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Application of radiofrequency ablation for splenic preservation



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ABSTRACT

Background: Traditional splenic preservation surgery involves considerable difficulties, high risks, and numerous postoperative complications. In this study, we applied radiofrequency ablation (RFA) to splenic preservation and explored its clinical value.

Methods: The clinical data of 129 patients with traumatic splenic rupture who received surgery in our hospital from September 2008–June 2013 were retrospectively analyzed. According to the operation methods, these patients were divided into three groups: 35 patients received splenic preservation surgery with RFA-assisted technique (RFA + suture repair group), 78 patients received splenic preservation surgery without RFA (traditional operation group), and 46 patients received splenectomy (splenectomy group). Preoperative, intraoperative, and postoperative-related parameters of the former two groups were compared. The postoperative complications and immunologic parameters of patients with preserved spleens were compared with those of patients who underwent splenectomy.

Result: In the RFA + suture repair group, 34 cases successfully underwent splenic preservation surgery. Meanwhile, 49 cases successfully underwent splenic preservation surgery in the traditional operation group. RFA + suture repair group had shorter mean operation time (79 ± 22 versus 119 ± 26 min, $P < 0.05$), less bleeding during surgery (115 ± 67 versus 235 ± 155 mL, $P < 0.05$), and less intraoperative transfusion (14% versus 36%, $P < 0.05$). The postoperative bleeding and hospital-stay duration were remarkably lower than those in the traditional operation group (100 ± 52 versus 219 ± 93 mL and 7.1 ± 1.4 d versus 11.7 ± 2.8 d, respectively, $P < 0.05$). The spleen-preserving patients showed better results than the splenectomy group did for some parameters related to complications and immunology.

Conclusions: Compared with traditional splenic preservation, RFA is simple and feasible, and it can greatly benefit the spleen preservation operation.

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1. Introduction

The spleen is the largest peripheral lymphoid organ in the human body. The importance of the role of spleen in blood

storage and filtration is well documented. However, the spleen is also the most vulnerable organ in the abdomen. The incidence of spleen injury among abdominal injuries is as high as 40%–50% [1–3]. For years, most traditional operations

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have adopted splenectomy to treat the traumatic rupture of the spleen. Previous studies show that splenectomy may increase the risk of thrombosis, severe infections, and overwhelming postsplenectomy sepsis (OPSI) syndrome. New findings on the immunologic and hematological functions of the spleen have emphasized on splenic conservation and whether this procedure is feasible and can be done safely. The option of splenic preservation surgery for patients who require operative management has received an increasing amount of attention [4,5]. In recent years, a commonly recognized concept of spleen protection during the treatment of traumatic spleen rupture is gradually being accepted among surgeons. However, traditional operations face considerable great difficulties, high risks, and many postoperative complications that pose certain challenges to clinical applications [6]. Numerous studies have been conducted on the application of radiofrequency ablation (RFA) in hepatectomy, and satisfactory outcomes for stopping bleeding have been obtained. Inspired by these findings, we applied RFA in splenic preservation to reduce bleeding during and after operation. This study aimed to evaluate the feasibility and safety of RFA in splenic preservation for spleen rupture.

2. Methods

The data of all patients who underwent splenic preservation surgery or splenectomy for splenic trauma in our hospital from September 2008–June 2013 were recorded prospectively in a computerized database. A total of 78 patients who underwent traditional spleen preservation from September 2008–December 2011 were selected from the database and designated as the traditional operation group. In addition, 35 patients who received an RFA-assisted spleen preservation operation from January 2012 were designated as the RFA + suture repair group. The related parameters of the two groups were statistically analyzed. These parameters included operation time, bleeding during operation, intraoperative and postoperative transfusion, postoperative drainage quantity, hospital stay, and postoperative complications. The immunologic alteration including hematological examination and humoral immunity parameters, which were detected 2 mo after surgery, and postoperative complications in the two groups were compared with those of patients who underwent splenectomy during this period.

The selection of surgical treatment strategy depended on the level of severity of the splenic damage, associated injuries, hemodynamic condition, and cardiovascular situation of the patient. First, all the patients with splenic trauma and those who were unsuitable for nonoperative management received splenic preservation surgery or splenectomy. Second, splenectomy was directly performed on patients with severe spleen rupture, complex or combined injuries, or unstable hemodynamics and pathologic spleen. Third, splenic preservation surgery was performed on patients with isolated spleen rupture and those who needed operative management. We have applied the RFA technique continuously starting from January 2012, and from then on there were no splenic preservation cases without RFA. However, before this date, we mainly used conventional methods to manage the operations.

2.1. Surgical methods

After the identification of operation indicators and the improvement of preoperative preparation, an incision under the left costal margin was made (when complex injuries were suspected in abdominal organs, an abdominal midline incision or lateral rectus incision was selected), and the bleeding of the splenic pedicle was quickly controlled. Hematoceles and blood clots were then extracted to identify the organ injury scale described by the American Association for the Surgery of Trauma of the rupture of the spleen. After the identification of spleen injury, different approaches were adopted for splenic preservation.

2.1.1. RFA + suture repair group

An auricular clamp was placed at the splenic pedicle before treatment. Minimal bleeding means that the rupture surface of the spleen was shallow or located at exposure locations, such as the distal polar and diaphragmatic surface. The blood vessel of the splenic pedicle was not blocked; rather, the radiofrequency device electrode (Type LDDJC-10044 of Mianyang Lide Corporation, Mianyang kechuang garden incubation building, Sichuan, China); Fig. 1 was directly inserted into the rupture site and was turned on for coagulation (Fig. 2). The coagulation was terminated after the impedance value on the display meter of the host machine reached about 300 Ω [7,8]. The electrode was gently turned off as soon as the exudation stopped (Fig. 3). For deep ruptures, large partial fractures, visible blade shapes, and ruptured splenic lobe vessels (Fig. 4), an auricular clamp was tightened at the hilum of the spleen to temporarily block splenic blood flow. A coagulator was inserted about 0.5 cm into the rupture where healthy splenic tissues were located. The depth reached 1 cm–4 cm (not too deep or too close to the hilum of the spleen to avoid injuring the artery and veins of the spleen). The stitch length interval was about 1 cm–2 cm. After several times of



Fig. 1 – The radiofrequency device electrode (multiple-electrode, Type LDDJC-10044, produced by Mianyang Lide Co, Ltd) has a maximum diameter of 12 mm and a functional electrode needle with a length of 40 mm. (Color version of the figure is available online.)

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