**Legend of Supplemental Figures:**

**Supplemental Figure 1.** A movie demonstrating user manipulation of registered power Doppler and micro-CT images of the 370-mm³ tumor shown in Fig. 1C using the image visualization software developed in our laboratory.

**Supplemental Figure 2.** Comparison of 3-D power Doppler images of wildtype and CaP prostate and surrounding tissues. Scale bars denote 1 mm.

**Supplemental Figure 3.** 3-D power Doppler images showing decreased vascularity in a large (>9 mm, at 30 and 55 weeks of age separately) tumor after the onset of rapid tumor growth and core necrosis. Micro-CT panels show 3-D rendered images displaying decreased vascularity in a 20 mm diameter tumor. Microfil perfusion allows visualization of vessels in the tumor and surrounding tissues. Power Doppler (Suppl. Fig. 3-2) and gray-scale ultrasound (Suppl. Fig. 3-3) images of mouse TG268 (38 weeks of age) showing two ventral prostate (VP) tumors, with different sizes of tumors and different patterns of tumor vascularity. The large right VP tumor possesses less vessel density than the smaller left VP tumor.

**Supplemental Figure 4.** Micorsurgical vessel ligation procedure mimicking interventional therapy of mouse prostate cancer. Blood vessels around the prostate and the accessory gland are shown in panel A. Microsurgical ligation is shown in panels B-D; panels C and D are enlarged views of the region within the box in panel B.

**Supplemental Figure 5.** Pulsed Doppler spectrum acquired from the superior vesical artery after a microsurgical intervention showing that blood flow to the bladder is maintained after surgery.

**Supplemental Figure 6.** (A-B) Power Doppler images displayed in different views of a tumor in a 30-week-old mouse. The arrow in panel A denotes a feeder vessel from a branch of the internal iliac artery that is presumably the normal blood supply to the prostate in this mouse. The arrow in panel B indicates an abnormal feeder vessel from
the spermatic artery. (C) Power Doppler image of the 5.3 mm diameter tumor in a 27-week-old mouse shown in Fig. 5F. The feeder vessel splits into multiple smaller vessels (arrow) as it enters the tumor. Scale bars denote 1 mm.