

Conclusion: Selective observation and various operative techniques can yield high renal salvage rates approximating 85% after GSW.

### **Topical haemostatics in renal trauma--an evaluation of four different substances in an experimental setting**

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Background: Damage control is valuable in hemodynamically unstable trauma patients. To improve the hemostasis of packing, topical hemostatic agents have been suggested. The effects of such agents are unclear in trauma situations. The purpose of this study was to investigate the hemostatic capacity, and the stability of the hemostatic clot, of four substances with different mode of action in an experimental traumatic bleeding model.

Methods: A standardized heminefrectomy was performed in 180 heparinized and normotensive Sprague-Dawley rats. Four different substances were studied (separately and in combinations) in a randomized fashion: gelatin (sponge and matrix), bovine thrombin, freeze-dried recombinant factor VIIa (rFVIIa), and microporous polysaccharide hemospheres. Eight treatment groups (15 animals/group) were considered, primary endpoint was hemostasis within 20 minutes of observation. The effective treatment groups were evaluated in a second set in the same experimental model, but with a prolonged observation time after hemostasis (60 minutes) to control the stability of the clot.

Results: Those animals treated with gelatin in the comparative study, with and without thrombin or rFVIIa, obtained hemostasis. Thrombin and rFVIIa alone did not have any hemostatic capacity. Only 20% to 25% of the animals obtained hemostasis with microporous polysaccharide hemospheres alone or in combination with rFVIIa. In the prolonged observation study, gelatin alone and in combination with thrombin or rFVIIa was studied. On average, 34% (20%-54%) of the animals rebled with no significant difference between the treatment groups.

Conclusions: Gelatin-containing products provided a fast hemostasis in this experimental model. One third of the animals rebled, regardless of whether thrombin or rFVIIa was added. Further studies are demanded to confirm these results clinically

### **Editorial Comment**

The above two articles on gunshot wounds to the kidney and the other on haemostatic agents are both very timely and raise many controversies and unanswered questions. Although the authors hold on to the dogma of a one-shot IVP before any renal exploration, I have generally found little utility in its use. In our hands, the IVP is usually a “fuzzy-gram” and adds little to the decision making. While Morey et al published some value in the IVP in helping to grade the renal injury, as to high or low grade, we have not had such luck. In our trauma center, if the patient is stable enough to undergo imaging, we take the patient to the CT scanner and get an accurate read as to the grade of renal and associated injuries. If the patient is so unstable that no imaging can be done and needs to be rushed to the OR, this patient is typically a “damage control” patient where fancy and time consuming renal reconstructions are a disservice to the patient. It is our feeling that a damage control patient with a kidney injury needs to be observed, temporized by packing or the like, or undergo a quick nephrectomy. In such an unstable patient, a one-shot IVP will not help you or allow you to change your intra-operative decision making. Furthermore, an easy way to assess contralateral kidney function is to place a vessel loop to occlude the ipsilateral injured kidney ureter, give indigo, and look for blue in the Foley. Blue indicates at least a partially functional contralateral kidney. The notion that we should do a one-shot IVP on all patients to prevent taking out a solitary kidney that has a 0.1% incidence makes no sense to me. While we

are in the tissue preservation business, and would like to preserve every kidney, kidney repair should not be at the expense of compromising patient recovery and survival from the associated injuries. While the urology community has been slow to accept the above statements, there is mounting evidence from the general surgical and trauma literature that one shot IVPs and getting primary vascular control are dogma, and have little value in the contemporary setting.

I also have problems with the dogma of primary, proximal vascular control of the renal hilum before opening Gerota's fascia. By definition a GSW to the kidney has penetrated Gerota's so it is an uncontained hematoma and Gerota's is open already. In general, if the kidney injury is significant, Grade 3-5, the hematoma has already done the kidney mobilization and dissection – so getting the kidney to the midline to place a vascular clamp on the hilum typically can be done very quickly and easily. Primary, proximal control has value for a zone 1 hematoma where there is a potential injury to the great vessels. Here getting proximal and distal control has great value to prevent exsanguination. However, if the injury is just to the renal parenchyma, I really don't understand the need for proximal control - especially in every patient. Furthermore, while the SF General group reports that it takes only 10 minutes to get proximal control, in my own experience it typically takes more like 20 plus minutes, especially on the right. So, in the unstable and potential damage control patient I feel we do the patient a disservice is delaying kidney repair for 20 or more minutes. They also report that they only clamp the renal artery 12% of the time – that suggests to me that they are over grading the renal injuries. In our experience, true grade 4 and 5 renal injuries are usually aggressively bleeding from the kidney, and clamping the hilum expedites and facilitates renal repair. As long as the warm ischemia time is < 30 minutes, I see no reason not to clamp the artery. Furthermore, the use of adjunctive hemostatic agents, such as Floseal and the use of Nu-knit make sense to me and can expedite vascular control. Such agents should not substitute for renal parenchymal suturing, but be an adjunct, expect perhaps in the very unstable damage control patient where packing the kidney and applying agents can preclude the need for a damage control nephrectomy.

The last comment I have is why we should treat low grade GSW to the kidney any differently then a blunt renal injury, if the kidney grade for grade injury is the same. Clearly high grade GSW have a high degree of blast injury and delayed necrosis and need to be more aggressively explored and repaired. However, for low velocity GSW and no clear intra-abdominal injury, I feel in this day and age of excellent interventional radiology imaging and the readily available use of selective angio-embolization in most trauma centers, that conservative management of isolated penetrating injuries, even grade 3 and 4 are very under utilized. Arguably, the rate of pseudoaneurysms and AV fistulas can approach 25% in conservatively managed high grade penetrating injuries – but an unnecessary abdominal exploration can be avoided – in so doing expediting morbidity and recovery time.

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