

Correlation of BMI with tumor stage in early breast cancer patients – Pooled analysis of the German SUCCESS A, B and C trials

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Background

The BMI influences both the incidence of cancer and survival [Calle 2003]. Obesity (BMI \geq 30kg/m²) has been shown to be both a risk factor for developing new cases of breast cancer in postmenopausal women and to be a poor prognostic factor for breast cancer patients [Renehan 2008, Harvie 2003]. Despite the general acceptance on a correlation between obesity and breast cancer, there is little evidence of a possible influence of BMI on tumor characteristics. The aim of this analysis was to examine the correlation of the body mass index (BMI) with tumor characteristics in early breast cancer.

Methods

We analyzed the data of 7997 patients with early, node positive or high risk node negative primary breast cancer treated with adjuvant taxan-based chemotherapy within the German multicenter phase III SUCCESS A, B or C trials. The patients' tumor stage at primary diagnosis was classified according to the UICC tumor-node-metastasis (TNM) classification. Additionally, the tumor's hormone-receptor (HR-)status and HER2-status were determined. Before enrollment into the study each patient was grouped according to the WHO global database on BMI. Contingency table methods were used to analyze the correlation of BMI and tumor characteristics. As this was a post-hoc analysis, no formal adjustment of error probabilities for multiplicity of testing was performed, but p-values were regarded as “significant” only if they were <0.001

Study Designs

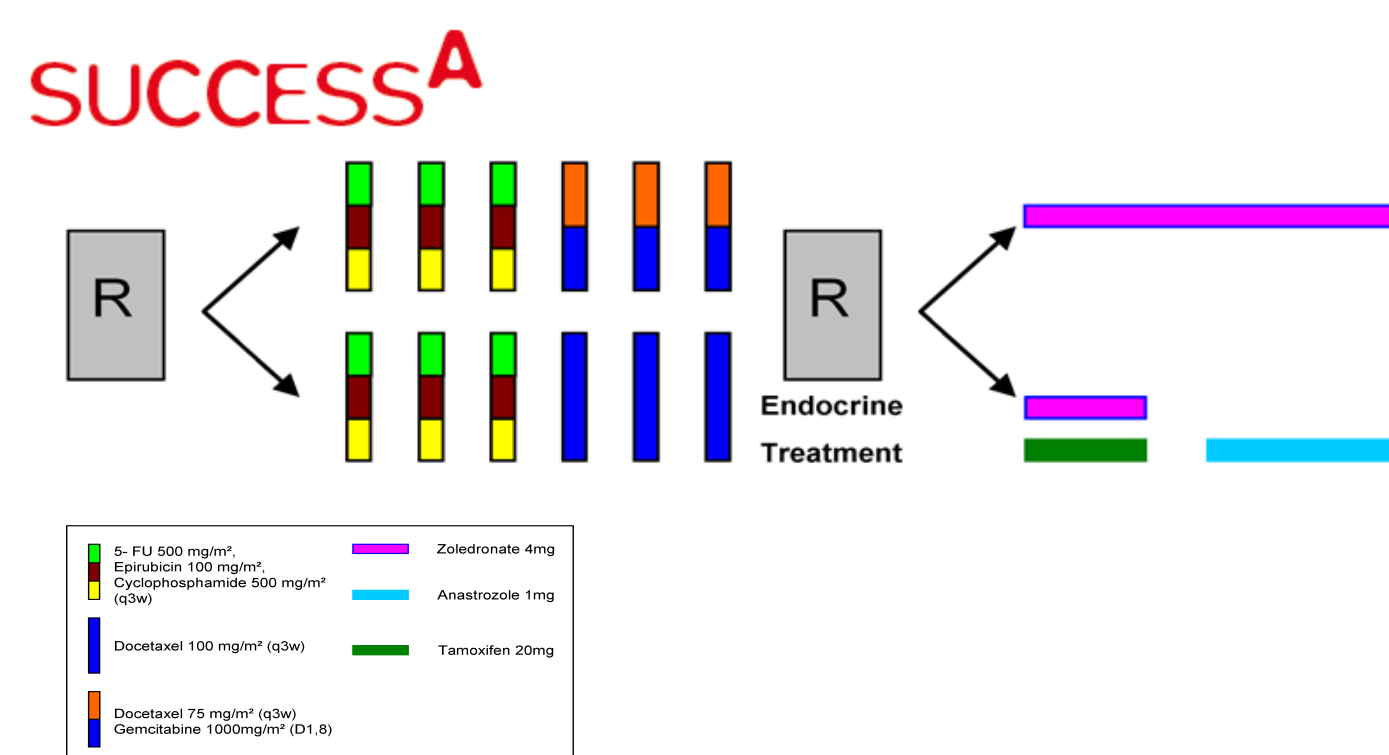


Figure 1: SUCCESS A Study Design

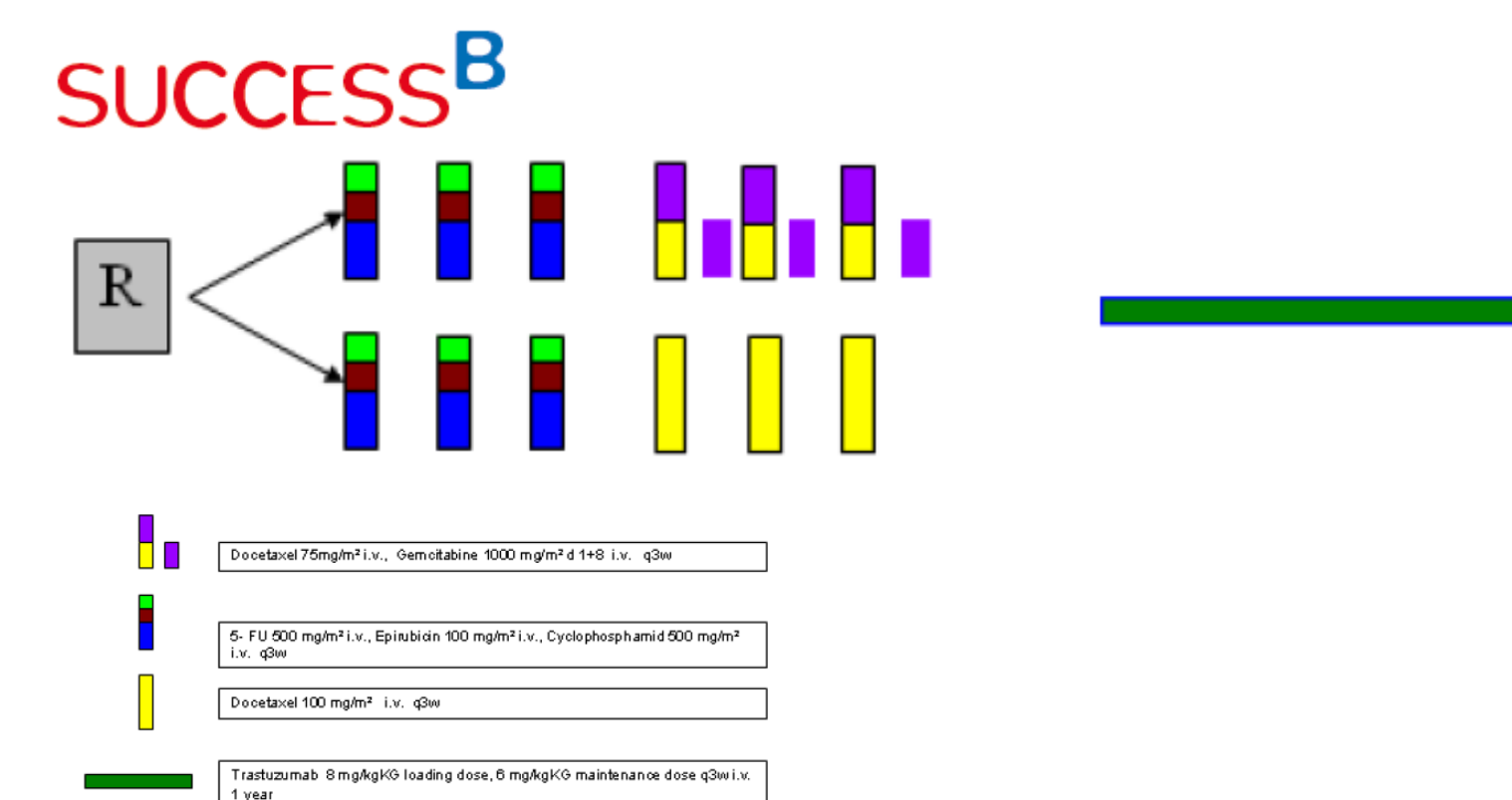


Figure 2: SUCCESS B Study Design

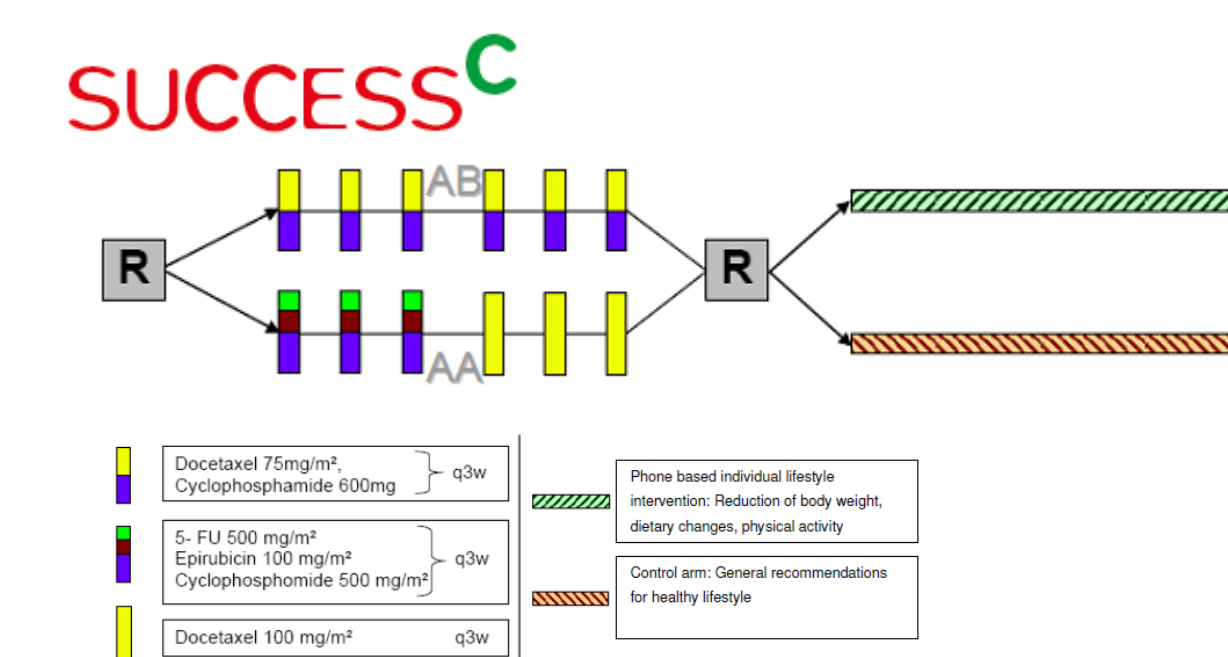


Figure 3: SUCCESS C Study Design

Results

Among the 7997 patients 100 (1.3%) patients were underweight, 3556 (44.5%) patients normal weight, 2569 (32.1%) patients overweight and 1772 (22.2%) obese. Of all patients 4508 patients (56.4%) suffered from a pT2-4 tumor, 4830 (60.4%) showed lymph node involvement (pN1-3) and 7509 (93.9%) had G2-3 tumors. 5839 patients (73.0%) were positive for ER or PR and 935 (11.7%) for HER2.

Table 1: Prevalence of tumor characteristics in different weight categories

	BMI (kg/m ²)				total
	<18,5 (n/%)	18,5-25 (n/%)	25-30 (n/%)	>30 (n/%)	
pT2-4	36 / 36,0%	1803 / 50,7%	1510 / 58,8%	1159 / 65,4%	4508
pN1-3	59 / 59,0%	2051 / 57,7%	1607 / 62,6%	1113 / 62,8%	4830
G2-3	95 / 95,0%	3338 / 93,9%	2420 / 94,2%	1656 / 93,5%	7509
HR-positive	73 / 73,0%	2563 / 72,1%	1874 / 72,9%	1329 / 75,0%	5839
HER2-positive	8 / 8,0%	434 / 12,2%	308 / 12,0%	185 / 10,4%	935
total	100	3556	2569	1772	7997

Overweight and obese patients had significantly larger tumors compared to patients with normal BMI (p<0.0001; p<0.0001). Furthermore, overweight and obesity were associated with a significantly higher rate of lymph node involvement (p=0.0001; p=0.0003) respectively. In contrast neither grading, tumor histology, ER/PR-status nor HER2-overexpression were correlated with BMI.

Table 2: Chi-squared test for tumor characteristics in different weight categories

	p-value (Chi-Square)		
	underweight vs. normal weight	overweight vs. normal weight	obesity vs. normal weight
Tumorsize (pT)	<.0001	<.0001	<.0001
Nodal involvement (pN)	0.0001	0.0001	0.0003
Grading (G)	0.5689	0.9740	0.3355
HR-Status	0.1616	0.4514	0.0234
HER2-Status	0.1929	0.8021	0.0599

Conclusion

These data show in a large number of patients that both obese and overweight women suffering from primary breast cancer have significantly larger tumors and more often positive axillary lymph nodes. As there are no differences in tumor biology, the advanced tumor stage might be due to more difficult and delayed detection of breast cancer and lymph node lesions in these women.

Acknowledgment



References

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