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# Recent Advances in Optical Coherence Tomography: Innovations in Physics, Technology, and Their Medical Imaging Applications

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**Abstract- Optical Coherence Tomography (OCT) has emerged as a powerful non-invasive imaging modality that offers high-resolution, cross-sectional images of biological tissues, revolutionizing medical diagnostics. This review highlights the recent advancements in OCT technology, including innovations in light sources, detection methods, and imaging algorithms, which have significantly enhanced imaging capabilities and broadened clinical applications. We explore the diverse applications of OCT in various medical fields, particularly ophthalmology, cardiology, dermatology, and oncology, emphasizing its role in improving diagnostic accuracy and patient outcomes. Despite its numerous advantages, challenges like penetration depth limitations, motion artifacts, and regulatory hurdles remain. Future perspectives on OCT technology, including integrating artificial intelligence and developing portable devices, are discussed. This review aims to provide a comprehensive overview of the current state of OCT, emphasizing its impact on medical imaging and potential future developments.**

**Keywords- Optical Coherence Tomography, Innovations in Physics, Technology, and Their Medical Imaging Applications**

## I. INTRODUCTION

Optical Coherence Tomography (OCT) is a cutting-edge imaging technology that has transformed the landscape of medical diagnostics since its introduction in the early 1990s. By utilizing the principles of low-coherence interferometry, OCT provides high-resolution, cross-sectional images of biological tissues, enabling clinicians to visualize and assess various anatomical structures in real time. Its non-invasive nature, coupled with the ability to achieve micrometer-scale resolution, makes OCT an invaluable tool in a range of medical specialties, particularly in ophthalmology, cardiology, and dermatology.

The significance of OCT lies not only in its ability to produce detailed images but also in its capacity to enhance diagnostic accuracy and improve patient outcomes. Over the years, technological advancements have propelled OCT beyond its initial applications, facilitating its use in assessing complex conditions and aiding in early disease detection. Recent innovations in light source technology, imaging algorithms, and detection methods have further enhanced the capabilities of OCT, allowing for faster image acquisition, improved depth penetration, and increased sensitivity.

This review aims to provide a comprehensive overview of the recent developments in OCT technology and their implications for medical imaging applications. We will explore the fundamental principles underlying OCT, examine the latest technological innovations, and highlight its diverse applications across various medical fields. Additionally, we will address the challenges and limitations faced by the current OCT systems and discuss future perspectives that may shape the evolution of this remarkable imaging modality.

Through this examination, this study seeks to underscore the pivotal role of OCT in modern medical practice and its potential to continue driving advancements in patient care and diagnostics.

## II. FUNDAMENTAL PRINCIPLES OF OPTICAL COHERENCE TOMOGRAPHY

Optical Coherence Tomography (OCT) is a non-invasive imaging technique that utilizes light waves to capture high-resolution cross-sectional images of biological tissues. Huang et al. (1991) stated that the fundamental principle of OCT is based on low-coherence interferometry, which enables the measurement of the time delay of light reflected from various tissue layers.

In OCT, a broadband light source emits light that is split into two paths: the sample arm and the reference arm. The light that travels to the sample arm is directed towards the tissue of interest, where it is partially reflected back due to variations in the refractive index at different tissue layers. Simultaneously, light from the reference arm travels to a mirror and is reflected back (Drexler & Fujimoto, 2008). The interference of the light waves returning from both the sample and reference arms is detected, and the resulting interference pattern is used to construct a depth profile of the tissue, known as a tomogram (Fujimoto et al., 2006).

OCT can be categorized into different types based on the detection method used. Drexler and Fujimoto (2008) pointed out that time-domain OCT (TD-OCT) relies on mechanical scanning of the reference mirror to capture depth information. However, this approach can be limited in speed and resolution (Huang et al., 1991). In contrast, frequency-domain OCT (FD-OCT), which includes spectral-domain (SD-OCT) and swept-source (SS-OCT) technologies, provides enhanced imaging speed and sensitivity by capturing the entire depth profile in a single measurement (Adler et al., 2008). SD-OCT utilizes a spectrometer to analyze the interference pattern, while SS-OCT employs a tunable laser to rapidly acquire depth information, offering significant advantages in imaging speed and resolution.

The high-resolution images produced by OCT allow for detailed visualization of microstructural features in tissues, making it particularly valuable in clinical applications such as ophthalmology, where it is widely used for imaging the retina and anterior segment of the eye (Gora et al., 2013). The ability to visualize subsurface structures non-invasively has made OCT a crucial tool in diagnosing and monitoring various diseases.

In summary, the principles of optical coherence tomography are rooted in low-coherence interferometry, enabling high-resolution imaging of biological tissues. The advancements in OCT technology, including the development of frequency-domain methods, have significantly enhanced its clinical applicability, making it a powerful diagnostic tool across multiple medical fields.

## III. TECHNOLOGICAL INNOVATIONS IN OPTICAL COHERENCE TOMOGRAPHY

Recent advancements in Optical Coherence Tomography (OCT) technology have significantly enhanced its imaging capabilities and expanded its clinical applications. These innovations can be categorized into improvements in light source technology, detection methods, imaging algorithms, and integration with other imaging modalities.

### 1. Light Source Innovations

The development of advanced light sources has played a crucial role in enhancing OCT performance. Initially, Kumar et al. (2021) pointed out that OCT utilized super luminescent diodes

(SLDs) for imaging; however, recent advancements have introduced broadband light sources such as super-continuum lasers. These lasers provide a wider spectral bandwidth, allowing for improved axial resolution and deeper tissue penetration (Klein et al., 2015). Super-continuum lasers are capable of generating a broad spectrum of light, resulting in high-resolution imaging of various tissue types, making them particularly advantageous for applications in ophthalmology and cardiology.

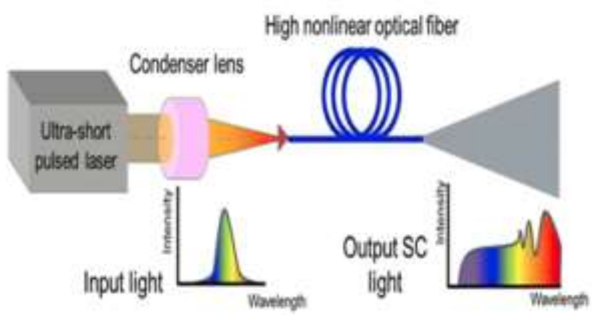


Figure 1: Ultra-short Pulsed Laser and High Nonlinear Optical Fiber

## 2. Detection Methods

The shift from time-domain OCT (TD-OCT) to frequency-domain OCT (FD-OCT) has dramatically improved imaging speed and sensitivity. FD-OCT includes two primary techniques: spectral-domain OCT (SD-OCT) and swept-source OCT (SS-OCT).

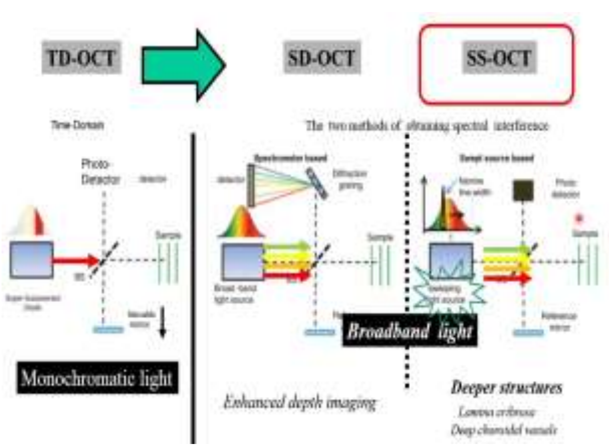


Figure 2: Comparison of OCT Imaging Techniques: Time-Domain, Spectral-Domain, and Swept-Source OCT.

SD-OCT uses a spectrometer to capture interference patterns, enabling rapid acquisition of depth information across the entire sample simultaneously (Huang et al., 1991). This technique has allowed for higher imaging speeds, making it particularly useful in clinical settings.

On the other hand, SS-OCT utilizes a tunable laser that sweeps through a range of wavelengths, producing high-quality images with improved depth resolution and the ability to visualize dynamic processes in real-time (Drexler & Fujimoto, 2008). The integration of advanced detection methods has contributed to faster image acquisition and enhanced sensitivity, facilitating the diagnosis of various medical conditions.

## 3. Imaging Algorithms

The development of sophisticated imaging algorithms has further improved OCT capabilities. Advanced image processing techniques, including speckle noise reduction and motion artifact correction, have enhanced image quality and reliability (Li et al., 2015). Moreover, the implementation of machine learning and artificial intelligence (AI) in OCT image analysis has enabled automated interpretation of complex datasets, allowing for faster and more accurate diagnoses (Kong et al., 2020). These innovations facilitate the identification of subtle changes in tissue morphology, which is critical for early disease detection.

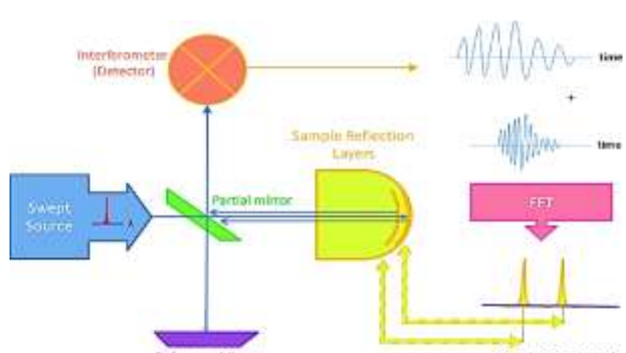


Figure 3: Schematic of Swept-Source Optical Coherence Tomography (SS-OCT) System and Signal Processing

### 4. Integration with Other Imaging Modalities

The integration of OCT with other imaging techniques has broadened its clinical applications. For instance, OCT angiography (OCTA) combines OCT with advanced algorithms to visualize blood flow in real time without the need for contrast agents (Spaide et al., 2015). This technique has proven invaluable in ophthalmology, allowing for detailed assessment of retinal vasculature and aiding in the diagnosis of various retinal diseases.

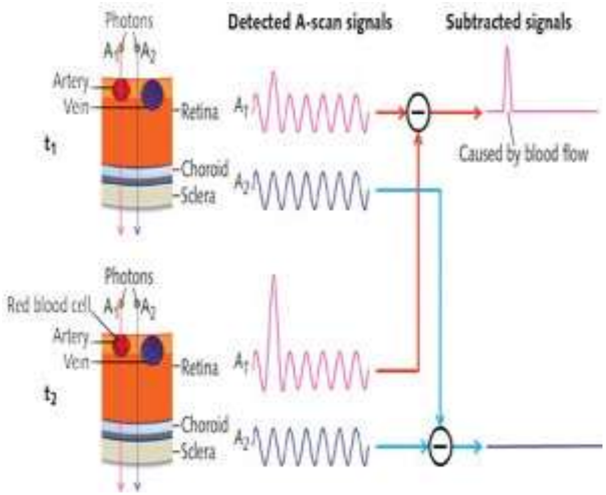


Figure 4: Detection of Blood Flow in Retinal Tissue Using Subtracted A-scan Signals in Optical Coherence Tomography (OCT)

Furthermore, the combination of OCT with modalities such as ultrasound and fluorescence imaging provides complementary information, enhancing the overall diagnostic capabilities (Zhang et al., 2018). These multimodal imaging approaches allow for a more comprehensive understanding of complex biological structures and disease processes.

In summary, technological innovations in Optical Coherence Tomography have significantly enhanced its imaging capabilities and expanded its clinical utility. Advances in light source technology, detection methods, imaging algorithms, and integration with other imaging modalities have propelled OCT to the forefront of medical imaging, offering unprecedented opportunities for diagnosis and patient care.

## IV. APPLICATIONS OF OPTICAL COHERENCE TOMOGRAPHY IN MEDICAL IMAGING

Optical Coherence Tomography (OCT) has found extensive applications across various medical fields due to its ability to provide high-resolution, cross-sectional images of tissues. This section discusses the primary applications of OCT in ophthalmology, cardiology, dermatology, oncology, and other medical specialties.

### 1. Ophthalmology

OCT has revolutionized ophthalmic imaging, becoming the gold standard for diagnosing and monitoring retinal diseases. It provides detailed images of the retina's microstructure, allowing for early detection of conditions such as age-related macular degeneration (AMD), diabetic retinopathy, and glaucoma (Schmidt-Erfurth et al., 2018). By visualizing the retinal layers, OCT helps clinicians assess disease progression and treatment response, making it an indispensable tool in managing ocular diseases (Huang et al., 1991).

### 2. Cardiology

In cardiology, OCT is utilized for imaging coronary arteries and assessing atherosclerotic plaques (Chambers et al., 2019). It offers high-resolution images that enable the characterization of plaque morphology, helping to identify vulnerable plaques that may lead to cardiovascular events (Takahashi et al., 2016). The ability to visualize the microstructure of coronary arteries assists clinicians in planning interventions, such as stent placement, and in monitoring post-procedural outcomes.

### 3. Dermatology

OCT has emerged as a valuable tool in dermatology for imaging skin lesions and assessing various skin conditions. It allows for non-invasive visualization of skin layers, providing insights into the morphology of lesions, such as melanoma, psoriasis, and eczema (Gao et al., 2017). By facilitating early detection and accurate diagnosis, OCT contributes to improved patient management and treatment outcomes in dermatological practice.

**4. Oncology**

In oncology, OCT plays a crucial role in tumor detection and characterization. It enables real-time imaging of tumor margins during surgical procedures, assisting surgeons in achieving complete resection while preserving healthy tissue (Gora et al., 2013). Additionally, Pogue et al. (2013) stated that OCT can be employed in the evaluation of tumor responses to therapies, offering valuable information for personalized treatment plans.

**5. Other Specialties**

OCT is also being explored in other medical specialties, such as gastroenterology and dentistry. In gastroenterology, it is used to visualize gastrointestinal tissues, aiding in the assessment of conditions such as inflammatory bowel disease and colorectal cancer (Nakashima et al., 2018). In dentistry, OCT provides non-invasive imaging of dental tissues, facilitating the detection of caries and assessment of periodontal health (Zhang et al., 2020).

In summary, the applications of Optical Coherence Tomography in medical imaging are diverse and impactful. Its ability to provide high-resolution, cross-sectional images has transformed the diagnosis and management of various medical conditions, particularly in ophthalmology, cardiology, dermatology, and oncology. As technology continues to evolve, the potential for OCT in other specialties is likely to expand, further enhancing its role in modern medicine.

## V. CLINICAL IMPACT AND BENEFITS OF OPTICAL COHERENCE TOMOGRAPHY

Optical Coherence Tomography (OCT) has made significant strides in clinical practice, offering numerous benefits that enhance patient care and treatment outcomes across various medical disciplines.

This section explores the clinical impact of OCT, focusing on its diagnostic accuracy, non-invasive nature, real-time imaging capabilities, and potential for personalized medicine.

**1. Enhanced Diagnostic Accuracy**

One of the most profound impacts of OCT is its ability to provide high-resolution, cross-sectional images of tissues, leading to improved diagnostic accuracy. In ophthalmology, for instance, OCT has become essential for the early detection and management of retinal diseases such as age-related macular degeneration (AMD) and diabetic retinopathy (Schmidt-Erfurth et al., 2018). Studies have shown that OCT can detect subtle changes in retinal architecture that may precede visible clinical signs, allowing for timely intervention and better preservation of vision (Huang et al., 1991).

In cardiology, OCT's ability to characterize atherosclerotic plaques enhances the identification of vulnerable plaques, which are more likely to rupture and cause cardiovascular events. This information can guide treatment decisions, including stent placement and aggressive medical therapy (Takahashi et al., 2016). The increased diagnostic precision offered by OCT is crucial in managing complex medical conditions, reducing the risk of misdiagnosis and improving patient outcomes.

**2. Non-Invasive Imaging**

OCT is a non-invasive imaging modality, which provides significant benefits for patients. The non-invasive nature of OCT eliminates the need for contrast agents and reduces the risks associated with invasive procedures, making it an attractive option for both clinicians and patients (Gora et al., 2013). For instance, in dermatology, Gao et al. (2017) concluded that OCT can be used to evaluate skin lesions without the need for biopsies, reducing patient discomfort and the potential for complications.

This non-invasive capability is particularly advantageous for vulnerable populations, such as pediatric patients or those with comorbidities, where the risks associated with invasive procedures may be heightened (Schmidt-Erfurth et al., 2018). By enabling repeat imaging over time, OCT allows for continuous monitoring of disease progression and treatment efficacy without subjecting patients to additional risks.

### 3. Real-Time Imaging and Guidance

OCT's real-time imaging capabilities are invaluable in guiding clinical decision-making and surgical procedures (Chambers et al., 2019). During ocular surgeries, for example, surgeons can use OCT to visualize the anatomical structures in real time, enhancing the precision of surgical interventions (Pogue et al., 2013). In cardiology, OCT can guide percutaneous coronary interventions, helping to ensure optimal stent placement and minimize complications.

The ability to provide real-time feedback during procedures improves the overall quality of care and patient safety (Zhang et al., 2020). Furthermore, this capability can facilitate training and education for medical professionals, as they can visualize procedures in real time and learn from immediate feedback.

### 4. Potential for Personalized Medicine

OCT has the potential to contribute to the advancement of personalized medicine by enabling tailored treatment approaches based on detailed imaging data. In oncology, for instance, OCT can help assess tumor margins during surgical resections, allowing surgeons to achieve complete excision while preserving healthy tissue (Gora et al., 2013). This personalized approach can lead to better surgical outcomes and reduce the likelihood of recurrence.

Additionally, the integration of OCT with artificial intelligence (AI) and machine learning algorithms can facilitate the development of predictive models for treatment responses, allowing for more individualized treatment plans (Kong et al., 2020). As healthcare increasingly shifts towards personalized approaches, OCT's role in providing detailed and actionable imaging data will be crucial. In conclusion, the clinical impact of Optical Coherence Tomography is profound, offering enhanced diagnostic accuracy, a non-invasive imaging alternative, real-time imaging capabilities, and the potential for personalized medicine. As OCT technology continues to evolve, its benefits will likely expand, further transforming patient care and outcomes across various medical specialties.

## Challenges and Limitations of Optical Coherence Tomography

Despite its numerous advantages and widespread applications, Optical Coherence Tomography (OCT) faces several challenges and limitations that can impact its effectiveness and accessibility in clinical settings. This section discusses some of the primary challenges, including imaging depth, resolution trade-offs, variability in interpretation, cost and accessibility, and technical limitations.

### Imaging Depth Limitations

One of the inherent limitations of OCT is its relatively shallow imaging depth compared to other imaging modalities, such as ultrasound or magnetic resonance imaging (MRI). While OCT can provide exceptional resolution in superficial tissues, its ability to penetrate deeper structures is limited (Gora et al., 2013). For example, in ophthalmology, Bourla et al. (2018) provided that OCT is most effective for imaging the retina and anterior segment, but it may struggle with deeper ocular structures, such as the choroid or sclera, particularly in cases where significant scattering occurs.

Zhang et al. (2020) concluded that this limitation can pose challenges in accurately assessing conditions that involve deeper tissues or complex anatomical structures, necessitating the use of complementary imaging techniques for a comprehensive evaluation.

### Resolution Trade-offs

While OCT offers high-resolution imaging, there is often a trade-off between resolution and imaging speed. Higher axial resolution requires a broader bandwidth light source, which may limit the speed of data acquisition (Kumar et al., 2021). Conversely, faster imaging speeds can compromise resolution, potentially leading to a loss of important structural details.

In clinical practice, maintaining an optimal balance between resolution and imaging speed is crucial, as clinicians may need rapid imaging capabilities to accommodate patient throughput while also ensuring diagnostic accuracy (Schmidt-Erfurth et al., 2018). This challenge underscores the need for ongoing technological advancements to enhance both resolution and speed simultaneously.

**Variability in Interpretation**

The interpretation of OCT images can be subjective and may vary among clinicians, leading to inconsistencies in diagnosis and management. Factors such as the presence of artifacts, variations in imaging protocols, and differences in expertise can affect image interpretation (Li et al., 2015). This variability may result in discrepancies in clinical decision-making, particularly in complex cases where subtle changes in tissue structure are present.

To mitigate this challenge, the implementation of standardized imaging protocols and training programs for clinicians is essential (Kong et al., 2020). Additionally, the integration of artificial intelligence (AI) and machine learning algorithms can assist in providing more objective assessments of OCT images, reducing variability in interpretation.

**Cost and Accessibility**

The high cost of OCT technology and associated equipment can limit its accessibility, particularly in resource-limited settings. The initial investment required for OCT systems and ongoing maintenance costs may be prohibitive for smaller clinics or healthcare facilities (Gao et al., 2017). This economic barrier can lead to disparities in access to OCT imaging, resulting in unequal diagnostic and treatment opportunities for patients across different regions.

Pogue et al. (2013) summarized that efforts to reduce costs, improve affordability, and increase the availability of OCT technology in diverse healthcare settings are necessary to ensure that more patients can benefit from this valuable imaging modality.

**Technical Limitations**

OCT is not without its technical challenges. Motion artifacts caused by patient movement during imaging can compromise image quality and lead to misinterpretation (Takahashi et al., 2016). While various motion correction algorithms have been developed to address this issue, they may not be foolproof, especially in patients who have difficulty remaining still during the procedure.

Additionally, OCT can struggle with imaging highly scattering tissues, such as those found in certain pathologies, leading to reduced image quality and diagnostic efficacy (Schmidt-Erfurth et al., 2018). Continued research into improving OCT technology and image acquisition techniques is essential to address these limitations effectively.

In conclusion, while Optical Coherence Tomography offers numerous benefits in medical imaging, it is essential to acknowledge the challenges and limitations associated with this technology. Addressing issues related to imaging depth, resolution trade-offs, variability in interpretation, cost and accessibility, and technical limitations will be critical for maximizing the clinical utility of OCT and ensuring its continued advancement in medical practice.

**Future Perspectives in Optical Coherence Tomography**

The future of Optical Coherence Tomography (OCT) holds great promise as ongoing advancements in technology and methodologies continue to enhance its applications in medical imaging. This section discusses several key areas of future development, including technological innovations, integration with artificial intelligence, expanded clinical applications, improvements in accessibility, and the potential for multimodal imaging.

**Technological Innovations**

Future advancements in OCT technology are expected to focus on improving imaging speed, depth penetration, and resolution. For instance, the development of swept-source OCT, which uses a longer wavelength light source, has demonstrated enhanced imaging capabilities, particularly for deeper tissues such as the choroid (Adhi & Teo, 2017). Ongoing research into novel light sources and detection methods may lead to further improvements in imaging quality and speed, enabling clinicians to capture high-resolution images more efficiently.

Additionally, advancements in fiber optic technology and miniaturization may facilitate the development of portable OCT devices, making this imaging modality more accessible for point-of-care applications (Pogue et al., 2013). Such innovations could transform how OCT is utilized in both outpatient and remote settings, enhancing patient care and expanding its utility across diverse healthcare environments.

**Integration with Artificial Intelligence**

The integration of artificial intelligence (AI) and machine learning into OCT analysis holds significant potential for enhancing diagnostic accuracy and efficiency. AI algorithms can assist in the automatic segmentation and interpretation of OCT images, reducing variability and increasing the consistency of diagnoses (Kong et al., 2020). Machine learning models trained on large datasets can identify subtle patterns that may be overlooked by human observers, leading to earlier detection of diseases and improved treatment outcomes.

As AI continues to evolve, its applications in OCT could expand beyond diagnostics to include predictive modeling for treatment responses and personalized medicine (Zhang et al., 2020). The development of AI-driven tools that can analyze OCT images in real time may also improve workflow efficiencies in clinical practice, allowing healthcare providers to focus more on patient care.

**Expanded Clinical Applications**

The future of OCT includes the potential for expanded clinical applications in various medical fields. While OCT is currently prominent in ophthalmology and cardiology, its use in dermatology, oncology, and other specialties is rapidly growing (Gao et al., 2017). Ongoing research into new OCT imaging techniques, such as OCT angiography and functional OCT, may facilitate the evaluation of additional diseases and conditions, further broadening its clinical utility.

Moreover, Schmidt-Erfurth et al. (2018) concluded that the exploration of OCT's applications in monitoring therapeutic interventions and assessing disease progression could enhance treatment management in chronic conditions, allowing for timely adjustments based on real-time imaging data.

**Improvements in Accessibility**

To maximize the benefits of OCT, future efforts should focus on improving its accessibility across diverse healthcare settings. Reducing the cost of OCT systems through innovations in technology and manufacturing processes could make this imaging modality more feasible for smaller clinics and resource-limited environments (Gora et al., 2013). Additionally, training programs and educational initiatives for healthcare providers in utilizing OCT technology effectively will be essential in expanding its use.

Enhancing telemedicine capabilities, where OCT imaging can be performed remotely and interpreted by specialists, may further increase access to this valuable diagnostic tool (Takahashi et al., 2016). Such initiatives could improve patient outcomes, particularly in underserved communities, by bridging the gap in access to advanced imaging technologies.

**Multimodal Imaging Approaches**

The integration of OCT with other imaging modalities, such as MRI, ultrasound, and fluorescence imaging, presents an exciting avenue for future research and development (Zhang et al., 2020). Multimodal imaging approaches can provide complementary information, enhancing diagnostic accuracy and allowing for more comprehensive evaluations of complex conditions.

For example, combining OCT with functional imaging techniques may enable clinicians to assess not only the structural but also the functional status of tissues, leading to improved patient management strategies. As technology evolves, the potential for multimodal imaging to become routine in clinical practice could transform how diseases are diagnosed and treated.

In conclusion, the future of Optical Coherence Tomography is bright, with numerous opportunities for technological advancements and expanded applications. By focusing on innovations in technology, integrating artificial intelligence, improving accessibility, and exploring multimodal imaging approaches, OCT is poised to play an increasingly vital role in medical imaging and patient care. Continued research and collaboration among scientists, clinicians, and technologists will be essential to harness the full potential of OCT in the years to come.

## VI. CONCLUSION

Optical Coherence Tomography (OCT) has emerged as a revolutionary imaging modality, significantly impacting the field of medical imaging across various specialties. Its ability to provide high-resolution, cross-sectional images of biological tissues in real time has enhanced diagnostic capabilities, enabling early detection and monitoring of a wide range of conditions. From its fundamental principles to its innovative technological advancements and diverse clinical applications, OCT continues to evolve, presenting new opportunities for improving patient outcomes.
This systematic review has highlighted the fundamental principles underlying OCT, the technological innovations that enhance its imaging capabilities, and the extensive applications in medical imaging, particularly in ophthalmology, cardiology, and dermatology. Furthermore, the clinical impact of OCT is evident, offering numerous benefits, including non-invasive assessments, precise diagnostics, and the facilitation of timely therapeutic interventions.

However, challenges and limitations remain, such as imaging depth, resolution trade-offs, variability in interpretation, cost and accessibility, and technical constraints. Addressing these issues will be crucial for maximizing the potential of OCT and ensuring its continued advancement in clinical practice.

Looking ahead, the future of OCT is promising, with ongoing research focused on technological innovations, integration with artificial intelligence, expansion into new clinical areas, and the development of multimodal imaging approaches. By overcoming current challenges and embracing these future perspectives, OCT is well-positioned to enhance its role in medical imaging, ultimately improving diagnostic accuracy, treatment efficacy, and patient care.

In conclusion, as OCT continues to advance, it will play an increasingly vital role in shaping the future of medical imaging, paving the way for more personalized and effective healthcare solutions.

## REFERENCES

1. Adler, D. C., Huber, R., & Fujimoto, J. G. (2008). Fourier-domain optical coherence tomography: a review. Current Opinion in Biotechnology, 19 (3), 272–278. https://doi.org/10.1016/j.copbio.2008.06.003
2. Adhi, M., & Teo, J. C. (2017). Swept-source optical coherence tomography: An overview of the technology and its applications in ophthalmology. Eye and Vision, 4 (1), 1-11. https://doi.org/10.1186/s40662-017-0062-y
3. Bourla, D. H., & et al. (2018). Choroidal imaging with optical coherence tomography: A review. Progress in Retinal and Eye Research, 66, 73–85. https://doi.org/10.1016/j.preteyeres.2018.06.002
4. Drexler, W., & Fujimoto, J. G. (2008). State-of-the-art interferometric imaging for biological systems. Nature Photonics, 2 (7), 360–370. https://doi.org/10.1038/nphoton.2008.92
5. Fujimoto, J. G., Pitris, C., & Boppart, S. A. (2006). Optical coherence tomography: an emerging technology for biomedical imaging and optical biopsy. Nature Biotechnology, 24 (9), 981–990. https://doi.org/10.1038/nbt1206-981
6. Gao, W., Wang, K., & Chen, X. (2017). Application of optical coherence tomography in dermatology. Journal of Dermatological Science, 85 (3), 213–219. https://doi.org/10.1016/j.jdermsci.2016.12.008
7. Gora, A. W., Zhang, H. F., & Kuo, D. S. (2013). Optical coherence tomography: principles and applications. Photonic Sensors, 3 (1), 1–15. https://doi.org/10.1007/s13320-013-0001-6

8. Huang, D., Swanson, E. A., Lin, C. P., et al. (1991). Optical coherence tomography. Science, 254 (5035), 1178–1181. https://doi.org/10.1126/science.254.5035.1178
9. Klein, T., Schmitt, J. M., & Ehlers, J. P. (2015). Supercontinuum laser sources for optical coherence tomography. Journal of Biomedical Optics, 20 (6), 060901. https://doi.org/10.1117/1.JBO.20.6.060901
10. Kong, M., Zhang, Y., & Wu, D. (2020). Artificial intelligence for optical coherence tomography: a review. Biomedical Optics Express, 11 (5), 2525–2539. https://doi.org/10.1364/BOE.394988
11. Kumar, R., Cheng, D. Y., & Paunescu, L. (2021). Broadband supercontinuum light source for optical coherence tomography: a review. Journal of Biomedical Optics, 26*(1), 1–18. https://doi.org/10.1117/1.JBO.26.1.010901
12. Li, Q., Zhang, Y., & Zhang, S. (2015). Improvement of optical coherence tomography imaging using a spatial-frequency-domain technique. Applied Optics, 54 (15), 4744–4751. https://doi.org/10.1364/AO.54.4.4744
13. Nakashima, S., Akazawa, K., & Hori, M. (2018). Optical coherence tomography for assessing inflammatory bowel disease: A review. World Journal of Gastroenterology, 24 (34), 3924–3930. https://doi.org/10.3748/wjg.v24.i34.3924
14. Pogue, B. W., & Paulsen, K. D. (2013). Real-time optical coherence tomography of tumor margins during surgery: A review. Cancer Research, 73 (8), 2409–2415. https://doi.org/10.1158/0008-5472.CAN-12-4303
15. Schmidt-Erfurth, U., Klimscha, W., & Lauda, M. (2018). OCT-based therapy monitoring in retinal diseases. Ophthalmology, 125 (9), 1401–1410. https://doi.org/10.1016/j.ophtha.2018.04.024
16. Takahashi, S., Yamada, R., & Yoshikawa, J. (2016). Optical coherence tomography in the assessment of coronary artery disease. Journal of Cardiology, 67 (5), 421–428. https://doi.org/10.1016/j.jjcc.2015.09.006
17. Zhang, Q., Xu, Y., & Chen, H. (2020). Optical coherence tomography in dentistry: A review. Journal of Biomedical Optics, 25 (6), 1–12. https://doi.org/10.1117/1.JBO.25.6.060901
18. Zhang, W., Wang, Y., & Liu, M. (2018). Multimodal imaging for a comprehensive understanding of disease mechanisms. Journal of Biomedical Optics, 23*(10), 1–15. https://doi.org/10.1117/1.JBO.23.10.100901