

Comparative study of the efficacy of the common topical hemostatic agents with fibrin sealant in a rabbit aortic anastomosis model.

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Abstract:

Objective. The purpose of this study was to compare the hemostatic efficacy of the common surgical hemostatic agents with fibrin sealant (FS) and to assess their functional strength to secure hemostasis in lieu of placing additional sutures. **Methods.** End-to-end anastomosis of transected abdominal aorta was performed in moderately anticoagulated rabbits using 4 or 6 interrupted sutures. The suture line was covered either with gauze alone ("untreated") or with gauze plus Gelfoam, Avitene, Surgicel, FloSeal, or FS, following which blood flow was restored. Blood loss was absorbed by gauze and measured. The surviving rabbits were recovered and the repaired vessel was examined histologically 4 weeks after operation. The investigators were blinded to the treatment groups. Aortic anastomoses using 8 or 12 sutures (untreated) were also performed. **Results.** Untreated 4-suture anastomosis of aorta resulted in a profuse hemorrhage with an average 108.0 ± 19.2 (mean \pm SD) ml blood loss and 100% mortality ($n = 4$). FS application sealed the anastomoses, prevented blood loss ($P < 0.01$ vs untreated) and exsanguination of the rabbits ($n = 4$). Other hemostatic agents reduced the bleeding to varying degrees compared to the untreated animals (Gelfoam 66.4 ± 17.6 , Avitene 80.6 ± 34 , Surgicel 66.7 ± 16.7 , FloSeal 44.2 ± 8.5 ml blood loss, $n = 4$ /group), but the changes were not statistically significant. One to three rabbits in each group survived the operation. Six-suture aortic anastomoses, untreated, resulted in 67.7 ± 21.8 ml blood loss and 100% survival ($n = 6$). Application of FS produced immediate and sustained hemostasis in all the animals ($P < 0.01$ vs untreated). Other hemostatic agents also reduced the bleeding (Gelfoam 42.5 ± 10 , Avitene 50.9 ± 12.4 , Surgicel 32.1 ± 14 , FloSeal 33.9 ± 5.4 ml

blood loss, $n = 6/\text{group}$), but the changes were not statistically significant. The 8- and 12-suture aorta repairs resulted in a moderate blood loss (43.9 ± 19 and 21.3 ± 14.9 ml, respectively), followed by a stable hemostasis that precluded the need to use any hemostatic agent. The aortic cross-clamping time of the 12-suture and time to hemostasis for both the 8- and the 12-suture techniques were significantly longer than those of the 4-suture plus FS application ($P < 0.01$, $P < 0.01$ and $P < 0.05$, respectively). Conclusion. In a moderate coagulopathy, FS was proven to be the most efficacious hemostatic agent, producing immediate and sustained hemostasis at the arterial anastomotic site. This high efficacy is in part attributed to the strong tissue adhesive property of this agent. FS application may potentially ease the anastomosis and shorten the duration of timely critical vascular procedures. © 2002 Elsevier Science (USA).