The application of a newly developed linear stapler preloaded with tissue reinforcement for distal pancreatectomy in the management of ovarian cancer

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Summary

Advanced ovarian cancer may extend into the spleen, and even the pancreatic tail, in which a splenectomy associated with distal pancreatectomy is crucial for optimal cytoreduction. A new linear stapler preloaded with tissue reinforcement is currently introduced. We herein report the first three cases of successful application of this device for distal pancreatectomy performed during cytoreductive surgery for ovarian cancer.

Key words: Ovarian cancer; Distal pancreatectomy; Linear stapler; Tissue reinforcement; Pancreatic leakage.

Introduction

Optimal cytoreduction at primary debulking surgery has been shown to be the most important prognostic factor in the management of ovarian cancer [1, 2]. Advanced ovarian cancer may involve the spleen and even into the pancreatic tail. Thus, distal pancreatectomy combined with splenectomy is necessary for optimal cytoreduction [3].

Pancreatic leakage is a major determinant of morbidity after distal pancreatectomy. In gastrointestinal surgery, the reported rates of pancreatic leakage are highly variable, ranging from 0-61% (21% on average) [4]. In the surgery performed for gynecologic cancer, Kehoe *et al*. reported that four of 17 patients who underwent a distal pancreatectomy developed pancreatic leakages and were managed with percutaneous drainage [3].

Prevention of the pancreatic leakage is crucial and many techniques have been developed for the closure of the pancreatic remnant. Simple closure using linear stapler devices has been introduced, with the hope that by utilizing techniques that are easily performed would improve the effectiveness and safety of the surgical procedures. This, however, has not yet been proven: the stapling technique is not necessarily safer than previous procedures, but it has been shown to be just as safe as a traditional hand-suture technique in terms of pancreatic leakage [4].

With the aim of less pancreatic leakage, some surgeons have proposed the addition of tissue reinforcement materials to the stapling line [5, 6]. In one such method, a biodegradable buttress mat is mounted on the facing surfaces of the cartridges of a linear stapler and is stapled onto both sides of the cutting edges during the firing. The reinforcement material supplies an anchor for the staples to compress and seal tissues edges firmly, and act as a scaffold for fibroblast-mediated wound healing.

A ready-to-use linear stapler preloaded with tissue reinforcement was recently released that allows a surgeon to apply the material by one-step firing. We herein report our experiences with the first three cases of ovarian cancer in which this device was used for distal pancreatectomy.

Case Reports

Three case are presented in which the distal pancreatectomy procedure with associated splenectomy using a Duet TRS Reload device (Covidien, Norwalk, CT) was carried out.

The newly introduced linear stapler, Duet TRS Reload, is preloaded and secured on the anvil and cartridge with synthetic absorbable reinforcement material for tissue reinforcement (Figure 1 A, B). This device places the reinforcement material on the both sides of the sealing line, and two triple staggered rows of staples are inserted while the tissues between the rows are simultaneously transected (Figure 1C).

Distal pancreatectomy combined with splenectomy was performed when a metastatic lesion of ovarian cancer was identified on the pancreatic tail, splenic hilus, or both. The spleen and pancreatic tail were mobilized, and splenic artery and vein were ligated and divided. Then, pancreatic parenchyma was simply transected using the Duet TRS Reload device (Figure 2). A drain was placed onto the pancreatic bed, and the amylase values of the drained fluid were measured postoperatively. Pancreatic leakage was suspected when the drained fluid contained elevated amylase greater than three times the upper normal serum value after postoperative day 3 [7]. The use of the device for distal pancreatectomy was approved by the Institutional Review Board.

Case 1

A 50-year-old female underwent primary surgery for bilateral ovarian tumors with upper abdominal disease. Her histopathological diagnosis was serous adenocarcinoma, and the clinical stage was IIIc. Extended surgery, including rectosigmoidec-

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Fig. 1

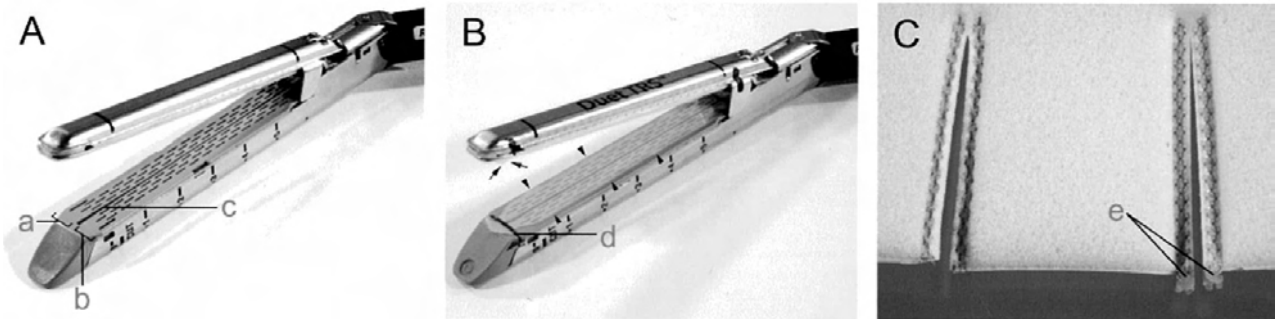

Fig. 2

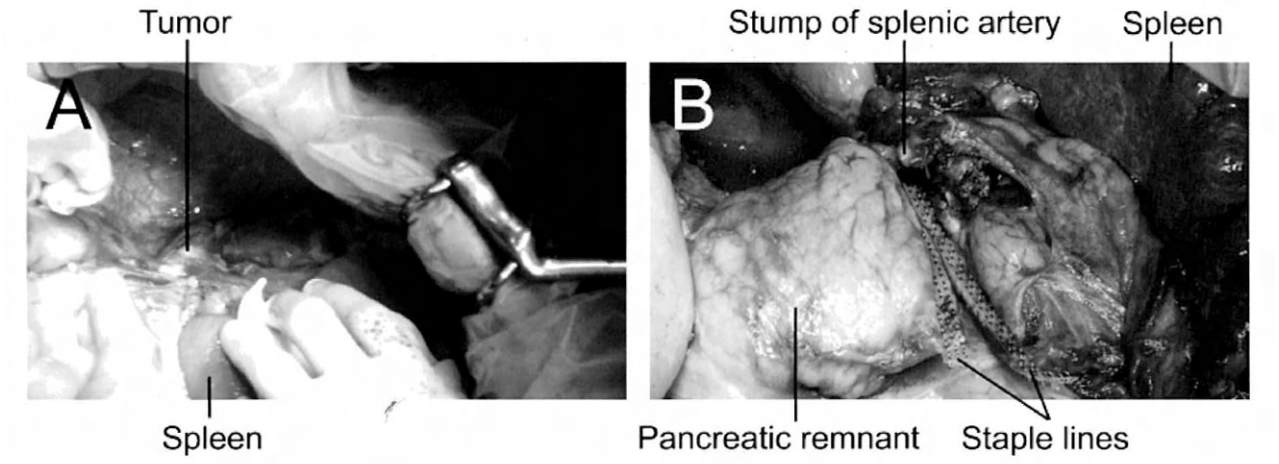

Figure 1. — A: Close-up view of the standard linear stapler. Two triple staggered rows of staples (a and b) can be seen. A groove (c) between the two rows is for the transection knife placed on the anvil. B: A close-up view of the new linear stapler, Duet TRS Reload (Covidien, Norwalk, CT). A semi-transparent material for reinforcement is preloaded onto the anvil (arrowheads) and cartridge (arrows) for each side. An anchoring suture (d) keeps the reinforcement material flat and secure during manipulation. C, Transection lines produced using the standard stapler (left side) and the stapler with the reinforcement (right side). The sleeves (e) are made of two layers of a semi-transparent material at the cutting edge.

Figure 2. — Intraoperative photographs of Case 2. A: Identification of the disease involving the superior part of the pancreatic tail. B: The appearance of the pancreatic remnant closed with staple-line reinforcement.

tomy, diaphragmatic stripping, systemic paraaortic and pelvic lymphadenectomy, and distal pancreatectomy with splenectomy were performed to accomplish a visible residual tumor-free status. The patient's postoperative course was uneventful without any evidence of pancreatic leakage. Oral feeding was resumed eight days after surgery.

Case 2

A 43-year-old female underwent primary surgery for a right ovarian tumor with extensive upper abdominal disseminated disease. The histopathological diagnosis of the ovarian tumor was serous adenocarcinoma, and the clinical stage was IIIC. Extended surgery, including rectosigmoidectomy, partial resection of the ileum, diaphragmatic stripping, systemic paraaortic and pelvic lymphadenectomy, and distal pancreatectomy with splenectomy were performed to accomplish a visible residual tumor-free status. The postoperative course was uneventful without any evidence of pancreatic leakage. Oral feeding was resumed 12 days after surgery.

Case 3

A 60-year-old female underwent primary surgery for Stage Ic ovarian cancer. Her histopathological diagnosis was clear cell adenocarcinoma of the left ovary. Eighteen months after the primary surgery, a metastatic lesion was demonstrated by a follow-up computed tomography scan at the splenic hilus, and a secondary cytoreductive surgery was performed, including distal pancreatectomy with splenectomy, in order to achieve a visible residual tumor-free status. Her postoperative course was uneventful without any evidence of pancreatic leakage. Oral feeding was resumed 14 days after surgery.

Discussion

A variety of attempts to avoid pancreatic leakage after distal pancreatectomy have been reported, including pancreatic duct ligation, ablative transection, use of fibrin glue, hand-sewn patches, stenting of the pancreatic duct, and use of stapling devices. However, a meta-analysis could not identify any technique that was significantly superior to the traditional hand-suture technique [4].

Recently, the application of tissue reinforcement for stapled transection lines was reported in a distal pancreatectomy in gastrointestinal surgery [5, 6]. Using this procedure, two pieces of bioabsorbable materials were placed over the anvil and cartridge, and stapled onto the cutting surfaces of the pancreas simultaneously during

firing. Consequently, two layers of reinforcement material sandwich the soft pancreatic parenchyma and strengthen the cutting edges. This technique significantly decreased the pancreatic stump leakage rates compared to that without the reinforcement.

A drawback of this technique is the manual loading of the reinforcement material. Surgeons need to set the reinforcement material for both the anvil and the cartridge every time before use. Moreover, careful handling of reinforcement-mounted devices is necessary during the manipulation to avoid accidental displacement or slipping off of the reinforcement material. Compared to this technique, a new linear stapler, the Duet TRS Reload, is preloaded with reinforcement material that is securely anchored on the cartridge by a nylon string. This ready-to-use device enables one-step endostapling with tissue reinforcement.

The use of tissue reinforcement strengthens the cutting surfaces and enhances tension strength, and reduces bleeding from the pancreatic stump [6]. The absorbable reinforcement material serves as a 3-dimensional platform for wound healing. Fibroblasts migrate to the pancreatic stump and secret collagen fibers promoting tissue healing, and macrophages degrade the reinforcement material. The reinforcement material integrated into the Duet TRS Reload is the absorbable synthetic polymer, which is composed of glycolide (60%) diaxonone (14%), and trimethylene carbonate (26%). Thus, complications caused by long-standing foreign body materials, such as infection, migration, erosion, or fistula formation, are unlikely occur as a result of these biodegradable materials [5]. However, while the Duet TRS Reload is currently in use, its use has not yet been approved for pancreatic surgery.

We herein reported the successful application of the linear stapler preloaded with tissue reinforcement to distal pancreatectomy in the management of three patients with ovarian cancer. The device is convenient and simplifies the closure technique. It is potentially useful for gynecological surgeons to perform distal pancreatectomies. Further studies are needed to confirm the efficacy and safety.

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