



Supplementary Figure 9.

A. The digital camera real-time photograph of the dissected mouse confirms the discovery of the imaging (**Figure 7. middle row**). An approximately 2 mm round-like tumor at the junction of left 6th rib and its cartilage corresponded to the costal abnormality on CT, Hot-spot on SPECT and SPECT/CT images. There was an about 1 mm mass at the junction of the left 8th rib and its cartilage corresponded to the slightly wider on the CT and showed little radiotracer uptake on SPECT and SPECT/CT. There was also a smaller swelling of about 0.7 mm at the junction of left 9th rib and its cartilage that was not seen on the imaging, indicating that bony lesions smaller than 1 mm in size are difficult to pick up by CT, SPECT and SPECT/CT. Light blue arrows – left 6th and 8th rib; Pink arrows – Left 9th rib, (The 8th and 9th ribs were not sampled for pathology).

B. Five sagittal pathologic views of the rib are taken from nine serial sections. From the section of outermost (a) to the innermost (e) are shown extension of tumor cells from the marrow cavity to the subcutaneous tissue of the rib (Bar, 1000um). (a) Only extraosseous metastatic tumors are seen. The subcutaneous tissue and tumor are well vascularized, but the rib is not seen. (b-e) The flow of tumor cells pouring out of the marrow cavity through a small gap stop the periosteum (yellow arrow), forming other masses (brown arrow). The multiple capillaries were found suggesting abundant blood supply (red arrows). The variations of width in the costal head was indicated (blue arrows). A very small tumor attached to the side of a large tumor affects the adjacent costal cartilage with great invasiveness (green arrow).

C. The histological features. (a) The broken rib with residual bone that the cell flow is smaller than (b) without residual bone through the gap (dark arrow). Bar, 50um.

D. (a) and (b) are digital camera photo and the feature of the mouse with a right scapula mixed metastases (orange arrow) confirmed the find of the imaging (**Figure 7. lower row**), respectively. Bar, 200um.

E. The tumor cells initially accumulated in the marrow cavity flowed out the costochondral junction and formed a bigger tumor under the periosteum (yellow arrow). Later, the flow of tumor cells forming other masses (brown arrow). The masses next to each other separated by capsules (white arrows). There are abundant blood supply (red arrows). The cell flow through the gap was indicated (violet arrow).

F. Enlarged picture A was shown a path (dark red arrows) was being established between the chondrocortex (blue box) of left 6th rib and the small tumor (green arrow). TU, tumor. Bar, 200um or 50 um.