**Supplementary Legends:**

**Figure S1:**

Equivalent amplification of human IFN- gene and the retrovirus transgene by the quantitative PCR. A standard curve was generated by the use of a plasmid encoding one copy of IFN- gene and one copy of the target pro-virus sequence.

**Figure S2:**

ELISPOT assay to test whether MAGE-A4–targeting TCR cross-reacts with other peptides with sequences similar to that of the MAGE-A4 peptide. Cells of MAGE-A4 CTL clone #2-28 were used as effector cells, targeting T2A24 cells pulsed with 9 peptides (including MAGE-A4 peptide as a positive control, and EBNA3A peptide as a negative control, respectively). No reactivity of the MAGE-A4 CTL clone was observed toward 7 similar peptides.

**Figure S3:**

Tetramer analysis of the TCR-gene−transduced T cells at pre-infusion. After TCR gene transduction, the cells were assayed for tetramers of MAGE-A4 peptide/HLA-A\*24:02 in all 10 patients. The percentages ranged from 1.8% to 12.6% in CD8+ T cells. In CD8- T cells, 0.3% to 8.5% cells were stained.

**Figure S4:**

Phenotypes of MAGE-A4-tetramer+/CD8+ T cells after TCR gene-transduced T-cell transfer. PBMCs were collected from TCR-MA-314 and -315 at 12 hours and 14 days after cell transfer. MAGE-A4-tetramer+/CD8+ T cells were selected; CD45RO+/CD45RA- cells were dominant 12 hours after the transfer, and at 14 days the proportion of CD45RO-/CD45RA+ cells had increased. The CCR7+/CD45RA+ fraction was elevated, and the CCR7-/CD62L+ fraction was diminished.

**Figure S5:**

Infiltration of TCR gene-transferred T cells in esophageal tumor sites. Tumor samples were biopsied on day 35 (TCR-MA-104, -106, and -210). In TCR-MA-104, TCR-transduced T cells were detected in the tumor tissues. The detection limit of the transduced cells is 100 copies/105 cells. At the same time, we re-assessed MAGE-A4 expression levels by quantitative PCR, revealing that antigen expression was still high in the case in which TCR gene-transduced T cells could be detected.

**Figure S6:**

Disease progression and overall survival of 10 patients who received transfer of TCR-transduced lymphocytes. After the transfer, 9 patients received peptide vaccinations until the time-points indicated. Seven patients developed progressive disease (PD) within 2 months. These patients survived for a median of 9 months (range, 3–15 months). After tumor progression, 6 patients received subsequent chemotherapies. One patient, TCR-MA-208, was free from disease for 21 months. In 2 patients, TCR-MA-212 and -213, who had minimal lesions at baseline, no disease progression was observed at 26 or 24 months (still ongoing).

**Figure S7:**

CT and PET scan images from TCR-MA-213. TCR-MA-213 had metastatic tumors in the cervical lymph nodes and was treated with radiotherapy and chemotherapy. Evaluation of tumor responses revealed residual tumors, which were confirmed by CT and FDG-PET scans. The tumor has not enlarged for 24 months after transfer of TCR-transduced lymphocytes. The uptake of FDG was still active 3 months after the transfer.

**Table S1:**

Peptides which have homologue sequences with MAGE-A4143-151 peptide