

POST-OPERATIVE INFECTION IN THE CONTEXT OF ONCOLOGY PATIENTS WITH SPINE AFFECTION: A RETROSPECTIVE ANALYSIS

INFECÇÃO PÓS OPERATÓRIA NO CONTEXTO DO DOENTE ONCOLÓGICO COM AFECÇÃO DA COLUNA: UMA ANÁLISE RETROSPECTIVA

INFECCIÓN POSTOPERATORIA EN EL CONTEXTO DE PACIENTES ONCOLÓGICOS CON AFECCIÓN DE LA COLUMNA: UN ANÁLISIS RETROSPECTIVO

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ABSTRACT

Objective: To identify characteristics and associate the complications in cancer patients operated on by the Spine Group at the Cancer Institute of the State of São Paulo (ICESP) from January 2020 to December 2020. **Methods:** Retrospective analysis of medical records of patients operated on by the spine group. **Results:** Of the total of 62 cases, the majority, 69.4%, were residents of the state of São Paulo. There were 24.2% of smokers, of which 93.3% died. We identified that 48.4% had no family history of CA. It was identified that 62.9% received radiotherapy, and 75.8% were undergoing systemic treatment. There were three preoperative transfusions, 16 intraoperative transfusions, and five postoperative transfusions. We found an association between cases that required postoperative transfusion and cases of infection, $p=0.019$. The total number of postoperative infections was 9 cases (14.5%). **Conclusions:** Postoperative infections are undesirable events in the oncological context in the postoperative period and may be associated with the patient's clinical conditions. **Level of Evidence III; Retrospective Study.**

Keywords: Postoperative Wound Infection; Spinal Cord Compression; Spine.

RESUMO

Objetivo: Identificar características e associar as complicações de pacientes oncológicos operados pelo Grupo de Coluna no Instituto do Câncer do Estado de São Paulo (ICESP) no período de janeiro de 2020 a dezembro de 2020. **Métodos:** Análise retrospectiva de prontuários de pacientes operados pelo grupo de coluna. **Resultados:** Do total de 62 casos, a maioria, 69,4%, residentes do estado de São Paulo. Havia 24,2% de tabagistas, destes 93,3% foram a óbito. Identificamos que 48,4% não tinham histórico familiar de CA. Foi identificado que 62,9% receberam radioterapia e 75,8% estavam sob tratamento sistêmico. Foram levantadas 3 transfusões pré-operatórias, 16 transfusões intra-operatórias e 5 transfusões pós-operatórias. Encontramos associação nos casos que necessitaram de transfusão pós-operatória com os casos de infecção, $p=0,019$. O total de casos de infecção pós-operatória foi de 9 casos (14,5%). **Conclusões:** Infecções pós-operatórias são eventos indesejáveis e estão presentes no período pós-operatório no contexto oncológico e podem estar associadas às condições clínicas do paciente. **Nível de Evidência III; Estudo retrospectivo.**

Descritores: Infecção de Ferida Pós-Operatória; Compressão da Medula Espinhal; Coluna Vertebral.

RESUMEN

Objetivo: Identificar características y complicaciones asociadas en pacientes con cáncer operados por el Grupo de Columna del Instituto del Cáncer del Estado de São Paulo (ICESP) de enero de 2020 a diciembre de 2020. **Métodos:** Análisis retrospectivo de historias clínicas de pacientes operados del grupo de columna. **Resultados:** Del total de 62 casos, la mayoría, 69,4%, eran residentes del estado de São Paulo. Hubo un 24,2% de fumadores, de los cuales el 93,3% falleció. Identificamos que el 48,4% no tenía antecedentes familiares de AC. Se identificó que el 62,9% recibía radioterapia y el 75,8% estaba en tratamiento sistémico. Hubo 3 transfusiones preoperatorias, 16 transfusiones intraoperatorias y 5 transfusiones posoperatorias. Se encontró asociación entre los casos que requirieron transfusión postoperatoria y los casos de infección, $p=0,019$. El número total de casos de infección postoperatoria fue de 9 casos (14,5%). **Conclusiones:** Las infecciones postoperatorias son eventos indeseables y están presentes en el postoperatorio en el contexto oncológico y pueden estar asociadas a las condiciones clínicas del paciente. **Nivel de Evidencia III; Estudio retrospectivo.**

Descriptor: Infección Postoperatoria de Herida; Compresión de la Médula Espinal; Columna Vertebral.

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INTRODUCTION

The knowledge in the oncology field has increased in recent decades, and the different treatment options have offered patients longer survival and better quality of life.¹ Since 2000, developed technologies have allowed for approaches and evaluations of tumors at the molecular level. An important breakthrough was the complete sequencing of the genome of several tumors, which was launched in 2005 as part of The Cancer Genome Atlas. This international project studies cancer through massive data generation techniques and computational biology.²

Systemic therapy in oncological medicine has advanced in understanding genetic abnormalities and has gained a better understanding of the interaction between tumor cells and the immune system.

Intensity-modulated radiation therapy (IMRT) is one of the greatest and most important developments for the treatment of neoplasms, with applications in various areas and types of tumors. IMRT has become prominent for improving the administration of radiation doses in the treatment area and reducing toxicity in normal tissues. It is important to have communication between the medical and technical teams during the planning of modern radiotherapy.³

Cancer represents a significant impact on society. Over the years, the problem has increased in less developed countries, which currently account for about 57% of cases and 65% of cancer deaths worldwide. It is estimated that 30% to 70% of patients with malignant tumors develop vertebral metastasis.^{4,5}

Along with the increase in cases and the increase in patient survival, the number of cases presenting metastatic spinal canal compression, a complication considered serious, has also increased.⁶

The syndrome of spinal cord compression can occur in different ways: invasion of locally advanced malignant neoplasms, bone or epidural metastases. It is known that the functional outcome of the treatment depends on the severity of the deficit, the time and speed of onset, and the promptness in adopting appropriate therapeutic measures for decompression of the spinal canal. One of the most used strategies is decompression surgery, which presents among the inherent risks of the procedure postoperative infection.^{7,8}

The most commonly used technique for decompression purposes is open laminectomy, which is usually recommended when other conservative measures do not achieve the expected result or when there is an ongoing neurological deficit. The laminectomy aims to relieve the posterior pressure on the spinal cord or nerves by removing the lamina, a thin layer of bone that is the roof of the vertebral canal.

Understanding and classifying spinal stability is key in decision-making regarding the need for stabilization with associated instrumentation. To collaborate with the issue, the Spine Oncology Study Group (SOSG) published the Neoplastic Spine Instability Score (SINS) based on the association of the best available literature with a consensus of expert opinions in 2012.^{9,1}

Regarding the postoperative infection, the risk factors for its occurrence must be considered. These risks can be divided into three types: related to the patient, the surgical procedure, and postoperative care. The incidence of infection is quite variable in the literature, and in some studies, it can reach up to 20%. Procedures such as discectomies and decompressive laminectomies have an incidence of 3%, while procedures requiring instrumentation have infection rates close to 12%.^{7,8}

However, in Brazil, there is not much data on the treatment of spine surgeries related to cancer. In this way, the objective of this work is to describe the operated cases and identify the characteristics of the patients, procedures, and outcomes involved in spinal oncology surgery.

METHOD

This study was duly approved by the ethics committee of the Hospital das Clínicas of the Faculty of Medicine of the Universidade de São Paulo (HCFMUSP), with opinion number 5.918.796 and CAAE number - 66594923.8.0000.0068, a study conducted at the

Cancer Institute of the State of São Paulo (ICESP), evaluating data from patients operated by the Spine Group. The medical records were selected through the TASY[®] system used at ICESP. The period defined for analysis was from January to December 2020, and all patients operated on by the Spine Group were included. The collected variables were patient and disease characteristics such as race, education, marital status, smoking, family history, pain, ambulation, international classification of diseases version 10 (ICD-10) primary and the onset of bone metastases (acquired by the integrated FOSP system (Fundação Oncocentro de São Paulo, where the input is performed by a team of trained professionals who review the data for inclusion (e.g., medical records, anatomical-pathological exams, laboratory tests, and other clinical life records of the patients)), hospitalization data such as date of hospitalization, nutritional performance, and nature of hospitalization (elective or urgent), intraoperative data such as type of surgery and duration of surgery, and postoperative data such as infection, administration of antibiotics, and death, which were collected with the Hospital Infection Control Commission (CCH) team also from TASY data. Transfusion data were collected in the preoperative, intraoperative, and postoperative stages, and these data were collected from the institution's blood bank administration team.

The data was stored in an Excel spreadsheet and imported into the Jamovi[®] statistics software. Categorical data were described by their absolute frequency, and respective proportion within each category, and the Spearman test was used for association analysis between independent samples.

Continuous data were described by mean values and their respective standard deviations. For inferential analysis, the t-student test was used to compare independent samples, and when necessary, the correlation test was performed. The type I error with a value less than or equal to 0.05 was accepted as statistically significant. Two independent researchers reviewed all the data.

RESULTS

Sixty-two cases were identified, the majority, 69.4%, residents of the state of São Paulo. There were 24.2% smokers, and 48.4% had no family history of CA. The pain in the spine was classified as mechanical in 61.3% and biological in 38.7%. The pain was radiated in 72.6% of the cases, with 14.5% being wheelchair users and 29% using some auxiliary device for ambulation.

The primary cancer was quite heterogeneous, and its distribution is described in Table 1.

Distribution of the number of cases by type of primary tumor

In the evaluated cases, 62.9% received radiotherapy, and 75.8% underwent systemic treatment. In 2020, 50% of the population died, with an average age of 56.8 ± 12.8 years, which was not different from the patients who did not die, 56.1 ± 14.9 years.

In the preoperative period, 45.2% of the patients were eutrophic, and 40.4% were obese or overweight.

In the preoperative period, the average transfusion was $1.33 + 0.57$ units of blood; in the intraoperative period, it was $2.38 + 2.68$ units of blood; and in the postoperative period, it was $1.2 + 0.44$ units of blood.

Three preoperative transfusions, 16 intraoperative transfusions, and five postoperative transfusions were identified. When we analyzed those who did not undergo preoperative transfusion, we found a greater chance of not needing intraoperative transfusion ($p < 0.05$). When we analyzed the association between intraoperative and postoperative transfusion, those who did not undergo intraoperative transfusion were likelier not to need postoperative transfusion ($p < 0.05$), indicating little intraoperative bleeding.

In the analysis of the association between blood transfusion and infection, no association was identified, $p > 0.05$. No association was also identified between intraoperative transfusion and infection, $p > 0.05$. However, an association was found in cases that required postoperative transfusion with cases of infection, $p = 0.019$.

Table 1. Primary cancer of the sample in this study.

Level	Count	Proportion
Carcinoma of the lips, oral cavity, and pharynx	1	0.0101
Multiple myeloma	7	0.0707
Multiple myeloma and malignant plasma cell neoplasms	1	0.0101
Neoplasm of uncertain or unknown behavior of female genital organs	1	0.0101
Malignant neoplasm of the bladder	3	0.0303
Malignant neoplasm of the spine	6	0.0606
Malignant neoplasm of the breast	15	0.1515
Malignant neoplasm of the oropharynx	3	0.0303
Malignant neoplasm of the prostate	10	0.1010
Malignant neoplasm of the cervix	2	0.0202
Malignant neoplasm of the colon	5	0.0505
Malignant neoplasm of the stomach	2	0.0202
Malignant neoplasm of the liver and intrahepatic bile ducts	3	0.0303
Malignant neoplasm of the small intestine	1	0.0101
Malignant neoplasm of the rectum	4	0.0404
Malignant neoplasm of the kidney, except renal pelvis	5	0.0505
Malignant neoplasm of connective and other soft tissues	2	0.0202
Malignant neoplasm of the bronchi and lungs	8	0.0808
Malignant neoplasm of soft tissues of the retroperitoneum and peritoneum	1	0.0101
Secondary malignant neoplasm of other sites	1	0.0101
Malignant neoplasm, unspecified location	2	0.0202
Malignant neoplasm of the tonsil	1	0.0101
Malignant neoplasm of the body of the uterus	1	0.0101
Malignant neoplasm of the spinal cord	5	0.0505
Lymphoid leukemia	1	0.0101
Other malignant neoplasms of the skin	2	0.0202
Malignant neoplasm of the bones of the pelvis, sacrum, and coccyx	1	0.0101
Malignant neoplasm of the parathyroid gland	1	0.0101
Malignant neoplasm of the retroperitoneum	1	0.0101
Malignant neoplasm of the scapula and long bones of the upper limbs	1	0.0101
Malignant neoplasm of the long bones of the lower limbs	1	0.0101
Hemangioma of any location	1	0.0101

The mean surgery time was 358 ± 105 minutes, ranging from 144 to 577 minutes of surgery.

Three types of surgery were performed: without decompression, 11 cases (cementation and fixation in situ); with decompression without arthrodesis, 21 cases; and the most frequent, with decompression + arthrodesis, 30 cases. The average time was different between decompression surgery with arthrodesis, 391 ± 94.7 minutes when compared to decompression surgery without arthrodesis, 311 ± 75.2 minutes, p<0.05, and surgery without decompression, 355 ± 148 minutes was not statistically different, p>0.05. Overall, there were 9 cases (14.5%) of postoperative infection.

Table 2 shows the characteristics related to the infection.

The infected cases stayed on average 26 + 11.7 days hospitalized, ranging from 9 to 42 days.

Regarding postoperative infection, we did not identify a statistically significant association with smoking, ambulation status, type of surgery, origin of pain, pre-surgical nutritional performance, or age.

Regarding the type of surgery, the surgery time with arthrodesis was longer than without arthrodesis, with a statistically significant difference, p<0.05. In comparing infection rates, surgery time did not imply a difference between the infected and non-infected; the difference was not statistically significant (p>0.05).

Table 2. Data on infection cases.

	n	Proportion
Post-Operative Infection		
No	53	0.855
Yes	9	0.145
ISC Ratings		
Superficial surgical site infection	5	0.556
Deep surgical site infection	4	0.444
Bacteria		
E.coli carba S + S.aureus oxa S	1	0.111
E.coli carba S + S.epidermidis	1	0.111
E.faecalis vanco S + S.aureus oxa S	1	0.111
K.pneumoniae carba S + E.coli carba S	1	0.111
Pseudomonas aeruginosa carba S + S.epidermidis + S.caprae	1	0.111
S.aureus oxa S	3	0.333
without agent	1	0.111
Antibiotics administered		
Cefepime	1	0.111
Ceftriaxone - Oxacillin	1	0.111
Linezolid - Cefepime - Vancomycin	1	0.111
Oxacillin - Piperacillin - Tazocin	1	0.111
Tazocin - Ciprofloxacin - Metronidazole	1	0.111
Tazocin - Vancomycin	1	0.111
Teicoplanin	1	0.111
Vancomycin - Cefepime	1	0.111
Vancomycin - Teicoplanin - Ertapenem	1	0.111

Despite the small sample size in the study, 50% of the deaths were in this sample. When we analyzed the associations of characteristics associated with this event, we found a strong association between smoking and death. Given that 24.2% of the sample were smokers, and of these, 93.3% died, and of the non-smokers, 36.2% died, p<0.001. No other baseline characteristic was associated with death.

DISCUSSION

A postoperative infection is an adverse event of any type of surgery, and using appropriate aseptic techniques and administration of prophylactic antibiotics and modern operating rooms are still insufficient to prevent postoperative infection. The frequency of postoperative infections varies widely. In the literature, this percentage reaches 20% in some studies, according to Chan and colleagues (2022). In surgeries such as discectomy and laminectomy, the infection rate is 3%, and in cases where there is instrumentation, the infection rate is approximately 12%^{2-5, 1,7,8}

The use of implants in spinal fusion surgeries is associated with extended surgical time, blood loss, and anatomically exposed surface area. Furthermore, a dead space is created around the implanted devices. Although he is not directly responsible for transplanting microorganisms, he is a contributing factor.¹⁰ Maintaining a sterile environment, paying attention to hemostasis, reducing necrotic tissue, and properly using implantable devices are important measures to reduce hospital costs and postoperative infection.

Between 2008 and 2021, Brazil had an average of about 5 million patients in the postoperative process. Each patient and their families personally experience this period. It is associated with anxiety, depression, fear of the procedure, and fear of anesthesia. We still have the fear of complications during and after surgery. In this way, establishing a good relationship between the doctor and the patient, considering personal beliefs and culture, can provide patients with greater peace of mind when facing post-operative infections.

In addition to the psychological perspective, surgery also produces trauma in tissues and organs. Surgical incisions can cause pain, restriction of movement, and the need for rest, as well as physiological adaptations of the body, such as decreased mobility, hormonal changes, water, electrolyte, peristalsis, pain, increased susceptibility to

infections, and excessive intraoperative bleeding. Therefore, effective monitoring by healthcare professionals is important.

Adverse events during hospitalization include nosocomial infections, often referred to as Healthcare-Associated Infections, defined as infections acquired after admission, during hospitalization, and after discharge. Perform clinical and/or laboratory tests while the patient is hospitalized, and the occurrence of clinical symptoms of infection 72 hours after admission, even if there is community transmission, keeps open the possibility of being considered a hospital infection.

Surgical infection is a type of nosocomial infection that causes very harmful side effects in surgical patients and is of great importance in Brazil and worldwide.¹¹ There is a significant clinical and social impact on health systems nationwide. In Brazil, there are still few studies that include information about post-surgical complications of cancer patients, mainly related to oncology clinics. Therefore, it is essential to promote studies on this topic.

Patient safety undergoing surgical treatment requires a joint effort from the healthcare team to comply with all harm reduction measures and error prevention that result in infectious complications. Due to these characteristics, professionals working in the surgical center are exposed to complex situations and must be trained to perform their tasks.

CONCLUSION

Postoperative infections are undesirable events, especially in the cancer surgery setting. Proper aseptic techniques, prophylactic antibiotics, and modern operating rooms are still insufficient to eradicate postoperative infections.

In this study, we found correlations between postoperative blood transfusion and infection. In this way, these populations must be studied further to understand and intervene to reduce the rates of comorbidities related to spinal surgeries in the oncological context. It was impossible to establish associations regarding the number of cleanings, the positivity of cultures, and the time between hospitalization and the surgical procedure. The retrospective analysis of medical records often brings incomplete data, and we suggest conducting a study with a longer time interval and a larger number of patients involved to obtain more robust data on this important field of study.

All authors declare no potential conflict of interest related to this article.

CONTRIBUTIONS OF THE AUTHORS: Each author contributed individually and significantly to the development of this article. OCBJ: conception, design, and interpretation of the work data; FBS: acquisition, analysis, and writing of the work; BGMMC: writing, review, and intellectual concept; CP: analysis and writing of the work; JCB.: acquisition and analysis of data; LRS: acquisition and analysis of data; WGJT.: article review and intellectual concept; AFC: review and final approval of the manuscript version to be published; HDK.: statistical analysis and critical review of the intellectual content of the article.

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