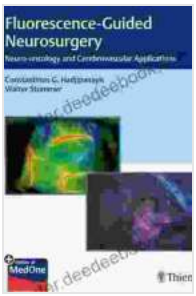
Fluorescence-Guided Neurosurgery: Applications in Neuro-Oncology and Cerebrovascular Surgery

Fluorescence-guided neurosurgery (FGN) is a rapidly evolving field that uses fluorescent dyes to visualize and guide surgical procedures. This technology has the potential to significantly improve the safety and efficacy of neurosurgery by providing surgeons with a real-time, intraoperative view of the target tissue.



Fluorescence-Guided Neurosurgery: Neuro-oncology and Cerebrovascular Applications by John R. Howard

4 out of 5

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Text-to-Speech	: Enabled
Screen Reader	: Supported
Enhanced typesetting	: Enabled
Print length	: 459 pages

Principles of Fluorescence-Guided Neurosurgery

FGN relies on the use of fluorescent dyes that emit light when exposed to a specific wavelength of light. These dyes can be injected into the patient either systemically or locally. Once the dye has accumulated in the target tissue, it can be visualized using a fluorescence microscope or camera.

The most common fluorescent dyes used in FGN are 5-aminolevulinic acid (5-ALA) and indocyanine green (ICG). 5-ALA is a precursor to the heme molecule, which is found in all cells. When 5-ALA is taken up by cells, it is converted to protoporphyrin IX (PpIX),which fluoresces red under blue light. ICG is a near-infrared dye that is excreted by the liver and taken up by the reticuloendothelial system. It fluoresces green under near-infrared light.

Applications of Fluorescence-Guided Neurosurgery in Neuro-Oncology

FGN has a wide range of applications in neuro-oncology, including:

- **Tumor visualization:** FGN can be used to visualize brain tumors during surgery, even if they are not visible to the naked eye. This can help surgeons to more accurately remove the tumor and reduce the risk of recurrence.
- **Delineation of tumor margins:** FGN can be used to delineate the margins of brain tumors, which can help surgeons to avoid damaging surrounding healthy tissue.
- **Intraoperative monitoring of tumor response to therapy:** FGN can be used to monitor the response of brain tumors to therapy by measuring the fluorescence intensity of the tumor.

Applications of Fluorescence-Guided Neurosurgery in Cerebrovascular Surgery

FGN also has a number of applications in cerebrovascular surgery, including:

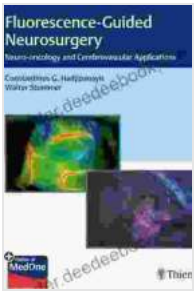
- **Cerebrovascular anastomosis:** FGN can be used to visualize and guide the anastomosis of blood vessels during cerebrovascular surgery. This can help to improve the patency of the anastomosis and reduce the risk of complications.
- **Intraoperative monitoring of cerebral blood flow:** FGN can be used to monitor cerebral blood flow during cerebrovascular surgery by measuring the fluorescence intensity of the brain tissue.
- **Detection of vascular malformations:** FGN can be used to detect vascular malformations, such as arteriovenous malformations (AVMs) and cavernous malformations. This can help surgeons to plan the best course of treatment for these malformations.

Clinical Benefits of Fluorescence-Guided Neurosurgery

FGN has a number of clinical benefits, including:

- **Improved visualization of target tissue:** FGN provides surgeons with a real-time, intraoperative view of the target tissue. This can help surgeons to more accurately perform surgical procedures and reduce the risk of complications.
- **Reduced need for intraoperative imaging:** FGN can reduce the need for intraoperative imaging, such as MRI or CT scans. This can save time and reduce the risk of radiation exposure to the patient.
- **Improved patient outcomes:** FGN has been shown to improve patient outcomes in a number of clinical studies. For example, one study found that FGN-guided glioma surgery was associated with a significantly reduced risk of recurrence and improved survival.

Fluorescence-guided neurosurgery is a rapidly evolving field with the potential to significantly improve the safety and efficacy of neurosurgery. This technology is currently being used in a number of clinical applications, and its use is expected to continue to grow in the years to come.



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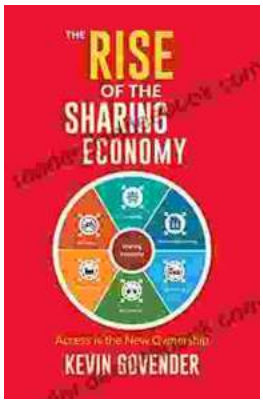

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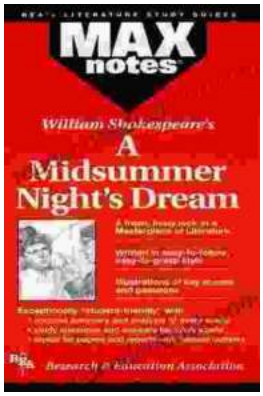

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