

Nosocomial infections in colo-rectal surgery of the old patient

M. Barbuscia¹, G. Melita¹, M. Trovato¹, C. Minniti¹, G. Lemma¹, S. Gorgone²

¹Chair of Digestive System Surgery, University of Messina, Messina, Italy

²Chair of General Surgery, University of Messina, Messina, Italy

Abstract. Every surgical act, especially in geriatric age, can be a relevant moment in the onset of nosocomial infections. This has a peculiar aspect in patient who undergo colo-rectal surgery, both in election and especially in emergency, in which the simple opening of intestines always involves a minimal contamination. In order to reduce the incidence of infections, and therefore the septic complications of this surgery, it is necessary to pay attention to the preparation of the surgical equipe, of the operating room, of the surgical instruments and, in election, to the careful preparation of the patient through a careful evaluation of the possible bio-umoral alterations, in order to correct them. The results of our experience allow us to say that the prevention of post-operative sepsis find its main moment in the careful evaluation and eventual correction of the nutritional status, in the stimulation of the immune system, in the antibiotic prophylaxis both parenteral and topical, and, last but not least, in a correct surgical technique. All this is particularly important for patients affected by colo-rectal neoplastic and inflammatory diseases, for which the intestinal bacteria, more virulent in weak and fragile patients, often represent the source of contamination that can start a sepsis and then assume an important part in determining the final result of surgery.

Key words: Infection, colo-rectal pathology, intestinal anastomoses

Colo-rectal surgery is more and more popular and patients, who in the past underwent surgery in highly specialized hospitals, nowadays, with technique refining, with the use of modern sutures and the spreading of staplers, can easily access this kind of surgery.

But an old problem turns up again to the surgeon: the risk of septic complications both in election and in emergency.

This is particularly important in geriatric patients, who are more easily affected by infections, both for the considerable reduction of local defences because of the interruption of protective barriers represented by skin and membranes, and for the alteration of physiological defences like the suspension of movements of the vibrating cilia of respiratory apparatus, the lack of peristalsis, the reduction of secretory acti-

vity; and for the alteration of the immunitary system (depression of phagocytes, reduction of Immunoglobulines and complement, reduction of the reticular-endothelial system, depression of T-cells).

All these cause an high incidence of infections (6-7% in election, 15-40% in emergency) and therefore of septic complications (1) although the refining of surgical and anaesthesiological techniques, the wide-spectrum antibiotic therapy and prophylaxis, the possibility of an optimal correction of under-nourishment, and the use of highly tolerable materials. In our country they arise in about 300.000 surgical patients; only the 20% are due to exogenous bacteria that overcome physiological defences, the 80% on the other side have an endogenous origin (due to bacteria that were in the patient either for the pathology that cau-

sed the admission and/or for other diseases, more frequent in geriatric patients, or acquired in hospital during pre-operative time, or, and this is the worst, transmitted from the staff before, during or after surgery). It is the patient that represents the main infection source: in fact he can contribute to the spreading of particularly virulent germs because of pre-existing centres of infection (dermatitis, dental abscesses, urinary, respiratory or gastro-enteric infections), that, if possible, must be eradicated.

The normal bacterial flora, i.e. the presence of opportunistic germs both on the skin and in the intestines, can also be a source of infection: in fact on the skin, especially in a wet ambient, there are a lot of aerobic and anaerobic germs; the mouth hosts Gram+ and Gram- bacteria; the flora of the upper parts of the intestine includes more than 400 bacterial species and in the colon and rectum the main bacterial flora (Gram+ aerobic and Gram- enterococci, staphylococci, lactobacilli and Gram- anaerobic germs) counts 10^{11} germs per gram of faeces.

The wounds, both of the skin and of the mucus membranes, caused either by the interruption of physiological barriers or by a trauma caused by endoscopic exams, or, above all, by surgery or after all the loss of host defences can cause the opportunistic germs to become pathogenous.

The alteration of immunitary defences, particularly in neoplastic patients and/or malnourished or because of important phlogistic events or more simply in old patients, can also be another factor promoting the onset of infections. In fact with the increasing of age some immunitary fractions (IgA, IgG, IgM) decrease progressively and, after 60 years old, the functionality of T-cells is noticeably compromised.

In order to decrease the incidence of infections and therefore of septic complications of this surgery, it is very important to put special care in a continuous education of the staff, in the preparation of the surgical equipe, of the operating rooms, of the instrumentarium (2-5) and, in election, in the careful preparation of the patient by means of an attentive evaluation of every possible bio-umoral alteration in order to correct them properly (6, 7).

The above-mentioned measures, in our opinion, must turn to the correction of the state of malnutrition

to avoid that a possible sepsis lead to status of hypercatabolism with a negativization of the nitric balance, to the stimulation of the immune system, to the antibiotic preparation of the patient both parenteral and topical, to the careful pre-operative cleaning of the intestine.

The observance of these principles contributed, in elective surgery, to a drastic, but still not satisfactory, reduction of the incidence and of the severity of the infections. Even higher is the incidence in emergency, whereas the acute event, that often involves an intervention in a septic background, the particular vascularization of the colon, the anatomic-pathological conditions of the stumps, and the precarious general conditions of the patients help the onset of infections.

Among infections we must remember also the urinary tract infections and the respiratory tract infections, sometimes induced by wrong maneuvers and/or by the non-observance of antisepsis. The septic complications, secondary to nosocomial infections, more common after colorectal surgery, must be distinguished in (8):

- a. *Infection of the place of cutting*: generally they interest the superficial layers of the wall (skin and subcutis) and appear both with the classic local signs of phlogosis (provoked or spontaneous pain, swelling, redness, heat) and with the appearance of purulent secretion from the wound from where responsible bacteria can be isolated.
- b. *Infection of deep layers (fascia and muscular plains)*: generally they show themselves with septic fever and spontaneous or provoked pain followed by purulent secretion from the tissue below the scar. They often come into the partial dehiscence, sometimes spontaneous, of the wound. The culture of the secretion or of parts of infected tissues is positive.
- c. *Infections of organ or, more frequently, of the spaces place of intervention*: also these patients show all the signs of sepsis (significant increasing of temperature, pain, purulent secretion from the drainage or from the trinitis remained after its extraction). The culture must isolate the germ responsible of the infection.
- d. These last, often represented by infections of a simple haematoma or seroma not properly

drained, can be sometimes caused by the filtration of intestinal material from a small gap of the anastomosis or from a real dehiscence: these aren't rare events in colo-rectal surgery (9-11).

Dehiscence, secondary to suppuration of intestinal tissues, to inadequate perfusion of the stumps, to the existence of a modest traction on the anastomosis, induces more serious complications the earlier it realizes (12-15). More frequently the onset of small "buttonholes" can lead to the formation of a small perianastomotic abscess that, through the drainage, becomes a stercoraceous fistula that, properly managed, quite rapidly heals spontaneously.

The laparoscopic technique, that nowadays has a specific role in colorectal surgery, also has infectious complications because of immunosuppression secondary to surgery. The smaller incidence of infectious complications does not concern the infections of surgical wound, whose percentage is near to the incidence of laparotomic surgery, but it is attributed to perineal suppurations, to intra-abdominal abscesses and to urinary and pleuro-pulmonary infections (16).

Case-report

We want to report the data of our experience concerning the last decade: from January 1994 to December 2004 we observed 260 patients affected by neoplastic or inflammatory colorectal pathology. Most of these patients (208) arrived in election and, especially if affected by neoplasm, they had a careful staging before the surgical treatment with radical purpose. Pre-operatively, we also provided to discover and eradicate septic foci, to evaluate a possible malnourishment or alterations of bio-umoral factors and subsequently to correct them, and to a careful cleaning and antibiotic preparation of the intestine. We always took care to observe a rigorous intra-operative conduct, always observing Halsted's principles: careful haemostasis, adequate tissular vascularization, removal of devitalized tissues, abolition of dead spaces, use of small calibre sutures, absence of tension on the margins, sagacious use of staplers.

We can consider 145 of these interventions as

clean-contaminated and 63 as contaminated. Of these respectively 102 (70,3%) and 43 (68.2%) interested patients in geriatric age.

52 patients, of whom 42 (80,7%) in geriatric age, occluded by the neoplastic process or perforated because of diverticulosis, arrived in emergency; such interventions, even if performed with all the prophylactic measures for infections practicable in emergency, must be considered dirty intervention. Also in these patients we preferred a single time treatment of the pathology: resection-anastomosis, protected only in two patients from an upstream colostomy. Both during the period of hospitalization and during the periodic observation prolonged until the 30th day, we carried out a rigid control considering the state of the wound, the appearance of phlogistic signs interesting the superficial layers, the onset of signs of sepsis of the abdominal wall and/or of the peritoneal cavity.

Results

In all the patients, who underwent surgery in election, the post-operative course was satisfying and, in most cases, the wound healed very rapidly and the average hospitalization was of 8 days.

Only 4 of the 102 patients in geriatric age, who underwent a clean-contaminated surgery, had signs of post-operative sepsis, and in particular:

- in 3 cases, after 5-7 days from intervention, we noticed the appearance of the signs of an infection localized in the place of incision with leakage of a modest quantity of secretion from the wound, without any sign of dehiscence, and subsequent spontaneous healing;
- the last patient, after 8 days from intervention, had a moderate thermal rise and intense pain in correspondence of the scar, that appeared prominent and of soft-elastic consistency; after the opening of a small breach, we had the leakage of quite a large quantity of purulent secretion emerging from the deep plains. Also in this case the remission of symptomatology was spontaneous and the breach made on a scar healed for second intention.

Also in the group of geriatrics patients who un-

derwent contaminated surgery (43), the incidence of infections was contained (5 cases - 11,6%):

- in 2 there was sepsis of the wound, extended also to deep plans;
- in other 2, the inadequate aspiration of the drainage determined a perianastomotic collection that, respectively in the 7th and in the 9th day, drained with the appearance of a purulent secretion from the tramis formerly place of the drainage;
- in only one patient similar collection was determined by a moderate filtration of intestinal material through a little "buttonhole" on the anastomosis. In this patient the expression of the secretion, the beginning of a new wide spectrum antibiotic treatment and, above all, the rest of intestine for three weeks and the beginning of a program of TPN, permitted the healing without any further surgical intervention.

Obviously the percentage of post-operative sepsis in the group of patients, who underwent surgery in emergency, was sensitively higher: (21,4%) 9 cases. Actually in these patients it is very difficult to discriminate if the onset of sepsis was nosocomial or if it was due to the anatomic-pathological situations that carried them to our observation.

In all the cases there were always purulent collections that in 7 patients originated from important dehiscence of the anastomosis. Both these cases needed a new surgical intervention (Hartmann's technique); one of these patients died because of a considerable peritoneal phlogosis and of the subsequent MOF.

Conclusion

The prevention of post-operative sepsis is based on a careful evaluation and eventual correction of the nutritional status, on the stimulation of the immune system, on the antibiotic prophylaxis both parenteral and topical and on the correct management of the intervention.

All this is particularly important for patients affected by colo-rectal neoplastic and inflammatory diseases, especially in geriatric age, for which the intestinal bacterial flora, sensitively more virulent in immu-

nodepressed and weak patients, often represents the source of contamination that can start a septic process and therefore assume a significant role in determining the final results of the surgical act, whatever managed. In these patients it is necessary to start, in the days before the intervention, an attentive preparation of the colon, aiming to rebalance the bacterial flora with the use of oral absorbable antibiotics and, in the immediacy of the intervention, to carry out a strict short-term protocol with the use of wide spectrum antibiotics.

The daily respect of simple rules permitted us to achieve significant results that make us remind that every minimal mistake can originate serious complications.

Take to the zero or, however, reduce further the incidence of nosocomial infections is the only way to live calmly the post-operative course of this kind of surgery, often very difficult.

References

1. Cennamo A, Falsetto A, De Pascale V, Izzo A, Castaldo N, Di Giacomo D. Le infezioni in chirurgia d'urgenza. Atti SIC 104° Congr. Roma 2002: 275-83.
2. Tonelli F, Dentico P, Novelli A, Periti P. Short-term antibiotic chemoprophylaxis with cefodizime in colorectal surgery: a comparative multi-center study. *It J Colo-proct* 1997; 4: 203-7.
3. Milsom JW, Smith DL. Double-blind comparison of single-dose alafloxacin and cefotetan as prophylaxis of infection following elective colorectal surgery. *Am J Surg* 1998; 176 (6a suppl): 46s-52s.
4. Zanella E, Rulli F. A multicenter randomized trial of prophylaxis with intravenous cefepime + metronidazole or ceftriazone + metronidazole in colorectal surgery. *J of Chemother* 2000; 12: 120-7.
5. Song F, Glenny AM. Antimicrobial prophylaxis in colorectal surgery: a systematic review of randomized controlled trials. *Healt Technol Ass* 1998; 2: 1-110.
6. Nichols RL. Surgical infections: prevention and treatment 1965 to 1995. *Am J Surg* 1996; 172 (1): 68-74.
7. Nyam DCNK, Yeo N, Cheong M, Goh HS. Antibiotic prophylaxis in colorectal surgery: A randomized, double-blind, controlled trial of amoxicillin-clavulanic acid vs ceftriazone and metronidazole. *Asian Journal of Surgery* 1995; 18 (3): 227-30.
8. Rau HG, Zimmerman A, Lachmann A, et al. Il rapporto costo-beneficio nella profilassi delle infezioni nella chirurgia coloretale. *J Chemother* 1999; 11 (5): 25-34.

9. Natalini E, Cesarini C, Aragona L, Giacobini M, Marchetti P. La terapia chirurgica delle neoplasie rettocoliche sn. *Policlinico Sez Chir* 1990; 97: 266-74.
10. Gargiulo A, Benedetti Valentini G, Caserta G, Gargiulo Ajr, Manzi F. Le peritoniti post-operatorie nella chirurgia colo-rettale. Atti SIC 100° Congresso, Roma 1998; 2: 31-8.
11. Peracchia A, Violi V, Sarli L, Pietra N. Deiscenze anastomotiche dopo resezione del colon sn e del retto per cancro. Atti SIC 96° Congresso, Roma 1994; 1: 59-71.
12. Seow-Choen F, Chua TL, Goh HS. Ischemic colitis and colorectal cancer some problem and pitfalls. *Int J Colorect Dis* 1993; 8: 210-2.
13. Simi M, Leardi S, Pietroletti R, Navarra L. Urgenze chirurgiche nella patologia oncologica del retto: problemi di vascularizzazione. Atti SIC 98° Congresso, Roma 1996; 4: 117-26.
14. Cennamo A, Falsetto A, Tolomeo R, Izzo A, Apperti M, Di Giacomo D. Le complicanze settiche nella chirurgia d'urgenza colo-rettale. Atti SIC 102° Congresso, Roma 2000; 3: 40-55.
15. Barbuscia M, Gorgone S, Rizzo AG, et al. La deiscenza delle anastomosi in chirurgia colo-rettale. *Gior Chir* 2002; 23 (8-9): 310-4.
16. Colizza S, Rossi S, Rodio F, et al. Le infezioni dopo chirurgia laparoscopica. Atti SIC 104° Congr. Roma 2002: 284-99.