

Women with Early-stage Cervical Cancer

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Introduction

Following breast, colorectal, and lung cancers, cervical cancer is the fourth most common cancer in women. It is also the fourth leading cause of cancer death. More than 90% of cancer-related deaths are caused by cancer cells' ability to invade surrounding tissues and metastasize to regional lymph nodes and distant organs. Cervical cancer typically spreads in a stepwise fashion from the primary tumour to adjacent structures such as the parametrium, vagina, urinary bladder, and rectum. Cancer cells can also spread to regional lymph nodes and distant locations [1].

Description

The presence of Parametrial Invasion (PMI) and pelvic node metastasis in early-stage (FIGO stage IA2-IIA) cervical cancer is associated with a higher risk of recurrence and a lower chance of survival. As a result, the primary surgical treatment for these patients typically consists of a radical hysterectomy with removal of the adjacent parametrium and a pelvic lymphadenectomy [2]. The treatment is generally effective, with a good survival rate. Significant intraoperative complications, such as excessive blood loss and organ injury, as well as long-term morbidities such as voiding dysfunction, lower gastrointestinal dysfunction, and sexual dysfunction, are common [3]. These conditions are primarily caused by trauma to the pelvic blood vessels and autonomic nerves during parametrial resection. The nerve-sparing technique for radical hysterectomy has been adopted in an attempt to reduce these long-term nerve-related morbidities. However, significant postoperative morbidities continue to be reported. Adjuvant postoperative pelvic radiation with concurrent chemotherapy is recommended in addition to radical surgery if cancer metastases in the parametrium/pelvic nodes or involved surgical margins are identified [4]. This would increase the risk of posttreatment morbidity in patients receiving combined therapeutic modalities.

However, the reported incidence of PMI in these early-stage patients ranges from 5–25 percent. As a result, the vast majority of patients are subjected to unnecessary "radical" surgery. As a result, accurate prediction of PMI among patients with early-stage cervical cancer due to surgery can aid in the rapid identification of patients with a low risk of metastasis, for which parametria removal is not required. A radical hysterectomy could be replaced by a less invasive simple hysterectomy in this case. As a result, treatment-

related complications may be reduced significantly. Primary concurrent chemoradiation (CCRT) can, on the other hand, be seriously considered for those preoperatively classified as having a high risk of PMI, with primary radical hysterectomy remaining as an alternative option [5]. This method achieves good oncological outcomes while reducing morbidity significantly. However, the current efficient system for predicting PMI is insufficient.

Conclusion

iPMI is a novel Machine Learning (ML)-based predictive model for identifying PMI in women with early-stage cervical cancer who are candidates for primary radical surgery. This type of modelling technique is increasingly being used in cancer prognostic model development studies due to its high predictability. We compared the predictive performance of the iPMI model developed using the random forest (RF) method to that of conventional Logistic Regression (LR) and other widely used ML classifiers such as Decision Tree (DT), K-nearest Neighbour (kNN), Multi-layer Perceptron (MLP), Naive Bayes (NB), Support Vector Machine (SVM), and Extreme Gradient Boosting (XGB).

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