# The Decentralization Problem of Low Power Lenses and Treatment Methods

**Mundher Sameen Shuker**

Department of Optics Technology, College of Health and Medical Technology, Middle Technical University, 10047 Bab Al Muadham, Baghdad, Iraq.

Correspondence author E-mail: Mundher59@gmail.com

**Abstract**

In a study where all patients (50) were chosen, the causes of the eccentricity issue with low energy lenses (0.25D to 1.0D) and treatment options were examined. who wore visual techniques teaching clinic at the College of Health and Medical Technologies-Bagdad. For the period from (1-9-2021 up to 1-5-2022). The causes of deviation in the center of the lenses were studied determined the treatment methods, it appeared that they occurred in the process of smoothing and centering. Process of the lenses was determined by using Newton's rings examination kit and the diameter of the lens after centrifuging and edges with several tools. In our study, it is to find suitable solutions for most of the low-grade lenses available in the local markets, including physical therapy for patients, Itis used to solve the problem of people with squint and others. most patients a treatment (56%) for patients within physical exercises for them and the most common problems that occur in lenses (0.25 and 0.5D), with a rate of 64% of the total number of lenses under study.

***Keywords:*** *decentralization, low power lenses, Newton's rings, and treatment methods.*

## مشكلة اللامركزية للعدسات منخفضة الطاقة وطرق العلاج

**أ.م.د. منذر سمين شكر**

**الخلاصة**

دراسة أسباب مشكلة اللامركزية للعدسات منخفضة الطاقة من (ربع لغاية درجة واحدة) وطرق العلاج حيث تم اختيار جميع المرضى (50) الذين ارتدوا على العيادة التعليمية للتقنيات بصرية في كلية التقنيات الصحية الطبية - بغداد للفترة من (1-9-2021 لغاية 1-5-2022). تمت دراسة أسباب الانحراف في مركز العدسات وتحديدها وطرق علاجها، وتبين أنها حدثت أثناء عملية التنعيم والتمركز. تم تحديد عملية العدسات باستخدام عدة فحص حلقات نيوتن وقطر العدسة بعد عملية التمركز والحواف بعدة أدوات. توصلنا في دراستنا إلى إيجاد الحلول المناسبة لمعظم العدسات منخفضة الدرجة المتوفرة في الأسواق المحلية، بما في ذلك العلاج الطبيعي للمرضى (التمارين الفزيائية)، وأستخدمها لحل مشكلة المصابين بالحول وغيرها. يتم علاج معظم المرضى بنسبة (56٪) للمرضى ضمن تمارين الفزيائية حيث ان أكثر المشاكل شيوعا التي تحدث في العدسات (0.25 و0.5) درجة وبنسبة 64٪ من اجمالي عدد العدسات قيد الدراسة.

***الكلمات الافتتاحية:*** *اللامركزية، العدسات منخفضة الطاقة، حلقات نيوتن، وطرق العلاج.*



P-ISSN: 2664-0562

E-ISSN:2664-0554

## Introduction

When the lens is slightly rotated about a vertical axis while being viewed through from a distance, the bitmap does not move [1]. That is, the horizontal rays pass through the visual center, which is the location inside the eye where the rays converge on the retina [2]. Each ray travelling through the optical center (OC) will be parallel to both its incident and originating sections because it is situated on the lens' axis [3]. In order to attain high degrees of surface smoothness (14), as shown in the fig. (1) from DIN-3140, the radius of curvature (R) is smoothed(Polished) [4] during the spherical lens smoothing process using very soft materials (powders), which also facilitates centering later on [4].

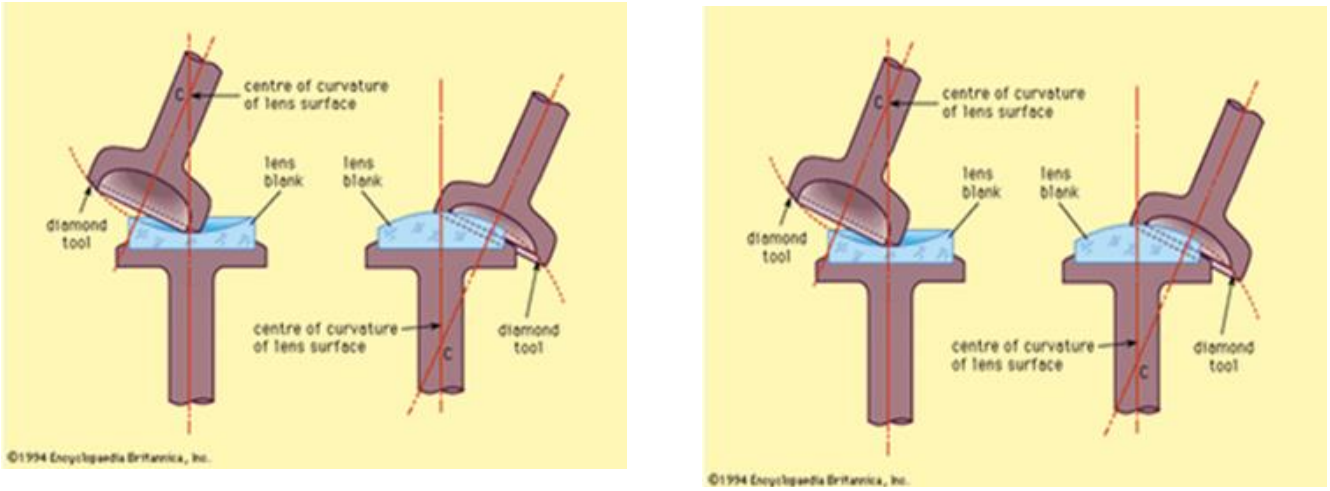


**Fig.(1):** smoothing spherical lenses.

**Fig.(2):** Test the curvature of the lens.

Prior to starting the centering procedure, the polished spherical surfaces (Roughness) are first examined using a Newton rings interferometer (N) for accuracy and smoothness of the entire surface (R) (see Fig. 2), as well as for optical surface flaws like cleanliness, scratches, points, and pits, among



P-ISSN: 2664-0562
E-ISSN:2664-0554

other things, using the Master test glass [5]. Each lens has a mechanical axis that is defined by the edges of the lens before it is placed on the centering machine and an optical axis that is determined by the center of the curves on each surface of the lens (When putting the lens on the centering machine, the outer edges of the lens define a mechanical axis).as shown in Fig. 3. The goal of the operation is to bring the optical axis and mechanical axis into alignment at a location known as the optical center by Measuring Gauges [6].

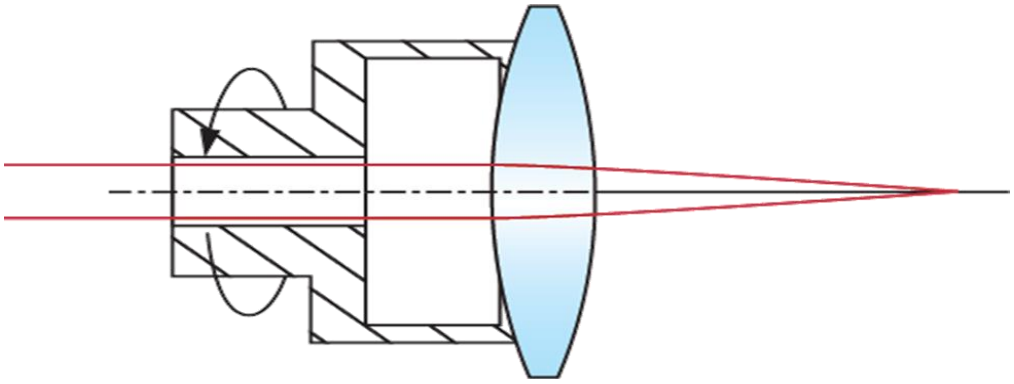

**Fig. (3):** Install the lens on the centering machine.

The optical is sent back for smoothing if it doesn't satisfy the necessary requirements. As a result, there is a chance to control it when centering the lens, however doing so is challenging and depends on the operator's level of expertise. This technique is manual [7], but there are more recent techniques that obtain the optical or lens center by using CNC machines. About the justifications due to Decentralization in lenses [7, 8] for carrying out the lens centering operation (the optical center of the lenses), the justifications for making the lens circular, or the advantage of centering the lenses, they are as follows:

1 - Aligning the patient's eye's axis with the lens's axis at the middle of the lens to correct the eye's refractive errors, or optical defects, after the light hits the retina.

2-In terms of sizes, distances, and equal radii(R) of balls from all directions, it is compatible with all styles of eyeglass frames used in patient treatment.

3- Eliminating all optical flaws, such as spherical aberration, etc.

what lenses do center and edging apply?

In order to conveniently align the axis of the lens within the glasses with the axis of the eye and enable the picture to be transferred at a place that is clear on the retina, focusing is necessary for all types of lenses (glass or plastic) [9]. Moreover, focusing is required for the lens' edge to ensure



P-ISSN: 2664-0562
E-ISSN:2664-0554

that the work is flawless and distinct. The extent will depend on what it achieves. For instance, Prisma lenses are unique from other kinds of lenses in terms of the quantity of edges, the Roughness of smoothness (8) and other elements [10].

**Material and Methods**

The lens is polished using two different stages: a medium polish and then a fine polish ( 14). While the lens is being brought to its ultimate radius, the smoky appearance vanishes and it turns transparent (R). The technician will be informed when the surface is within tolerance using a master test plate or an interferometer. Next the lens is cleaned and prepared for the centering process that follows. The optical axis will be in the center of the lens and the physical diameter of the optical system will be reduced as a result of this procedure.

Using a chuck to install the lens, a technician then shines a laser beam through it. Therefore, the focus point of the beam also rotates with the lens. The degree of rotation of this focused point of light is measured in in-arc minutes. Once the rotation of the focal point is within tolerance, the technician will adjust the lens. The revolving lens element is then ground using a spinning, diamond-impregnated grinding wheel to the necessary mechanical diameter once the lens has been properly aligned. A deviation in the center of the lens may happen during this procedure due to inexperienced personnel or a change in the lenses' R with a change in the smoothing aid. A deviation in the center of the lens may occur during this process. For lenses, this is especially true. Low strength at (0.25 ,0.50 ,0.75 and 1.0 D) and in different kinds of glass, polycarbonic or plastic lenses (CR-39), the amount of departure is expected to be more than (C= 2 mm) from the center of the genuine lens, and the amount of disparity (tolerances) is t=50up to 250um. After obtaining a high smoothness of its value following the spherical smoothing process, the lens is preserved with the shell's material after having the spherical surfaces (the radii of the curvature of the lens, R) examined using the interference kit (examination of Newton's rings -N) and the examination kit to determine the optical defects on the surface. The pieces are sent to the centering stage for spherical surfaces subject to outside influences to obtain the optical axis or optical center (OC), with the requirement that the optical axis line up with the mechanical axis (MC) of the apparatus so that the images are centered on the target at one point as shown in Figure 4.



P-ISSN: 2664-0562
E-ISSN:2664-0554

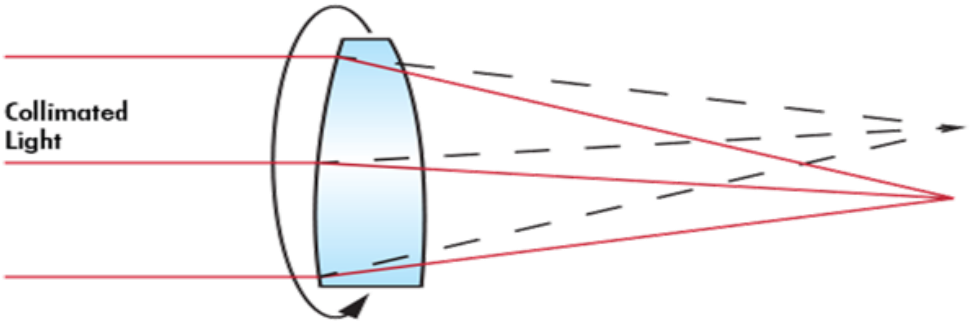


**Fig. (4):** Decentering of Collimated Light.

The lens must be properly cleaned of preservatives before being attached to the centering device with wax, as depicted in Figure 1. The outer diameter of the lens is honed to the appropriate smoothness and quantity proportional to the diameter using abrasive stones (necessary size). We check the lens before removing it. Using a mechanical vernier (Vernier Caliper) show in Fig (6). it is important to determine the machines outside diameter, which can range from 65 to 70 mm depending on the request. Before fully cleaning the equipment, we must also make sure that the mechanical and optical axes are aligned. spherical aberration is one type of aberration. It can bean see that the patient is uncomfortable when wearing the corrective glasses for their refractive flaws in the eye, but the image is not clear, as evidenced by optical defects such as aberration, the most prominent of which is (spherical aberration), or the onset of headaches periodically., which results in a reluctance to wear therapeutic glasses from the patient.

It is necessary to carry out the process of breaking the hollow of the lens from the inside and outside of the lens according to the standard measurements, the size of which is (0.5 mm X 45 $^{0}$ X 2), and with a smooth amount (8), to avoid issues with transportation and ease of installing the lens in the frame as well as other issues to determine its validity and examine the lenses well in quality control in terms of specifications required, including the circular diameter of the lens.

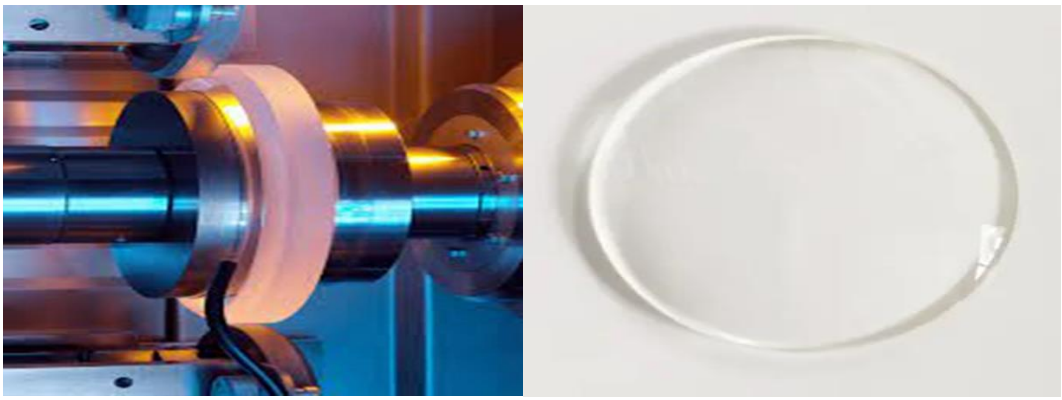

**Fig. ( 5 ):** machines outside diameter befter and after centering



P-ISSN: 2664-0562
E-ISSN:2664-0554

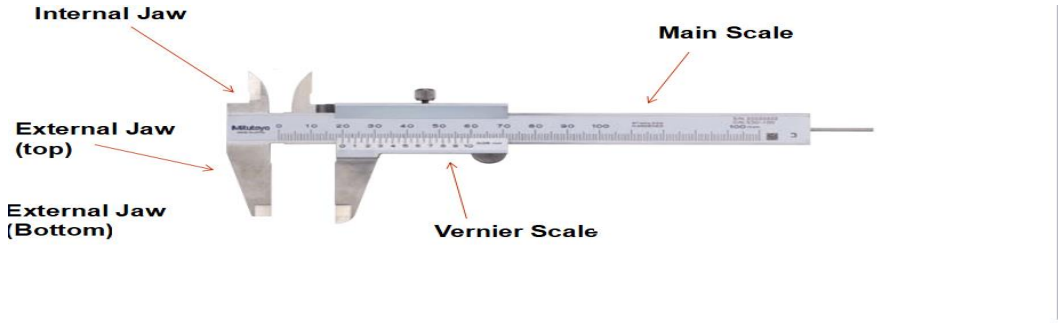


**Fig: (6):** Basic Instrument of measurement( Vernier Caliper).

**Result and Discussion**

A total of 50 patients who were visual techniques teaching clinic at the College of Health and Medical Technologies-Bagdad, the prescription was determined for each patient, and patients who needed low-grade glasses were selected as a table(!): The relation between age(years) & gender.

| Items (years). | Male | Female | Total= % |
|---|---|---|---|
| **20-21** | 10 | 06 | 16=32% |
| **22-23** | 12 | 16 | 28=56% |
| **24-25** | 02 | 04 | 06=12% |
| **Total** | 24 | 26 | 50=100% |

The number of males under study was 48%, while females = 52% ,The highest number of patients within ages (20-23) years= 88%. The patients' desire was to find appropriate solutions without changing the lenses.

The relationship represents the distribution of low energy scores with the ages of the patients show in a table 2.

**Table (2):** The relation between age (years) & Low Power lenses (D).

| Items (years). | 0.25D | 0.50D | 0.75D | 1.0D |
|---|---|---|---|---|
| **20-21** | 8 | 6 | 3 | 1 |
| **22-23** | 8 | 10 | 6 | 2 |
| **24-25** | 3 | 2 | 1 | - |
| **Total** | 19 | 18 | 10 | 3 |

The most common problems that occur in lenses (0.25 and 0.5D), with a rate of 64%=37 patients of the total number of lenses under study. Patients treated according to the type of treatment show in a table3.



P-ISSN: 2664-0562
E-ISSN:2664-0554

**Table (3):** The relation between ages and improved patients for each low power lenses.

| Items years | 0.25D After Treatments | 0.5 D After Treatments. | 0.75D After Treatments. | 1.0 D After Treatments |
|---|---|---|---|---|
| **20-25** | 9Patients | 6 Patients | 6 Patients | 7 Patients |

The number of patients who responded to treatment are 28 patients, as is (5) patients with eyes adjustment (Accommodation), 16 (32%) patients for physical therapy, and 7(14%) patients to change the size of the frame, according to each modality below. table No. 4.

**Table (4):** The relationship of ages with treatment of patients for each modality.

| Items (years) | Accommodation | physical therapy | Change Frames |
|---|---|---|---|
| **20-25** | 5 Patients | 16 Patients | 7Patients |

Most of the patients used plastic frames of different sizes and colors after the treatment and they chose the appropriate frames for them. The lenses were examined using a manual or automatic lensometer measuring device after confirming the center of the lens and before installing it in the frame

**Fig (7):** Method for measuring lens power.



P-ISSN: 2664-0562
E-ISSN:2664-0554

**Conclusion**

As for the treatment for such cases in our daily life, it is the possibility of:

1-Accumulation the eye to this degree by wearing the glasses for three minutes for the first time only and then taking them off for a period of 3-4 times, in order to adapt the eye to this degree before wearing them continuously, that is, the eye adapts to the glasses after a period of 3 Minutes without a headache for the patient.

2-Choose appropriate frames (the frame in which the height of the lens is low) (B-dimensions less than 22mm}, especially for children, or use them in reading glasses for adults, or use them for special cases.

3- It can be used in the treatment of strabismus in children, if the deviation in the center of the lens in any direction does not exceed 4 mm.

4-Perf (or physical therapy to stimulate the eye muscles and get rid of the eyeglasses, or not use them at all at work. Otherwise, the patient will have a headache for a long time or refrain from wearing glasses.



P-ISSN: 2664-0562
E-ISSN:2664-0554

**References**


1. Mundher Seeman Shuker, AH Al-Hamdani, MS Mahdi Electro-Optic Designing and Construction to test the Tilting and the Decentering, University of Thi-Qar Journal 14 (2), 62-71.

2. Mundher Seeman Shuker New Treatment for Regular Astigmatism Using Physical Exercises. Medico-legal Update 21 (1).

3. Katie Schwertz, An Introduction to the Optics Manufacturing Process, Opt Mechanics (OPTI 521) ,2008.

4. Smith, Warren J. Modern Optical Engineering: The Design of Optical Systems. New, York: McGraw-Hill Professional, 2007.

5. C.S. Liu, Y.J. Ou. Grinding Wheel Loading Evaluation by Using Acoustic Emission Signals and Digital Image, Processing. Sensors 20(15):4092. (2020).

6. Frédéric Lamontagne, Maxime Savard, Nichola Desnoyers, and Mathieu Tremblay "High accuracy lens centering using edge contact mounting," Optical Engineering 60(5), 051212, (2021).

7. Mundher Seeman Shuker, New Treatment for Regular Astigmatism Using Physical Exercises, Medico-legal Update, 2021.

8. Bentley, Julie. “Optical Prints and Tolerancing”. Presented at an Optics 444 Lecture at the University of Rochester (2008).

9. H Shareef, Mundher Sameen Shuker, S Jaffar, the Impact of Eye Exercises on High Myopia and Visual Acuity in Patients Aged (15-30) Years, Journal of Physics, 2020/11/1.

10. Shu Kie, How Are Eyeglass Lens’ Edges Polished, 13 March 2023. https://link.springer.com




P-ISSN: 2664-0562

E-ISSN:2664-0554