

THE FAR NASAL PART OF THE VISUAL FIELD – PART I

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SUMMARY

Aims: The aim of the study was to determine the limits of the far nasal part of the visual field.

Material and Methods: Visual field examination was performed in 15 healthy subjects (30 eyes), specifically nine women aged 20–43 years and six men aged 22–35 years. All eyes were found to have physiological ocular findings and visual acuity of 1.0 with correction less than or equal to 3 diopters. The visual field was examined with a Medmont M700 instrument by shifting the fixation point 40 degrees temporally and simultaneously turning the head nasally, with a spatial accommodation program. A total of 89 examination points were included using flicker stimuli.

Results: The far nasal limit of the visual field reached 100° in 13.3% of eyes, 105° in 20% of eyes and up to 110° in 66.7% of eyes.

Conclusion: The limit of the far nasal part of the field of vision reached 100–110 degrees (when nose shielding was eliminated).

Keywords: visual field, nasal range of visual field, perimetry, enhanced perimetry

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INTRODUCTION

In 1825, Jan Evangelista Purkyně emphasized that visual acuity in the visual field becomes increasingly less sharp in the direction towards the periphery. The peripheral parts of the retina serve mainly for orientational vision. We can determine this for example during walking, when we perceive a certain obstacle, a stone on the path, the edge of the pavement etc. with the peripheral part of the retina. Such an object is not in sharp focus, but as soon as the message from the retina reaches the cortical visual sphere, the eye reflexively turns in that direction and fixes upon the object with the central landscape [1]. Purkyně also described the limits of the visual field, specifically temporally 100 degrees, inferiorly 80 degrees, superiorly 60 degrees and the same also nasally [2]. Of the current Czech ophthalmology textbooks, mention of the

range of the visual field appears only in Heissigerová et al. The visual field is the part of the space which a person perceives when fixing sight on a single point. Temporally the field has a range of 95 degrees, nasally 65, superiorly 60 and inferiorly 70 [3]. According to Pöppel and Harvey, the nasal limits of the visual field are 50 to 60 degrees, temporal up to 90 degrees [4]. Spector et al. describe peripheral vision reaching up to 100 degrees temporally and 60 degrees nasally, superiorly and inferiorly [5]. Similarly Heijl et al. and Racette et al. state the range of the visual field at more than 90 degrees temporally, 70 degrees inferiorly and 60 degrees nasally and superiorly [6–8].

Due to the inconsistency in the values of the temporal limits of the visual field, in the previous study we conducted a verification of its values with the aid of a subjective evaluation, and we then validated this result by means of a theoretical calculation. In healthy individuals we deter-

mined temporal limits of the visual field of 110 degrees [9]. We were also interested in the situation regarding the far nasal part of the visual field, which is practically unused. Even if this part appears to be “superfluous” from a medical perspective, in our view it is diagnostically very important. The reason for this assertion is also the representation of nerve structures, which are less abundantly represented in the temporal part of the retina than in the nasal part of the retina, both on the level of the photoreceptors [10–12] and the ganglion cells of the retina [13].

This difference may be significant from a clinical perspective. For this reason, our aim in this study was also to determine the limits of the far nasal part of the visual field, i.e. exceeding 50–60 degrees. We attempted to achieve

this by shifting the fixation point temporally, with simultaneous turning of the head to the other side. We did not find any similar study in the available literature.

MATERIAL AND METHODS

The cohort comprised 15 healthy subjects, specifically nine women aged 20–43 years (mean age 27.6 years) and six men aged 22–35 years (mean age 30 years). A physiological ocular finding was determined in all eyes, including pupillary reaction and visual acuity of 1.0 with correction less than or equal to 3 diopters. Because it was not possible to evaluate the accuracy of fixation, the entire cohort was composed of healthcare employees (doctors and nurses) at the JL Eye Clinic in Prague. All were familiarized with the examination by means of this technology and had repeatedly undertaken a control examination, as a result of which we were able to exclude artificial findings, including incorrect fixation. The examination was conducted under natural conditions, without artificial mydriasis.

We conducted the examination of the visual field on the instrument Medmont M700 (Medmont Pty Ltd, Australia) by means of a threshold strategy of the test, in which it was possible to supplement the nasal part of the visual field with further examination points up to a total number of 89 (spatially adaptive test). Each point was tested 2.5 times on average. Exposures to stimuli were realized by means of the flicker method (6–18 Hz), and according to the patient’s algorithm of adaptive reaction speed without false positive or negative stimuli. The fixation point was shifted 40 degrees temporally, and the

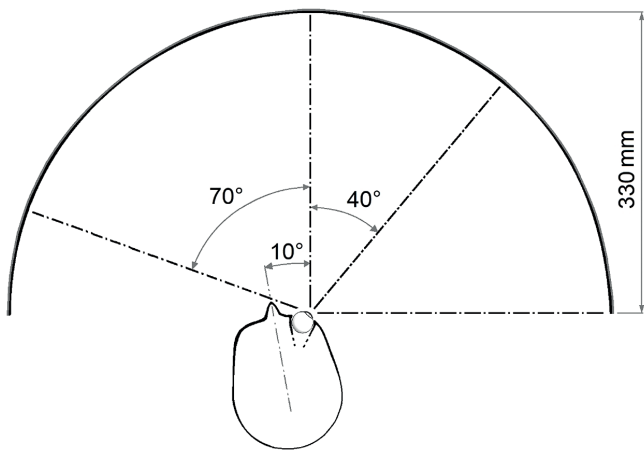


Figure 1. Head position and eye rotation 40 degrees temporal

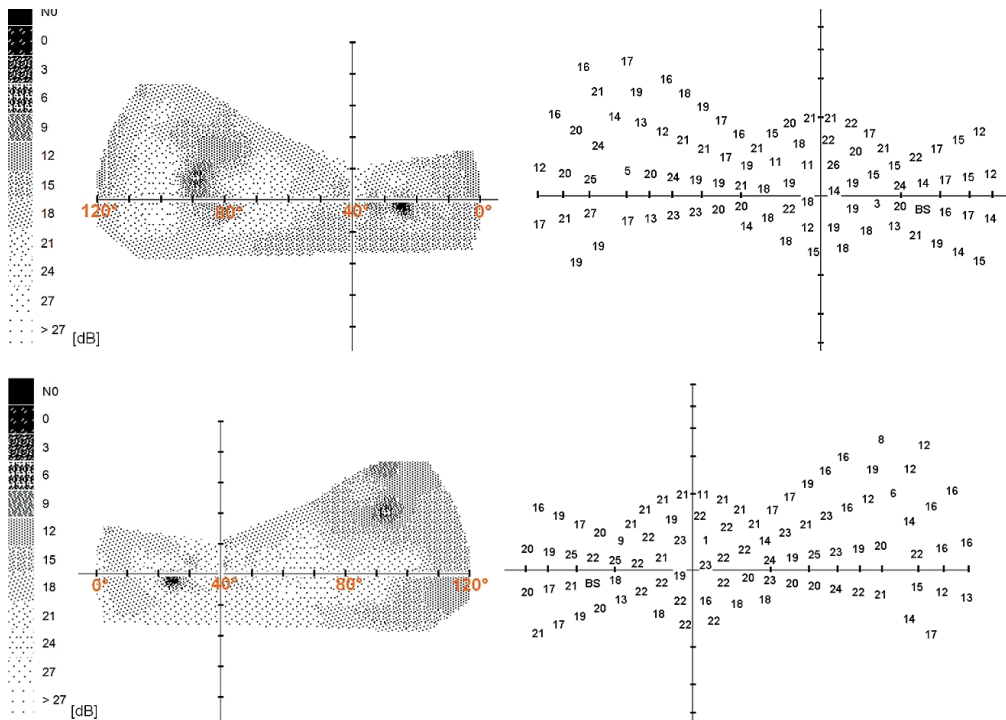


Figure 2. The range of the nasal part of the visual field and the distribution of the examined points. Top – right eye, bottom – left eye

ding to objects with a low spatial frequency and high contrast sensitivity, responding to moving stimuli, not responding to colored stimuli [14]. The magnocellular ganglion cells therefore react to contrast, structure and movement in the receptive field. From this it is possible to assume their greater sensitivity in perimetric examination, in which the stimuli used are movement [15], contrast in combination with movement [16–19] and rapidly flashing light stimuli [19–21].

Unfortunately, these technologies are not used in regular practice for examining the visual field. In our case we used flashing light stimuli. Before any applicable introduction of this method into practice, it shall be necessary to resolve control of fixation upon the shift of the fixation point, and also to resolve the

most suitable type of stimulation. Although we used flicker stimuli in this study, it is possible that more appropriate stimuli will be determined. It shall also naturally be necessary to verify the distal part of the visual field in a large cohort of healthy individuals. These are the limitations of our study.

An application for this method was submitted to the Office for Patents and Inventions under number: PV 2023-150.

CONCLUSION

A range of the distal nasal limits of the visual field (following adjustment of the position of the fixation point) in healthy individuals of 100 to 110 on a horizontal plane.

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