

## Extraperitoneal Mobilization of the Omentum – Analysis of a Personal Series of 12 Patients

P. V.-H. Boțianu<sup>1</sup>, V. Damian<sup>1</sup>, S. Ionică<sup>1</sup>, O.R. Lucaciu<sup>1</sup>, A.-M. V. Boțianu<sup>2</sup>, A.-M. Boțianu<sup>1</sup>

<sup>1</sup>Surgical Department 4, University of Medicine and Pharmacy from Târgu-Mureș, România

<sup>2</sup>Medical Department 4, University of Medicine and Pharmacy from Târgu-Mureș, România

### Rezumat

#### **Mobilizarea extraperitoneală a epiploonului – analiza unei serii personale de 12 cazuri**

**Obiectiv:** Scopul lucrării este de a evalua rezultatele obținute după mobilizarea epiploonului în afara cavității peritoneale.

**Material și metodă:** În perioada 01.01.2006-01.01.2012, autorul principal a efectuat un număr de 12 mobilizări ale unor lambouri de epiploon în afara cavității peritoneale. Indicațiile folosirii acestui lambou au fost umplerea profilactică a spațiului restant după operația Miles – 5 cazuri, rezolvarea unor complicații pelvi-subperitoneale și perineale după chirurgie rectală – 3 cazuri, acoperirea unor proteze vasculare – 3 cazuri (2 dintre ele cu infecție activă) și închiderea unei fistule bronșice post-pneumonectomie – 1 caz. Mobilizarea lamboului s-a făcut prin laparotomie – 10 cazuri, pe cale laparoscopică – 1 caz și transdiafragmatic (toracotomie) – 1 caz; toate intervențiile au fost efectuate de aceeași echipă, fără asistență din partea unui chirurg plastician.

**Rezultate:** Am înregistrat un singur deces imediat postoperator prin infarct miocardic în ziua a 12-a postoperator (infecție de proteză vasculară la un pacient de 75 de ani). Nu am înregistrat necroze ale lamboului de epiploon, evaluarea fiind clinică și imagistică. La urmărirea tardivă (1-5 ani) nu am înregistrat complicații semnificative legate de folosirea acestui lambou.

**Concluzii:** Epiploonul este o soluție pentru o mare varietate

de defecte situate în afara cavității peritoneale; mobilizarea lui este relativ simplă și nu implică o morbiditate deosebită. Cunoașterea anatomiei și a tehnicilor de mobilizare a epiploonului este obligatorie în chirurgia digestivă, toracică și vasculară.

**Cuvinte cheie:** lambou de epiploon, mobilizare extraperitoneală

### Abstract

**Objective:** The aim of the paper is to evaluate the results achieved after mobilization of the omentum outside the peritoneal cavity.

**Material and method:** Between 01.01.2006-01.01.2012, the main author has performed an extraperitoneal mobilization of the omentum in 12 patients. The indications for the use of this flap were: prophylactic filling of the remnant space after the Miles procedure – 4 cases, solving of some pelvi-subperitoneal and perineal complications after rectal surgery – 3 cases, covering of vascular prosthesis – 3 cases (2 of them with active infection) and closure of a post-pneumonectomy bronchial fistula – 1 case. The mobilization of the flap was performed by laparotomy – 10 cases, by laparoscopy – 1 case and transdiaphragmatic (thoracotomy) – 1 case; all the procedures were performed by the same team, with no assistance on behalf of a plastic surgeon.

**Results:** We have encountered one immediate postoperative death through myocardial infarction on postoperative day 12 (vascular prosthesis infection in a 75 years old patient). Based on the clinical and imagistic evaluation, we have encountered no necrosis of the omental flap. At late follow-up (1-5 years) we have encountered no significant complications related to the use of this flap.

Corresponding author:

Prof. Dr. Alexandru-Mihail Boțianu  
540139 Gheorghe Marinescu 66/1  
Târgu-Mureș, Jud. Mureș, România  
Fax: +40365882623  
E-mail: botianu\_alexandru@yahoo.com

**Conclusions:** The omentum is a solution for a great variety of defects located outside the peritoneal cavity; its mobilization is relatively simple and does not involve a major morbidity. Knowledge of the omentum's anatomy and techniques of mobilization are mandatory in digestive, thoracic and vascular surgery.

**Key words:** omentum flap, extraperitoneal mobilization

## Introduction

The omentum flap has been used in a great variety of defects in different areas (1,2,3). However, the techniques of mobilization and the indications are not standardized, especially if the defect is outside the peritoneal cavity. There are significant attitude differences between the plastic-reconstructive and the general surgeons. The aim of the paper is to evaluate the results achieved after mobilization of the omentum outside the peritoneal cavity in a clinic with general-digestive, thoracic and vascular surgery profile.

## Material and Method

This is a clinical retrospective study performed in Surgical Clinic 4, University of Medicine and Pharmacy from Târgu-Mureș, România.

### *Patients*

Between 01.01.2006-01.01.2012, the main author has performed an extraperitoneal mobilization of the omentum in 12 patients. Demographic data are of no particular interest - male/female ratio 5/1, average age 56 years, ranges 45 and 76. The omentum flap was used as part of a digestive surgery procedure in 8 cases (Fig. 1), vascular surgery procedure in 3 cases (Fig. 2) and in one general thoracic surgery procedure. The details about the indication for the use of the flap and the associated procedures are presented in Table 1. Patients in whom we have used the omentum to cover low colo-rectal anastomoses were not included in this study, since we consider that this situation is not a true extraperitoneal mobilization.

### *Surgical technique*

The mobilization of the flap was performed by laparotomy - 10 cases, by laparoscopy - 1 case and transdiaphragmatic (thoracotomy) - 1 case (Fig. 3). The decision of how to mobilize the flap and the choice of the nutrient vessels was always taken intraoperative, after analyzing the defect and the local anatomy, according to the classic principles stated by Kiricuța (1). In order to achieve a flap with good blood supply we have used the following vessels: left epiploic vessels + Barkow's arcade - 7 cases, right epiploic vessels + Barkow's arcade - 3 cases, left gastro-epiploic vessels - 1 case, epiploic vessels - 1 case. All the procedures were performed by the same

team, with no assistance on behalf of a plastic-reconstructive surgeon.

The following parameters were analysed: viability of the flap, mortality, early and late morbidity, postoperative hospitalisation (intensive-care and overall) and the ability of the flap to achieve local control of the infection.

## Results

### *Viability of the flap*

All the flaps were evaluated at the end of their mobilization and at the end of the surgical procedure. All the flaps have reached the defect as planned with no significant ischemic changes requiring resection of the distal part.

We have encountered no flap necrosis in the postoperative period. Some patients were followed-up by imagistic methods - mainly ultrasound and CT (also used as a part of the oncologic follow-up). The most reliable is the postoperative clinical course, since in all the cases the omentum was brought in a closed space. In such circumstance any flap necrosis leads to the (re-)appearance of a severe and life-endangering suppuration.

### *Mortality and early morbidity*

We have encountered one immediate postoperative death (8,3%) through myocardial infarction on postoperative day 12 (vascular prosthesis infection in a 75 years old patient). Excepting a minor wound suppuration, we had no early morbidity related to the mobilization of the omentum.

### *Hospitalisation*

#### **ICU, general, curative vs prophylactic**

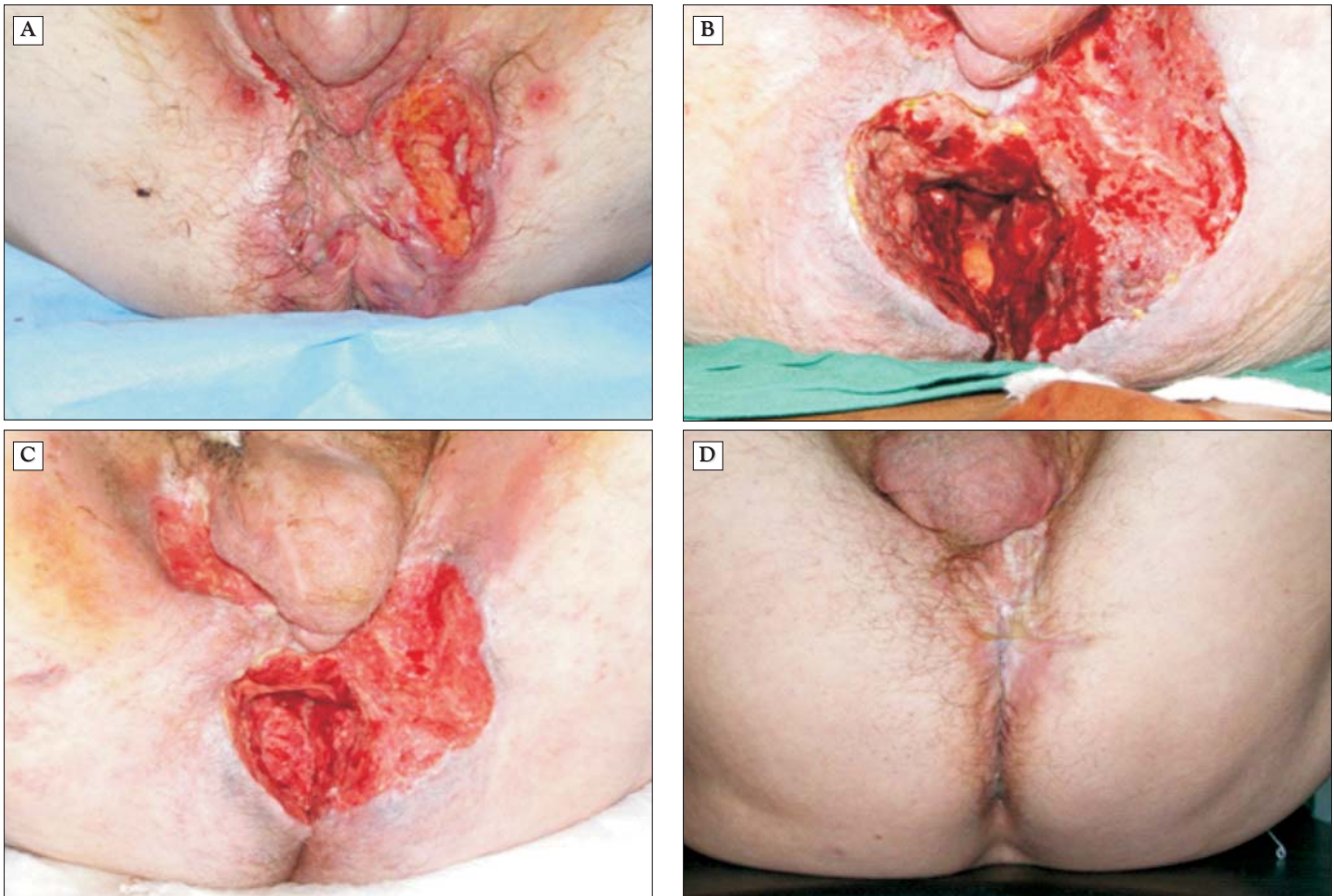
The intensive-care unit stay ranged between 0 and 4 days, with an average of 1,8. The overall postoperative hospitalisation ranged between 12 and 62 days, with an average of 23 days. In the patients with chronic suppurated defects the postoperative hospitalisation was significantly longer (ranges 12-62, with an average of 37 days) compared with the patients with non-infected defects (ranges 11-30, average 16 days). Although the limited number of the patients does not allow a steady statistical analysis, it seems that the overall hospitalisation is determined by the indication of the procedure and not by the omentum flap mobilization by itself.

### *Infection healing*

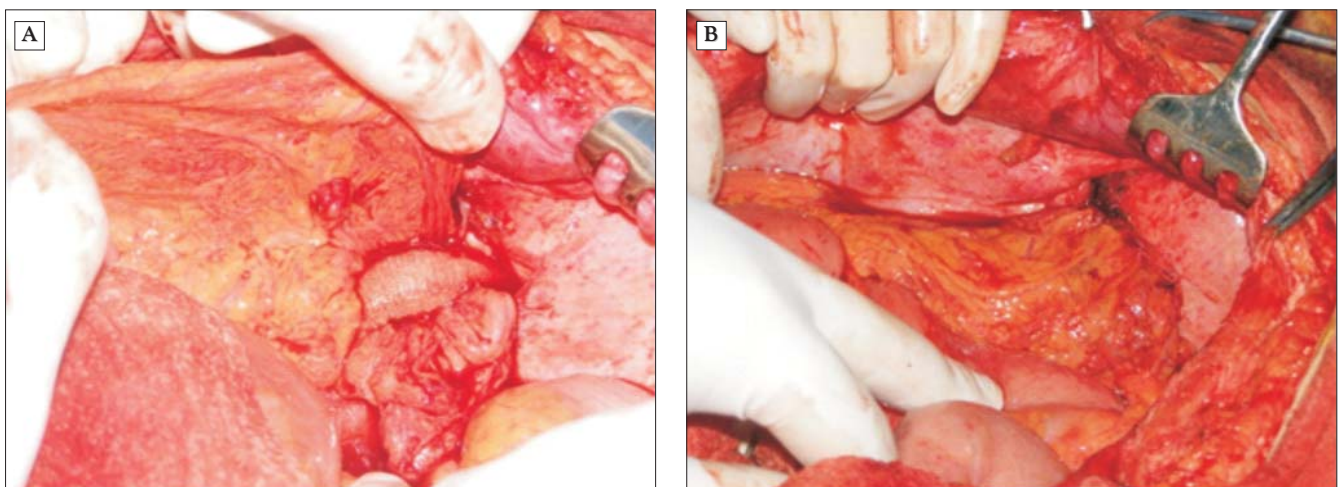
In 4 cases, the omentum was used to treat chronic suppurations, that lasted between 6 weeks and 1.5 years. In all the 3 survivors, we have achieved immediate and long-term control of infection with no late recurrence. In the 4th patient, with death through myocardial infarction on postoperative day 12, we found a viable flap with no signs of active infection at the autopsy.

### *Late morbidity*

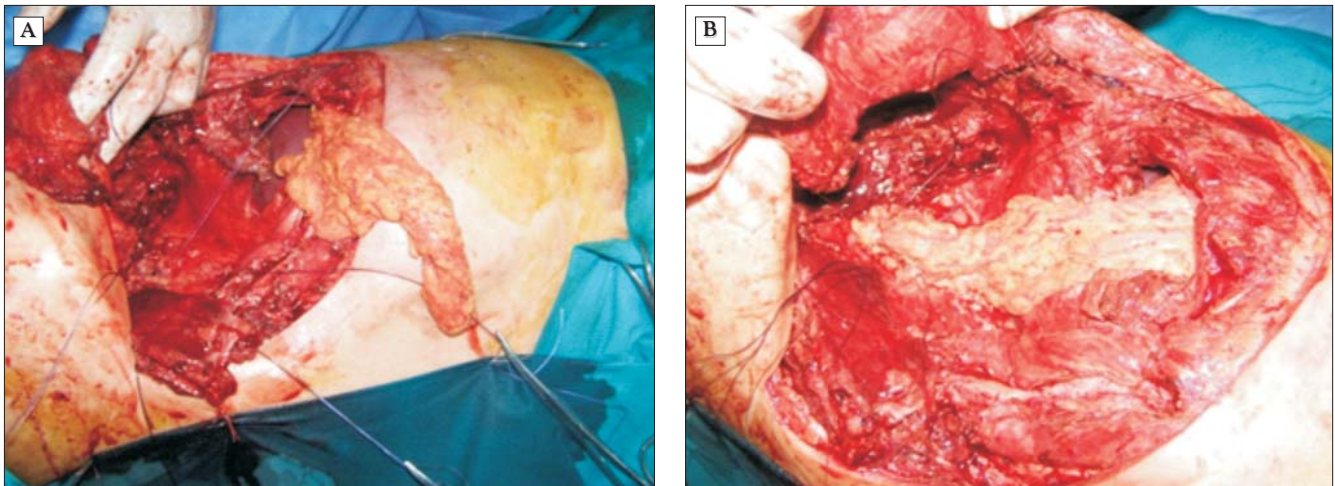
We have encountered one patient (8,3%) with late incisional hernia developed adjacent to the place where the omentum flap was brought outside the abdominal cavity. At late fol-



**Figure 1.** (A) 58 years old male operated for a rectal cancer – Dixon procedure with a low colo-rectal anastomosis, followed by multiple re-operations for fistula, peritonitis and evisceration. The rectal stump was abandoned and a colostoma was performed. The patient developed a fistula between an intestinal loop and the rectal stump with an extended pelvi-subperitoneal and perineal suppuration that lasted for almost 2 years. Staged treatment consisted in debridement of the perineal, buttock and scrotal suppuration, removal of the remnant rectal stump, packing and endoscopic exploration of the pelvi-subperitoneal cavity, followed by laparotomy with segmentary resection of the small bowel and plompage of the suppurated pelvi-perineal space using an omental flap. A. aspect at admittance to our unit, after 2 years of perineal suppuration. (B) Aspect of the perineal wound at the end of the procedure – the omental flap appears at the bottom of the wound. (C) Aspect of the wound at 4 days after the omentum plompage with the viable flap. (D) Aspect of the wound at one year after surgery – secondary healing



**Figure 2.** A 75 years old patient with an infected aorto-femoral by-pass (A). The infected vascular prosthesis was completely wrapped by an omental flap (B)



**Figure 3.** A 58 years old patient with a right post-pneumonectomy empyema. (A) – Trandiaphragmatic mobilization of an omental flap and the aspect of the bronchial fistula (arrow). (B) – patch closure of the bronchial fistula with the omentum flap

**Table 1.** Indications for the use of the omentum flap and the associated procedures performed

Indication for the use of the omentum	No. of patients	Associated procedures
Prophylactic filling of the remnant space after the Miles procedure	5	- abdomino-perineal resection – 5 cases - cholecystectomy – 2 cases
Complications after rectal surgery	3	- segmentary enterectomy – 1 case - segmentary enterectomy + excision of local tumoral recurrence – 1 case - segmentary enterectomy + rectal stump removal + pelvi-subperitoneal and perineal debridement – 1 case
Covering of vascular prosthesis (2 with active infection)	3	- aorto-prosthetic suture, removal of a retroperitoneal hematoma and cure of an evisceration (re-operation for bleeding after aorto-bifemoral by-pass) – 1 case - wedge sigmoid resection (colo-parietal peri-prosthetic fistula) – 1 case
Closure of a post-pneumonectomy bronchial fistula	1	- thoraco-mediastinal plication + muscle flaps – 1 case

low-up (ranges 5-44 months, average 21 months after omentoplasty) we have encountered no reoperation for intestinal obstruction; 3 patients died during the follow-up period of causes not related to the use of the omental flap (2 patients operated initially for rectal cancer through liver metastases, respectively adrenal + pulmonary metastases, one patient with vascular prosthesis infection through hyperkalemia during an emergency revascularisation of the contralateral leg).

## Discussions

The use of the omentum has a very wide range of indications (4,5,6). In digestive surgery, flaps with more or less limited mobilization are used inside the peritoneal cavity by many authors with good results (7,8,9); although a subject of controversy, covering of digestive anastomoses with the omentum should be taken into consideration in cases with high-risk for fistula such as pancreato-digestive (10,11) or low colo-rectal anastomoses (12), with or without other prophylactic measures

(13,14). The molecular medicine has started to study its involvement in fields like neoangiogenesis, cancer, obesity and complex tissue reconstruction (15,16,17). However, in units that are not dedicated to plastic-reconstructive surgery the omentum is not used very frequent outside the peritoneal cavity. Our own series is a relatively small one – 12 patients operated by a single surgeon in a period of 6 years, and heterogenous – including patients with digestive, vascular and thoracic procedures. The omentum flap was used for prophylaxy in 5 cases and with curative indication in 7 cases (treatment of some complications, mainly infections).

Ours study shows that the omentum can be safely mobilized and used by surgeons without specific training in plastic-reconstructive surgery. We have encountered no significant early morbidity that could be clearly related to the use of this flap; an important aspect to note is that most patients had more or less complex associated procedures.

Many authors are reluctant to use the omentum due to the fear of late complications – mainly intestinal obstruction and

incisional hernia (18,19). In our study, we found no significant long-time sequelae or late complications after the use of this flap. Although the number of the patients is small and the follow-up period is limited, we believe that the incidence of the complications associated with the use of this flap is low and their consequences are outweighed by the benefits brought by the use of this well-vascularized tissue.

The laparoscopic mobilization of the omentum (performed in one of our patients) deserves a special attention since it solves some of the main problems associated with the omentum flap. First, it allows an exploration of the omentum and avoids an useless laparotomy in cases with unfavourable anatomy. Second, it is associated with a lower rate of incisional hernias and adhesion-related intestinal obstructions, which are the main long-time concerns related to the omentum flap. As well as other authors, we believe that the laparoscopic approach will increase the indications for the use of this flap in the general context of minimally-invasive surgery development (20,21,22, 23).

## Conclusions

The use of an omentum flap is an excellent solution for a great variety of defects located outside the peritoneal cavity. It's mobilization is relatively simple and does not involve a major morbidity; it is accesible also to surgeons not specialized in plastic-reconstructive surgery. There is no standardized technique for omentum mobilization and a carefull evaluation of the local anatomy is always required. Knowledge of the omentum's anatomy and the techniques of flap preparation are mandatory in digestive, thoracic and vascular surgery.

## References

- Kiricuță I. Use of the omentum in plastic surgery. București: Ed. Medicală / Medical Publishing House; 1980.
- Shen YM, Shen ZY. Greater omentum in reconstruction of refractory wounds. *Chin J Traumatol*. 2003;6(2):81-5.
- Losken A, Carlson GW, Culbertson JH, Scott Hultman C, Kumar AV, et al. Omental free flap reconstruction in complex head and neck deformities. *Head Neck*. 2002;24(4):326-31.
- Jurkiewicz MJ, Arnold PG. The omentum: An account of its use in the reconstruction of the chest wall. *Ann Surg*. 1977;185(5):548-54.
- Stîngu C, Mitulescu G, Ungureanu C, Popescu I. Soft tissue reconstruction after total pelvic exenteration. *Chirurgia (Bucur)*. 2007;102(4):389-99. Romanian
- Horch RE, Horbach T, Lang W. The nutrient omentum free flap: revascularization with vein bypasses and greater omentum flap in severe arterial ulcers. *J Vasc Surg*. 2007;45(4):837-40.
- Wahba R, Kleinert R, Prenzel K, Bangard C, Hölscher AH, Stippel DL. Laparoscopic deroofing of nonparasitic liver cysts with or without greater omentum flap. *Surg Laparosc Endosc Percutan Tech*. 2011;21(1):54-8.
- Tomuş C, Iancu C, Pop F, Al Hajjar N, Puia C, Munteanu D, et al. Intrahepatic rupture of hepatic hydatid cysts: results of 17 years' experience. *Chirurgia (Bucur)*. 2009;104(4):409-13.
- Kapoor VK, Sharma A, Behari A, Singh RK. Omental flaps in pancreaticoduodenectomy. *JOP*. 2006;7(6):608-15.
- Popescu I, Dumitraşcu T. Pancreatoduodenectomy - past, present and future. *Chirurgia (Bucur)*. 2011;106(3):287-96.
- Pătraşcu T, Doran H, Bugă C, Mihalache O, Bobircă F, Costache A, et al. The management of postoperative pancreatic fistulas. *Chirurgia (Bucur)*. 2011;106(6):737-41.
- Zaharie F, Mocan L, Tomuş C, Mocan T, Zaharie R, Bartoş D, et al. Risk factors for anastomotic leakage following colorectal resection for cancer. *Chirurgia (Bucur)*. 2012;107(1):27-32.
- Nicolau AE. Temporary loop-ileostomy for distal anastomosis protection in colorectal resections. *Chirurgia (Bucur)*. 2011;106(2):227-32.
- Beuran M, Chiotoroiu AL, Chilie A, Morteau S, Vartic M, Avram M, et al. Stapled vs. hand-sewn colorectal anastomosis in complicated colorectal cancer-a retrospective study. *Chirurgia (Bucur)*. 2010;105(5):645-51.
- Collins D, Hogan AM, O'Shea D, Winter DC. The omentum: anatomical, metabolic, and surgical aspects. *J Gastrointest Surg*. 2009;13(6):1138-46. Epub 2009 Mar 17.
- Takaba K, Jiang C, Nemoto S, Saji Y, Ikeda T, Urayama S et al. A combination of omental flap and growth factor therapy induces arteriogenesis and increases myocardial perfusion in chronic myocardial ischemia: evolving concept of biologic coronary artery bypass grafting. *J Thorac Cardiovasc Surg*. 2006;132(4):891-99. Epub 2006 Aug 30.
- Iuonuş AM, Gongănu DN, Precup CG, Dindelegan GC, Ciuce C. Current methods for wound debridement. *Chirurgia (Bucur)*. 2011;106(5):605-12.
- van Garderen JA, Wiggers T, van Geel AN. Complications of the pedicled omentoplasty. *Neth J Surg*. 1991;43(5):171-4.
- Hultman CS, Carlson GW, Losken A, Jones G, Culbertson J, Mackay G et al. Utility of the omentum in the reconstruction of complex extraperitoneal wounds and defects: donor-site complications in 135 patients from 1975 to 2000. *Ann Surg*. 2002;235(6):782-95.
- Zaha H, Inamine S. Laparoscopically harvested omental flap: results for 96 patients. *Surg Endosc*. 2010;24(1):103-7.
- Van Wingerden JJ, Coret M, Van Nieuwenhoven CA, Totté ER. The endoscopically harvested omental flap for deep sternal wound infection: the Leeuwarden experience. *Eur J Cardiothorac Surg*. 2010;37(1):87-92.
- Dragomirescu C, Copăescu C. History of laparoscopic surgery in Romania. Papers published in *Chirurgia* journal. *Chirurgia (Bucur)*. 2010;105(5):603-24.
- Angelescu N, Grama F, Angelescu M. Historic review of minimally invasive surgery in Romania-a new surgical era. *Chirurgia (Bucur)*. 2011;106(6):703-8.