**Highlights:**

1. miR-3156-5p was up-regulated in hypoxia-induced HCC cells and endothelial cells .

2. miR-3156-5p heightened HCC cells’ proliferation and endothelial cells’ tube formation.

3. Overexpressing SOCS5 reduced HCC cell proliferation.

4. Overexpressing miR-3156-5p facilitated angiogenesis and tumor growth *in vivo*.

5. SOCS5 was a direct target of miR-3156-5p