

The Management of Colon Cancer in Case of Coexistence with an Abdominal Aortic Aneurysm

A. Eliescu^{1,2}, E. Bratucu¹

¹Department I of Surgical Oncology, "Prof. Dr. Al. Trestioreanu" Institute of Oncology, Bucharest, Romania

²5th Department of Surgery and Vascular Surgery, General Hospital of Thessaloniki "Hippokration", Greece

Rezumat

Abordarea terapeutică a cancerului colonic în cazul coexistenței unui anevrism al aortei abdominale

Cazurile de cancer colorectal (CRC) având ca factor de comorbiditate prezența unui anevrism al aortei abdominale (AAA) sunt rare (0,5-2%)(1). Ambele maladii, netratate, au un grad crescut de mortalitate (2,3). Abordarea unor astfel de cazuri constituie o provocare pentru chirurg, acesta confruntându-se cu multiple dileme datorate particularității acestei duble entități patologice. Prezentăm două cazuri clinice de adenocarcinom al colonului concomitent cu AAA, asemănătoare din multiple puncte de vedere. Ambele cazuri au fost tratate cu succes, în privința exciziei tumorale, practicându-se hemicolectomie dreaptă. Pentru fiecare caz s-a ales o strategie chirurgicală vasculară diferită. În primul caz s-a efectuat EVAR (endovascular aortic repair). În al doilea caz, datorită gradului ridicat de risc al operării sacului anevrismal, s-a optat pentru o tactică expectativă. S-a ales prezentarea acestor cazuri datorită rarității incidenței lor, precum și din intenția de a se nuanța anumite aspecte caracteristice. Controversele principale dezbătute sunt: necesitatea tratării maladiilor simultan sau în două etape, ordinea lor de

abordare și alegerea unei operații deschise sau a unei tehnici endovasculare. Din experiența noastră și în concordanță cu majoritatea lucrărilor de specialitate, o terapie secvențială cu EVAR în prima etapă este o metodă de elecție. Pe măsură ce tehnologia chirurgicală evoluează, posibilitățile de amplasare a protezelor intravasculare se extind, putând fi astfel abordate cazuri cu o anatomie tot mai solicitantă.

Cuvinte cheie: cancer colorectal (CRC), anevrism aortic abdominal (AAA), tratament secvențial, endovascular aortic repair (EVAR)

Abstract

Colorectal cancer with the presence of an abdominal aortic aneurysm as a comorbidity factor is rare (0.5-2%) (1). Both diseases, while untreated, have a high degree of mortality (2,3). Management of such cases is a challenge for the surgeon, who confronts multiple dilemmas due to the particularity of this dual pathological entity. We present two clinical cases of adenocarcinoma of the colon concomitant with AAA, similar in many ways. Both cases were successfully treated regarding tumor excision by practicing right hemicolectomy. For each case a different strategy for vascular surgery was chosen. In the first case an EVAR (endovascular aortic repair) was performed. In the second case, because of the high risk of the aneurysmal sac operation, we opted for an expectation tactic. The presentation of these cases was chosen due to the rarity of their occurrence as well as because of the intention to highlight certain characteristic aspects. The main controversies debated are the necessity of treating the diseases simultaneously or in

Corresponding author:

Eliescu Andreas M.D.
5th Department of Surgery and Vascular
Surgery, General Hospital "Hippokration"
49 Konstantinoupoleos street, P.O.54642
Thessaloniki, Greece
E-mail: andreas_eliescu@yahoo.com

two stages, their approach order and the choice of an open surgery or an endovascular technique. From our experience and according to most literature, a staged therapy with EVAR in the first step is a method of choice. As surgical technique evolves, possibilities of endograft placement are expanding, thus, cases with more challenging anatomy can be approached.

Key words: Colorectal cancer (CRC), abdominal aortic aneurysm (AAA), staged treatment, endovascular aortic repair (EVAR)

Introduction

Few cases are cited in the bibliography of tumors as colon or rectal adenocarcinoma which are complicated by the presence of an AAA (4). CRC is considered the second leading cause of death due to cancer, in the United States (2), and the rupture of AAA is considered to be the tenth cause of death in men over 65 years (3).

A limited size AAA is usually asymptomatic and a diameter less than 5 to 5.5 cm does not require surgical approach (5). These are occasionally found during routine imagistic examinations for other diseases. The most commonly used are ultrasound, abdominal CT scan or MRI. Aneurysms of larger size can become symptomatic and can be manifest themselves through diffuse abdominal pain sensation and perception of the pulsation at this area. Phenomena of compression are described on adjacent organs such as the intestinal tract (duodenum) leading to transit disorders or causing aortoenteric fistula.

Compression on the urinary tract can cause hydronephrosis secondary to ureteral obstruction and disorder of renal function. Also an AAA can cause chronic back pain. Embolic phenomena and ischemia can occur due to a partial or total thrombosis of the aneurysm. But the major complication of an abdominal aortic aneurysm is its rupture, with a high mortality rate, being between 40% and 70% for those who reached the hospital and 90% for those who did not receive medical help (3).

Performing a hemicolectomy for CRC in the presence of an AAA, is a challenge for the surgeon due to the changes in some anatomical aspects and the possible risk of injuring the aneurysmal sac. Such situations are demanding and require choosing the best order of therapy for both diseases.

Cases report

We present two cases of CRC concomitant with AAA that were treated in our clinic in one month interval.

Case 1

A 67- year-old patient is hospitalized in a state of fatigability and paleness, accentuated in the last two months. Routine laboratory tests revealed Ht-25%. Colonoscopic

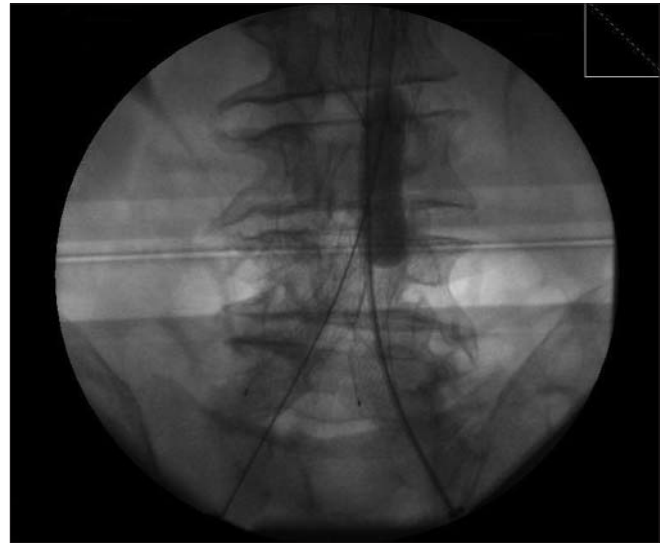


Figure 1. *Case 1 - Fluoroscopy of EVAR: The placement of the bifurcated aortic stent-graft*

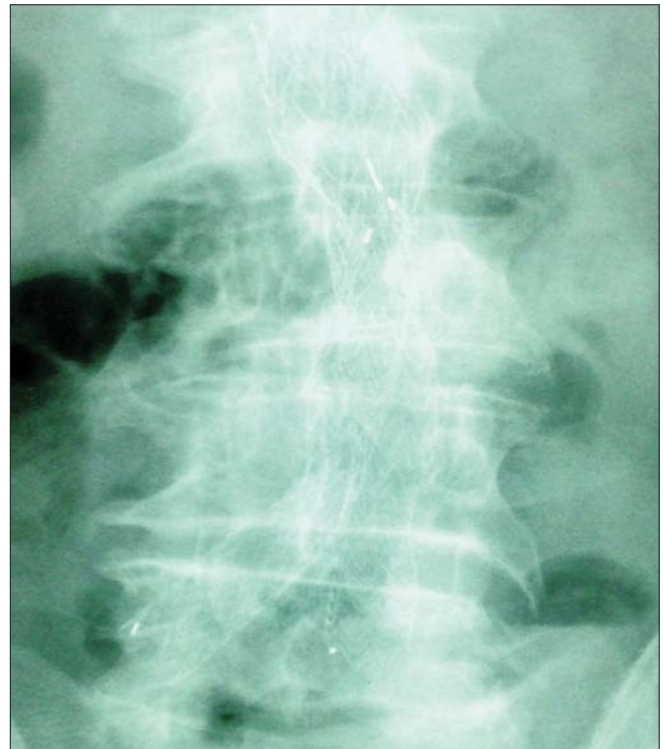


Figure 2. *Case 1 - The postoperative Rx reveals satisfactory expand of the aortic prosthesis*

examination was performed and showed a tumor in the cecum, friable and haemorrhagic. Biopsy examination reveals adenocarcinoma with medium and low differentiation. Tumor markers CEA-2,36 (N.R. <5-10), CA19.9-16, 88 (N.R. 0-37), AFP-1, 80 (N.R. 0-15). Abdominal CT, 1) tumor mass in the ileocecal valve without evidence of lymph node, 2) presence of infrarenal AAA with a diameter of 5 cm. Surgery in two steps was opted. In the first step the patient underwent an EVAR. A bifurcated Gore Excluder vascular prosthesis was used, introduced via the

femoral artery, and placed below renal arteries (Fig. 1, 2). Satisfactory control angiography without the presence of endoleak was mentioned. Seven days after, an open surgery is performed. The patient underwent a right hemicolectomy and side to side ileocolic anastomosis with the transverse colon, using a surgical stapler GIA 80. The pathological examination revealed adenocarcinoma with moderate differentiation, stage IIB (T3N1cM0) with deposits in pericolic tissue. 11 lymph nodes were excised with no metastasis. The patient was discharged after 5 days in satisfactory condition and sent for evaluation in an oncology clinic.

Case 2

A 82-year-old patient is transferred from the Department of Pathology where he was hospitalized due to a pronounced paleness and state of fatigue. He reports aggravation of the symptoms in the last month and the presence of two melaena in a period of 10 days. Pathological history includes 1) hypertension, 2) rupture of abdominal aortic aneurysm (RAAA) four years ago, which was treated endovascularly with aortouniliac (AUI) prosthesis (Endofit) and crossover femoral bypass. Laboratory tests: Hb-7.04, Ht-20.5%, urea 54, creatinine 1.82. The Abdominal CT scan reveals 1) thrombosed AAA with a diameter of 18.2 cm surrounding the vascular prosthesis. The aneurysmal sac starts from the celiac artery and ends at the aortic bifurcation without apparent endoleak. 2) bilateral hydronephrosis with dilatation of the proximal part of the ureters. 3) right kidney cyst with a diameter of 11 cm (Fig. 3). CT scan compared with a previous one four years ago, shows an AAA increase of 4 cm. Not finding the cause of anemia, the patient underwent colonoscopy. This revealed a friable ulcerated tumor mass in the ascending colon, close to the ileocecal valve without intestinal obstruction (Fig. 4). The biopsy diagnosed invasive, moderately differentiated adenocarcinoma. Tumor markers CEA: 1,3, CA 19-9: 11,6. The removal of the tumor mass is decided and it is practiced with some difficulty due to the voluminous aneurysmal sac and the renal cyst. A limited right hemicolectomy and ileocolic side to side anastomosis with the GIA-80 surgical stapler takes place. By paracentesis 800 ml of viscous liquid are extracted from the renal cyst. The microbial culture reveals *Staphylococcus coagulase* negative.

The anatomopathological examination shows moderately differentiated adenocarcinoma and invasion in muscularis propria. Nine lymph nodes were excised without tumor invasion (Stage I - T2N0M0).

The patient was discharged after 5 days in a satisfactory health condition with directions of follow-up of AAA and oncologic evaluation. Due to the advanced age of the patient and the increased risk of the aneurysm operation, therapeutic intervention was not performed. In this case, there were two possible options: a) An open surgery with a resection of the aneurysmal sac, the placement of a Dacron prosthesis and a main arteries reimplantation (mesenterica superior and renals), a difficult and high-risk operation. b) An EVAR procedure using a fenestrated or a branched stent-graft.



Figure 3. Case 2 – CT scanning of the abdomen shows the large aortic aneurysmal sac with the endovascular prosthesis and the large right kidney cyst



Figure 4. Case 2 – Colonoscopy reveals the colonic tumor mass

Discussions

Observing the cases mentioned above, many questions arise about choosing the best option regarding the concomitant therapy of CRC and AAA.

There is a lack of consensus regarding which lesion to be resected first and which treatment is better to be practiced, a one-stage or a two-stages one, an open repair (OR) of AAA or an EVAR.

It is accepted that the stage and the prognosis of CRC in terms of life expectancy are the major factors in the decision of performing a therapy for both diseases (6). An AAA operation in some cases may be optional, depending on the size of the aneurysm and the life expectancy of the patient.

Numerous articles have been written regarding the therapy of both pathological entities in a stage or sequentially, the authors of which support their opinions with rigorous arguments.

Multiple strategies can be chosen regarding the approach of CRC concomitant with AAA. Both diseases can be treated simultaneously or we can treat first the CRC or the AAA. Another option may be the treatment of only the CRC while the not treated AAA to be followed-up on a regular basis (as we indicated in the case 2 in this paper) (7).

Theoretically, a one-stage therapy, when it is possible for the patient's condition, could have a lower morbidity and mortality rate because of the avoidance of a subsequent surgical trauma and of a further stress due to a new anesthesia. Also, the risk of aggravation of the untreated injury in the first stage is eliminated (8).

There are authors who argue that a major operation of the abdominal cavity such as the CRC resection may increase the risk of the AAA rupture in the perioperative period, especially for aneurysms larger than 6 cm (9,10,11,12). Kiskinis et al support that the resection of the AAA first, could lead to a significant delay in the surgical treatment of the CRC and of the adjuvant therapy required (1). Also, in a sequential procedure where open surgery is performed in both stages, it is more difficult to deal with the problems of the second laparotomy. Veraldi and collaborators after their own study and literature review regarding the postoperative morbidity and mortality rates within 30 days in a single-stage therapy (102 cases) found a rate of 8% and respectively 4.5%, and in the case of a sequential therapy (118 cases), a rate of 21, 3% and respectively 6% was reported (8). Most of the authors agree that the concomitant therapeutic approach of CRC and AAA is mandatory when both diseases are life-threatening (e.g. an AAA > 6 cm coexisting with an obstructive tumor) (10,13). On the other hand, the staged therapy advocates claim that this method avoids exposure to a longer-lasting and increased in magnitude operation, more demanding for the patient (4). After all, an open AAA repair, simultaneous with a surgical treatment of CRC, presents a potential risk of cross-contamination and infection of vascular prosthesis, a complication of increased morbidity and mortality (1,11).

A prospective study carried out by Shalhoub et al, in two specialized centers between 2001 and 2006, analyzed 24 cases of CRC concomitant with AAA.

Two-stages surgical interventions were performed in 12 patients and single-stage therapy in 1 patient. AAA rupture, vascular prosthesis infection or death, have not been reported. From their experience, the main conclusion was that performing a sequential treatment is safe (14). Veraldi et al. claim that after bibliography research, a single vascular graft infection in 118 cases treated in stages was reported (8). Especially, a staged therapy with EVAR initially, is an option of choice, due to a faster recovery and a shorter period of convalescence, compared with open repair procedure (12). Another topic of debate is the order that both diseases should be treated.

Most authors agree that the symptomatic lesion and the most life-threatening disease should be treated first. (e.g. a large AAA, or an obstructive CRC) (7,10,12,13,14). If CRC and AAA are asymptomatic there is an algorithm proposed by Baxter et al. from Mayo Clinic: In patients with AAA

< 5 cm, initial CRC resection and postoperative follow-up of the aneurysm should be done. If AAA > 5 cm, then it should be resected first.

In their own study it is reported that after 20 resections of the CRC, 2 RAAA were observed during the postoperative period (an incidence rate of 10%) (9).

Other authors also believe that treating CRC first, a major operation of the abdominal cavity, may increase the risk of AAA rupture in the perioperative period.

Robinson and co. in a study reveal that two of the 10 patients with AAA > 6 cm, who had initially undergone resection of the CRC, had rupture of AAA in the immediate postoperative period (20% Incidence rate) (10). Lin et al from Michael E DeBakey Medical Center, report an incidence of 6% of the RAAA after excision of CRC (12) It is supposed that the laparotomy trauma is a precipitating factor of aneurysm rupture due to reduction of the quantity of collagen of the aortic wall, through a mechanism mediated by the activity of collagenase and protease (15). On the other hand, there are opinions that claim that AAA resection in the first stage can lead to a significant delay of the surgical treatment of CRC and the adjuvant therapy required (1). Lin et al. in a retrospective study revealed that the delay in the surgical treatment of the CRC after open repair of AAA or after EVAR was 115 and 12 days respectively (12). Until now no study has shown the oncological implications due to a delayed treatment of CRC after resection of AAA (1,4). Ideally, any delay should be avoided. The EVAR technique seems to be a procedure that does not require a long period of recovery.

It should be investigated if the use of techniques such as the laparoscopic colectomy might hold a place in the management of CRC simultaneous with AAA, and if it could shorten the period between the two phases of the staged therapy.

An important issue is which operating technique is more indicated, an open procedure or an EVAR. Open repair (OR) of the AAA, simultaneously or immediately after CRC treatment, may increase the risk of graft infection, and theoretically may also lead to the creation of an aortoenteric fistula (AEF), both with a high morbidity and mortality rate (16,17,18). Perioperative mortality cited was 35% for AEF and 17% for the graft infection (16). Also, a two-stages open procedure, multiplies the risks to which the patient is exposed, thus the second laparotomy will be performed in a hostile environment. In such cases an EVAR may be preferable as a minimally invasive procedure that would prevent the potential exposure of the prosthesis to a contaminated environment.

EVAR technique was initially developed to treat patients considered to be of high risk for OR (14,19). Subsequently this technique has become increasingly prevalent. Jordan et al in a study performed, have classified patients as low risk and high risk. Patients with one or more of the following factors were considered as high risk: 1) age > 80 years, 2) chronic renal failure (Creatinine > 2), 3) heart failure or severe coronary artery disease, 4) impaired lung function, 5) re-intervention surgery on the aorta, 6) hostile abdomen 7) the need to undergo emergent surgery (19).

EVAR technique cannot be used in all cases of AAA. It is necessary to fulfill certain criteria such as a healthy part of the infrarenal aorta (neck) with a diameter not exceeding 30 mm and a length of at least 15 mm, a neck angulation of $<60^\circ$, absence of thrombus or calcifications disposed circumferential in the aneurysm neck or the iliac arteries (20). Using new types of vascular prostheses such as the branched or the fenestrated, many of these criteria tend to be surpassed.

If the EVAR technique cannot be used, an open repair (OR) is the only option. By following strict aseptic rules, we can minimize the infection risk of the vascular prosthesis. Therefore, adequate administration of antibiotics, a meticulous retroperitoneal suture followed by careful preparation of the bowel and the use of omental wrap around the vascular prosthesis can lead to a successful outcome.

Studies comparing the total perioperative mortality between EVAR and OR shows that the rate was 1.2% for EVAR and 4.8% for the OR (21). Drury et al. found a similar percentage of 1.6% and 4.7% (22).

Porcellini et al. have evaluated in a retrospective study the results of EVAR and OR of AAA in 25 patients who also underwent treatment of CRC. The hospitalization period for patients undergoing EVAR and treatment of CRC (11 cases) was 12.8 days and in case of OR (14 cases) was 18.2 days. There was no death in the group that underwent EVAR, while in the group that had undergone OR, 3 patients died perioperatively (21.4%). Postoperative complications were reported in a patient in the EVAR group (9.1%) and in 7 patients in the OR group (50%). Survival rate at 1 year and 2 years was 100% and 90.9% for EVAR and 71.4% and 49% for OR (11).

Despite all the advantages of EVAR, Lin et al. mention in their group under research, 2 patients, who, having suffered concomitant right hemicolectomy, presented sigmoid ischemia (18% Incidence rates). He recommends the use of additional preoperative imaging techniques to confirm the presence of collateral flow of inferior mesenteric artery (IMA). Thus a similar complication can be avoided (12). Another striking issue, especially nowadays, is the high cost of EVAR. The total cost of the treatment and 4 years of follow-up was significantly higher for EVAR than for open surgery (21).

Patients with advanced CRC and large AAA in conjunction with other morbidity factors, need a good evaluation of the results expected (6). It is required to taken in to account ethical issues before they undertake any surgery. It is unlikely that these patients, with a poor prognosis, will have any benefit from AAA operation. On the other hand, either the low risk or the high risk cases, eligible for EVAR, have a lower rate of morbidity and mortality, with a lower duration of hospitalization (19). Also, the minimal invasiveness provided by EVAR procedure has a significant contribution to a patient's well-being, an important matter to be taken into consideration, especially if he also suffers from concomitant CRC.

Conclusions

Careful decision-making is required regarding which treatment

is more appropriate to be applied. A rigorous patient evaluation and selection is an important factor of the operation outcome (6).

A staged treatment is safe to be followed.

Most authors choose to use EVAR technique in the first stage, followed subsequently by the resection of CRC (11,12,14).

The EVAR technique, if the criteria of an endograft are met, is a method to be chosen because of its minimal invasive characteristics, especially for the patient with multiple comorbidity factors.

It is important to be noted that as surgical technology evolves, indications for the placement of intravascular prostheses are expanding. Therefore cases with more challenging anatomy can be dealt with. New procedures lead to better outcomes but also new challenges arise and new issues to be managed.

Further prospective trials are required in order to highlight the best therapeutic strategy for the best outcomes.

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