

Figure 7-17 A liver studded with metastatic cancer.

**Hematogenous Spread.** Hematogenous spread is typical of sarcomas but is also seen with carcinomas. Arteries, with their thicker walls, are less readily penetrated than are veins. Arterial spread may occur, however, when tumor cells pass through the pulmonary capillary beds or pulmonary arteriovenous shunts or when pulmonary metastases themselves give rise to additional tumor emboli. In such vascular spread, several factors influence the patterns of distribution of the metastases. With venous invasion, the bloodborne cells follow the venous flow draining the site of the neoplasm, and the tumor cells often come to rest in the first capillary bed they encounter. Understandably the liver (Fig. 7-17) and the lungs (Fig. 7-18) are most frequently involved in such hematogenous dissemination, because all portal area drainage flows to the liver and all caval blood flows to the lungs. Cancers arising in close proximity to the vertebral column often embolize through the paravertebral plexus, and this pathway is involved in the frequent vertebral metastases of carcinomas of the thyroid and prostate.

Certain cancers have a propensity for invasion of veins. Renal cell carcinoma often invades the branches of the renal vein and then the renal vein itself, from where it may

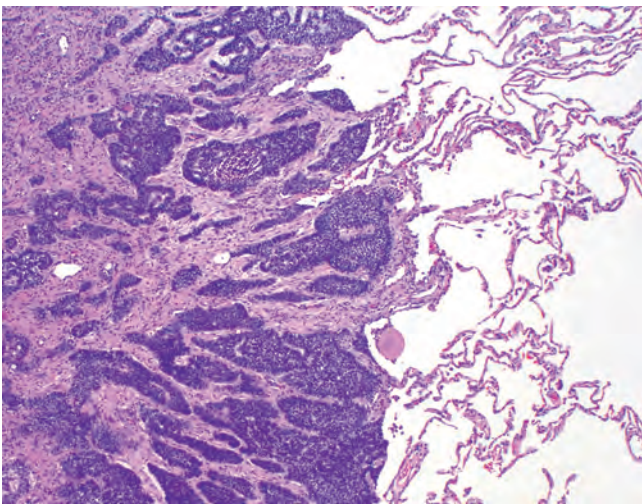


Figure 7-18 Microscopic view of lung metastasis. A colonic adenocarcinoma has formed a metastatic nodule in the lung. (Courtesy Dr. Shuji Ogino, Dana Farber Cancer Institute, Boston, Mass.)

Table 7-2 Comparisons Between Benign and Malignant Tumors

Characteristics	Benign	Malignant
Differentiation/anaplasia	Well differentiated; structure sometimes typical of tissue of origin	Some lack of differentiation (anaplasia); structure often atypical
Rate of growth	Usually progressive and slow; may come to a standstill or regress; mitotic figures rare and normal	Erratic, may be slow to rapid; mitotic figures may be numerous and abnormal
Local invasion	Usually cohesive, expansile, well-demarcated masses that do not invade or infiltrate surrounding normal tissues	Locally invasive, infiltrating surrounding tissue; sometimes may be misleadingly cohesive and expansile
Metastasis	Absent	Frequent; more likely with large undifferentiated primary tumors

grow in a snakelike fashion up the inferior vena cava, sometimes reaching the right side of the heart. Hepatocellular carcinomas often penetrate portal and hepatic radicles to grow within them into the main venous channels. Remarkably, such intravenous growth may not be accompanied by widespread dissemination. Histologic evidence of penetration of small vessels at the site of the primary neoplasm is obviously an ominous feature.

Many observations suggest that mere anatomic localization of the neoplasm and natural pathways of venous drainage do not wholly explain the systemic distributions of metastases. For example, breast carcinoma preferentially spreads to bone, bronchogenic carcinomas tend to involve the adrenals and the brain, and neuroblastomas spread to the liver and bones. Conversely, skeletal muscles and the spleen, despite receiving a high percentage of the cardiac output and having large vascular beds, are rarely the site of secondary deposits. The probable basis of such tissue-specific homing of tumor cells is discussed later.

The distinguishing features of benign and malignant tumors are summarized in Table 7-2 and Figure 7-19. Having completed our overview of the morphology and behavior of neoplasms, we now discuss the pathogenesis of neoplasia, starting with clues gleaned from studies of the epidemiology of cancer.

## KEY CONCEPTS

### Characteristics of Benign and Malignant Neoplasms

- Benign and malignant tumors can be distinguished from one another based on the degree of differentiation, rate of growth, local invasiveness, and distant spread.
- Benign tumors resemble the tissue of origin and are well differentiated; malignant tumors are less well differentiated or completely undifferentiated (anaplastic).
- Benign tumors are more likely to retain functions of their cells of origin, whereas malignant tumors sometimes acquire unexpected functions due to derangements in differentiation.