Does inflammatory biomarker data improve survival estimates in patients with skeletal metastases?

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Background:

Accurate and objective means of estimating survival are important in terminally ill patients because they help set expectations and guide treatment. We previously developed a tool designed to estimate postoperative survival in patients undergoing surgery for skeletal metastases. Called PATHFx (www.pathfx.org), it contains disease specific, basic laboratory data, functional status, and the surgeon's own estimate of survival. Though the tool has been externally validated in two international patient populations, it is possible that characterizing each patient's systemic inflammatory response may improve model accuracy.

Question/Purpose:

We asked if a combined model, containing biomarker data in addition to the PATHFx variables, was more accurate than a model containing the PATHFx variables alone, in estimating the likelihood of survival at one, three, six, and 12 months after surgery.

Patients and Methods:

We analyzed prospectively collected data from 95 patients undergoing surgery for skeletal metastases, and collected disease-specific, basic laboratory, and demographic data. In addition, we quantified 32 serum inflammatory cytokines and chemokines including EGF, Eotaxin, FGF, GCSF, GMCSF, HGF, IFNa, IFNy, IL10, IL12, IL13, IL15, IL17, IL1a, IL1b, IL1Ra, IL2, IL2R, IL3, IL4, IL5, IL6, IL7, IL8, IP10, MCP1, MIG, MIP1a, MIP1b, RANTES, TNFa and VEGF. We developed Bayesian Belief Network models representing (1) PATHFx variables and (2) a combined model containing PATHFx variables and inflammatory biomarker data. We performed cross validation and measured accuracy using receiver operator characteristic analysis.

Results:

The combined model was more accurate than the model containing only the PATHFx variables at the six and 12-month time-points, with areas under the receiver operator curve (AUC) of 0.84 vs. 0.73, and 0.80 vs. 0.76, respectively. At the three-month time point, both models demonstrated similar accuracy with an AUC of 0.80 vs. 0.79. At the one-month time-point, however, the combined model was less accurate with an AUC of 0.64 vs. 0.80. Specifically, RANTES, IP10, MIP1a were most closely associated with one, three and six-month survival, respectively.

Conclusions:

The combined model containing inflammatory data is at least as accurate as the model containing disease specific, basic laboratory data, functional status, and the surgeon's own estimate of survival. External validation is required to determine whether the improvement in accuracy is worth the added expense of obtaining inflammatory biomarker data.