RETROSPECTIVE EPIDEMIOLOGIC RESEARCH ON PREVALENCE OF INFECTIONS IN SURGICALLY TREATED ONCOLOGIC PATIENTS

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RETROSPECTIVE EPIDEMIOLOGIC RESEARCH ON PREVALENCE OF INFECTIONS IN SURGICALLY TREATED ONCOLOGIC PATIENTS (Abstract): The aim of this work was the retrospective study of the frequency of infections in surgically treated oncologic patients. Material and methods: Our research included 753 oncologic patients treated at the Second Surgical Clinic of the Regional Institute of Oncology, Iași, between January 2013 and December 2014, with the selection of cases which had infectious complications. Results: The lot of patients was structured in 7 age groups and the most frequent oncologic patients had ages between 60-79 years. The most frequent malignancies were large bowel, breast, rectal, esophageal cancers, malignant hemopathies, gastric and liver malignant tumors. In our lot of 753 oncologic patients we depicted 113 (15.01%) infections. Conclusions: Our study proved that the anatomic location of the cancer, the hospitalization duration and the number of the hospitalizations has an important role in appearance of the infectious complications. The gastrointestinal malignant tumors were the most frequent malignancies associated with postoperative infections. The patients with gastrointestinal cancers from urban area, with ages between 50 and 79 years had the highest risk of infectious complications. For main causative organism was proved a high sensitivity for colistin. Clinical, paraclinical and epidemiological exams did not emphasize any decisive factors; we took into account the risks of infection during multiple pre-, intra- and postoperative procedures; all these have been associated with increased receptivity of immunosuppressed oncologic patients. Keywords: INFECTION, ONCOLOGY, EPIDEMIOLOGY, GASTROINTESTINAL NEOPLASM.

Oncologic pathology produces severe changes in patient’s life; the immunosuppression associated with the malignancy favors the infections with various germs, the most dangerous of all being the ones given by organisms with high aggressiveness (1, 2). For oncologic patients with advanced disease, the most frequent complication with vital risk and the main cause of death are the infectious complications.
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(3, 4). The causative organisms determining the infections in case of patients with cancer are the opportunist organisms. The risk of selection of antibiotic resistant germs increases along with the hospitalisation duration and antibiotic therapy (5, 6). The risk factors which favor the infections of an immunocompromised host are the dysfunctions of the immune system, neutropaenia, misbalances of central nervous system, the obstructive phenomena, medical invasive maneuvers, splenectomy, dysbacteriosis and the presence of microorganisms (7, 8).

MATERIAL AND METHODS

Our research included 753 patients with malignancies (354 in 2013 and 399 in 2014), treated at Second Surgical Clinic of the Regional Institute of Oncology, Iași, between January 2013 and December 2014. The information was obtained in collaboration with the Department of Prevention and Control of Nosocomial Infections and by studying the registers containing surgical protocols. The data were processed and interpreted with epidemiologic (prevalence, inquiry), statistic and computerized methods. In order to calculate the quantitative differences we used χ², p and t-student tests. The linear regression was calculated with the following formula \( y = a + bx \) and had underlined the evolution of the phenomenon.

RESULTS AND DISCUSSION

The distribution according to the age groups. The lot of patients was structured on 7 age groups: 20-29 years (13 patients, 1.72%), 30-39 (32; 4.24%), 40-49 (76; 10.09%), 50-59 (169; 22.44%), 60-69 (256; 33.99%), 70-79 (165; 21.91%) and over 80 (42; 5.57%) (fig. 1).

The evaluation of the oncologic patients according to the age groups. We observed that 18.06% of the patients were from the 60-64 years group, followed by 65-69 (15.93%) and 55-59 (14.20%), which shows the socio-economic and familial implications (fig. 2).

The structure of the lot of patients according to the gender. The differences of prevalence between the two genders were not significant (p>0.05), 50.19% of patients were males and 49.80% females.

According to the residence, 61.08% of patients lived in urban area and 38.91% in rural area, with a difference statistically significant (p<0.05). This situation can be explained by the differences of education and lack of accessibility to the medical assistance in case of the rural residents.

![age histogram](attachment:image.png)

Fig. 1. The distribution by age groups of the oncologic patients included in the study
Evaluation of the prevalence of certain forms of cancer. The patients we had studied had the following malignancies: large bowel (96 cases; 12.75%), breast (88 patients; 11.68%), rectum (87; 11.55%), esophagus (64; 8.49%), malignant hemopathies (59; 7.83%), gastric (55; 7.31%), liver (34; 4.51%), uterus (34; 4.51%), ovary (29; 3.85%), pancreas (27; 3.58%), skin (23; 3.05%), soft tissue (23; 3.05%), recto-sigmoid (23; 3.05%), pharynx (19; 2.52%), lung (18; 2.39%) (fig. 3).

Comparing the frequency of different malignancies in 2013 and 2014, we observed a significant increase in number of various cancers in 2014: esophageal (40 cases in 2014 compared with 24 in 2013, meaning an increased percentage of 3.25%), breast malignant tumors (51 cases in 2014 compared with 37 in 2013, meaning an increased percentage of 2.33), large bowel – percentage difference of 2.20, pharynx (2.09%), thyroid (1.19%).

In 2013, we encountered some other malignancies with a higher frequency: gastric (37 cases in 2013 compared with 18...
in 2014, meaning a significant percentage difference of 5.94), malignant hemopathies (32 cases in 2013 compared with 18 in 2014, difference of 2.27%), skin - 1.70%, lung 1.35%, ovary 1.25%. In case of kidney, tongue, soft tissue, recto-sigmoid and pancreatic neoplasm we found a stationary tendency (percentage difference of less than 1) (fig. 3).

Infections encountered in case of oncologic patients. In our study, according to the literature, the infections prevalence was related to the characteristics of the primary tumor and to different co morbidities of each patient (8). The oncologic patients, secondary to immunosuppression, have an increased receptivity to various endogenous and exogenous organisms, inside and outside the hospital; the microorganisms which determine the infections are, most of the times, various species of bacteria with multiple antibiotic resistance.

Distribution of the infections related to the malignant diseases. Between January 2013 and December 2014, among the 753 patients included in the lot of study, 113 (15.01%) suffered from various infections; the most frequent of all infected patients were de ones with rectal cancers (23.0%), followed by: large bowel (16.81%), breast (11.50%), gastric (8.84%), uterine cancers (6.9%). Far less frequent were the infections appeared in case of ovary, skin, liver, biliary ducts, recto-sigmoid, lung, pharynx, esophagus, pancreatic, urinary bladder and small bowel cancers (fig. 4).

![Pie chart](image)

**Fig. 4.** Distribution of the infections related to the malignant diseases between 2013 and 2014

Mean hospitalization duration (number of days). Among the oncologic patients there was a significant difference (p≤0.05) between the mean hospitalizations duration in case of patients with infections (24.025 days) compared with those without infections (9.76 days). The hospitalization duration before surgery was longer in case of the patients with postoperative infections (5.88 days) than for the patients without infections (2.72 days), which proves that the risk of infection increases with prolonged preoperative hospitalization (p ≤ 0.05).
Bacteria’s frequency in case of oncologic patients’ infections. Among the 113 patients with infections, we have encountered 204 determinations of 23 bacteria: for 63 (55.75%) cases there was only one causative organism and for 50 (44.24%) cases there were two or more causative organism; the difference among this two categories has a mean statistical significance (p<0.05) and can be explained by the various sites of infection and the multiple surgical procedures performed on immunosuppressed patients. The most frequent causative organism was \textit{E. coli} (27.94%), followed by \textit{Klebsiella pneumoniae} (18.62%), \textit{Pseudomonas aeruginosa} (8.33%), and \textit{Staphylococcus aureus} (7.84%). We noticed that \textit{Staphylococcus aureus} is now on the fourth place, according to the data from the literature, standing for a decreased involvement of this bacteria community and hospital infections (fig. 5).

![Fig. 5. Bacteria’s frequency in case of oncologic patients’ infections](image)

Among the 53 cases of nosocomial infections, the most were isolated from the postoperative wounds (27: 50.95%), followed by acute enterocolitides (13: 24.53%), urinary infections (6: 11.32%), pneumonia (5: 9.43%), and sepsis (2: 3.77%).

\textbf{Causative organism observed in various biologic products.} Among the 27 probes from the postoperative wounds we had isolated: \textit{S. aureus} (33.33%), \textit{K. pneumoniae} (14.28%) \textit{Pseudomonas aeruginosa} (10.47%), \textit{E. coli} (10.47%), \textit{Enterococcus faecalis} (8.57%) and associations in other cases – 22.88% and in case of 6 positive urine cultures, \textit{E. coli} (47.91%) and \textit{K. pneumoniae} (27.08%) had been dominant. We had identified in haemocultures: \textit{E. coli} and \textit{Pseudomonas aeruginosa}; in coproculture: \textit{Clostridium difficile}.

\textbf{The interval between surgery and the occurrence of infection.} The infection began during the first 48 hours in 3 cases, after 72 hours in 3, during the first week in 20, during the second week in 10, during the third week in 10, during the fourth week in 4 and in 3 cases after more than 1 month since surgery. Most of the infections appeared in the first two weeks after surgery (fig. 6).
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The analysis of the antibiotic sensitivity of the bacteria isolated from the cultures showed the following aspects: 38 (97.43%) of 39 strains of *E. coli* had sensitivity for carbapenem (imipenem / meropenem) and all 33 (100%) strains for polypeptide (colistin); 24 (97.43%) of 33 strains of *K. pneumoniae* had sensitivity for carbapenem (imipenem/meropenem), 31 (96.87%) of 32 strains for polypeptide (colistin); 10 (83.33%) of 12 strains of *Pseudomonas aeruginosa* had sensitivity for aminoglycoside (gentamicin) and fluoroquinolone (ciprofloxacin), all 12 (100%) strains for polypeptide (colistin); all 11 strains of *S. aureus* had sensitivity for fluoroquinolone (ciprofloxacin), glycopeptide (vancomycin), sulfonamide (sulfamethoxazole), 11 (91.66%) of 12 tested strains had sensitivity for rifampicin; all 11 tested strains of *Enterococcus faecalis* had sensitivity for glycopeptide (vancomycin) and ampicillin, 10 (90.90%) of 11 strains for aminoglycoside (gentamicin). The appearance of the resistance of some strains of *K. pneumoniae* for carbapenem is of great concern. An efficient measure to limit the antibiotic multiresistance is avoiding unjustified treatments and implementing programs of good practice of antibioptherapy. *Pseudomonas aeruginosa* had resistance for most antibiotic classes because the difficulties of passing the cellular membrane; we remarked also resistance for spare antibiotics (carbapenem); 3 (27.27%) of 11 strains tested had resistance for imipenem. All tested strains of *S. aureus* had resistance for ampicillin and 50% for cephalosporines, macrolide (erythro-mycine) and tetracycline.

**CONCLUSIONS**

Our study showed that the anatomic location of the cancer, the hospitalization duration and the number of the hospitalizations have an important role in appearance of the infectious complications. The digestive malignant tumors were the most frequent malignancies associated with postoperative infections. The patients with digestive cancers from urban area, with ages between 50 and 79 years had the highest risk of infectious complications. For main causative organism was proved a high sensitivity for colistin. Clinical, paraclinical and epidemiological exams did not emphasize any decisive factors; we took into account the risks of infection during multiple pre-, intra- and postoperative procedures; all these have been associated with increased receptivity of immunosuppressed oncologic patients.
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