**Supplementary Table 1**: **Comparison of clinicopathologic characteristics between successful tests and not successful tests.**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Successful test** | **Not successful test** | **P-value** |
| **Tumor size**  (median. cm) | 2.8 | 2.5 | P = 0.181 |
| **Histological subtype**  Ductal carcinoma  Lobular carcinoma  Other | 99 (79.2%)  22 (17.6%)  4 (3.2%) | 39 (86.7%)  5 (11.1%)  1 (2.2%) | P = 0.597 |
| **Histological grade**  1  2  3 | 13 (10.4%)  49 (39.2%)  63 (50.4%) | 6 (13.3%)  25 (55.6%)  14 (31.1%) | P = 0.069 |
| **Receptor Status**  ER/PR +. HER2-  HER2+\*  TNBC | 91 (72.8%)  18 (14.4%)  16 (12.8%) | 39 (86.7%)  4 (8.9%)  2 (4.4%) | P = 0.160 |
| **Total** | 125 | 45 |  |

**\*independent of ER/PR status.** Significance was calculated by Fisher’s exact test for categorical data and by Mann-Whitney test for continuous data (tumor size).

**Supplementary Table 2**: **Comparison of clinicopathologic characteristics RECAP positive/negative/intermediate tumors.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **HRP** | **HRi** | **HRD** | **P-value**  **HRP vs HRi** | **P-value HRP vs HRD** |
| **Tumor size**  (median. cm) | 2.7 | 3.2 | 3.1 | P = 0.459 | P = 0.118 |
| **Histological subtype**  Ductal carcinoma  Lobular carcinoma  Other | 75 (78.9%)  19 (20%)  1 (1.1%) | 6 (100%)  0  0 | 18 (75%)  3 (12.5%)  3 (12.5%) | P = 0.616 | P = 0.038 |
| **Histological grade**  1  2  3 | 13 (13.7%)  44 (46.3%)  38 (40%) | 0  0  6 (100%) | 0  5 (21%)  19 (79%) | P = 0.010 | P < 0.001 |
| **Receptor Status**  ER/PR +. HER2-  HER2+\*  TNBC | 79 (83.2%)  12 (12.6%)  4 (4.2%) | 2 (33%)  3 (50%)  1 (17%) | 10 (41.7%)  3 (12.5%)  11 (45.8%) | P = 0.014 | P < 0.001 |
| **Total** | 95 | 6 | 24 |  |  |

**\*independent of ER/PR status.** Significance was calculated by Fisher’s exact test for categorical data and by Mann-Whitney test for continuous data (tumor size).

**Supplementary table 3:** **All characteristics and RECAP test outcomes per tumor**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sample ID | Histological subtype | ER | PR | HER2 | B&R grade | Tumor size (cm) | RECAP outcome | RAD51 FOCI % |
| P001\* | metaplastic | neg | neg | neg | 3 | 5.5 | negative | 1 |
| P002\* | ductal/lobular | pos | pos | neg | 3 | 4.8 | negative | 1 |
| P003\* | ductal | pos | pos | neg | 3 | 3 | positive | 88 |
| P005\* | ductal | pos | neg | neg | 2 | 2.5 | NA |  |
| P008\* | ductal | pos | neg | neg | 3 | 2.2 | NA |  |
| P009\* | ductal | pos | pos | neg | 1 | 1.5 | positive | 75 |
| P012\* | ductal | neg | neg | pos | 3 | 5.1 | NA |  |
| M002\* | ductal | pos | neg | pos | 2 | 3.2 | NA |  |
| M003\* | lobular | pos | neg | neg | 2 | 2.8 | NA |  |
| M005\* | ductal | pos | neg | neg | 1 | 5.5 | NA |  |
| M007\* | ductal | pos | pos | neg | 3 | 2.6 | NA |  |
| M009\* | lobular | pos | pos | neg | 2 | 2.8 | positive | 71 |
| M018\* | ductal | pos | pos | neg | 3 | 12.5 | positive | 71 |
| M019\* | lobular | pos | pos | neg | 3 | 8.2 | positive | 77 |
| M021\* | ductal | neg | neg | pos | 3 | 2.4 | positive | 67 |
| M022\* | ductal | pos | pos | neg | 1 | 1.6 | positive | 81 |
| M023\* | ductal | pos | pos | neg | 3 | 3.4 | positive | 89 |
| M025\* | ductal | pos | pos | neg | 2 | 1.7 | positive | 67 |
| M026\* | ductal | pos | pos | neg | 2 | 4.5 | NA |  |
| M028\* | ductal | neg | neg | neg | 3 | 4.8 | negative | 3 |
| M029\* | ductal | pos | pos | pos | 3 | 3.5 | positive | 62 |
| M030\* | ductal | pos | pos | neg | 2 | 10 | positive | 67 |
| M031\* | ductal | pos | pos | neg | 2 | 2.1 | NA |  |
| M043\* | ductal | pos | neg | neg | 3 | 4.3 | positive | 75 |
| M046\* | ductal | neg | neg | pos | 3 | 2.3 | positive | 70 |
| M047\* | ductal | pos | pos | neg | 3 | 2.5 | NA |  |
| M048\* | lobular | pos | neg | neg | 3 | 5.8 | positive | 86 |
| M051\* | ductal | pos | pos | neg | 3 | 2.7 | positive | 75 |
| M052\* | ductal | pos | pos | neg | 3 | 7.5 | positive | 71 |
| M055\* | ductal | pos | pos | neg | 3 | 5.4 | intermediate | 38 |
| M056\* | ductal | pos | neg | neg | 3 | 2.9 | positive | 74 |
| M057\* | ductal | neg | neg | neg | 3 | 2.2 | negative | 13 |
| M058\* | ductal | pos | pos | neg | 3 | 2.6 | positive | 79 |
| M059\* | ductal | pos | neg | neg | 2 | 3.4 | positive | 84 |
| M060\* | ductal | pos | pos | neg | 2 | 2.2 | positive | 84 |
| M061\* | ductal | pos | pos | neg | 2 | 1.4 | NA |  |
| M062\* | ductal | neg | neg | neg | 3 | 3.4 | positive | 83 |
| M063\* | ductal | pos | pos | neg | 2 | 1.4 | positive | 71 |
| M064\* | ductal | pos | pos | neg | 2 | 3.4 | NA |  |
| M065\* | ductal | pos | pos | pos | 3 | 2.1 | positive | 57 |
| M066\* | ductal | pos | neg | neg | 1 | 1.8 | NA |  |
| M067\* | lobular | pos | pos | neg | 2 | 1.3 | positive | 74 |
| M068\* | ductal | pos | pos | neg | 1 | 1.5 | NA |  |
| M069\* | ductal | pos | pos | neg | 3 | 1.9 | NA |  |
| M070\* | lobular | pos | pos | neg | 2 | 4 | NA |  |
| M071\* | lobular | pos | pos | neg | 2 | 5.5 | positive | 75 |
| M072\* | ductal | pos | pos | neg | 2.00 | 11.00 | positive | 74 |
| M073\* | lobular | pos | pos | neg | 2.00 | 1.80 | NA |  |
| M074\* | ductal | pos | pos | neg | 2.00 | 10.50 | positive | 77 |
| M075\* | ductal | pos | pos | neg | 3 | 10.00 | NA |  |
| M077 | ductal | neg | neg | neg | 3 | 2.30 | low/negative | 0.5 |
| M078 | ductal | pos | pos | neg | 3 | 2.50 | positive | 53 |
| M079 | ductal | pos | pos | neg | 2 | 1.50 | NA |  |
| M080 | ductal | pos | pos | neg | 3 | 2.10 | positive | 85 |
| M082 | micro papillary | pos | pos | neg | 2 | 6.50 | NA |  |
| M083 | ductal | pos | pos | neg | 2 | 6.50 | positive | 62 |
| M084 | lobular | pos | pos | neg | 2 | 2.50 | positive | 65 |
| M086 | ductal | pos | pos | neg | 1 | 1.40 | NA |  |
| M088 | ductal | pos | neg | neg | 2 | 3.8 | NA |  |
| M089 | ductal | pos | pos | neg | 3 | 3.8 | positive | 82 |
| M090 | ductal | pos | neg | neg | 3 | 3.4 | positive | 85 |
| M092 | ductal | pos | neg | neg | 2 | 9 | NA |  |
| M093 | lobular | pos | pos | neg | 2 | 2.5 | low/negative | 8 |
| M094 | ductal | pos | neg | pos | 2 | 1.7 | low/negative | 8 |
| M096 | ductal | pos | pos | neg | 3 | 2.8 | low/negative | 4 |
| M097 | ductal | pos | pos | neg | 3 | 2.6 | NA |  |
| M098 | ductal | pos | pos | neg | 1 | 1.9 | NA |  |
| M099 | ductal | pos | pos | neg | 1 | 1 | NA |  |
| M100 | ductal | neg | neg | neg | 3 | 2.5 | positive | 97 |
| M101 | ductal | neg | neg | neg | 3 | 1.6 | NA |  |
| M102 | lobular | pos | pos | neg | 3 | 7 | NA |  |
| M104 | ductal | pos | pos | neg | 3 | 1.3 | positive | 90 |
| M106 | ductal | neg | neg | pos | 3 | 2.6 | low/negative | 6 |
| M107 | ductal | pos | pos | neg | 2 | 1.4 | NA |  |
| M108 | ductal | pos | pos | neg | 2 | 2.6 | positive | 80 |
| M109 | ductal | pos | pos | neg | 1 | 2.5 | positive | 94 |
| M110 | lobular | pos | pos | neg | 1 | 2.9 | positive | 94 |
| M111 | ductal | pos | pos | pos | 1 | 3.5 | positive | 90 |
| M112 | ductal | pos | pos | pos | 3 | 3.5 | different | 30 |
| M113 | ductal | pos | neg | neg | 2 | 1.2 | positive | 55 |
| M114 | lobular | pos | neg | neg | 2 | 3 | positive | 78 |
| M115 | ductal | pos | pos | neg | 2 | 1.8 | positive | 51 |
| M116 | ductal | pos | pos | neg | 2 | 3.8 | NA |  |
| M117 | ductal | pos | pos | neg | 3 | 1.8 | positive | 67 |
| M118 | ductal | pos | pos | neg | 3 | 1.7 | NA |  |
| M119 | ductal | neg | neg | neg | 3 | 7 | low/negative | 0.5 |
| M120 | ductal | pos | pos | neg | 2 | 3 | positive | 59 |
| M121 | lobular | pos | neg | neg | 2 | 9.7 | positive | 86 |
| M125 | ductal | pos | pos | neg | 3 | 2.6 | positive | 66 |
| M128 | ductal | pos | neg | pos | 3 | 1.4 | positive | 67 |
| M129 | ductal | pos | pos | neg | 1 | 1.6 | positive | 91 |
| M130 | ductal | pos | pos | neg | 3 | 2.5 | NA |  |
| M131 | ductal | neg | neg | neg | 3 | 5.5 | low/negative | 1 |
| M133 | ductal | pos | pos | neg | 2 | 5.5 | positive | 84 |
| M135 | ductal | pos | pos | neg | 3 | 5.5 | positive | 95 |
| M136 | ductal | neg | neg | neg | 3 | 2.3 | low/negative | 5 |
| M141 | ductal | pos | neg | neg | 3 | 2.5 | intermediate | 28 |
| M142 | ductal | pos | neg | pos | 2 | 3.2 | positive | 80 |
| M143 | ductal | pos | pos | neg | 3 | 2.7 | positive | 96 |
| M144 | ductal | neg | neg | neg | 3 | 2.2 | NA |  |
| M146 | ductal | pos | pos | neg | 2 | 1.9 | positive | 58 |
| M147 | ductal | pos | pos | neg | 2 | 2.2 | NA |  |
| M148 | ductal | pos | pos | neg | 3 | 2.5 | NA |  |
| M149 | ductal | pos | pos | pos | 3 | 2.6 | positive | 53 |
| M150 | ductal | pos | pos | neg | 2 | 1.3 | positive | 92 |
| M152 | ductal | pos | pos | neg | 2 | 5.5 | NA |  |
| M153 | ductal | pos | pos | neg | 3 | 4 | positive | 95 |
| M155 | lobular | pos | neg | neg | 2 | 1.8 | positive | 65 |
| M156 | ductal | pos | pos | neg | 2 | 2.5 | negative | 5 |
| M157 | ductal | pos | pos | neg | 1 | 1.4 | positive | 88 |
| M159 | ductal | pos | pos | neg | 2 | 3 | positive | 95 |
| M162 | ductal | pos | pos | neg | 1 | 1.5 | positive | 93 |
| M163 | ductal | pos | pos | neg | 2 | 2.2 | NA |  |
| M164 | ductal | pos | pos | neg | 2 | 2.5 | positive | 88 |
| M166 | ductal | pos | pos | neg | 3 | 3 | positive | 92 |
| M169 | ductal | pos | pos | neg | 3 | 4 | positive | 66 |
| M170 | ductal | pos | pos | neg | 3 | 4.5 | positive | 51 |
| M171 | ductal | pos | pos | pos | 3 | 7.5 | positive | 63 |
| M175 | ductal | pos | pos | neg | 2 | 1.1 | NA |  |
| M176 | ductal | pos | pos | neg | 2 | 4.4 | NA |  |
| M178 | ductal | pos | pos | pos | 2 | 1.7 | NA |  |
| M179 | ductal | pos | pos | neg | 1 | 2.2 | positive | 75 |
| M180 | ductal | pos | neg | neg | 2 | 2.2 | positive | 71 |
| M181 | ductal | neg | neg | neg | 3 | 5.5 | positive | 78 |
| M182 | ductal | neg | neg | neg | 3 | 1.9 | negative | 2 |
| M183 | ductal | pos | pos | neg | 2 | 1.3 | positive | 66 |
| M187 | ductal | pos | pos | neg | 2 | 3.2 | positive | 96 |
| M188 | ductal | pos | pos | neg | 3 | 12.1 | negative | 1 |
| M191 | lobular | pos | pos | neg | 2 | 3 | NA |  |
| M193 | ductal | pos | pos | neg | 3 | 1.2 | positive | 82 |
| M195 | lobular | pos | neg | neg | 2 | 2.4 | positive | 82 |
| M197 | mucineus | pos | pos | neg | 2 | 2 | positive | 91 |
| M198 | ductal | pos | neg | neg | 2 | 2.8 | NA |  |
| M199 | ductal | pos | neg | pos | 1 | 7 | positive | 72 |
| M200 | ductal | pos | pos | neg | 3 | 3.5 | positive | 89 |
| M201 | lobular | pos | pos | neg | 2 | 4.5 | positive | 94 |
| M204 | ductal | pos | pos | neg | 2 | 2.6 | NA |  |
| M205 | lobular | pos | pos | neg | 2 | 5.1 | positive | 88 |
| M208 | ductal | pos | neg | pos | 2 | 2.2 | positive | 79 |
| M209 | ductal | neg | neg | pos | 3 | 2.8 | intermediate | 25 |
| M210 | lobular | pos | neg | neg | 3 | 1.2 | positive | 86 |
| M211 | ductal | neg | neg | pos | 3 | 4 | negative | 0 |
| M213 | ductal | neg | neg | neg | 2 | 2.9 | positive | 86 |
| M217 | ductal | pos | neg | neg | 3 | 7 | positive | 91 |
| M218 | ductal | pos | pos | neg | 2 | 1.2 | positive | 95 |
| M225 | ductal | pos | pos | neg | 2 | 2.8 | positive | 95 |
| M229 | ductal | pos | pos | neg | 1 | 4.5 | positive | 100 |
| M231 | ductal | pos | neg | neg | 3 | 2.2 | negative | 2 |
| M232 | ductal | pos | neg | neg | 3 | 3.2 | negative | 0 |
| M233 | lobular | pos | pos | neg | 2 | 1.1 | positive | 94 |
| M237 | lobular | pos | pos | pos | 3 | 3.5 | positive | 95 |
| M239 | ductal | pos | pos | neg | 1 | 1 | positive | 85 |
| M244 | lobular | pos | pos | neg | 2 | 2.5 | positive | 82 |
| M247 | ductal | pos | pos | neg | 2 | 4.5 | positive | 90 |
| M248 | ductal | neg | neg | neg | 3 | 3.5 | negative | 0 |
| M253 | ductal | neg | neg | neg | 3 | 4 | intermediate | 26 |
| m255 | ductal | neg | neg | pos | 3 | 6.5 | NA |  |
| M258 | ductal | pos | pos | neg | 2 | 4.1 | positive | 100 |
| M259 | ductal | pos | pos | neg | 2 | 2.6 | positive | 92 |
| M260 | ductal | pos | pos | neg | 3 | 8.5 | negative | 10 |
| M262 | lobular | pos | pos | neg | 2 | 1.4 | positive | 99 |
| M263 | ductal | neg | pos | neg | 2 | 1.4 | NA |  |
| M264 | ductal | pos | neg | neg | 1 | 1.2 | positive | 92 |
| M266 | ductal | pos | pos | neg | 2 | 2.4 | positive | 98 |
| M269 | lobular | pos | pos | neg | 2 | 3.8 | positive | 92 |
| M270 | ductal | neg | neg | neg | 3 | 3 | negative | 0 |
| M271 | lobular | pos | neg | neg | 2 | 7.5 | negative | 17 |
| M275 | lobular | pos | neg | neg | 2 | 2.7 | negative | 3 |
| M277 | pappilair | neg | neg | neg | 3 | 3.8 | negative | 2 |
| M278 | ductal | pos | pos | pos | 3 | 2.4 | intermediate | 37 |