Correlation of tumor relapse and elevated expression of survivin and vascular endothelial growth factor in superficial bladder transitional cell carcinoma

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ABSTRACT. Survivin and vascular endothelial growth factor (VEGF) are newly discovered tumor markers closely correlated with bladder cancer. We analyzed the expression of survivin and VEGF in paraffin-embedded tumor tissues from 78 patients with bladder transitional cell carcinoma (BTCC) using an immunohistochemistry method. Normal bladder mucosae from 10 non-BTCC cases were also included as a control group. All patients were closely followed up for tumor recurrence after undergoing transurethral resection of bladder tumor procedures. The positive expression rates of survivin and VEGF in superficial BTCC were 66.7\% (52/78) and 69.2\% (54/78), respectively, which were significantly higher than those in the control group, 0\% (0/10). A positive correlation was found between survivin and VEGF expression ($r = 0.283$, $P < 0.01$). Thirty-two of 78 patients (41.0\%) displayed recurrence during follow-up (median: 47; range:
7-62 months). The tumor recurrence rate in survivin(+) patients was 53.8% (28/52), which was significantly higher than that in survivin(-) patients [15.4% (4/26); P < 0.05]. The recurrence rate in VEGF(+)/VEGF(-) patients was 50.0% (27/54) and 20.8% (5/24), respectively (P < 0.05). The sensitivity for predicting the relapse of superficial BTCC was 87.5% in the survivin(+) group, 84.4% in the VEGF(+) group, and 78.1% in the survivin(+)/VEGF(+) group, and the specificity was 47.8, 41.3, and 65.2%, respectively. Survivin and VEGF interact and jointly regulate the biological behavior of bladder cancer. Our results suggest that overexpression of survivin and VEGF accompany a higher risk of BTCC recurrence, making survivin and VEGF biomarkers for predicting the relapse of bladder cancer.

**Key words:** Survivin; Vascular endothelial growth factor; Recurrence; Bladder cancer