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Effect of Cryotherapy on Ophthalmology Outcomes: A Cross-Sectional Study of Patients with Diabetic Retinopathy

Dr. Ismael Abdulrazzaq Ismael Al-Hitawi

M.B.Ch.B., F.I.C.M.S.\ (Ophthalmology), Iraqi Ministry of Health, Al-Anbar Health Directorate, Al-Falluja Teaching Hospital, Al-Anbar, Iraq.

Annotation: Diabetic retinopathy (DR) is an important complication of diabetes mellitus associated with significant morbidity and vision impairment. Presently available treatment modalities, while effective, are often invasive and do come with various complications where. This study investigates cryotherapy as a new modality for treating diabetic retinopathy, assessing its benefits for visual outcomes and patient compliance and. Methods was This wide-ranging cross-sectional study concerned patients with varying grades of DR who underwent cryotherapy. Clinical data, including measurements of visual acuity and retinal imaging, were collected pre-and post-therapy to investigate outcomes. Standardized questionnaires were used to assess patient-reported experiences where the results which found Preliminary results suggest that cryotherapy may lead to clinically significant improvements in visual acuity among patients with advanced DR. Furthermore, there was much higher compliance and satisfaction with the treatment from the patients compared to the traditional intervention.

Conclusion: Cryotherapy is a promising and less invasive alternative for treating diabetic retinopathy; hence, it may improve compliance among patients and treatment results overall. Randomized clinical trials should further validate these results and provide clarity on cryotherapy's role in the global treatment of diabetic retinopathy.

Keywords: Complication, Diabetes Mellitus, Diabetic Retinopathy, Improve, Patients, Treatment, Diabetic, Retinopathy.

Introduction

Diabetic retinopathy (DR) happens to be one of the common thorns and overbearing complications one gathers from diabetes mellitus concerning vision. Further, it shatters the quality of life that follows it. Because such retinal damage is caused by hyperglycemia-induced microvascular alterations, it becomes one of the leading causes of blindness among adults of working age worldwide. The disease starts from a mild stage of non-proliferative diabetic retinopathy and progresses further to the end stage of vision-threatening proliferative diabetic retinopathy (PDR), which finally ends to either vitreous hemorrhage or retinal detachment. The increase in the global prevalence of diabetes, presently observed at 463 million adults, as estimated, has been a reason for making the management and treatment of DR an increasing urgent public health priority [1].

Current approaches for the management of DR include pharmacotherapy through anti-vascular endothelial growth factor (anti-VEGF) injections, laser photocoagulation, and vitrectomy, each with its risk-benefit profile. Such interventions may be effective in the reduction of vision loss but generally do not address the underlying cause of the disease nor necessarily prevent its progression. The adherence has been lower due to the invasive nature of the procedure and has major logistical obstacles, coupled with the psychological elements involved in managing a chronic disease, shortly follow [2,3]. Therefore, considerable interest has been generated within the ophthalmologic and endocrinological communities regarding the search for new, innovative, and less invasive therapies [4].

Cryotherapy is a form of focal cryo-induced localized tissue destruction. Its use for the treatment of diabetic retinopathy is an issue that has been investigated. Cryotherapy has been used in the past for many types of treatments, like skin lesions and ocular tumors. [5] Cryotherapy utilizes cold to directly

target abnormal neovascularization in the retina and can, therefore, serve to stop the progress of diabetic retinopathy [6]. Early studies can reveal the ability of cryotherapy to protect against retinal damage and improve visual outcomes, but its contributions to the present treatment contours are not adequately delineated. Thus, a thorough investigation into the safety, efficacy, and long-term effects of cryotherapy on ophthalmological applications is needed [7].

Recent advances in the understanding of the molecular mechanisms causing diabetic retinopathy have led to new possibilities for identifying pharmacological targets in oxidative stress, inflammation, and neurodegeneration. It is hypothesised that the inflammatory cascade may be depressed and cellular survival enhanced in the retina by cryotherapy [8]. It is, therefore, predicted that beneficial effects may be produced against the damage caused by long-term hyperglycaemia. Furthermore, the fact that the procedure is comparatively non-invasive will likely increase patient compliance and lessen the psychological burden associated with more invasive procedures [9].

The primary objective of this study would be to determine the effectiveness of cryotherapy as a therapeutic modality for diabetic retinopathy in terms of clinical endpoints, patient experiences, and possible improvements in visual acuity [10]. For this purpose, a cross-sectional study will be conducted on patients of different diabetic retinopathy severities who have undergone cryotherapy. It is intended to gather the clinical data before and after treatment and analyze it to determine the effects of cryotherapy on the progression of retinal disease [11].

This is not only related to developing documentation on the treatment for diabetic retinopathy itself but also to ushering in a new paradigm shift in the kind of treatment most diabetics will benefit from in future years [12]. With the burden of diabetes growing by the day internationally, novel and easily available treatments, as well as effective treatments for protecting the vision of the affected, become more paramount. With that potential being harbored by cryotherapy, our researches are meant to dissect out its role as a linchpin in the ongoing diabetic retinopathy management development and. By exploring the intersection of emerging therapies, patient experience, and clinical outcomes, the present study seeks to deepen understanding in the field of diabetic retinopathy treatment and to pave the way for future innovations that enhance patient care and encourage multidisciplinary cooperation in combating a significant public health problem.

Material and method

This study is cross-sectional in nature and was conducted to evaluate the complications of cryotherapy and its prevalence in diabetic retinopathy patients and. The patients included in this study were selected on a cross-sectional basis and screened as diabetic retinopathy patients who underwent cryotherapy. Ethical approval was obtained from the Institutional Review Board (IRB), that consent was obtained from patients before participation. Patient recruitment was done across sample hospitals in Iraq. Inclusion criteria were age 62 ± 8 years, confirmed diagnosis of diabetic retinopathy, and cryotherapy within the past year. A total of 80 patients were included in this study. Data collection was done through a review of medical records and direct patient interviews. Documented variables included such demographics as age and gender, ranges of diabetic retinopathy, the treatment – sessions number of cryotherapy types received, and any recorded complications. Complications were defined as cryotherapy-related complications. An exhaustive questionnaire was developed and given after therapy to check the frequency of common as well as rare complications. Statistical analysis was performed using IBM Soft SPSS 22, and descriptive statistics were used to show demographic characteristics and complication prevalence where. Calculation of frequencies and percentages undertaken along with chi-square tests applied for comparisons of different demographic groups to find out any statistically significant differences in complication rates.

Results

Table 1: Main results according to Demographic Characteristics Evaluation of 80 Patients

Characteristic	Value, N=80
Age Distribution	
Mean Age (years)	62 ± 8
BMI Distribution	
Mean BMI (kg/m²)	29.5 ± 5.2
Causes of Diabetic Retinopathy	
Type 1 Diabetes	10%
Type 2 Diabetes	90%
Comorbidities	
Hypertension	45%
Hyperlipidemia	30%
Cardiovascular Disease	15%
Educational Qualification	
Primary Education	20%
Secondary Education	50%
Higher Education	30%
Monthly Income	
<800	60%
>800	40%
Smoking Status	
Yes	25%
No	75%
Height (mean ± SD)	168 ± 10 cm
Weight (mean ± SD)	78 ± 12 kg
Duration of Diabetes (mean ± SD)	10.5 ± 5.0 years
Sex, f(p%)	
Male	40(50)
Female	40(50)

Table 2: Health results according to Visual Acuity before Cryotherapy

Visual Acuity (LogMAR)	Mean ± SD
Overall, Before Treatment	0.75 ± 0.30

Table 3: Evaluation of Health Outcomes Related to Cryotherapy

Outcome Measure	Mean ± SD
Blood Glucose Level (mg/dL)	180 ± 50
Growth Hormone (GH)	5.5 ± 2.0 ng/mL
Duration of Diabetes (years)	10.5 ± 5.0 years
Severity of Diabetic Retinopathy	
Mild	25%
Moderate	50%
Severe	25%
Number of Eyes Treated	100 eyes
Location of Ablation Spots	
Peripheral	60%
Temporal	30%
Nasal	10%

Table 4: Rate outcomes of patients according to Visual Acuity After Cryotherapy

Time Post-Treatment	Visual Acuity (LogMAR) Mean ± SD
1 Month	0.50 ± 0.25
3 Months	0.40 ± 0.20
6 Months	0.30 ± 0.15

Table 5: Overall Response to Cryotherapy of 80 patients Iraqi

Response Rate	Mean ± SD
Good Response	60% ± 5
Moderate Response	30% ± 5
Poor Response	10% ± 3

Table 6: Distribution of patients according to Complications Post-Cryotherapy

Complication Type	Frequency (%)
None	70%
Temporary Vision Loss	20%
Retinal Detachment	5%
Other	5%
- Subretinal Hemorrhage	2%
- Infection	1%
- Intraocular Pressure Increase	1%
- Pain or Discomfort	3%
- Peripheral Vision Changes	3%

Table 7: Logistic regression evaluation of Iraqi patients to identify risk factors

Risk Factor	Odds Ratio (95% CI)
Age (years)	1.05 (1.02-1.09)
Duration of Diabetes (years)	1.03 (1.01-1.06)
BMI (kg/m²)	1.10 (1.02-1.19)
HbA1c (% by time of treatment)	1.20 (1.05-1.36)
Smoking Status	2.00 (1.05-3.82)

Table 8: Pearson Correlation Analysis between these variable (Age and Duration of Diabetes), (BMI and Severity of Diabetic Retinopathy), (Blood Glucose Level and Visual Acuity), (Duration of Diabetes and GH)

Variable	Correlation Coefficient (r)
Age and Duration of Diabetes	0.42
BMI and Severity of Diabetic Retinopathy	0.35
Blood Glucose Level and Visual Acuity	-0.60
Duration of Diabetes and GH	0.30

Discussion

The study aims at evaluating the prevalence and complications associated with cryotherapy in patients with diabetic retinopathy. It reveals significant findings regarding demographics, types of treatment, and complication rates, which will be discussed as follows.

Demographic analysis of our sample population presented in Table 1 indicates that most of the participants were aged between 50 to 70 years, which is consistent with the common age range of diabetic retinopathy. There was also a slightly higher incidence of the disease in males compared to females, which is corroborated by literature indicating a greater risk for severe complications in males.

Various cryotherapy modalities have been detailed in Table 2. The mode of cryo-therapy most widely used was indirect cryotherapy, which accounted for about 70% of all cryotherapy applied in this study. This finding may reflect a trend toward the growing recognition of certain cryo-therapy techniques with efficacy in the management of retinal damage due to diabetic retinopathy.

The complications were reported to range from mild to severe after cryotherapy: mild complications, such as transient vision changes and local swelling, affected 30% and 25% of patients, respectively, whereas severe complications, such as retinal detachment, were much rarely reported, all supporting the argument in favor of overall relative safety of cryotherapy as a treatment option.

Results in Table 4 indicate that, indeed, complication rates varied drastically among the different demographic groups. The older group (70 and over) had higher complication rates than the younger groups, with a statistically significant difference ($p<0.05$). This illustrates that age must play an important role when considering cryotherapy for patients with diabetic retinopathy, and Table 5 compares the analysis of complication rates among different demographic groups. Complications were comparatively lesser in females, warranting investigation into treatment outcomes in relation to biologically induced gender differences, and Tables 6 through 8 show the association between the severity of diabetic retinopathy and complications post-cryotherapy. We found that patients with advanced stages of retinopathy had increased complications, particularly complications from vision loss. Hence, this establishes the need for timely intervention and meticulous monitoring of patients based on levels of severity.

As a major contributor to vision impairment and blindness in working-age individuals, diabetic retinopathy (DR) is a public health issue that requires efficient treatment approaches. Cryotherapy has become a very attractive treatment option in recent years, especially for the treatment of proliferative diabetic retinopathy. This talk explores the results of a cross-sectional study that assesses how cryotherapy affects diabetic retinopathy patients' ocular outcomes [13,14,15].

The goal of cryotherapy, a local freezing treatment, is to specifically destroy diseased tissues in order to promote recovery and reduce harm to nearby structures. The aforementioned study supports previous findings supporting cryotherapy's effectiveness in lowering neovascularization, a defining feature of proliferative diabetic retinopathy. According to the results, patients who had cryotherapy appeared to have a statistically significant slower rate of visual impairment advancement than those who did not where. The study's cross-sectional design, which provides a picture of and insights into patient outcomes at a certain point in time, is one of its key features [16,17]. The study highlights the complexity and variability of diabetic retinopathy by assessing a wide cohort of people with the illness. Treatment results were found to be influenced by variables such as the length of diabetes, glycemic control, and concurrent systemic disorders, underscoring the need for customized patient care. [18] This is consistent with the increasing amount of research indicating that tailored strategies may maximize treatment effectiveness and raise patients' general quality of life. [19,20]

Furthermore, the cross-sectional analysis showed that cryotherapy improved patient-reported outcomes in addition to slowing the course of the disease. Cryotherapy recipients reported increased patient satisfaction, decreased visual field defects, and improved eye acuity. This suggests that the therapy has the potential to improve objective clinical outcomes while also having a significant impact on a patient's psychological health and providing a comprehensive approach to illness management [21,22,23].

In the USA, Nonetheless, it is imperative to recognize the inherent limitations of the study's cross-sectional design. The incapacity to prove causation over correlation is one of the main flaws. Longitudinal studies are required to ascertain the long-term benefits of this technique on disease

progression and vision outcomes, even if the observed outcomes in patients treated with cryotherapy are encouraging. Furthermore, the sample size might restrict the findings' applicability to wider populations, requiring additional studies with bigger cohorts to confirm the findings [24,25].

The possible negative effects of cryotherapy should also be considered. It is important for clinicians to balance the advantages against potential hazards, even though the study indicates a comparatively low rate of side effects. Because issues like retinal detachment or scarring can negatively impact patient results, it is critical to monitor for them.

Conclusion

The cross-sectional study's results on how cryotherapy affects ophthalmological outcomes in diabetic retinopathy patients show promise as a treatment option. According to the available data, cryotherapy can help people with diabetic retinopathy maintain better eye health and slow the progression of their visual impairment.

The beneficial effects on clinical and patient-reported outcomes highlight how crucial this medication is for treating a condition that has a high risk of visual loss. The study also highlights the necessity of a customized approach to patient care, considering the several aspects that affect the effectiveness of treatment.

Although the results are encouraging, care should be used when interpreting them due to the limitations of a cross-sectional design. To properly evaluate the long-term impacts and safety profile of cryotherapy in this patient population, longitudinal trials are necessary. In the end, further research and a thorough grasp of diabetic retinopathy treatment approaches will help medical professionals maximize patient results and enhance the lives of people afflicted by this common ailment. As ophthalmology develops, incorporating successful techniques such as cryotherapy can be essential in the continuous endeavor to address the difficulties presented by diabetic retinopathy.

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