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UNCORRECTED NEAR VISUAL ACUITY AFTER MONOFOCAL INTRAOCULAR LENS IMPLANTATION

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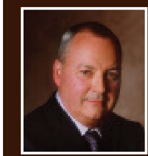

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SUMMARY

Aim of the study was to evaluate retrospectively selected parameters, which influence the postoperative near visual acuity in a group of pseudophakic eyes of patients with Uncorrected Distance Visual Acuity (UDVA) and according to acquired results establish those, which mostly influenced good Uncorrected Near Visual Acuity (UNVA) after the implantation of monofocal IntraOcular Lens (IOL). Altogether, 122 pseudophakic eyes of 65patients were followed up, out of them in 57 patients both eyes were operated on. The frequency of visual acuity for three groups of operated eyes categorized according to the crucial parameter – eye's axial length (short, average, long) was evaluated. In each of groups, the average parameters (age, axial length, keratometry, and depth of the anterior chamber) were established, as well as relative frequency of postoperative uncorrected near visual acuity on conventionally used reading tables. The near visual acuity assessment for each eye separately was preformed in its horizontal position using the Zeiss table. The study did not confirm positive correlation of postoperative near visual acuity on the age of the patient, depth of the anterior chamber, nor the implanted IOL type. It was confirmed the presumption of optimal near visual acuity for eyes with axial length shorter than 23.5 mm, and in the process, between both parameters slightly negative correlation was found. On the other hand, middle positive correlation between uncorrected near visual acuity and central corneal power (in dioptres) in eyes with the axial length 22.5 – 23.5 mm was found.

The study confirmed, that higher values of the central corneal power (in dioptres) and the high borderline value of the axial length up to 23.5 mm are the condition for optimal postoperative uncorrected near visual acuity after the implantation of monofocal intraocular lens.

Key words: Uncorrected Near Visual Acuity (UNVA), monofocal intraocular lens, pseudoaccommodation

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INTRODUCTION

With regard to the development of models of higher generations, it is possible to calculate reliably the appropriate optical power of an intraocular lens (IOL) in order to attain postoperative distance emmetropia. Visual acuity remains the core criterion for the success of a surgical procedure, and the requirement for comfortable distance and near vision without further correction by eyeglasses has culminated in the development of multifocal and accommodative IOLs. An obstacle in the case of these models is the high financial cost and in many patients observed asthenopic complaints caused by higher order aberrations (9, 8). In some patients with pseudophakia, not only very good uncorrected distance visual acuity (UDVA), but also uncorrected near visual acuity (UNVA) was determined following the implantation of a monofocal IOL. Theoretically it is possible to presume a significant role of pseudo-accommodation amplitude and the capacity for axial shift of the IOL in these eyes. Among the factors with an influence on postoperative near vision are age, astigmatism, pupil size, axial length of eye, axial shift of IOL, central optical corneal power and aberration (2).

The aim of the study was to evaluate retrospectively selected parameters influencing postoperative near vision in a cohort of pseudophakic eyes of patients with UDVA, and on the basis of the obtained results to determine those parameters which most influenced good UNVA following the implantation of a monofocal IOL.

METHOD AND COHORT

The study included patients operated on for cataract with implantation of a monofocal IOL. The operation was performed by a single surgeon (ŠP) using an identical technique (phakoemulsification by entry incision of 2.2 mm with prediction of induced astigmatism 0.50 D), the evaluation period was within the range of 4 to 130 months after surgery. UDVA in the operated eyes attained a minimum value of 0.8. The SRK/T formula was used for calculation of the optical power of the IOL for emmetropia. In total 122 operated eyes of 65 patients were observed, in which both eyes were operated on in 57 patients.

The observed preoperative parameters covered average corneal keratometry (K) (autokeratometer NIDEK KM 500) and axial length of the eye (AL) (OA 1000 – Tomey). The evaluated postoperative parameters covered central optical corneal power (KC) (Anterior Segment Analyser Orbscan II – Technolas), depth of anterior chamber (AC) (OcuScan – Alcon), age of patient (AGE), uncorrected near visual acuity (UNVA) and with correction by the given optical power (nCORR). In order to determine the values of distance vision, ETDRS optotypes were used for each eye separately. Examination of near vision was performed for each eye separately in its horizontal position with the aid of a Zeiss table. The obtained results in the above-stated preoperative and postoperative parameters were evaluated in order to determine their influence on UNVA following the implantation of a monofocal IOL.

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RESULTS

All the initial data is presented in table 1. With regard to the nature of the data, its statistical interpretation was implemented by means of relative frequency and the correlation coefficient between the individual parameters. The most significant factor in optimal postoperative UNVA was axial length of the eye. For the purposes of the study, the given cohort was categorised into three groups. Eyes with an axial length shorter than 22.5 mm were classified into the group designated as (potentially) hypermetropic, the category of average length was represented by values within the range of 22.5 to 23.5 mm, and we categorised axial lengths greater than 23.5 mm as the (potentially) myopic group. The group with average axial length (52 eyes) was the most widely represented, followed by the group with short length (38 eyes) and the least represented was the group of myopic eyes (32 eyes).

The average values of the observed parameters were stipulated for the entire cohort and the individual categories, including standard deviations (table 2). The average age of the cohort of 122 eyes in a total of 65 patients was determined at 69.98 ± 7.64 years. The average age of all three groups was practically identical. According to expectation, the average values of keratometry according to the individual groups were indirectly proportional to axial length, and average depth of the anterior chamber increased together with the axial length of the eye.

The most frequently implanted IOL model was SN60AT (in 71 eyes = 58.2%), followed by MA50BM (20 eyes = 23.8%), SN60WF (16 eyes = 13.1%) and a toric IOL of the SN6ATx range was implanted in only 6 eyes (4.9%) (table 3). No dependency was found between the individual models and UNVA. Nevertheless, in all eyes with UNVA of 0.8 and better, an IOL of the SA60AT model was always implanted.

With regard to the method and selection of patients for the study, a relative frequency of UDVA values equal to 1.0 and better was determined in 97.54% of eyes, in which a value of 0.8 was determined in the remaining 2.46%. The relative frequency of postoperative UNVA in the entire cohort virtually corresponded to an even distribution (graph 1). In total 70.49% of eyes in the cohort attained satisfactory values of UNVA (0.5 and better), in 30.33% of eyes the value of vision was higher (0.6 and better), in 9.84% the UNVA value was 0.8 and better, and in 16.39% of eyes UNVA reached 1.0 (table 4). According to graph 2, the groups with short and average axial length form the most numerous section of the cohort, in which better than average (0.5) near visual acuity

Table 1 Initial data of observed cohort of operated eyes

SEX/YoB	K [D]	KC [D]	AL [mm]	AC [mm]	IOL [D]	UDVA	UNVA	nCORR [D]
F/1938	44,50	44,50	22,80	3,28	22,0 SN6AT	1,00	0,50	2,00
	44,50	42,50	22,56	3,27	23,0 SN6AT	1,00	0,50	2,00
F/1946	44,00	45,90	23,60	4,10	21,5 SN60WF	1,50	0,60	1,00
	45,25	45,12	22,92	4,00	21,5 SN60WF	1,50	0,60	1,00
F/1947	44,50	45,61	22,32	3,80	23,5 SN60WF	1,00	0,50	2,00
	45,50	45,64	22,16	3,80	24,0 SN60WF	1,00	0,60	2,00
F/1953	43,25	42,72	22,46	3,70	24,0 SA60AT	1,00	0,50	2,00
	43,25	43,94	22,38	3,70	24,5 SA60AT	1,00	0,50	2,00
M/1936	43,75	44,10	22,94	3,60	22,0 MA50BM	0,80	0,40	2,50
	44,25	45,60	22,95	3,70	22,0 MA50BM	0,80	0,40	2,50
F/1940	43,25	44,00	22,22	4,20	25,0 SN60WF	1,20	0,30	2,25
	43,00	44,27	22,42	3,60	24,5 SN60WF	1,20	0,30	2,25
M/1968	41,00	42,15	21,46	3,40	30,5 SA60AT	1,00	0,80	1,00
F/1945	45,25	45,57	21,81	4,10	24,5 SA60AT	1,00	0,80	1,00
	44,75	44,67	21,80	4,10	25,0 SA60AT	1,00	0,80	1,00
M/1956	43,75	45,15	22,81	3,90	22,5 SA60AT	1,50	0,60	1,00
	44,00	44,36	22,81	3,80	22,0 SA60AT	1,50	0,60	1,00
F/1943	45,75	45,93	22,20	3,80	22,5 SA60AT	1,20	0,50	2,00
	45,75	46,26	22,28	3,80	22,0 SA60AT	1,20	0,50	2,00
F/1947	45,50	46,56	22,73	4,20	21,0 SA60AT	1,00	0,60	1,00
	45,75	47,18	22,87	4,20	20,0 SA60AT	1,00	0,60	1,00
M/1935	43,50	43,73	22,96	2,20	22,0 SA60AT	1,00	0,50	2,00
	43,75	45,96	22,99	4,00	22,0 SA60AT	1,00	0,50	2,00
F/1940	45,00	45,20	21,87	3,50	24,0 SA60AT	1,20	0,50	1,50
	45,00	45,58	21,96	3,50	24,0 SA60AT	1,20	0,50	1,50
F/1953	44,50	44,68	21,16	3,90	27,5 SA60AT	0,80	0,40	2,00
	44,75	43,77	21,28	3,90	26,5 SA60AT	1,00	0,80	1,00

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Continue with table 1 Initial data of observed cohort of operated eyes

f/1952	45,25	45,64	21,96	3,90	23,5 SA60AT	1,50	0,20	2,00
	45,00	45,81	21,95	3,80	24,0 SA60AT	1,50	0,20	2,00
F/1943	44,75	44,86	21,54	3,80	25,5 SA60AT	1,20	1,00	0,00
	45,00	47,16	21,80	3,80	27,0 SA60AT	1,20	1,00	0,00
F/1948	45,75	46,10	21,68	3,80	24,0 SA60AT	1,20	0,80	0,75
	45,50	46,10	21,64	3,80	24,5 SA60AT	1,20	0,80	0,75
F/1950	44,50	43,93	22,81	3,90	21,5 SA60AT	1,50	0,50	1,00
F/1947	43,00	42,81	22,87	4,30	22,0 SA60AT	1,20	0,50	1,50
F/1941	47,50	46,50	21,47	4,10	23,0 SA60AT	1,20	0,60	1,50
	47,50	46,50	21,43	4,10	23,0 SA60AT	1,20	0,60	1,50
F/1945	43,50	43,62	22,64	3,90	23,0 SA60AT	1,00	0,40	2,50
	43,75	42,15	22,85	3,90	22,0 SA60AT	1,00	0,40	2,50
F/1954	44,50	46,05	21,28	4,00	27,0 SA60AT	1,00	0,50	1,50
	45,50	46,06	21,12	4,00	26,5 SA60AT	1,00	0,50	1,50
F/1942	45,75	45,28	22,40	3,70	22,0 SA60AT	1,00	0,60	1,50
	45,75	45,94	22,35	3,60	22,0 SA60AT	1,00	0,60	1,50
M/1943	44,00	46,47	22,58	3,60	23,0 SA60AT	1,20	0,40	2,00
	46,00	46,35	22,14	3,60	22,0 SA60AT	1,20	0,40	2,00
F/1948	44,00	45,07	21,99	3,50	25,0 SA60AT	1,00	0,40	1,50
	44,25	45,00	21,95	3,50	24,5 SA60AT	1,00	0,40	1,50
F/1941	44,00	47,90	22,58	3,40	23,0 SA60AT	1,00	0,80	1,00
	43,75	46,48	22,66	3,80	23,0 SA60AT	1,00	0,80	1,00
F/1939	43,75	43,12	21,75	3,80	26,0 SA60AT	1,00	0,40	2,00
	44,00	42,00	21,75	3,80	25,5 SA60AT	1,00	0,40	2,00
M/1958	44,75	46,50	22,70	3,70	22,0 SA60AT	1,20	0,80	1,00
	44,75	45,14	22,80	3,80	21,5 SA60AT	1,20	0,80	1,00
F/1951	44,25	44,46	22,51	4,30	23,0 SA60AT	1,20	0,30	1,50
	44,25	44,45	22,47	4,20	23,0 SA60AT	1,20	0,30	1,50
F/1930	44,50	44,78	21,87	3,70	24,5 SA60AT	1,00	0,50	1,50
	44,50	44,84	22,13	3,50	24,5 SA60AT	1,00	0,50	1,50
F/1946	45,00	45,91	21,94	3,30	24,5 MA50BM	1,00	0,30	2,00
	45,00	45,70	21,99	3,50	24,5 MA50BM	1,00	0,30	2,00
M/1963	40,50	41,24	22,74	3,80	26,5 SN60WF	1,20	0,40	1,50
F/1934	43,50	45,19	22,96	3,70	22,5 SA60AT	1,00	0,50	2,50
	44,00	42,37	22,98	3,80	22,0 SA60AT	1,00	0,50	2,50
M/1952	41,00	41,50	24,13	3,80	21,5 SN60WF	1,20	0,20	1,50
	41,25	41,40	24,12	3,90	21,5 SN60WF	1,20	0,20	1,50
M/1957	42,00	42,74	24,75	4,20	18,5 SN60WF	1,50	0,50	1,50
	42,00	42,85	24,76	4,40	18,5 SN60WF	1,50	0,50	1,50
M/1940	43,00	43,19	23,85	3,70	20,5 MA50BM	1,20	0,60	1,50
	43,25	42,43	23,42	3,80	21,5 MA50BM	1,20	0,60	1,50
M/1942	45,00	45,96	23,69	4,20	18,5 MA50BM	1,20	0,50	2,00
	44,75	44,45	23,41	3,90	20,0 MA50BM	1,20	0,50	2,00
F/1942	44,50	44,84	24,46	3,90	17,0 MA50BM	1,50	0,60	2,00
	44,50	44,72	24,35	3,90	17,5 MA50BM	1,00	0,50	2,00
F/1949	44,50	44,22	23,57	3,90	20,0 MA50BM	1,20	0,50	2,00
	44,50	44,79	23,41	3,80	20,5 MA50BM	1,20	0,50	2,00
F/1946	43,00	42,83	23,81	4,10	20,5 MA50BM	1,20	0,30	2,00
	42,75	43,57	23,74	4,10	21,0 MA50BM	1,20	0,30	2,00

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Continue with table 1 Initial data of observed cohort of operated eyes

M/1963	40,50	40,20	23,24	3,80	24,5 SN60WF	1,20	0,40	1,50
F/1943	44,75	44,71	24,81	4,00	15,5 MA50BM	1,20	0,60	1,50
M/1943	44,75	44,90	23,50	4,40	20,0 SN6AT	1,20	0,50	2,00
	44,25	43,22	23,48	4,30	20,5 SN6AT	1,20	0,50	2,00
M/1946	43,00	43,54	23,67	4,00	19,5 SN6AT	1,00	0,50	2,25
	44,00	46,21	23,58	3,96	20,5 SN6AT	1,00	0,50	2,25
M/1941	44,50	45,36	23,35	3,60	20,0 MA50BM	1,20	0,60	2,00
	44,50	45,65	23,50	3,60	21,5 MA50BM	1,20	0,60	2,00
F/1954	43,75	43,62	23,50	4,00	20,0 SA60AT	1,20	0,30	2,00
	44,25	43,83	23,30	3,70	20,0 SA60AT	1,50	0,20	2,00
F/1952	40,50	40,92	23,54	3,70	23,5 SA60AT	1,20	0,60	1,50
	40,75	42,53	23,73	3,70	22,5 SA60AT	1,20	0,60	1,50
M/1949	40,50	41,28	23,88	4,20	22,5 SA60AT	1,20	0,50	1,50
	40,75	41,04	23,92	4,10	22,5 SA60AT	1,20	0,50	1,50
M/1942	42,25	43,09	23,32	3,60	23,0 SN60WF	1,00	0,50	2,00
	42,00	42,09	23,30	3,60	23,0 SN60WF	1,20	0,50	2,00
F/1950	43,50	43,90	23,31	3,80	21,0 SA60AT	1,50	0,50	1,50
M/1939	44,00	44,32	23,29	4,20	21,0 MA50BM	1,00	0,60	2,00
	44,25	45,66	23,26	4,20	21,0 MA50BM	1,00	0,60	2,00
F/1946	41,50	41,26	24,83	4,10	20,0 MA50BM	1,00	0,50	1,75
	41,50	41,66	24,65	4,10	22,0 MA50BM	1,00	0,50	1,75
F/1943	44,00	44,26	23,40	3,60	21,5 SA60AT	1,00	0,60	1,50
	44,00	43,93	23,00	3,50	21,5 SA60AT	1,00	0,50	1,50
M/1944	42,50	41,24	23,78	4,20	21,0 SA60AT	1,00	0,50	2,00
	42,25	43,05	23,55	4,20	21,5 SA60AT	1,00	0,60	2,00
F/1966	41,00	41,62	23,40	4,10	24,5 SA60AT	1,50	0,60	1,50
	41,00	40,82	23,12	4,10	24,0 SA60AT	1,50	0,60	1,50
M/1952	45,00	46,56	23,90	3,90	20,0 SA60AT	1,00	0,50	2,00
	45,25	45,81	23,90	3,90	20,0 SA60AT	1,00	0,50	2,00
M/1952	44,50	45,13	23,61	4,10	19,5 MA50BM	1,00	0,20	2,25
	44,25	45,81	23,66	4,20	20,0 MA50BM	1,00	0,20	2,25
F/1947	42,50	41,88	23,40	4,20	23,0 SA60AT	1,20	0,40	1,50
M/1949	43,50	42,78	23,17	4,20	21,5 SA60AT	1,00	0,50	2,00
	44,75	44,65	23,10	3,80	20,5 SA60AT	1,00	0,50	2,00
M/1948	43,75	43,54	23,37	3,70	20,5 SA60AT	1,20	0,50	1,50
	43,75	44,15	23,44	3,90	20,5 SA60AT	1,20	0,50	1,50
M/1931	43,00	43,94	23,41	3,90	21,5 MA50BM	1,20	0,50	2,25
	43,25	43,44	23,44	3,80	21,0 MA50BM	1,20	0,50	2,25
F/1958	40,75	40,68	24,27	3,89	21,5 SA60AT	1,00	0,50	1,75
	40,75	40,43	23,97	4,00	22,0 SA60AT	1,00	0,50	1,75
F/1947	45,50	45,43	23,63	3,80	18,5 SN60WF	1,00	0,40	1,50
	44,75	44,56	23,53	3,70	19,5 SN60WF	1,00	0,40	1,50
F/1947	43,00	41,93	23,51	3,90	21,5 MA50BM	1,20	0,40	2,25
	43,00	42,29	23,42	3,90	22,0 MA50BM	1,20	0,40	2,25
F/1954	42,50	43,64	22,10	4,10	23,0 MA50BM	1,50	0,40	2,00
	42,75	42,48	23,10	4,10	22,5 MA50BM	1,50	0,40	2,00
SEX/YoB	**K [D]**	**KC [D]**	**AL [mm]**	**AC [mm]**	**IOL [D]**	**UDVA**	**UNVA**	**nCORR [D]**

SEX sex, YoB year of birth, **K** (D) average keratometry value, **KC** (D) central optical corneal power, **AL** (mm) axial length of eye, **AC** (mm) depth of anterior chamber, **UDVA** uncorrected distance visual acuity, **UNVA** uncorrected near visual acuity, **nCORR** (D) value of correction for near vision of 1.0

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Table 2 Average values of individual categories and entire cohort

AVERAGE VALUES	DIVISION OF GROUPS ACCORDING TO AXIAL LENGTH OF EYE (mm)			ENTIRE COHORT
	< 22,5	≤ 22,5 - 23,5 ≥	> 23,5	
age	70,37 ± 7,90	70,07 ± 8,70	69,11 ± 4,82	69,98 ± 7,64
AL (mm)	21,91 ± 0,37	23,08 ± 0,30	23,96 ± 0,42	22,95 ± 0,86
K (D)	44,74 ± 1,22	43,69 ± 1,13	42,91 ± 1,63	43,81 ± 1,48
AC (mm)	3,78 ± 0,23	3,83 ± 0,34	4,00 ± 0,18	3,86 ± 0,29

AL – axial length of eye, K – keratometry value, AC – depth of anterior chamber

Table 3 Frequency of implanted models of IOL

FREQUENCY OF IOL MODELS	DIVISION OF GROUPS ACCORDING TO AXIAL LENGTH OF EYE (MM)			ENTIRE COHORT
	< 22,5	≤ 22,5 - 23,5 ≥	> 23,5	
MA50BM	3	13	13	29 (58,2%)
SA60AT	31	30	10	71 (23,8%)
SN6ATx	0	4	2	6 (13,1%)
SN60WF	4	5	7	16 (4,9%)

Table 4 Dependency of axial length of eye (AL) on UNVA

AVERAGE VALUES	DIVISION OF GROUPS ACCORDING TO AXIAL LENGTH OF EYE (MM)			ENTIRE COHORT
	< 22,5	≤ 22,5 - 23,5 ≥	> 23,5	
věk	70,37 ± 7,90	70,07 ± 8,70	69,11 ± 4,82	69,98 ± 7,64
AL [mm]	21,91 ± 0,37	23,08 ± 0,30	23,96 ± 0,42	22,95 ± 0,86
K [D]	44,74 ± 1,22	43,69 ± 1,13	42,91 ± 1,63	43,81 ± 1,48
AC [mm]	3,78 ± 0,23	3,83 ± 0,34	4,00 ± 0,18	3,86 ± 0,29

UDVA – uncorrected distance visual acuity, UNVA – uncorrected near visual acuity

Table 5 Relative frequency of UNVA related to number of eyes in individual groups

VISUAL ACUITY		DIVISION OF GROUPS ACCORDING TO AXIAL LENGTH OF EYE (MM)			ENTIRE COHORT
		< 22,5	≤ 22,5 - 23,5 ≥	> 23,5	
UDVA	1.0 and better (%)	97,37	96,15	100,00	97,54
UNVA	0.5 and better (%)	19,67	31,97	18,85	70,49
	0.6 and better (%)	10,66	13,93	5,74	30,33
(in given group)	0.8 and better (%)	6,56	3,28	0,00	9,84
		16,39	0,00	0,00	16,39

UDVA – uncorrected distance visual acuity, UNVA – uncorrected near visual acuity

Table 6 Mutual relationships of parameters described by means of correlation coefficients

CORRELATION COEFFICIENTS		DIVISION OF GROUPS ACCORDING TO AXIAL LENGTH OF EYE (MM)			ENTIRE COHORT
		< 22,5	≤ 22,5 - 23,5 ≥	> 23,5	
UNVA a	**AL**	-0,36	-0,17	0,16	-0,20
	AC	0,11	0,18	0,27	-0,05
	KC	0,12	0,46	-0,01	0,23

UNVA – uncorrected near visual acuity, AL – axial length of eye, K – keratometry value, AC – depth of anterior chamber

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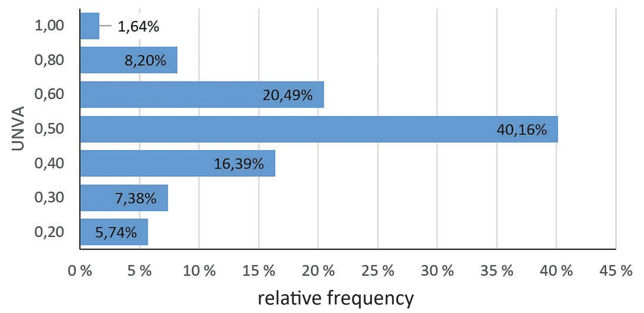
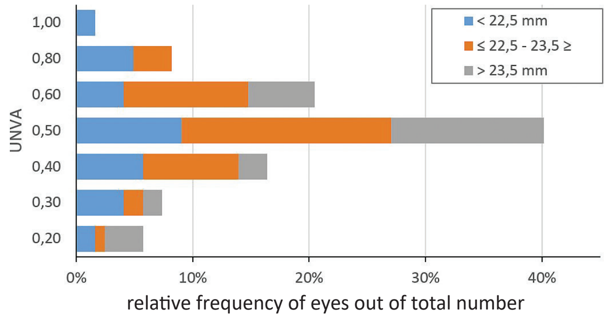
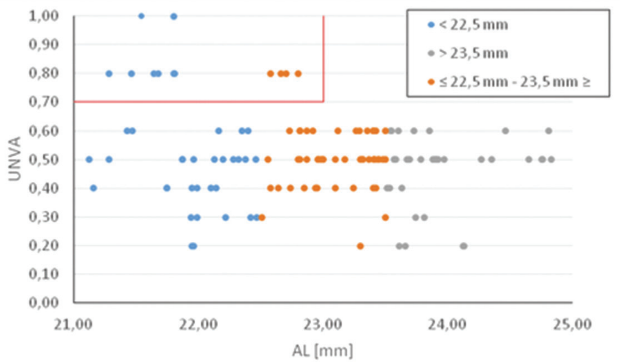


Graph 1 Distribution of relative frequency of UNVA



Graph 2 Distribution of relative frequency of eyes according to UNVA depending on axial length of eye



Graph 3 Dependency of axial length of eye (AL) on UNVA

was observed. The dependency of axial length of the eye on UNVA is illustrated in graph 3.

In all eyes optimum vision was achieved by means of addition for near vision. The recommended correction for visual acuity up to 1.0 for near vision did not exceed 1.5 D in 46.72% of eyes, and correction in a maximum amount of 1.0 D was required in 15.57% of eyes.

According to the values of the correlation coefficient between two matrices of values, we differentiate the following: weak (<0.3), medium (0.3 - 0.8) and strong (>0.8) linear dependency (correlation). A weak positive coefficient of correlation was established between UNVA and KC for the entire cohort (0.23), but for the group with average axial length a medium positive correlation (0.46) was determined in these two parameters. In the case of the parameter of postoperative depth of the anterior chamber, no relevant correlation with UNVA was determined, only for high AL a weak positive correlation was determined (0.27). The mutual relationships of the parameters described by means of the correlation coefficients are summarized in table 5.

DISCUSSION

Patients following cataract surgery or extraction of a clear lens with implantation of a multifocal intraocular lens have high expectations and demands for visual functions and the refractive result (11, 12, 13, 14). Postoperative emmetropia plays a significant role in these types of implants, and from the perspective of the patient is the main criterion of success of the operation. However, despite attaining optimal UDVA and UNVA, some patients are not satisfied with the result due to a reduction in the quality of vision which is manifested in blurring, photophobia, halo effects, diplopia etc. (8, 9).

In certain patients with pseudophakia, very good uncorrected vision not only to distance but also near vision (UNVA) was determined following the implantation of a monofocal IOL. The mechanism of manifest accommodation or pseudo-accommodation following implantation of monofocal IOLs with an influence on UNVA is not sufficiently well known, and a number of factors share in this phenomenon (2). According to clinical experiences, an indirect dependency of UNVA on the axial length of the eye is presumed. A theoretical study (Nawa (1)) of calculations for average values of the model of the eye defines possible pseudo-accommodation in short eyes (calculated for AL = 21 mm) to 2.3 D, upon a presumption of a shift of the IOL by 1 mm. In myopic eyes (AL = 27 mm), pseudo-accommodation of 0.8 D was calculated for an identical model of the eye. Lim (2) also confirmed in a study of 84 eyes with an implanted model SN60WF that the factor of short axial length, together with a narrow pupil, has a positive effect on attaining good UNVA following the implantation of a monofocal IOL. Following the categorisation of our cohort of patients according to AL, it was also demonstrated that the dominant majority of the 30.33% of eyes in which UNVA of 0.6 and better was recorded had an axial length shorter or equal to a value of 23.5 mm. Upon uncorrected near visual acuity of 0.8, an axial length of up to 22.5 mm predominated.

In patients following cataract surgery, not only predicted distance visual acuity but also uncorrected near visual acuity is important. Summary studies (10) assessing uncorrected near visual acuity in the case of monofocal intraocular lenses state values from 0.3log MAR (decimal 0.5) for the type AMO, for the type SA60AT up to 0.6log MAR (0.32). In our study, no influence of the design of individual models of IOL was unequivocally proven. The presence of the model SN60AT in all eyes with UNVA of 0.8 and better was evidently caused by its significantly high frequency of implantation.

No correlation between age and UNVA value was demonstrated in our cohort. However, Hayashi's study (3) confirms patient age as a negative factor of postoperative amplitude of pseudo-accommodation (correlation coefficient equal to -0.49). However, in his study he includes also patients aged

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under 40 years, whereas in the cohort of patients we present the youngest patient was operated on at the age of 49 years, and the average age of the entire cohort was 69.98 ± 7.64 years. A relevant evaluation of the dependency of postoperative pseudo-accommodation on age would require a greater age dispersion of the patients operated on. According to Nanavaty's study (4), a significant role influencing postoperative near visual acuity upon implantation of monofocal IOLs is played only by corneal astigmatism (against the rule), which increases the probability of pseudo-accommodation by up to ten times. In our cohort, patients without significant values of residual astigmatism and the necessity of its correction were included.

The mutual relationships of the parameters described by means of the correlation coefficients attest to a low negative correlation of UNVA and AL (-0.20), although in short eyes of less than 22.5 mm there is a medium negative correlation (-0.36), as well as a low correlation of the depth of the anterior chamber with axial length of the eye, and a medium correlation of central optical power of the cornea for average length of the eye. The correlation of postoperative depth of the anterior chamber paradoxically has a medium positive value (0.27), but within the framework of the entire cohort of patients, it is not of a more significant character.

CONCLUSION

No significant influence of patient age, postoperative depth of anterior chamber and implanted model of IOL on optimal postoperative UNVA following the implantation of a monofocal IOL was unequivocally confirmed by our study. A value of 23.5 mm was confirmed as the maximum axial length for a presumption of optimal postoperative UNVA. With a reduction of axial length (under 22.5 mm), there already exists a medium negative correlation with postoperative UNVA. A weak value of correlation between UNVA and KC was determined, in which a medium positive correlation of both parameters was found for the category of average AL.

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