

Cyanoacrylate Glue as an Alternative to an Additional Suture Line

in the Repair of Type A Aortic Dissection

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We describe the use of cyanoacrylate glue in conjunction with gelatin-resorcinol-formalin glue for the treatment of type A aortic dissection. Instead of placing an additional suture line 2-3 cm from the edges of the aortic stumps to create a large pocket for gluing, we have been using a cyanoacrylate adhesive for approximating the walls of the true and false lumina without the risk of tearing them. Moreover, the simplicity and quickness of the procedure enables application of the cyanoacrylate glue even deeper into the aortic arch, creating a wider area for gluing the dissected layers. (Tex Heart Inst J 1999;26:275-7)

The use of biological glues has made the surgical treatment of type A aortic dissection easier and has improved greatly the patient's outcome.^{1,2} The biological glue used most commonly is composed of gelatin, resorcinol, and formalin (GRF). It is applied to the dissected aortic wall with moderate pressure, and within 5 minutes firm adhesion is obtained. Consequently, the aortic stumps become more solid and hold the suture line with less risk of bleeding. We describe the use of a combination of GRF glue and a cyanoacrylate glue, which should further improve the surgical technique.

Technique

In the original technique, as described by Guilmet and associates,³ the surgeon inserts the GRF glue and the activator between the 2 aortic layers and joins the edges of the layers with a continuous suture. To apply pressure to the dissected aortic wall after gluing, surgeons have used a variety of instruments, including balloon catheters, Hegar dilators, modified clamps,⁴ and modified clips.⁵ A Blalock-type continuous suture, placed 2 to 3 cm from the edges of the aortic stumps to create a large pocket for gluing,^{1,3} has been advised to prevent the glue and the activator from escaping downstream. However, this suture places the thin and fragile aortic walls at risk of tearing during suturing or when the blood re-enters the false lumen after repair is completed.

Instead of placing this additional suture line (Fig. 1), we have been using a cyanoacrylate adhesive (Glubran; General Enterprise Marketing; Viareggio, Italy) for approximating the walls of the true and false lumina at the point where the Blalock-type suture is usually placed—or even deeper into the aortic arch. We apply a few drops of this glue between the dissected aortic layers along their circumference (Fig. 2). After a few seconds of pressure between the surgeon's fingers, a good adhesion is obtained. This creates a large blind pocket that is then filled with GRF glue. Then, pressure can be applied for the 5 minutes necessary to enable the GRF glue to become adhesive, without fear of the glue's escaping downstream. A complete and homogeneous adhesion of the 2 layers is obtained without the risk of tearing them.

Discussion

Twenty years ago, Guilmet and colleagues³ first suggested the possibility of using a biological glue to fuse the walls of the false and true lumina in type A aortic dissection and to obtain a solid aortic stump upon which to anastomose a Dacron pros-

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thesis. In 1990,¹ the same group reported good long-term results in more than 100 patients treated with this technique. Since then, many surgeons have tested and attested the reliability of GRF glue for repairing this peculiar lesion. Additional data^{2,6} indicate

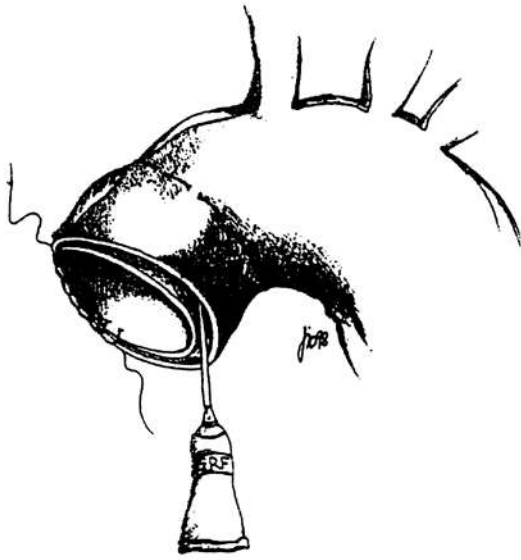


Fig. 1 The surgical technique as originally described by Guilmet and colleagues.³ After a Blalock-type suture is placed 2 to 3 cm from the edges of the aortic stumps, the GRF glue is inserted between the 2 aortic layers while a continuous suture is placed to join the edges.

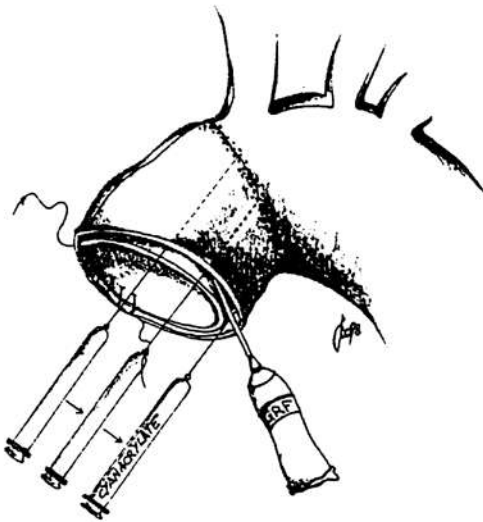


Fig. 2 A few drops of cyanoacrylate glue are applied along the circumference of the dissected aortic layers 2 to 3 cm from the edges of the aortic stumps, creating a blind pocket that is then filled with GRF glue. The simplicity and quickness of the procedure enables application of the cyanoacrylate glue even deeper into the aortic arch, creating a wider area for gluing the dissected layers.

that the use of GRF glue provides long-term stability in the reconstituted dissected aorta.

When the GRF is applied between the 2 distal aortic layers without an aortic clamp ("open aorta" technique) and without any distal suture line, the glue can escape downstream, preventing a complete circumferential adhesion of the 2 walls. Conversely, the presence of an aortic clamp or of a Blalock-type suture may tear the inner layer and create a new site of entry. The simple use of cyanoacrylate glue as we have described avoids any unnecessary trauma to the aortic walls while maintaining the advantages of uniform and homogeneous distribution of the GRF glue. Moreover, the simplicity and quickness of the procedure enables application of the cyanoacrylate glue even deeper into the aortic arch, creating a wider area for gluing the dissected layers.

The cyanoacrylate glue that we have used is a chemical adhesive composed of 2 ethyl cyanoacrylate, butylacrylate, and metacrylossisolfolane. Commonly used in plastic surgery, it polymerizes very rapidly (10 to 150 s), and its elastic properties are similar to those of the tissue to which it is applied. Given these characteristics, it might be possible to use cyanoacrylate glue alone to reconstruct solid aortic stumps even more quickly than with GRF glue. However, we did not dare to replace a glue that has demonstrated good reliability in a large series of patients. For the time being, we preferred to use the cyanoacrylate glue only to avoid all unnecessary suture lines that could damage the fragile aortic walls. We believe that our use of cyanoacrylate glue, as indicated in this modification of the technique, enables safer and more efficient use of the GRF glue. Furthermore, a new type of glue with the characteristics of both cyanoacrylate glue and GRF glue might be desirable as an alternative for future use.

Acknowledgment

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Editorial Commentary

A need exists for tissue glues in cardiovascular surgery, but approval for clinical use has not been forthcoming from the Food and Drug Administration. Therefore, surgeons in the United States have lagged behind those in most developed countries. The resorcin-gelatin glues available commercially in many European countries have not been available to us, even though we have prepared them in our own pharmacy and have proved their effectiveness in a series of acute aortic dissections repaired here at the Texas Heart Institute. De Paulis and associates have added cyanoacrylate, which is probably used in commercial glues for non-surgical conditions. Orthopedic surgeons have used such glues now for many years.

Recently, several medical supply firms have developed fibrin glues made from biologic sources. These glues have been used mostly for achieving hemostasis, but they may also be useful for acute aortic dissections. The need for adhesives in cardiovascular surgery is real and provides another opportunity for research.

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