

Fibrin sealant agents: clinical application of TachoSil® in abdominal surgery. Six years experience in an emergency surgery department and review of the literature

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SUMMARY: Fibrin sealant agents: clinical application of TACHOSIL® in abdominal surgery. Six years experience in an emergency surgery department and review of the literature.

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Background: The success of every surgical procedure depends on an appropriate hemostasis. Topical haemostatic agents, like fibrin sealants, are an option for providing haemostasis and may be particularly useful for complex injuries.

Aim: The aim of the study is to evaluate the use of TachoSil® in

abdominal surgery and its benefits to prevent bleedings, and to establish its fields of use.

Methods: A retrospective observational study was performed on 308 patients underwent to emergency surgery with TachoSil®'s application into our department between January 2012 and March 2018.

Results: After the application of the hemostatic device there have been no haemorrhagic complications that have needed a second surgical intervention. Most frequently use of TachoSil® was in the gallbladder bed after cholecystectomy for an acute cholecystitis.

Conclusions: Our experience, supported by other reports in the literature, suggests the use of TachoSil® may provide an effective option in helping to control bleedings.

KEY WORDS: TachoSil® - Fbrin sealant - Hemostatic sealants agent - Bleeding control - Topical haemostatic agents.

Introduction

The success of every surgical procedure depends on an appropriate hemostasis (1). The use of topical absorbable hemostatics can be necessary when the conventional surgical methods (electro-coagulation, suture, ligature and cautery) or the simple compression result inappropriate or insufficient to achieve hemostasis.

The reduction of the loss of blood during surgery may contribute to reduce the morbidity and mortality in post-op, and contemporarily to decrease the times of the hospitalization (2).

Topical haemostatic agents, like fibrin sealants, are an option for providing haemostasis and may be particularly useful for complex injuries and areas which are difficult to treat. Several such agents, which exert their effects in various ways, are currently available (3). Of these agents, TachoSil® is used largely in surgery, both for suture support and in situations where sutures cannot control or would aggravate bleeding and, compared with synthetic agents, they have the advantage of being biocompatible and biodegradable, while not being associated with adverse events, such as inflammation and foreign body reactions.

TachoSil® are two-component products, consisting of fibrinogen and thrombin, which interact during application to form a clot. They mimic the final stages of the blood coagulation process: when fibrinogen and thrombin, the two components of fibrin sealants, are mixed during application of the

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sealant to the tissue surface, thrombin cleaves the fibrinogen to fibrin monomers, which polymerize to form a soluble mesh. Thrombin also activates factor XIII to factor XIIIa, which covalently crosslinks the soluble fibrin mesh to form a stable clot. Both these steps, the conversion of fibrinogen and the crosslinkage of fibrin, require the presence of calcium ions (4).

The aim of this study is to evaluate the use of TachoSil® in abdominal surgery and its benefits to prevent new bleedings, and to establish its fields of use.

Patients and methods

A literature search was carried out to identify all relevant studies relating to “topical haemostatic agents” using databases as PubMed, Embase and Cochrane. Search used terms including words as “TachoSil®, fibrin sealant patches or glues, hemostatic sealants agent, bleeding control, topical haemostatic agents”, but also the commercial names of the individual products.

Furthermore, a retrospective observational study was performed on 308 patients underwent to emergency surgery with TachoSil®’s application into our department between January 2012 and March 2018. Patients were classified into a range of different groups according to anatomical district involved. Demographic, clinical and diagnostic features, were studied according to morbidity/mortality rates.

Results and discussion

A systematic literature search about the surgical use of TachoSil® was performed.

The clinical efficacy of TachoSil® was shown firstly by a clinical study of hepatic surgery (5). Various topical haemostatic agents were utilized to reduce operative blood loss in liver resection. A randomized clinical trial comparing the effect of different haemostatic agents for haemostasis of the liver after hepatic resection. In this randomized clinical trial 45 patients undergoing liver resection were assigned to receive Tachosil®, Surgicel® and Glubran2® for controlling bleeding. Better results in TachoSil® in comparison to the other two are indicative of its better efficacy and superiority in controlling hemostasis (6). Emergency liver resection during active

bleeding in a patient who takes anticoagulant therapy is a complicated and high risk surgery. A study describes a technique that is combination of staplers, total vascular occlusion and hemostatic agent (TachoSil®) application for safe and quick hepatectomy. The conclusion was that emergency hepatectomy with staplers under vascular control hemostatic agents provided a rapid and safe surgery (7).

Many others applications in different fields of surgery have been reported in the literature. Splenectomy in patients suffering from onco-haematological conditions presents clotting-related problems which make correct haemostasis more difficult. The use of TachoSil® has proved effective as an aid in haemostasis and suggests the validity of its use in elective and emergency splenectomy, in these types of patient (8).

Postoperative pancreatic fistula is a frequent and clinically relevant problem after distal pancreatectomy. A variety of methods have been tested in the attempt to prevent the postoperative pancreatic fistula. Many studies comparing pancreatic stump closure with the addition of TachoSil® to conventional stump closure (9). Distal pancreatectomy is the standard surgical treatment for tumors of the pancreas located to the left of the superior mesenteric vein (10, 11). Indications include pancreatic ductal adenocarcinoma, mucinous and serous cystadenoma, intraductal papillary mucinous neoplasm, neuroendocrine tumors and chronic pancreatitis (12, 13). Randomised trials and retrospective and prospective clinical studies comparing conventional closure (stapler or hand sewn closure) after distal pancreatectomy to conventional closure with addition of TachoSil®. The application of TachoSil® to the pancreatic stump after distal pancreatectomy is a safe procedure but provides relevant benefit in terms of postoperative pancreatic fistula, mortality, reoperation rate, blood loss or length of hospital stay. TachoSil® should not be used to prevent postoperative pancreatic fistula or reduce its severity after distal pancreatectomy as it is costly and ineffective for this indication (9).

TachoSil® in major surgery because of locally advanced kidney cancer that invades the liver is a valuable complement to conventional surgical methods allowing for atraumatic stop bleeding and seal parenchymal liver tissue (14).

Anastomotic leakage is a frequent postoperative complication of colorectal resection. The AA assessed the feasibility and safety of applying a haemo-

static tissue sealant (TachoSil®) to colorectal anastomoses following resection. TachoSil® was applied as reinforcement of the anastomotic line after laparoscopic or open colorectal resection. Application was considered feasible if TachoSil® fully adhered, covered ≥ 1 cm beyond the margin of the anastomotic line and patches overlapped by ≥ 1 cm. Application of TachoSil® to reinforce the anastomotic line in colorectal resections appears to be feasible and well tolerated (15).

Laparoscopic sleeve gastrectomy (LSG) is one of the most common procedures of bariatric surgery. Nevertheless complications after LSG are common, the most frequent is bleeding. The hemostatic-sealant drug Tachosil®, that contains a collagen sponge coated by human fibrinogen and thrombin was shown to reduce post-operative bleeding and probably promote optimal wound healing (16).

Application of hemostatic fleece (TachoSil®) directly onto the bleeding surfaces of the lower uterine segment has been used to obtain hemostasis during cesarean section caused by placenta previa. TachoSil® did not seem to impair healing of the endometrium or scar formation in the uterus after intrauterine application. Resorption of TachoSil® seems to progress individually. Intrauterine treatment with TachoSil® is a valuable supplement to the traditional treatment of post-partum haemorrhage and may help retain reproductive capability (17).

In our department 308 patients underwent to emergency surgery (Table 1). Most frequently use of TachoSil® was in the gallbladder bed after cholecystectomy for an acute cholecystitis. In 30 patients the hemostatic device was used at the level of large intestine for diverticular disease, in 11 cases and in the other cases during bowel's surgical procedures. It was used, also, into splenic parenchyma for trauma injuries in 22 cases and during large intestine mobilization in 6 cases. Jejunum was interested in 20 patients, liver in 12 cases and stomach in 11 cases (in 8 cases for peptic ulcer and in 3 cases after surgery for gastric cancer). Also in 13 cases we use TachoSil® for appendicitis, in 9 cases during appendectomy and in 4 cases during contextual cecum resection. In the small bowel hemostatic device was used in 9 cases, in the meantime in 6 patients with anastomotic leakage TachoSil® has been held necessary to the surgeon. In a small percentage of cases fibrin sealant was used for minor injuries, after pancectomy and abdominal trauma, 24 patients was died for no-bleeding complications such as cardiac failure (13

TABLE 1 - OUR EXPERIENCE.

Anatomical district/disease	Patients
Gallbladder bed	138
Large intestine	30
Spleen	28
Jejunum	20
Appendix	13
Liver	12
Stomach	11
Small bowel	9
Anastomotic leakage	6
Minor injuries	4
Abdominal wall	3
Pancreas	2
Ovary	2
Urinary bladder	2
Diaphragm	2
Testis	1
Retroperitoneum	1

cases), MOF (6 cases) and respiratory distress (5 cases). We had 9 cases of anemia: seven (five after colon surgery, two after stomach surgery) treated with monitoring of hemoglobin (no blood transfusion); two needed blood transfusion (1UI) after colon surgery. No second surgical intervention for haemorrhagic complications.

Conclusions

Our experience, supported by other reports in the literature, suggests the use of TachoSil® may provide an effective option in helping to control bleedings (18-27).

After the application of the hemostatic device there have been no haemorrhagic complications that have needed a second surgical intervention. During the last years, the number of local hemostatic increased notably inspite of the clinical documentation about this product is poor (28-36).

Surgical device show several differences in terms of clinical and economic aspects, if compared with pharmacological therapy. Different hemostatic dressings share overlapping clinical indications.

Some are aimed to facilitate hemostasis (FloSeal®, Sivek®, Tabotamp® e Curaspon Standard®), other show effectiveness in both sealing tissues and in supporting the suture (Beriplast®, Quixil®, Tachosil®, Tisseel®, Tissucol®, Coseal® e Glubran®).

Literature reports the off label use of fibrin glues to secure the surgical mesh, to facilitate the closing of fistulas and to prevent the formation of postoper-

ative adhesences. Although the use of topic hemostatic patches in this clinical scenarios depicted above seems to show a certain degree of clinical relevance, further research is needed.

Conflict of interest statement

Authors do not have conflict of interest.

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