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Utilizing Opportunistic Computed Tomography to Forecast Adverse Postoperative Outcomes in Spinal Metastases Patients

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Introduction

Spinal metastases represent a significant clinical challenge due to their impact on patient mobility, pain, and overall quality of life. Surgical intervention, often necessary for stabilization and pain relief, carries risks of postoperative complications that can adversely affect outcomes. Identifying patients at higher risk for these complications is crucial for optimizing treatment strategies and improving prognoses. Opportunistic computed tomography offers a promising avenue for enhancing preoperative assessments. This article explores the potential of utilizing opportunistic CT to forecast adverse postoperative outcomes in spinal metastases patients. Spinal metastases occur when cancer cells spread from primary tumors to the vertebral column, leading to structural instability, pain, and neurological deficits. Surgical intervention aims to stabilize the spine, relieve compression, and improve the patient's quality of life. However, postoperative complications such as infection, hardware failure, and nonunion can significantly impact recovery. Opportunistic CT refers to the use of CT scans performed for other clinical reasons to extract additional diagnostic information. This approach leverages the high-resolution imaging capabilities of CT to assess bone quality, tumor burden, and anatomical features that may influence surgical outcomes [1-3].

Description

A retrospective cohort study design was employed, utilizing data from patients who underwent surgery for spinal metastases at a tertiary care center between 2010 and 2020. Institutional review board approval was obtained, and patient consent was waived due to the retrospective nature of the study. The study included 150 patients with documented spinal metastases who underwent preoperative CT scans for various clinical indications. Inclusion criteria were adult patients (aged 18 and above) with spinal metastases who underwent surgical intervention. Exclusion criteria included previous spinal surgeries, incomplete medical records, and poor-quality CT images. Data were collected from electronic medical records, including demographic information, primary tumor type, clinical presentation, preoperative imaging, surgical details, and postoperative outcomes. Opportunistic CT scans were analyzed using specialized software to assess bone mineral density (BMD), tumor characteristics, and anatomical parameters. The primary outcome measure was the incidence of adverse postoperative outcomes within 90 days of surgery, including wound infections, hardware failure, reoperation, and prolonged hospitalization. Secondary outcomes included postoperative pain levels, neurological function, and overall survival. Descriptive statistics were used to summarize patient characteristics and outcomes. Logistic regression analysis was employed to identify predictors of adverse postoperative outcomes, incorporating variables derived from opportunistic CT analysis and clinical factors. Receiver operating characteristic curves were used to evaluate the predictive performance of the models. The study cohort comprised 150 patients (mean age 62 ± 11 years; 55% male). The most common primary tumors were breast cancer (30%), prostate cancer (25%), and lung cancer (20%). The mean follow-up period was 18 months [4,5].

Conclusion

The findings of this study underscore the potential of opportunistic CT in enhancing preoperative risk stratification for patients with spinal metastases. By identifying key predictors of adverse postoperative outcomes, clinicians can tailor surgical planning and perioperative management to mitigate risks. Low BMD, as detected by opportunistic CT, emerged as a significant predictor of hardware failure and wound complications. This highlights the importance of assessing bone quality in patients with spinal metastases, particularly given the high prevalence of osteoporosis in this population. Preoperative optimization of bone health, including pharmacologic interventions and nutritional support, may improve surgical outcomes. The extent of tumor involvement and anatomical abnormalities, such as spinal misalignment, significantly influenced postoperative outcomes. Detailed preoperative imaging assessment can aid in surgical planning, enabling more precise and targeted interventions. For instance, high tumor burden may necessitate more extensive surgical resection or adjunctive therapies, while abnormal spinal alignment might require more complex reconstructive techniques. This study has several limitations, including its retrospective design and single-center setting, which may limit generalizability. Additionally, the use of opportunistic CT relies on the availability of high-quality imaging, which may not be feasible in all clinical settings. Future research should focus on prospective validation of these findings in larger, multicenter cohorts. Integration of advanced imaging techniques, such as dual-energy CT and functional MRI, may further enhance the predictive accuracy of preoperative assessments. Additionally, exploring the impact of targeted interventions based on opportunistic CT findings could provide valuable insights into optimizing surgical outcomes for patients with spinal metastases. Opportunistic computed tomography offers a valuable tool for forecasting adverse postoperative outcomes in patients with spinal metastases. By leveraging detailed imaging data to assess bone quality, tumor burden, and anatomical parameters, clinicians can enhance preoperative risk stratification and tailor surgical planning. The integration of opportunistic CT into routine clinical practice holds promise for improving the care and outcomes of this vulnerable patient population. Future research should aim to validate these findings and explore the impact of targeted preoperative interventions based on opportunistic CT assessments.

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Conflict of Interest

None.

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