Supplementary Table 1. Details of primary antibodies and immunohistochemistry dilutions.

| Antigen | Clone | Catalogue | Dilution | Vendor                                         |
|---------|-------|-----------|----------|------------------------------------------------|
| VISTA   | D1L2G | 64953     | 1:200    | Cell Signalling Technology, United States of America |
| CD3     | LN10  | PA0553    | Prediluted | Leica Microsystems, Shanghai of China          |
| CD4     | 4B12  | PA0427    | Prediluted | Leica Microsystems, Shanghai of China          |
| CD8     | 4B11  | PA0183    | Prediluted | Leica Microsystems, Shanghai of China          |
| CD19    | EP169 | ZA-0569   | Prediluted | Zhongshan Golden Bridge Biotechnology CO.LTD, Beijing of China |
Supplementary Table 2. The 139 TNBC patients ID from The Cancer Genome Atlas Provisional dataset.

| PATIENT_ID | PATIENT_ID | PATIENT_ID | PATIENT_ID | PATIENT_ID |
|------------|------------|------------|------------|------------|
| TCGA-AC-A7 | TCGA-E9-A5 | TCGA-C8-A2 | TCGA-HN-A2 | TCGA-A2-A0 |
| TCGA-E2-A57| TCGA-OL-A9 | TCGA-AN-A | TCGA-D8-A1 | TCGA-GM-A  |
| TCGA-A7-A4 | TCGA-E2-A1 | TCGA-E2-A1 | TCGA-A7-A2 | TCGA-AN-A  |
| TCGA-GI-A2C| TCGA-BH-A0 | TCGA-A7-A6 | TCGA-OL-A6 | TCGA-AO-A  |
| TCGA-E2-A1L| TCGA-D8-A2 | TCGA-EW-A | TCGA-E2-A1 | TCGA-GM-A  |
| TCGA-BH-A1 | TCGA-BH-A0 | TCGA-OL-A6 | TCGA-BH-A0 | TCGA-E2-A1 |
| TCGA-AQ-A5 | TCGA-B6-A4 | TCGA-C8-A3 | TCGA-GM-A | TCGA-E2-A1 |
| TCGA-A7-A5 | TCGA-AN-A0 | TCGA-AO-A | TCGA-A7-A4 | TCGA-C8-A1 |
| TCGA-AO-A0 | TCGA-D8-A2 | TCGA-A2-A0 | TCGA-A8-A0 | TCGA-BH-A  |
| TCGA-A8-A07| TCGA-E2-A1 | TCGA-AR-A1 | TCGA-D8-A1 | TCGA-AR-A  |
| TCGA-AC-A2 | TCGA-C8-A1 | TCGA-A1-A0 | TCGA-AR-A1 | TCGA-S3-AA |
| TCGA-A7-A0 | TCGA-A2-A3 | TCGA-EW-A | TCGA-BH-A0 | TCGA-AR-A  |
| TCGA-AO-A1 | TCGA-AR-A0 | TCGA-E2-A1 | TCGA-BH-A0 | TCGA-OL-A  |
| TCGA-BH-A0 | TCGA-A2-A0 | TCGA-D8-A1 | TCGA-BH-A0 | TCGA-D8-A2 |
| TCGA-E2-A15| TCGA-A2-A0 | TCGA-A2-A0 | TCGA-A7-A6 | TCGA-EW-A  |
| TCGA-AR-A1 | TCGA-A2-A1 | TCGA-A7-A6 | TCGA-LL-A7 | TCGA-AQ-A  |
| TCGA-B6-A40| TCGA-OL-A5 | TCGA-GM-A | TCGA-A2-A3 | TCGA-OL-A  |
| TCGA-E2-A1L| TCGA-EW-A | TCGA-A8-A0 | TCGA-AO-A1 | TCGA-A2-A0 |
| TCGA-AR-A2 | TCGA-AO-A0 | TCGA-BH-A0 | TCGA-A2-A3 | TCGA-EW-A  |
| TCGA-A2-A3 | TCGA-E2-A1 | TCGA-E2-A1 | TCGA-GM-A | TCGA-AR-A  |
| TCGA-LL-A74| TCGA-AR-A0 | TCGA-AN-A | TCGA-E2-A5 | TCGA-EW-A  |
| TCGA-A2-A0 | TCGA-D8-A1 | TCGA-EW-A | TCGA-AR-A2 | TCGA-A2-A0 |
| TCGA-EW-A1 | TCGA-B6-A4 | TCGA-C8-A2 | TCGA-BH-A0 | TCGA-E2-A1 |
| TCGA-EO-A1 | TCGA-C8-A1 | TCGA-A2-A0 | TCGA-GM-A | TCGA-LL-A5 |
| TCGA-AN-A0 | TCGA-A1-A0 | TCGA-E2-A1 | TCGA-AO-A1 | TCGA-S3-AA |
| TCGA-A2-A0 | TCGA-D8-A1 | TCGA-D8-A1 | TCGA-A2-A0 | TCGA-EW-A  |
| TCGA-AN-A0 | TCGA-AC-A2 | TCGA-AC-A6 | TCGA-BH-A0 | TCGA-LL-A4 |

TNBC, triple-negative breast cancer.
Supplementary Table 3. Details of statistical methods used in tables and figures.

| Statistical methods                      | Corresponding tables or figures                                      |
|------------------------------------------|---------------------------------------------------------------------|
| Chi-square test                          | Table 1. Table 2. Supplementary Table 4. Supplementary Table 5.      |
| Spearman’s correlation test              | Supplementary Table 6.                                              |
| Person’s correlation test                 | Figure 2. Supplementary Table 7.                                    |
| Kaplan-Meier method with log-rank tests  | Figure 3. Figure 5. Supplementary Table 8.                          |
| Cox regression models analysis           | Table 3. Table 4.                                                   |
**Supplementary Table 4. VISTA on tumor cells and clinicopathological characteristics in TNBC.**

| Parameters                     | VISTA on tumor cells | p value |
|-------------------------------|----------------------|---------|
|                               | Negative    | Positive |         |
|                               | N   | %       | N   | %       |         |
| **Age**                       |       |         |       |         |         |
| <50 years                     | 145  | 57.1    | 119  | 57.5    | 26      | 55.3    | 0.786   |
| ≥50 years                     | 109  | 42.9    | 88   | 42.5    | 21      | 44.7    |         |
| **Tumor stage**               |       |         |       |         |         |         | 0.272   |
| pT1                           | 120  | 47.2    | 103  | 49.8    | 17      | 36.2    |         |
| pT2                           | 120  | 47.2    | 94   | 45.4    | 26      | 55.2    |         |
| pT3                           | 9    | 3.5     | 7    | 3.4     | 2       | 4.3     |         |
| pT4                           | 5    | 2.1     | 3    | 1.4     | 2       | 4.3     |         |
| **Lymph node**                |       |         |       |         |         |         | 0.792   |
| pN0                           | 146  | 57.5    | 117  | 56.5    | 29      | 61.7    |         |
| pN1                           | 55   | 21.7    | 46   | 22.2    | 9       | 19.1    |         |
| pN2                           | 23   | 9.1     | 18   | 8.7     | 5       | 10.6    |         |
| pN3                           | 30   | 11.7    | 26   | 12.6    | 4       | 8.6     |         |
| **AJCC stage**                |       |         |       |         |         |         | 0.326   |
| I                             | 83   | 32.7    | 71   | 34.3    | 12      | 25.5    |         |
| II                            | 116  | 45.7    | 90   | 43.5    | 26      | 55.3    |         |
| III                           | 55   | 21.6    | 46   | 22.2    | 9       | 19.2    |         |
| **Ki 67**                     |       |         |       |         |         |         | 0.090   |
| <14%                          | 39   | 15.4    | 28   | 13.5    | 11      | 23.4    |         |
| ≥14%                          | 215  | 84.6    | 179  | 86.5    | 36      | 76.6    |         |
| **Differentiation**           |       |         |       |         |         |         | 0.307   |
| Well                          | 2    | 0.8     | 1    | 0.5     | 1       | 2.1     |         |
| Moderate                      | 67   | 26.4    | 52   | 25.1    | 15      | 31.9    |         |
| Poor                          | 185  | 72.8    | 154  | 74.4    | 31      | 66.0    |         |
| **Basal like**                |       |         |       |         |         |         | 0.533   |
| Yes                           | 223  | 87.8    | 183  | 88.4    | 40      | 85.1    |         |
| No                            | 31   | 12.2    | 24   | 11.6    | 7       | 14.9    |         |
| **VISTA on IC**               |       |         |       |         |         |         | 0.423   |
| Positive                      | 143  | 56.3    | 119  | 57.5    | 24      | 51.1    |         |
| Negative                      | 111  | 43.7    | 88   | 42.5    | 23      | 48.9    |         |

VISTA, V-domain Ig suppressor of T-cell activation; TNBC, triple-negative breast cancer; AJCC, American Joint Committee on Cancer; IC, immune cell
Supplementary Table 5. Correlation of VISTA on tumor cells and other immune markers in TNBC.

| Markers | VISTA on tumor cells |   |   |   |
|---------|----------------------|---|---|---|
|         | N                   | % | N | % |
| TILs    |                      |   |   |   |
| <5%     | 143                  | 56.3 | 116 | 56.0 | 27 | 57.4 |
| ≥5%     | 111                  | 43.7 | 91 | 44.0 | 20 | 42.6 |
| CD3     |                      |   |   |   |
| <20%    | 125                  | 49.2 | 104 | 50.2 | 21 | 44.7 |
| ≥20%    | 129                  | 50.8 | 103 | 49.8 | 26 | 55.3 |
| CD8     |                      |   |   |   |
| <10%    | 121                  | 47.6 | 100 | 48.3 | 21 | 44.7 |
| ≥10%    | 133                  | 52.4 | 107 | 51.7 | 26 | 55.3 |
| CD4     |                      |   |   |   |
| <10%    | 104                  | 40.9 | 86 | 41.5 | 18 | 38.3 |
| ≥10%    | 150                  | 59.1 | 121 | 58.5 | 29 | 61.7 |
| CD19    |                      |   |   |   |
| <1%     | 115                  | 45.3 | 98 | 47.3 | 17 | 36.2 |
| ≥1%     | 139                  | 54.7 | 109 | 52.7 | 30 | 63.8 |

VISTA, V-domain Ig suppressor of T-cell activation; TNBC, triple-negative breast cancer; TIL, tumor-infiltrating lymphocyte.
Supplementary Table 6. Correlation between percentage of VISTA-positive ICs and TILs by Spearman’s correlation analyses in TNBC.

| Variables (%) | VISTA on ICs | VISTA on TCs | CD3+TILs | CD4+TILs | CD8+TILs | CD19+TILs | TILs |
|---------------|--------------|--------------|----------|----------|----------|-----------|------|
| VISTA on ICs  | 1            |              |          |          |          |           |      |
| VISTA on TCs  | 0.013        | 1            |          |          |          |           |      |
| CD3+TILs      | 0.222*       | 0.101        | 1        |          |          |           |      |
| CD4+TILs      | 0.423*       | 0.067        | 0.670*   | 1        |          |           |      |
| CD8+TILs      | 0.214*       | 0.075        | 0.918*   | 0.632*   | 1        |           |      |
| CD19+TILs     | 0.465*       | 0.049        | 0.474*   | 0.549*   | 0.487*   | 1         |      |
| TILs          | 0.266*       | 0.014        | 0.667*   | 0.531*   | 0.649*   | 0.601*    | 1    |

*P<0.001

VISTA, V-domain Ig suppressor of T-cell activation; IC, immune cell; TC, tumor cell; TIL, tumor-infiltrating lymphocyte; TNBC, triple-negative breast cancer.
Supplementary Table 7. Correlation between VISTA mRNA and CD3, CD4, CD8 and CD19 mRNA by Person’s correlation analyses in 139 TNBC from the The Cancer Genome Atlas Provisional dataset.

*P < 0.001

VISTA, V-domain Ig suppressor of T-cell activation; TNBC, triple-negative breast cancer.

| Variables | VISTA | CD3     | CD4     | CD8     | CD19    |
|-----------|-------|---------|---------|---------|---------|
| VISTA     | 1     |         |         |         |         |
| CD3       | 0.497*| 1       |         |         |         |
| CD4       | 0.764*| 0.709*  | 1       |         |         |
| CD8       | 0.579*| 0.839*  | 0.689*  | 1       |         |
| CD19      | 0.573*| 0.732*  | 0.621*  | 0.711*  | 1       |
Supplementary Table 8. Relationships between VISTA expression on ICs and 5-year RFS/OS in TNBC.

| Characteristics | 5-year Relapse-free survival (%) | 5-year Overall survival (%) |
|-----------------|----------------------------------|----------------------------|
|                 | VISTA on ICs                     | VISTA on ICs               | p  | VISTA on ICs | VISTA on ICs | p  |
| Whole group     | VISTA Negative: 64.6, Positive: 79.0 | p = 0.011                  | 72.0, Positive: 90.0 | p < 0.001 |
| Basal like      | VISTA Negative: 63.6, Positive: 78.8 | p = 0.020                  | 70.9, Positive: 90.5 | p < 0.001 |
| T1-2N0          | VISTA Negative: 73.1, Positive: 86.8 | p = 0.038                  | 82.7, Positive: 95.6 | p = 0.022 |
| Tumor stage     | T1: Negative: 75.0, Positive: 83.8 | p = 0.189                  | 78.6, Positive: 94.1 | p = 0.032 |
|                 | T2: Negative: 57.1, Positive: 77.9 | p = 0.017                  | 69.2, Positive: 89.7 | p = 0.005 |
| Lymph node      | N0: Negative: 71.7, Positive: 86 | p = 0.030                  | 81.1, Positive: 94.6 | p = 0.020 |
| AJCC stage      | I: Negative: 68.2, Positive: 78.8 | p = 0.381                  | 72.4, Positive: 93.9 | p = 0.103 |
|                 | II: Negative: 61.5                | p = -                      | 73.7, Positive: -     | p = -      |
|                 | N4: Negative: 41.2, Positive: 38.5 | p = 0.901                  | 41.2, Positive: 69.2  | p = 0.120 |
| AJCC stage      | I: Negative: 79.4, Positive: 88.6 | p = 0.295                  | 86.7, Positive: 98.1  | p = 0.107 |
|                 | II: Negative: 62.2, Positive: 81.7 | p = 0.031                  | 73.3, Positive: 91.5  | p = 0.020 |
|                 | III: Negative: 51.7, Positive: 42.1 | p = 0.473                  | 58.3, Positive: 68.4  | p = 0.443 |

VISTA, V-domain Ig suppressor of T-cell activation; AJCC, American Joint Committee on Cancer; IC, immune cell; RFS, relapse-free survival; DSS, disease-specific survival; TNBC, triple-negative breast cancer.
Supplementary Figure 1. Representative immunohistochemical staining of (a) CD3, (b)CD4, (c)CD8 and (d) CD19 in tumor-infiltrating lymphocytes (TILs) in triple-negative breast cancer.

Supplementary Figure 2. High expression of VISTA mRNA (C10orf54) correlated with favorable (a) relapse-free survival (RFS) and (b) overall survival (OS) in basal-like breast cancer. High expression of VISTA mRNA (C10orf54) and CD4(CD4) using multigene classifier showed prolonged (c) RFS and (d) OS.