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Personal experience and litterary review

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Fibrin sealant in general surgery. Personal experience and literary review

In *consideration of the use of fibrin glue in a general surgery department, authors analyze their last two years series. Operations on liver and biliary ducts, bowel and proctologic surgery, thyroid and breast surgery, abdominal wall hernias, fistulas and difficult wounds are considered with a literary review on fibrin sealant.*

KEY WORDS: Biological glue, Fibrin sealant, General surgery

Introduction

It is well known that, especially in the field of healthcare, technology plays a predominant and essential role in improving treatment results. This can easily be seen in various areas of surgery in which the major innovations made in recent years have been utilized. These innovations include reduction of blood loss; improvement of techniques used in hepatobiliary and colorectal surgery; use of prostheses in day surgery; and sentinel lymph node analysis in cancer surgery. It has become evident that extensive technological devices are essential in laparoscopic procedures and bowel anastomosis in which staplers, vessels, biological sealants and tissues sealed with ultrasound (UltraCision® harmonic scalpel) or radio frequency (LigaSure™ Technology) are used. "The common denominator among all subspecialties is an improvement in patient care, manifested as a decrease in morbidity and mortality" [1-3]. After traumatic or postoperative tissue breakage the priorities of any biological system are cessation of hemorrhage, prevention of infection, and restoration of tissue integrity and function. Several hemostatic techniques achieve the goal of hemorrhage cessation [4]. Topical hemostatic agents have been used in surgery with varying degrees of success. These agents include oxidized cellulose, absorbable gelatin sponges, microfibrillar collagen and fibrin seals [5]. Fibrin sealants and fibrin glues have become effective instruments in the care of surgical patients and have been used as an adjunct to hemostasis, wound healing, and drug delivery [6]. Fibrin sealants have a lot of applications also as biological adhesives in surgical procedures [7]. Human fibrin glue is without doubt a valuable adjunct to surgery as a measure against bleeding complications, and is therefore especially useful for cirrhotic patients with coagulation problems. This is easy to understand since the key biological property of human fibrin glue is its ability to facilitate hemostasis, by mimicking the advanced phases of the coagulation cascade, followed, due to the activation of growth factors, attraction of fibroblasts, and promotion of their replication, by the reparative processes of fibrosis and angiogenesis. It is important not to forget the indirect effect fibrin glue has in the battle against infection, due to its ability to fill dead space which might otherwise provide nourishment for bacteria. Fibrin glue, has been used for approximately 20 years in all areas of surgery and in a wide variety of clinical applications [8]. There are specific on-label indications for use of commercial fibrin sealants. There is also extensive literature supporting the use of fibrin sealant in a wide variety of off-label appli-

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cations. The surgical fields that can benefit human fibrin glue effects are numerous, liver and biliary surgery, bowel and proctologic surgery, thyroid and breast surgery, abdominal wall hernias, fistulas and difficult wounds surgery. The daily use of human fibrin glue improve the surgical outcome in many fields of general surgery [4,6-36], there are few contrary report [5,37-41] and very few that suggest that fibrin glue should be used with caution in humans[42-45].

Materials and methods

From January 2010 to February 2012, 325 patients underwent general surgery operations in which fibrin sealant was used at the Department of General Surgery of the Second University of Naples. The surgical fields, types of operations and other considered parameters are shown in Table I.

Fibrin sealant was used by "spray set for Tissucol® (Baxter – Biosurgery©)" in 96 cases (29.53%) that underwent to liver surgery, laparoscopic cholecistectomy, total thyrodectomy, axillary lynphadenectomy, incisional abdominal hernias. In the rest of the series the glue has been directly applied on the tissue. In our liver cases fibrin sealant has been sprayed directly on liver parenchyma, contrariwise on the biliary ducts it has been applied by duplojet®, in the laparoscopic colecistectomies fibrin sealant has been applied by a longer catheter (DUPLOCATH 35 M.I.S. Application Catheter®), in the bowel cases the application has been with a tip applicator that can be useful for sealing anastomosis in a wide variety of surgical. Spray fibrin sealant 5ml has been used in hepatectomy, liver resections and in the incisional hernias, 2ml in cholecistectomies, total thyroidectomies, lynphadenectomies. In the group in which the glue application was direct on the tissue it has been used 2ml in biliary and bowel surgery to protect the performed anastomosis, and in thyroid lobectomies to fill the dead space. 1ml fibrin sealant was used in the rest of the

Table I

	N°	%	Operation Types	Complications		Recurrence	Complete healing
Liver	13	4	9 Right ep.	2	22.22%		7
			4 Liver resections	–			4
Biliary	18	5.5	12 cholecistectomies	–			12
			4 cholecistojejunostomy	–			4
			2 choledocojejunostomy	1	50%		1
Bowel	20	6.1	5 small bowel resections	–			5
			11 rectal anterior resections	1	9.09%		11
			3 left hemicolectomies				3
			1 right hemicolectomy	–			–
Procto	26	8	11 anal fistulas	1	9.09%	2	9
			15 sinus pilonidalis	–		3	12
Thyroid	36	11	22 total thyrodectomy	1	4.54%		22
			9 left lobectomy	–			9
			5 right lobectomy	1	20%		5
Breast	48	14.7	21 mastectomy + lymphadenectomy	–			21
			17 quadrantectomy + lymphadenectomy	–			17
			10 benign tumors	–			10
Hernias	62	19	14 umbilical hernias	1	7.14%	1	13
			37 inguinal hernias	2	5.40%	1	34
			11 incisional hernias	1			10
Fistulas	43	13.2	23 abdominal fistulas in chron Dis.	–		9	14
			20 abdominal postoperative fistulas	–			20
wounds	59	18.1	26 diabetes ulcers	–		7	19
			13 vascular ulcers	–		1	12
			20 various aetiology	–		3	17

series. In this series 533ml of human fibrin glue for a total cost of euro 46.371 have been used.

Results

Complete healing without complications and recurrence was achieved in 91.69%.Total complications rate was 3.38% (11/325). In the group of liver cases the major complications have been observed. In two cases we had infectious complications, the other 11 patients had an improved outcome in terms of drainage (reduction of volume and time) and hospital stay. In the group of biliary surgery it was observed 1 temporary leakage. In the bowel group, 1 rectal fistula in a knight Griffen operation, and 1infection in proctology. Two bleedings (total thyroidectomy and lobectomy) in the thyroid group and 3 serohematoma and 1 neuralgic pain in the hernias group (Table II). The higher recurrence rate (39.1%) was observed in the group of patients with abdominal Chron's Disease fistulas and in the ulcers group (18.6%). In our series there were not emergency operations.

Discussion

In our liver cases fibrin sealant has been sprayed directly on liver parenchyma, but sponge technique is also useful for bleeding from the parenchyma of visceral organs, such as the liver and the spleen [46]. The application of fibrin sealant to an actively bleeding tissue or parenchima could be difficult. A good approach for using fibrin sealant in this situation is to combine it with a [46]. Contrariwise on the biliary ways it has been applied by duploject® to protect the cholecistojejuneal and choledocojejuneal anastomosis to avoid biliary leakage. In laparoscopic colecistectomies fibrin sealant has been applied by a longer catheter (DUPLOCATH 35 M.I.S. Application Catheter®) on the bed of the gallbladder to avoid bleeding and leaking complications [16,47]. The spray

Table II

	Operation Types	Complications N°	%	Type
Liver	9 Right ep.	2	22.22%	infection
	4 Liver resections	–		
Biliary	12 cholecistectomies	–		
	4 cholecistojejunostomy	–		
	2 choledocojejunostomy	1	50%	temporary leakage
Bowel	5 small bowel resections	–		
	11 rectal anterior resections	1	9.09%	fistula
	3 left hemicolectomies	–		
	1 right hemicolectomy	–		
Procto	11 anal fistulas	1	9.09%	infection
	15 sinus pilonidalis	–		
Thyroid	22 total thyrodectomy	1	4.54%	bleeding
	9 left lobectomy	–		
	5 right lobectomy	1	20%	bleeding
Breast	21 mastectomy + lymphadenectomy	–		
	17 quadrantectomy + lymphadenectomy	–		
	10 benign tumors	–		
Hernias	14 umbilical hernias	1	7.14%	pain
	37 inguinal hernias	2	5.40%	serohematoma
	11 incisional hernias	1	9.09%	serohematoma
Fistulas	23 abdominal fistulas in chron Dis.	–		
	20 abdominal postoperative fistulas	–		
wounds	26 diabetes ulcers	–		
	13 vascular ulcers	–		
	20 various aetiology	–		

technique is particularly useful to cover large surface areas of bleeding (reoperative surgical dissections, inflamed tissues). It also results in the efficient use of the sealant, thus reducing the costs associated with the use of the glue [46]. The use of fibrin sealant for sealing enteric anastomoses, particularly for colonic anastomosis, is still controversial, in literature there are mixed results reports [27,28,30,40,48-51]. Several of these reports attempt to use fibrin sealant in emergency situations, including peritonitis and high-risk sutured anastomoses [48-53]. In our bowel series the application was made with a tip applicator that can be useful for sealing anastomosis in a wide variety of surgical. Over the last 10 years, many reports has developed on the use of fibrin sealant for anal fistulas [20,21,38]. The most of reports support its use because it is easier, less painful, and less likely to cause anal incontinence, less invasive and conservative approach. [21,54-57]. The methods are associated with an intermediate chance of success. Good results seem to be achieving in the treatment of pilonidal sinus also [18,19]. A wide variety of other abdominal fistulas have been closed using fibrin sealant [58]. With respect to fistulas, abdominal or other, is important to state that tract needs to be as clean as possible, and granulation tissue should be removed prior to placing the fibrin sealant, and the entire trunk should be filled with glue. Fibrin sealant can be used also to promote a wide variety of tissue apposition and adherence indications. The classic example is the use of fibrin sealant to stamp out potential spaces at the time of lymphatic dissections in the axilla [11-13]. The goal is to achieve adherence of the skin to underlying tissues after removal of lymphatics so that a dead space for seroma formation or bleeding is cut out. Same concept can be invoke for bleeding in thyroid surgery [14,59-61]. Fibrin glue have been used extensively in head and neck procedures, it have been used to reduce drainage and to improve postoperative results [59-62]. In abdominal wall defects surgery there is a wide use of human fibrin glue, particularly for its adhesive capability, it consent to avoid sutures in some cases. Fibrin sealant for mesh fixation in Lichtenstein repair of small-medium sized inguinal hernias is well tolerated and reduces the rate of pain/numbness/groin discomfort by 45% relative to sutures without increasing hernia recurrence [9]. It is also used, in the same field, to prevent hemorrage or hematoma, seroma and infections in patients with chronic disease (cirrhosis). Fibrin glue value in hernia repair and in cirrhotic patients undergoing major surgery, is well established. Since cirrhotic patients are, par excellence, patients with coagulation deficits, and also more frequently affected by abdominal hernias, than other individuals, it is very interesting the possibility of using fibrin glue to benefit this rather large group of complicated patients. Adequate support for these patients includes the consideration that the application of fibrin glue not only facilitates hemostasis but, since the glue has biological properties (growth factors) that stimulate fibrosis and angiogenesis, could eliminate the risk of delayed fibrosis formation on the prosthesis, which is, theoretically, high because of the protein deficiencies typical of cirrhotic patients, which are one of the reasons they develop ascites [8,62-66]. There is no ideal procedure for the treatment of chronic skin ulcers. Demographic features, cause of the wound, location of the wound produce an extremely various landscape in this field. The use of fibrin glue, associate with other methods (negative-pressure therapy, platelet gel, skin grafts) could shorten the period from coverage to integration, improving clinical outcomes and shorten hospital stays, with decreased risks of accompanying complications [21,22]. In literature there is no evidence that human fibrin glue is carcinogenic. It is biodegradable, so the long-term effects of the agent itself and its metabolites are minimal and there are no recent reports of significant fibrosis or tissue reaction using these materials [46].

Conclusions

Enshrined the fibrin sealant no toxicity, advantages in surgical outcomes are evident. The market for biological support to surgery is growing up fast as surgeons are increasing their experience with products like fibrin sealants. Its use as a drug delivery and tissue engineering vehicle will be the next step in the near future. The routine use of fibrin sealants will decrease bleeding and other complications and improve outcomes. This should result in improved cost-effectiveness indeed.

Riassunto

Gli autori analizzano la propria casistica degli ultimi due anni in rapporto all'utilizzazione di colla di fibrina umana. Vengono presi in considerazione interventi sull'apparato epatobiliare, enterico e proctologico, sulla tiroide e sulla mammella, sui difetti erniari della parete addominale e sulle fistole addominali e le ferite e ulcere difficili. Revisione della letterature.

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