clamp is recommended during application. In addition, traction longitudinally along the incision is recommended to appose the edges, although the wound may also seal without apposition if the adhesive coats the entire surface. Multiple applications may be required in some animals, particularly if the original application is too thick or is accidentally dislodged.

In cats, closure with adhesive was much easier than with suture because of the thinness of the tissues. Postoperatively, no pleural effusion was noted after 6 hours and an airtight seal was maintained for at least one week in all animals.^{1,3}

In cats, tissue reaction from the adhesive was similar to that of suture closure. In dogs, tissue adhesive closure resulted in a greater degree of tissue necrosis and foreign body reaction than suture closure.^{1,3} I have used Tissumend II to close a traumatic lung lobe laceration in a clinical patient; although the wound was dorsal on the lobe and bled mildly before repair, a complete seal was obtained and no postoperative pneumothorax was noted.



Application of the adhesive: the lung lobe is held in traction along the incision line to appose the tissue edges while a thin layer of adhesive is applied.

Clinically, animals with refractory ulcerations, descemetocoeles, corneal lacerations, and lamellar keratectomy have been successfully treated with butyl cyanoacrylate application.^{4,5} However, how these studies apply to use of this specific formulation is unclear, as stated in a technical report from the manufacturer. When applied to experimentally induced corneal abrasions, Tissumend II produced a rapid seal of the defect and caused minimal discomfort.⁶ Within one week after application, the stratified squamous epithelium was continuous over the surface of keratectomy sites, and by 4 weeks the stroma appeared normal.⁶

Advantages

Because Tissumend II Sterile Tissue Adhesive provides a rapid seal, surgery times may be reduced. Additionally, eventual hydrolysis of the adhesive may reduce the risk of infection and

continues

inflammatory reaction seen when nonabsorbable compounds are used.⁷ Exothermic reaction is limited, thus reducing potential tissue damage. Individual packaging reduces waste of the adhesive.

Disadvantages

Appropriate application of tissue adhesive requires practice, particularly when used internally. It works well if applied as a thin film; thick applications tend to contract away from tissue edges. If applied slowly or with a pipette tip contaminated by strands of glue or fibers, the adhesive will be dragged off the wound. Additionally, the adhesive adheres quickly to gloves and can therefore be accidentally dislodged if touched before dry. The adhesive will not adhere well to moist tissues. Lungs that are overinflated



Final appearance of inflated lung lobe after adhesive closure of two lacerations.



Courtesy Dr. Rocco Mele, Tucson, Arizona

Deep eroding ulcer with neovascularization in a 3-year-old male Chihuahua



Courtesy Dr. Rocco Mele, Tucson, Arizona

After debridement to remove the nonadherent edges, Tissumend II was applied to the ulcer.



Courtesy Dr. Rocco Mele, Tucson, Arizona

Four weeks after application of Tissumend II

after application will leak, particularly if the adhesive is applied too thickly. Because the compound persists for several weeks in tissues, it is not recommended for infected wounds. It must be kept refrigerated; if exposed to temperatures above 90°F, the product may become unstable and should not be used. The adhesive may be difficult to remove from clothes or metal instruments.

Few peer-reviewed references for Tissumend II Sterile Tissue Adhesive are available; however, toxicity of cyanoacrylates in general has been widely evaluated. Toxicity depends on the specific cyanoacrylate derivative. Shorter chain derivatives (methyl- and ethyl-cyanoacrylate) such as Tissumend II are more histotoxic than longer-

chain (butyl- and isobutyl-cyanoacrylate) derivatives.⁷ Reactions can vary from mild acute inflammation to tissue necrosis and chronic foreign body giant cell reaction.⁷ Toxicity can also vary between species.³

With some cyanoacrylate products, severity of reactions is not significantly different from that seen with conventional suture techniques.^{3,8} Clinically, tissue adhesives can provide satisfactory healing with minimal complications if used appropriately; however, use of Tissumend II Sterile Tissue Adhesive as a hemostatic agent (ie, for hepatic or splenic injury) or for certain types of internal wound closure (ie, cystotomy) have not been evaluated.^{9, 10} At this time the product cannot be recommended for closure of

the gastrointestinal tract because of the potential for bacterial contamination.

Economic Impact

Tissue Adhesive is less expensive than most packages of suture materials. Because closure is rapid, anesthesia and surgery time is reduced, further decreasing overall costs. The absorbable nature of the compound may reduce potential inflammatory reactions seen with nonabsorbable tissue adhesives, thereby decreasing the risk of costly complications; however, proposed cost savings can only be speculated at this time.¹¹ ■

See Aids & Resources, back page, for references, contacts, and appendices.

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