A Validated Integration Of Tumor Deposits In N Staging For Prognostication In Colon Cancer

Richard Sassun M.D.[1], Annaclara Sileo M.D.[1], Jyi Cheng Ng M.D.[1], Sara Aboelmaaty M.D.[1], Ibrahim Gomaa M.D.[1], Jay Mandrekar Ph.D.[2], Kristen K. Rumer M.D., M.S.[1], Nicholas P. McKenna M.D., M.S.[1], David W. Larson M.D., M.B.A.[1]

[1] Division of Colon and Rectal Surgery, Mayo Clinic, Rochester, MN, USA.

[2] Department of Health Sciences Research, Mayo Clinic, Rochester, MN, USA.

ABSTRACT

Background: Tumor deposits (TD) have prognostic value in colon cancer (CC), but the current AJCC staging only consider them if there are no concurrent positive lymph nodes (LN^+). This study aimed to devise a staging system for CC, merging TD with LN^+ count while retaining the current AJCC staging framework.

Methods: A "real LN^+ (RLN^+)" count was derived using a two-criteria formula: if TD=0, the AJCC N staging applies; if TD=1 and LN^+=0, then RLN^+=4 since the N1c stage has an overall survival (OS) similar to N2a stage. RLN^+ was used to derive Sassun-Mayo N/TNM stages according to AJCC staging. ROC and Kaplan-Meier analyses were performed using the two stagings, assessing their efficiency for 3-year OS. External validation was performed using the National Cancer Database (NCDB 2010-2021).

Results: 788 institutional patients with stage III CC (2010-2022) were included. ROC curve areas were improved using the Sassun-Mayo stages (3-year death: 0.63 AJCC TNM; 0.66 Sassun-Mayo TNM). Kaplan-Meier curves revealed visible overlaps among AJCC N stages, which were absent in the Sassun-Mayo N stages. NCDB validation on 77,790 patients was successful yielding a significantly higher concordance index in the Sassun-Mayo N/TNM stages. Patients upstaged from N1 to N2 (13.2%) had a 3-year OS identical to AJCC N2a patients. Additionally, 3.9% of patients were upstaged from N2a to N2b.

Conclusions: 17.1% of stage III CC patients were understaged. The Sassun-Mayo N/TNM stages provided superior OS stratification compared to the current AJCC staging, suggesting that their implementation would improve the prognostication in CC.

Figures

Figure 1. Survival curves for different staging systems.
Red-circled indicates incorrect stratification.
(A) Kaplan-Meier survival curves for 3 years overall survival according to AJCC N stages; (B) Kaplan-Meier survival curves for 3 years overall survival according to the Sassun-Mayo N stages; (C) Inclusion of patients with TD$^+$ in AJCC N1a and N1b stages overestimates their prognosis. Conversely, the prognosis for AJCC N1a/b patients that are TD$^-$ is artificially lowered by the inclusion of patients with tumor deposits in those groups; (D) The overall survival for these two groups was nearly identical (87% at 3 years).