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detailed anatomical information in a timely manner, facilitating rapid diagnosis and timely intervention [5]. Moreover, advancements in contrast-enhanced CT imaging and functional imaging techniques such as perfusion CT and CT angiography have further expanded the diagnostic utility of CT scans, enabling the assessment of tissue perfusion, vascularity, and metabolic activity.

### Guidance in Surgery

In addition to its diagnostic role, CT imaging plays a crucial role in guiding surgical interventions and optimizing patient outcomes. Pre-operative CT scans provide surgeons with valuable anatomical information, allowing for meticulous surgical planning and accurate localization of target structures. Intraoperative CT guidance facilitates real-time navigation and verification of surgical outcomes, ensuring precision and minimizing intraoperative complications. Furthermore, image-guided interventions such as CT-guided biopsies and percutaneous drainage procedures offer minimally invasive alternatives to traditional surgical approaches, reducing patient morbidity and hospital stay [6].

### Challenges and Future Directions

Despite its numerous benefits, CT imaging also presents challenges, including radiation exposure, contrast agent use, and accessibility issues. Efforts are underway to mitigate these challenges through dose optimization strategies, alternative contrast agents, and advancements in technology. Additionally, ongoing research in areas such as spectral CT imaging, artificial intelligence, and machine learning holds promise for further enhancing the capabilities of CT imaging and expanding its