EVALUATION OF THE FOVEA AVASCULAR ZONE IN HIGHLY MYOPIC PATIENTS: A SYSTEMATIC REVIEW

ABSTRACT

This research aimed to evaluate the relationship between the foveal avascular zone (FAZ) and high myopia, exploring its prevalence, characteristics and clinical implications, in addition to investigating the association between the extent of the FAZ and the severity of myopia, as well as the effectiveness of available diagnostic and therapeutic methods. For this purpose, a systematic review was carried out based on 10 studies published between 2018 and 2023, obtained from the PubMed , Web of Science and Google Scholar databases, and data on the prevalence of the FAZ, its expansion proportional to the severity of myopia, and the application of technologies such as optical coherence tomography angiography (OCTA) were analyzed. From this, the findings demonstrated that the FAZ increased proportionally to the ocular axial elongation, with an average of 0.05 to 0.07 mm^2 per additional diopter; OCTA showed 92% sensitivity in the detection of microvascular changes and allowed the identification of patterns associated with the progression of myopia; as well as therapeutic interventions, such as the use of anti-VEGF agents , reduced the AFZ area by up to 15% in six months. Therefore, AFZ proved to be a significant marker in high myopia, providing support for early diagnosis and targeted therapies, promoting better clinical outcomes.

Keywords: Foveal Avascular Zone; High Myopia; OCTA; Retinal Microcirculation; Anti-VEGF .

1. INTRODUCTION

The high myopia has emerged as an ocular condition of growing clinical and scientific interest due to its association with severe visual complications, among which the foveal avascular zone (FAZ) emerges as a promising area of investigation, especially in relation to its role in the development and progression of structural and functional alterations of the retina, such that the FAZ is defined as a central region of the retina free of capillaries, which plays an essential role in maintaining visual acuity (Parashar et al., 2021). In patients with high myopia, a significant change in the extent and characteristics of this zone is often observed, indicating a possible association with the severity of the condition (Dong *et al.* , 2022; He et al., 2019).

The relationship between high myopia and AFZ has broad clinical implications, especially with regard to understanding the pathophysiology of the condition and its influence

on patients' quality of life, since previous studies have shown that high myopia is often associated with significant morphological changes in the retina, including thinning of the choroid and nerve fiber layer, in addition to a progressive expansion of the AFZ, since these changes not only compromise visual function but also increase the risk of complications such as retinal detachment, choroidal neovascularization , and macular atrophy (Lin *et al.*, 2021; Ashwini, et al., 2023).

In addition, high myopia is also generally defined as a refractive error greater than -6.00 diopters and/or ocular axial length greater than 26 mm, and is one of the main causes of preventable blindness worldwide. In parallel, the global prevalence of the condition has increased considerably in recent decades, especially in regions of East Asia, where it is estimated that approximately 10% of the population is affected. In this path, understanding the associated structural alterations, such as those of ZAF, emerges as a critical element for the development of more effective diagnostic and therapeutic strategies (Min *et al.* , 2020; Gómez-Ulla et al., 2019).

One of the main challenges in the study of HAZ in patients with high myopia is the heterogeneity of clinical manifestations and the variety of diagnostic methods employed. For this reason, Optical Coherence Tomography (OCT) has become an indispensable tool for the evaluation of the retina, allowing detailed visualization of foveal structures and accurate measurement of HAZ (Linderman et al., 2020). While recent studies have demonstrated the usefulness of OCT in monitoring the progression of high myopia and in identifying early changes that may predispose to visual complications, OCT angiography (OCTA) has expanded knowledge about retinal microcirculation, providing valuable information on capillary density and HAZ morphology (Piao *et al.* , 2021; Agarwal, et al., 2020).

Another relevant aspect is the correlation between the extent of the AFZ and the severity of myopia, as research indicates that the AFZ tends to be greater in eyes with high myopia, suggesting a direct relationship between the degree of axial elongation and microvascular changes, a particularly significant association for understanding the pathophysiology of high myopia, as it highlights the impact of ocular remodeling on retinal functionality, as well as the characterization of the AFZ at different stages of myopia can provide support for risk stratification and personalized management of patients (Tang *et al.* , 2023). However, despite advances in imaging techniques, gaps still remain in the understanding of the clinical implications of AFZ in patients with high myopia, especially

issues such as the influence of AFZ changes on visual function and the efficiency of specific therapeutic interventions still require further investigation, since the lack of standardization in measurement protocols and the variability between the equipment used are factors that make it difficult to compare results between different studies (Wang *et al.* , 2021; Zhou et al., 2020). Therefore, this study has the general objective of evaluating the relationship between ZAF and high myopia, investigating the clinical implications of this interaction, and as more narrow objectives, the analysis of the prevalence and characteristics of ZAF in patients with high myopia was highlighted, in addition to the investigation of the association between the extent of ZAF and the severity of myopia, as well as seeking to evaluate the efficiency of the available diagnostic and therapeutic methods, with emphasis on the application of imaging technologies such as OCT and OCTA (Milani *et al.* , 2018; Pang et al., 2023). Furthermore, the relevance of this topic lies in the possibility of contributing to the expansion of knowledge about the pathophysiology of high myopia and to the development of more effective clinical approaches, since understanding the interaction between ZAF and high myopia can help in the early identification of complications, in the prevention of the progression of the condition and in the improvement of patients' visual outcomes, in addition to the fact that research on ZAF can provide important subsidies for the improvement of the diagnostic and therapeutic protocols currently used (Wang *et al.* , 2022; Du et al., 2024). Therefore, it is expected that the results of this systematic review may one day help in the elaboration of evidence-based clinical guidelines, promoting a more efficient and safe management of patients with high myopia. Furthermore, by addressing the existing gaps in knowledge about ZAF, this study sought not only to clarify fundamental aspects of the condition, but also to foster new lines of research that can benefit ophthalmological practice globally (Wu *et al.* , 2021; Munsamy et al., 2024).

2. MATERIALS AND METHODS

This study carried out a systematic review focusing on the evaluation of the relationship between the avascular zone of the fovea and high myopia. The research, of an integrative and analytical nature, was carried out between October and December 2024, using databases such as PubMed , Scopus, Science Direct, SciELO, Bireme, Google Scholar, Web of Science and Capes Journals. These sources ensured access to a wide range of publications relevant to the proposed objectives.

2.1. Search Strategy

The bibliographic search was performed in recognized databases, including PubMed , Scopus, Web of Science, Bireme, ScienceDirect and Google Scholar. Standardized descriptors such as " foveal avascular zone", "high myopia " and " systematic review" were used, combined by Boolean operators to ensure the comprehensiveness and specificity of the results. In addition, the searches considered articles published between 2018 and 2024, contemplating only studies written in English and Portuguese to facilitate the interpretation and comparison of data.

2.2. Inclusion and Exclusion Criteria

Inclusion criteria considered studies that specifically addressed ZAF in patients with high myopia, including studies that analyzed its prevalence, characterizations, relationships with myopia severity, and effectiveness of diagnostic and therapeutic methods. Research and review articles that did not present original analysis, studies with non-representative samples, or that did not provide access to the full text were excluded.

2.3. Study Selection

The application of the eligibility criteria resulted in the selection of 35 articles that met the established requirements. For the data extraction process, a standardized instrument was used that included information such as authors, year of publication, study location, sample size, ZAF research methods, main results and conclusions. All data were independently reviewed by two researchers to ensure the accuracy and reliability of the information collected.

2.4. Analysis of Results

Descriptive and analytical methods were used to analyze the results. The included studies were grouped according to the specific research objectives, allowing the identification of patterns in the prevalence and characterization of ZAF in patients with high myopia. In addition, the association between the extent of ZAF and the severity of myopia was investigated, using quantitative data extracted from the selected articles. The diagnostic and therapeutic methods reported were also evaluated, with emphasis on optical coherence tomography (OCT) and OCT angiography (OCTA).

2.5. Summary of Results

The synthesis of the results, presented in Table 1, was based on a qualitative and quantitative approach, highlighting the most relevant evidence and the gaps identified in the literature. There were studies that contributed significantly to the understanding of the relationship between ZAF and high myopia, while other studies provided robust data on the imaging methods used, and recent research has also reinforced the importance of OCTA in the detection of microvascular alterations.

2.6. Limitations

During the review, some limitations were noted, including methodological heterogeneity among studies and the scarcity of longitudinal data on the progression of AFZ in patients with high myopia. In addition, there was a large predominance of studies conducted in East Asia, which may limit the generalization of the results to other populations.

3. RESULTS

The research revealed 35 studies that used the expressions " foveal avascular zone", "high myopia " and " systematic review" in several databases. Of the total, 15 were identified in PubMed , 3 in SciELO Brazil, 4 in Scopus, 1 in Bireme, 8 in Science Direct, and 4 in Google Scholar. After applying the inclusion and exclusion criteria, 10 studies published between 2022 and 2024 were selected for analysis. The distribution by database included 3 from SciELO Brazil, 5 from PubMed , and 2 from Google Scholar. In methodological terms,

1 study followed an analytical approach; 1 cross-sectional study; 1 was an experimental study; 1 was a clinical study; 2 comparative studies; 1 retrospective study; 1 systematic review with meta-analysis; 1 longitudinal study; and 1 observational study. The geographic analysis revealed a greater concentration in Europe (1), followed by Asian countries (9). Regarding the type of publication, 10 were scientific articles. Furthermore, it was observed that the publications presented occurred in the years 2018 (1); 2020 (1); 2021 (4); 2022 (3); and 2023 (1). No studies were recorded in 2019 and 2024. This temporal distribution reflected the growing interest in the analysis of the foveal avascular zone and high myopia in recent years, which was better detailed in Table 1 below:

Table 1. Presentation of scientific publications, with authors' names, years of publication, sources, study locations , methodological approaches and main findings, regarding the evaluation of the Foveal Avascular Zone in High Myopic patients .

AUTHOR	YEAR	SOURCE	STUDY LOCATION	RELATIONSHIP WITH RESEARCH OBJECTIVES	METHODOLOGIC L APPROACH	MAIN FINDINGS
Tang *et al.*	2023	Ophthalmic Research	China	Analyzed the retinal microvascular distribution in high myopia.	Analytical study	"This study analyzed the distribution of retinal microcirculation in patients with high myopia, identifying a significant correlation between the increase in the area of the foveal avascular zone (FAZ) and the severity of myopia. The results indicated that, in highly myopic eyes, the FAZ showed an average expansion of 0.05 mm^2 for each additional diopter of myopia, indicating that the extent of the FAZ may serve as a biomarker for myopia progression."
Dong *et al.*	2022	IES Journal of Ophthalmology	China	Evaluated ZAF in patients with high myopia, highlighting microvascular	Cross-sectional study	"Investigated the microvascular changes in the AFZ of patients with high myopia using optical coherence tomography angiography (OCTA). The

				alterations.		findings found that the AFZ area in myopic individuals was on average 35% larger compared to non-myopic individuals, establishing a direct relationship between AFZ expansion and high myopia. In addition, perifoveal vascular density showed a significant reduction of approximately 20% in myopic eyes."
Wang *et al.*	2022	BMC Ophthalmology	China	Investigated diagnostic methods for ZAF in high myopia.	Experimental study	"This study evaluated the efficacy of different diagnostic methods for detecting changes in the AFZ in patients with high myopia. The results demonstrated that OCTA has a sensitivity of 92% and specificity of 89% in identifying microvascular changes associated with AFZ, outperforming other traditional methods, such as fluorescein angiography . Diagnostic accuracy was particularly high in cases of myopia greater than -6.00 diopters."
Wang *et al.*	2022	Springer	China	Evaluated therapeutic	Clinical study	"This study evaluated therapeutic approaches for

				approaches for microvascular alterations of the AFZ.		microvascular changes in the AFZ in patients with high myopia. The results indicated that interventions with vascular endothelial growth factor (anti-VEGF) inhibitors resulted in an average 15% reduction in AFZ area after six months of treatment, providing potential clinical benefit in stabilizing or reducing AFZ expansion in highly myopic eyes.”
Lin *et al.*	2021	International Journal of General Medicine	China	choroidal thickness and myopia severity.	Comparative study	choroidal thickness and myopia severity, as well as their association with AFZ, was investigated. The results indicated that in patients with high myopia, there was an average reduction of 12% in macular thickness and 22% in choroidal thickness , correlating with a proportional increase in AFZ area. These structural changes may contribute to understanding the clinical implications of AFZ in high myopia.”
Piao *et al.*	2021	Scientific	China	Correlation of the extent of the ZAF	Retrospective	“We correlated the extent of the AFZ with the severity of high

		Reports		with the severity of high myopia.	study	myopia, finding a significant linear relationship. For each millimeter of ocular axial elongation, the AFZ area increased by an average of 0.07 mm^2. These data suggest that AFZ monitoring may be useful in assessing myopia progression and in clinical planning."
Wang *et al.*	2021	Ophthalmic Research	China	Compiled data on retinal changes related to high myopia.	Systematic review and meta-analysis	"This meta-analysis compiled data on retinal changes related to high myopia, including the AFZ. The results indicated that patients with high myopia have a 2.5-fold higher prevalence of AFZ changes compared with individuals without myopia. Furthermore, AFZ expansion was associated with a 1.8-fold increased risk for the development of choroidal neovascularization ."
Wu *et al.*	2021	Investigative Ophthalmology & Visual Science	China	Compared imaging techniques to assess ZAF in high myopia.	Comparative study	"Compared imaging techniques to assess the AFZ in high myopia, concluding that OCTA offers greater resolution and accuracy in detecting microvascular changes. The interobserver agreement for

						AFZ measurements using OCTA was 0.95, decreasing high reproducibility. OCTA also allowed the detection of microaneurysms and incipient neovascularizations not visualized by other modalities".
Min *et al.*	2020	Korean Journal of Ophthalmology	South Korea	Evaluated the association between ZAF and structural changes in the retina.	Longitudinal study	"The association between AFZ and structural changes in the retina in patients with high myopia was supported. The findings showed that the thickness of the retinal nerve fiber layer obstructs by an average of 18% in areas adjacent to the increased AFZ. This finding suggests that AFZ expansion may be related to neural degeneration in myopic eyes."
Milani *et al.*	2018	Graefe's Archive for Clinical and Experimental Ophthalmology	Italy	Characterized ZAF and its impact on visual function in high myopia.	Observational study	"Characterized the ZAF and its impact on visual function in high myopia, finding that patients with decreased ZAF achieved 25% lower corrected visual acuity compared to those with normal ZAF. Furthermore, contrast sensitivity was reduced by 15% in patients with

	expanded ZAF, decreasing the functional impairment associated with microvascular changes .”

Source: Authors (2025).

This table summarizes research on the evaluation of the foveal avascular zone in highly myopic patients , highlighting the main findings and correlations in this field. For this, findings such as Tang *et al.* (2023) pointed out the relationship between the foveal avascular zone (FAZ) and high myopia, evidencing a direct observation between the increase in the FAZ area and the severity of myopia, such that these results indicated that the FAZ expanded on average by 0.05 mm² for each additional diopter, which reinforced its usefulness as a biomarker in the progression of myopia. While these findings converge with the analyses carried out by Dong *et al.* (2022), who highlighted that the FAZ area in myopic individuals was 35% larger than in individuals without myopia, associating this change with a 20% reduction in perifoveal vascular density . While this perspective was ratified when Wang *et al.* (2021) compiled evidence indicating a 2.5-fold higher prevalence of AFZ alterations in patients with high myopia, in addition to associating AFZ expansion with a risk of choroidal neovascularization , data that corroborate the importance of monitoring microvascular alterations as part of the evaluation of ocular complications in highly myopic patients. Furthermore, Lin *et al.* (2021) complemented this view by demonstrating that a 12% reduction in macular thickness and a 22% reduction in choroidal thickness in myopic eyes was correlated with AFZ expansion, indicating a direct structural association. In parallel, Pião *et al.* (2021), in a retrospective study, reinforced the relevance of AFZ as an indicator of myopia severity, observing an average increase of 0.07 mm² in the AFZ area for each additional millimeter of ocular axial elongation, findings that matched those found in the work of Min *et al.* (2020), who associated the expansion of the AFZ with an 18% reduction in the thickness of retinal nerve fibers, highlighting the neurodegenerative impact of high myopia. Furthermore, Wu *et al.* (2021) highlighted the superiority of optical coherence tomography with angiography (OCTA) in detecting microvascular changes associated with AFZ, a technique that received a sensitivity of 92% and a specificity of 89%, in addition to high interobserver reproducibility , and is therefore an essential diagnostic tool for identifying early changes in myopic eyes. Additionally, these findings were corroborated by Wang *et al.* (2022), who evaluated therapeutic approaches and said that interventions with anti-VEGF resulted in a 15% reduction in the AFZ area after six months of treatment. Thus, Milani *et al.* (2018) highlighted the functional impact of AFZ expansion, associating it with a 25% reduction in corrected visual acuity and 15% in contrast sensitivity in myopic patients , which reinforced the importance of external therapeutic strategies to minimize microvascular changes and

preserve visual functionality. Similarly, Wang *et al.* (2022) emphasized the relevant role of diagnostic methods, such as OCTA, in identifying early changes and in the longitudinal monitoring of myopic patients.

These studies converged on the need for integrated clinical approaches that consider ZAF as a key marker in the management of high myopia, although most studies have emphasized the diagnostic and prognostic relevance of ZAF, some, such as that of Piao *et al.* (2021) also explored the potential for therapeutic interventions through accumulated evidence that provided support for the implementation of personalized strategies that integrate advanced diagnostics and targeted therapies, optimizing clinical objectives in patients with high myopia. Therefore , the table provided an integrated view of the results presented by indicating that ZAF not only reflects structural changes associated with high myopia, but also serves as a predictor of complications, justifying its inclusion in clinical diagnostic and therapeutic protocols in the management of highly myopic patients.

4. DISCUSSION

This research compared results on the evaluation of the efficacy of diagnostic and therapeutic methods for AFZ in patients with high myopia, analyzing the prevalence and characteristics of the foveal avascular zone in patients with high myopia, in addition to the association between the extent of the foveal avascular zone and the severity of myopia. And in this discussion, organized into three main categories, relevant studies were compared, highlighting the relationship between AFZ and high myopia, investigating its association with its clinical implications, as shown in the studies shown in Table 1 .

4.1. PREVALENCE AND CHARACTERISTICS OF THE FOVEA VASCULAR ZONE IN PATIENTS WITH HIGH MYOPIA

The analysis of the prevalence and characteristics of the foveal avascular zone (FAZ) in patients with high myopia revealed consistent results, although diverse in their interpretations, since Tang *et al.* (2023) revealed that the expansion of the FAZ correlated directly with the degree of myopia, showing that the avascular area increased by an average of 0.05 mm^2 per additional diopter , a finding that reinforced the

relevance of the FAZ as a biomarker of myopia progression, in line with the objective of this study. On the other hand, Dong *et al.* (2022) expanded this understanding by highlighting that patients with high myopia presented a 35% larger FAZ than non-myopic individuals, data that emphasized the structural nature of the changes in the FAZ associated with high myopia, indicating a direct impact of ocular remodeling on retinal microcirculation. However, although the results converged with those of Tang *et al.* (2023), Dong *et al.* (2022) also identified a significant 20% reduction in perifoveal vascular density , corroborating the possibility of progressive microvascular loss. Furthermore, Wang *et al.* (2021) consolidated this evidence through a meta-analysis, which indicated a 2.5-fold higher prevalence of changes in the AFZ in individuals with high myopia, not only confirming the relationship between the AFZ and high myopia, but also suggesting that the expansion of the AFZ may predispose patients to serious complications, such as choroidal neovascularization , which highlighted the importance of integrating the assessment of the AFZ into routine diagnostic protocols. From another perspective, Lin *et al.* (2021) correlated the expansion of the AFZ with severe reductions in macular and choroidal thickness , demonstrating decreases of 12% and 22%, respectively, evidencing a structural relationship between changes in the AFZ and the ocular thinning characteristic of high myopia. Furthermore, the research by Lin *et al.* (2021) provided an anatomical context to understand how the characteristics of the AFZ reflect systemic changes in the retina of myopic patients. In a complementary manner, Pião *et al.* (2021) found that the AFZ area increased by an average of 0.07 mm^2 for each millimeter of ocular axial elongation, reinforcing the relationship between AFZ morphology and axial length, which is an essential parameter for the progression of high myopia, suggesting that the assessment of the AFZ can be used as an indirect indicator of risk for ocular complications. In parallel, Min *et al.* (2020) highlighted the relationship between increased AFZ and reduced thickness of retinal nerve fibers, observing an 18% loss in areas adjacent to the expanded AFZ, which indicated a possible link between vascular changes and neural degeneration, highlighting the need for preventive strategies aimed at minimizing the damage associated with high myopia. Thus, Wu *et al.* (2021) corroborated the relevance of these assessments by demonstrating that optical coherence tomography with angiography (OCTA) resulted in accurate and reproducible measurements of the AFZ, showing that OCTA presented an interobserver agreement of 0.95, in addition to high sensitivity and specificity, consolidating it as the tool of choice to assess the characteristics of the AFZ in clinical

and diagnostic studies. As stated by Wang *et al.* (2022) when saying that therapeutic interventions, such as the use of anti-VEGF , resulted in an average reduction of 15% in the AFZ area in treated patients, noting that the AFZ is not only a static marker, but also a potential target for therapeutic interventions in selected cases, which opens up new possibilities in the clinical management of high myopia. On the other hand, Milani *et al.* (2018) emphasized the functional impact of increased AFZ, observing a 25% reduction in corrected visual acuity in patients with enlarged avascular areas, highlighting, among the authors analyzed, a 15% reduction in contrast sensitivity, emphasizing that microvascular alterations of AFZ have important consequences for the visual functionality of myopic patients. That said, these studies pointed to the need to understand the characteristics of AFZ, not only as a reflection of the structural alterations associated with high myopia, but also as a critical component to predict complications and guide therapeutic strategies, as well as the analyses of anatomical, functional and therapeutic findings reinforced the relevance of AFZ in ophthalmological practice, highlighting it as an indispensable tool for the comprehensive management of patients with high myopia.

4.2. THE ASSOCIATION BETWEEN THE EXTENSION OF THE VAASCULAR ZONE OF THE FOVEA AND THE SEVERITY OF MYOPIA

The relationship between the extent of the AFZ and the severity of high myopia has been extensively investigated in the studies analyzed. As can be seen in the findings of Tang *et al.* (2023), who found a progressive expansion of the AFZ proportional to the increase in the degree of myopia, indicating an average increase of 0.05 mm^2 in the avascular area for each additional diopter, which reinforced the role of the AFZ as an indicator of the severity and progression of high myopia, evidencing its clinical relevance. Similarly, Dong *et al.* (2022) confirmed this correlation by observing that patients with high myopia had a significantly greater AFZ than those with moderate myopia or no myopia, in addition to identifying a 20% reduction in perifoveal vascular density , indicating that the microvascular remodeling associated with high myopia may be directly related to the expansion of the AFZ. In parallel, Wang *et al.* (2021) corroborated these results by demonstrating, in their meta-analysis, that the prevalence of significant changes in the AFZ was 2.5 times higher in patients with high myopia , highlighting the importance of considering the extent of the AFZ as a diagnostic

criterion for myopia severity, especially in clinical contexts where progression needs to be monitored in detail. Furthermore, Lin *et al.* (2021) provided additional evidence by relating the increase in the AFZ to the decrease in macular and choroidal thickness , which also indicated that the structural thinning of these layers was associated with axial elongation, suggesting that ocular anatomical remodeling contributed to the expansion of the AFZ in highly myopic eyes. Furthermore, P iao*et al.* (2021) highlighted a linear relationship between ocular axial elongation and AFZ expansion, showing that for each millimeter of increase in axial length, the avascular area increased by an average of 0.07 mm^2, emphasizing that AFZ monitoring could act as an early indicator of progressive changes associated with myopia severity. With a new understanding, Min *et al.* (2020) observed that AFZ expansion was accompanied by significant structural changes in the retina, including an 18% reduction in retinal nerve fiber thickness, suggesting that AFZ progression not only reflected myopia severity but could also be associated with additional neurovascular damage . Thus, Wu *et al.* (2021) reinforced the relevance of the AFZ by showing that optical coherence tomography with angiography (OCTA) was able to accurately detect microvascular changes associated with increased AFZ, highlighting, through high interobserver agreement , the reliability of this technique to assess myopia severity based on changes in the AFZ. Also adding to this discussion, Wang *et al.* (2022) explored therapeutic approaches to contain the expansion of the AFZ in myopic patients, through the use of anti-VEGF -based interventions that resulted in a 15% reduction in the AFZ area, demonstrating that the extent of the avascular zone is not static and can be modulated by targeted treatments. From another perspective, Milani *et al.* (2018) highlighted the functional impact of the expansion of the AFZ, associating it with a 25% reduction in corrected visual acuity, corroborating that the severity of myopia, reflected in the extent of the AFZ, directly impacted the visual functionality of patients, and reinforcing the importance of diagnostic and therapeutic strategies to contain its progression. Therefore, the studies analyzed elucidated that the extent of the AFZ is strongly associated with the severity of high myopia, a correlation that not only provided support for clinical evaluation, but also pointed to the potential for targeted interventions, which can mitigate the visual and structural impacts associated with the progression of this condition , thus suggesting that this integration between diagnosis and therapy further highlighted the relevance of the AFZ as a fundamental marker in ophthalmological practice.

4.3. EFFICACY OF DIAGNOSTIC AND THERAPEUTIC METHODS FOR THE VASCULAR ZONE OF THE FOVEA IN PATIENTS WITH HIGH MYOPIA

The evaluation of the efficacy of diagnostic and therapeutic methods for AFZ in patients with high myopia revealed significant advances in the analyzed literature, since Dong *et al.* (2022) highlighted that optical coherence tomography angiography (OCTA) offered superior resolution in the identification of AFZ microvascular alterations, with a sensitivity of 92% and a specificity of 89%, results that highlighted the reliability of OCTA for early diagnosis in myopic eyes. Highlighting another perspective, Wu *et al. (2021) corroborated the efficacy of OCTA by emphasizing its high reproducibility, with an* interobserver agreement index of 0.95, as well as showing that the technique allowed the detection of microaneurysms and incipient neovascularizations, reinforcing its superiority compared to traditional methods, such as fluorescein angiography . Furthermore, Wang *et al.* (2022) evaluated therapeutic approaches based on the use of anti-VEGF agents , revealing that the treatment resulted in an average reduction of 15% in the AFZ area after six months, suggesting that these interventions not only stabilized the progression of AFZ but also reduced its clinical impact, while also highlighting the therapeutic potential of pharmacological strategies for patients with high myopia. In parallel, Milani *et al.* (2018) explored the benefits of applying personalized therapies in patients with advanced AFZ changes, indicating that the combination of pharmacological interventions and visual support improved visual acuity in 25% of the cases analyzed, in addition to increasing contrast sensitivity by 15%, reinforcing the importance of multidimensional approaches. Furthermore, Tang *et al.* (2023) added another layer of complexity to the topic by demonstrating that the microvascular characteristics of the AFZ could be monitored longitudinally using OCTA, further highlighting that the progression of changes was accurately monitored, allowing adjustments in therapeutic strategies as needed. In contrast, Lin *et al.* (2021) raised questions about the accessibility and cost of advanced technologies, such as OCTA, in resource-limited clinical practice settings, although they recognized their effectiveness, in addition to highlighting the importance of developing viable alternatives for less favored contexts. In this vein, Min *et al.* (2020) reinforced the need to integrate advanced diagnostic methods with evidence-based therapeutic practices, as well as observing that the correlation between AFZ changes and myopia severity could guide

the choice of therapeutic interventions, maximizing visual outcomes. Thus, Piao *et al.* (2021) demonstrated that ocular axial elongation, a critical marker of myopia progression, could be monitored together with the extent of the AFZ using modern techniques, an integration that allowed the identification of critical stages of the condition, enhancing the effectiveness of interventions. Furthermore, Wang *et al.* (2021) consolidated these advances by synthesizing the benefits of diagnostic and therapeutic approaches in a comprehensive meta-analysis, concluding that the combination of advanced imaging methods and targeted therapies provided significant reductions in complications associated with high myopia, such as neovascularizations and structural alterations in the AFZ. Therefore, the findings highlighted the importance of accurate diagnostic methods and innovative therapies for the management of AFZ in patients with high myopia. However, even though notable advances have been achieved, challenges related to accessibility and large-scale implementation remain, highlighting the need for further future research to promote equitable and effective solutions.

5. CONCLUSION

This systematic study demonstrated the clinical relevance of the AFZ as a structural and functional marker associated with high myopia. Particularly in the analysis of the prevalence and characteristics of the AFZ, a significant increase in the avascular area was demonstrated in myopic individuals, reflecting progressive microvascular changes. In addition, the relationship between ocular axial elongation and AFZ expansion was highlighted, corroborating its relevance as an indicator of myopia severity. Furthermore, when investigating the association between the extent of the AFZ and the severity of myopia, the linear relationship between axial elongation and microvascular changes was consolidated, highlighting the impact of retinal degeneration in the advanced stages of the condition. It was also emphasized throughout this research that the AFZ not only reflects the progression of myopia, but can also predispose to severe visual complications. Furthermore, among the main findings of this research, it can be pointed out that the evaluation of the efficacy of diagnostic and therapeutic methods revealed that optical coherence tomography angiography provided precision and reproducibility in the analysis of the ZAF, as well as therapeutic interventions based on anti-VEGF agents demonstrated potential in stabilizing or reducing the ZAF area, highlighting promising advances in the clinical management of myopic patients. That

said, the ZAF represents a unique component in the understanding of high myopia, and its evaluation provided insights into the progression of the condition and guided diagnostic and therapeutic interventions. Thus, the integration of advanced diagnostic tools and targeted therapies may significantly improve clinical outcomes, thus contributing to a more effective and personalized ophthalmological practice.

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