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How I Do It

Refinement in the technique of perihepatic packing: a safe and effective surgical hemostasis and multidisciplinary approach can improve the outcome in severe liver trauma

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Repacking;
Hemostasis;
Survival;
Complications;
Trauma center

Abstract

BACKGROUND: Since 2005, we refined the technique of perihepatic packing including complete mobilization of the right lobe and packing around the posterior paracaval surface, lateral right side, and anterior and posteroinferior surfaces.

METHODS: Two groups of patients with grade IV/V liver trauma underwent perihepatic packing before and after 2005. The study group included 12 patients treated with the new technique. The control group included 23 patients treated with the old technique.

RESULTS: All 13 patients except one who died within 24 hours were treated with the old technique. The overall survival rate was 75% in the patients treated with the new technique (vs 30.4%, $P < .02$); the liver-related mortality was 8.3% versus 34.8% (P = not significant). The mean survival time in the intensive care unit was longer in the latest group (39.4 vs 22.3 days, P = not significant). The incidence of rebleeding requiring repacking was 16.7% in the patients who underwent new packing versus 45.5% in the patient who were treated with the old technique (P = not significant). The overall (81.8% vs 100%, P = not significant) and liver-related morbidity rate (18.2% vs 41.7%, P = not significant) and the incidence of abdominal sepsis (9.1% vs 41.7%, P = not significant) decreased.

CONCLUSIONS: Our refined technique of perihepatic packing seems to be safe and effective.

Major liver trauma, when associated with extensive parenchymal injury and uncontrollable bleeding, may rapidly and "irreversibly" evolve toward the development of the lethal triad of death (acidosis, hypothermia, and coagulopathy). These situations are challenging for the trauma surgeon. In the last decades, temporary packing with gauzes has been extensively used since its reintroduction in the 1970s by some trauma surgeons, becoming a safer and more effective alternative to liver resections.[1] This strategic approach has been defined by Rotondo et al[2] in 1993. This concept and its definition have been derived from the mil-

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itary strategy adopted by the US Navy in order to perform quickly the necessary, essential repairs to a ship for absorbing damages and maintaining mission integrity.[3] Those repairs should be just sufficient for navigating the ship back to its own native harbor for definitive repairs. This concept to bail out surgery and reoperate for definitive surgery after appropriate intensive care unit (ICU) resuscitation and angiography with embolization when indicated has been introduced for severely injured trauma patients[4] and massive liver trauma. The first described surgical approach to uncontrollable traumatic liver hemorrhage, based on the concept of gaining temporary control by packing and occlusion of the porta hepatis, has been the "Pringle Maneuver."[5] As early as 1900s, abbreviated laparotomy and planned reexploration for hepatic trauma have been proposed.[6,7] Packing as a method to control hemorrhage from liver injuries was also described by Halsted in 1903.[8] Based on the experience in World War I, the Medical Department of the US Army recommended intrahepatic packing or sutures to be used for large liver wounds with or without active hemorrhage.[9] The first pioneer experiences in packing of liver injuries were discouraged after experiencing serious complications in World War II and the Vietnam War.[10] Observations from the 2nd Auxiliary Surgical Group in the Mediterranean and Southern European Campaigns suggested alternative approaches to liver wounds.[11] Because of the potential for late complications from these experiences, such as sepsis and recurrent hemorrhage after the removal of packs, packing for liver injures was almost abandoned for nearly 2 decades.[12] Nevertheless, during the 1970s and 1980s, perihepatic packing was reestablished as safe and effective in managing liver injuries.[13–17] In fact, in the 1970s, the results of the aggressive surgical strategies that were preferred during the previous decade were disappointing. Ironically, after adopting these aggressive surgical procedures, occurred the same complications (even more frequently and worse) that previously led the surgeons to abandon packing.[18] Major hepatic resections had become rare ever since 1982.[19–21] Perihepatic packing is currently used in 4% to 25% of patients requiring operative management for liver injury.[9,22] A careful selection of the patients for perihepatic packing (massive liver injuries with uncontrollable hemorrhage associated to hemodynamic instability and lethal triad), together with appropriate timing of packs removal, could guarantee low morbidity and mortality rates.[6,12,23] Several techniques of perihepatic packing have been proposed to achieve an effective hemostasis with a low incidence of rebleeding after its removal.[12,24–26] Nonetheless, it is unclear which one of these techniques guaranteed the best results. Hence, we attempted to systematize and standardize the number and location of packs to be used and the direction of the compression forces. In our level I trauma center in Bologna, Italy, we started a dedicated surgical activity focused on trauma surgery in 1989. We had an initial ex-

Figure 2 Step 1: complete mobilization of the right lobe by sharp dissection of the falciform and right triangular and coronary ligament.

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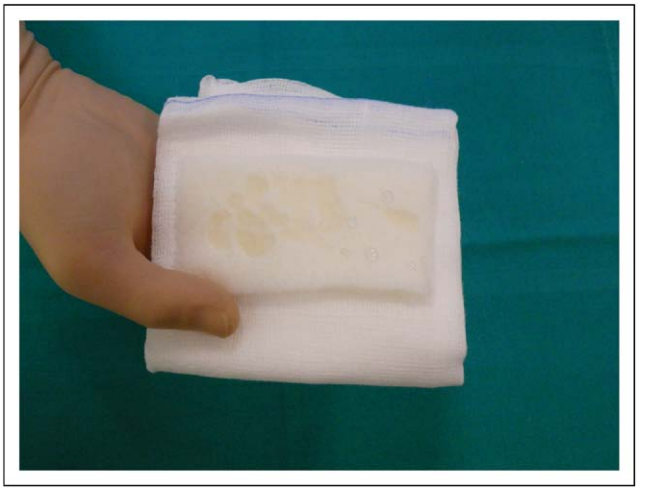

Figure 3 Folded gauze laparotomy sponges coated with topical hemostatic agents.