SURVEY ON PROBLEMS ASSOCIATED WITH THE USE OF PROGRESSIVE ADDITION LENSES (PAL)

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ABSTRACT
Progressive addition lenses (PAL) are meant to provide clear and comfortable vision to wearer at every given distance. But it is increasingly becoming common to hear PAL wearers expressing one form of misgiving or the other over their effectiveness. This Lagos based study of 106 PAL wearers revealed that most of the problems associated with the use of PAL have to do with precision in mounting lenses to specification using appropriate data: Interpupillary Distance (IPD); Segment Height (SH); Optic Centre of Lenses (OC); Geometric Centre of Frame (Mid-Datum Depth). 15 subjects (14.2% of study population) have discomfort with use of PAL due to wrong placement of segment height, while 8 subjects (7.5%) have difficulty using PAL due to inaccurate application of IPD resulting in decentration with concomitant prismatic effect. Statistical analysis of data using Chi Square revealed that the various complaints about use of PAL had no relationship with age of wearer. This study underscored urgent need for the establishment of formal training school for practicing dispending opticians in Nigeria.

KEYWORDS: Dispensing optician, Progressive addition lenses, Optic Centre of lenses, Mid-Datum Depth.

INTRODUCTION

A progressive addition lens (PAL) is one designed to give a continuous clear and comfortable vision at every given distance (whether far or near)[1]. It is able to achieve this by a gradual change in plus power in steps of about 0.12dioptre in the progressive zone[2.] Thus as the eyes rotate from the distant portion (DP) through the near portion (NP), the wearer does not experience image jump (usually associated with bifocal or trifocal lenses) due to the seamless transition in power.

The basic design of a PAL is illustrated in figure I where the lens is divided into three parts; the DP represents the part of the lens which carries the distant prescription; followed by the progression Zone (PZ) which measures between 12mm-25mm in length; and the NP which carries the effective reading prescription[3]. By its design the DP and the NP have wider field of vision than the progression zone, which is sometimes described as the ñcorridor of the lensò (Fig 1b). It measures approximately 4mm wide[4]. And lateral to this corridor (on both sides) are areas of indistinct vision occasioned by surface astigmatism and prismatic effect. Thus when the eyes of the wearer rotates laterally beyond the Zone of distinct vision, he experiences a ñdizzyò or swimming effectò where objects appear to rock slightly before coming into the area of distinct vision[5].

To avoid this nauseating experience, it is very important to ensure accurate measurement of the Inter-pupillary Distance (IPD) together with the corresponding measurement of each eye wires (lateral and vertical) of the spectacle frame on the face of the wearer. This would ensure proper centration of lenses on the frame so that the visual axis of the wearer would coincide with the pupillary aperture (or optical centre) of the PAL.

This is because the smallest amount of ocular asymmetry would be sufficient to disposition the central zones unfavourably[6.] In such situation, the wearer's visual axis would fail to coincide with the zones of distinct vision of the lens. This would in turn precipitate discomfort occasioned by induced astigmatism and/or prismatic effect. Such errors in the mounting of the lenses may create serious adaptation problem that may permanently disenchant the wearer from the use of PAL.

MATERIALS AND METHODS

The data for this study were collected from 5 clinics spread in different locations in Lagos. The choice of Lagos was based on its cosmopolitan nature with its very high population density. Lagos as a mega-city, is highly industrialized with a very high concentration of persons in the upper/middle social strata who can easily afford the cost of PAL.

In all, a total of 186 case notes of PAL wearers were screened. Out of these, only 106 PAL wearers (aged between 37-66 years) were accessible for the study from their addresses. This enabled the researchers administer the questionnaires directly and have first-hand information about their individual impression on the use of Pal.

Some of the areas investigated in the study include proper application of the following:

i. Interpupillary distance (IPD)
ii. Size of frame (normal size, under or over sized).
iii. Segment height (vertical and horizontal).
iv. Geometric centre (GC) of frame (marked @ Datum centre).
v. Centration of lenses.

RESULTS

Analysis of the data obtained in this research showed that 69.8% of patients interviewed were found to have comfortable fit with their PAL while 30.2% of the people had uncomfortable fit. Younger patients achieved comfortable fit more than older patients (fig. 1)

On the cause of discomfort amongst PAL wearers, segment height was found to be the most causative factor (46.9%), followed by decentration (25%) and adaptation (18.8%). Inaccurate prescription was found to be the least causative factor (9.4%) of discomfort amongst Pal wearers.

Test of significance showed that the complaints are independent of each other, in other words one complaint do not lead to the other. Moreover, the various complaints about use of PAL had no relationship with age of wearers.

DISCUSSION

The results revealed that of the total of 106 subjects that were fitted with PAL, 30.2% (32 subjects) had one form of discomfort or the other. Their complaints include: in appropriate segment heights positioning; poor application of interpupillay distance (IPD); decentration and poor adaptation techniques (fig 2).

On the other hand, data in fig. 3 revealed that the main source of discomfort in PAL is the inappropriate positioning of the segment height, which constitute 46.9% of total complaints. High segment heights resulted in obstruction of distant vision, while low segment heights produced indistinct vision at near work.

Another major source of discomfort is inaccurate centration of lenses, which constituted 25% of complaints. In these cases the pupillary aperture of the PAL did not coincide with the user's line of sight. This may have resulted from inaccurate measurement of IPD or Improper application of data. The consequent decentration of the lenses produced induced prism with its concomitant discomfort. The source of discomfort is the extra demand on fusional reserves.

All the PAL users having adaptation problems constituted 18.8% of total complaints. This represents the number of PAL wearers who could not get used to their narrow fields of vision as opposed to wider field found in bifocal lenses.

The data showed that most of the problems associated with the use of PAL emanated from poor application of appropriate data (IPD, segment Height, etc) by the ophthalmic laboratory technicians. This may not be too surprising given a situation whereby the majority of dispensing opticians manning the ophthalmic labs lack formal training having learnt their trade through apprenticeship.

This underscores the urgent need for the establishment of a formal training programme for dispensing opticians in Nigeria. Such a programme would not only enable them have better understanding of their jobs, but would also sharpen their skills and efficiency in the application of specific data.

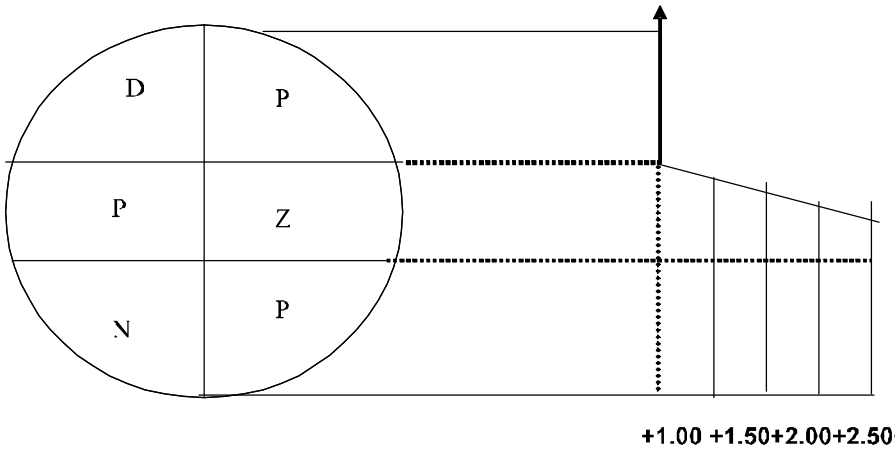
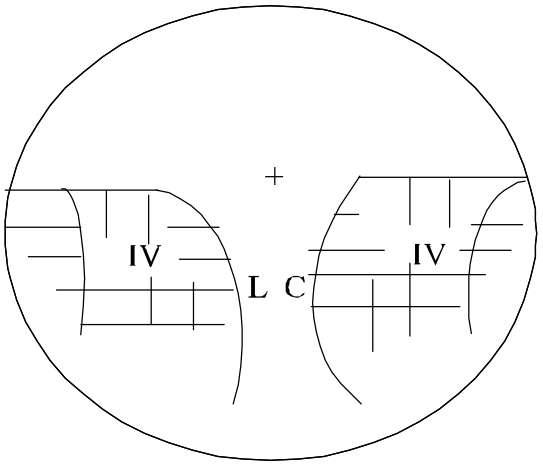


FIG1$_{(a)}$: ILLUSTRATES VARIATION IN POWER FROM THE DISTANT PORTION (DP) THROUGH PROGRESSION ZONE (PZ) TO THE NEAR PORTION (NP) IN A + 1.00DS ADD 2.00 PAL



Key

+ = Pupillary Aperture of PAL

LC = Lens corridor (PZ)

IV = Indistinct vision

FIG 1(b): HIGHLIGHT ZONES OF INDISTINCT VISION (IV).

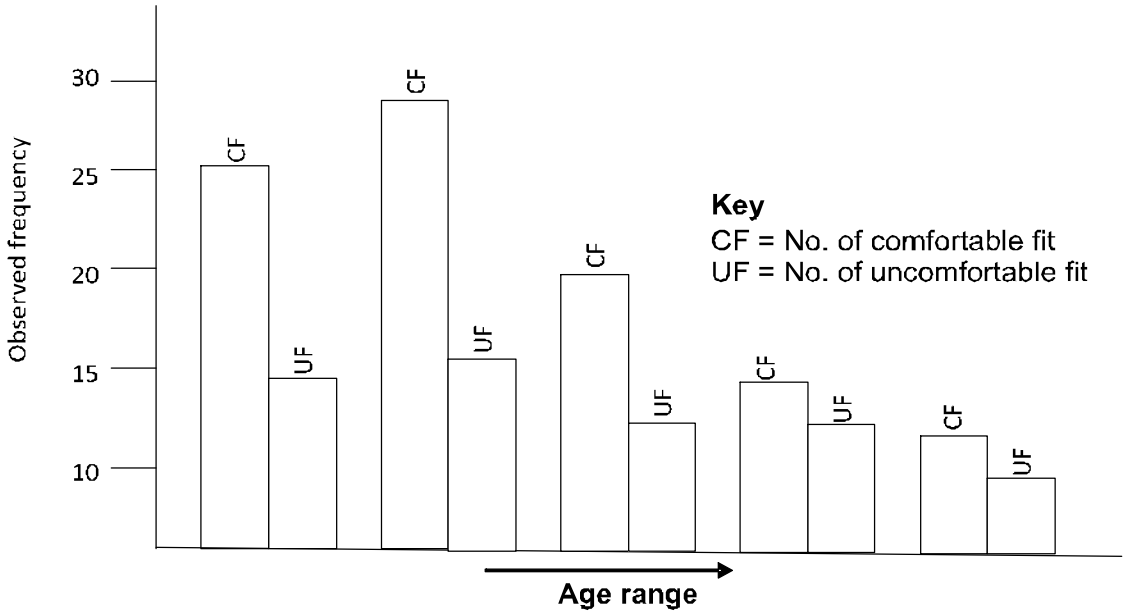


FIG 2: HISTOGRAM ON FREQUENCY DISTRIBUTION OF THE LEVEL OF COMFORT/DISCOMFORT

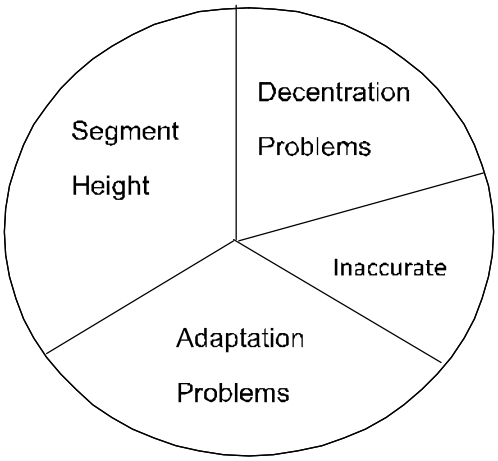


FIG 3: PIE CHART ON FREQUENCY DISTRIBUTION AMONGST PAL USERS

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ACKNOWLEDGEMENT

We express our gratitude to Dr. M.O. Ogwu for his assistance in the collection of data.