CHANGES OF THE SPECTRUM IN PRIMARILY INDICATED OPERATIONS DUE TO RETINAL DETACHMENT OVER A PERIOD OF 15 YEARS

Javorská L.[1], Krásnik V.[2], Vavrová K.[2], Strmeň P.[2]

[1]Department of Ophthalmology, One-Day Healthcare, Poprad Hospital, Head: MUDr. Mária Michalková
[2]Department of Ophthalmology, Faculty of Medicine, Comenius University and University Hospital, Bratislava, Head: doc. MUDr. Vladimír Krásnik, PhD.

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MUDr. Lívia Javorská
Oftalmologické oddelenie JZS,
Nemocnica Poprad, a.s.
Banícka 28
058 01 Poprad
e-mail: javorskalivia@gmail.com

SUMMARY

Purpose: To evaluate the effectiveness of surgery for the rhegmatogenous retinal detachment, depending upon changes in the type of the primary surgery in the last 15 years.
Materials and methods: There were 991 patients with primary rhegmatogenous retinal detachment operated (in total 1020 eyes) at the Department of Ophthalmology Faculty of Medicine and University Hospital Bratislava. In the prospective part, in A group concerning the years 1999-2001, there were 346 eyes, 339 patients included. In the first retrospective part, in B group concerning the years 1994-1998 there were 464 eyes, 455 patients. In the second retrospective part, in C group concerning the years 2009-2010, 210 eyes, 197 patients were enrolled. We have analyzed the anatomical and functional results, focusing on the primary indicated surgical procedure of retinal detachment. The primary pars plana vitrectomy was in A group indicated in 54,6%, in group B in 27,6% and in group C in 90,4%.
Results: We have recorded the improvement of visual acuity after retinal detachment surgery in A group in 54.7% of eyes, in B group in 58.2% of eyes and in C group in 57% of eyes. The same visual acuity as it was before the first surgery for retinal detachment was recorded in A group in 26.8%, in B group in 19.8% and in C group C in 28% of eyes. Attached retina has been achieved in 75 % in A group after the first surgery and after the last surgical procedure the success rate increased to 98%. The anatomical success was 72% of eyes after the first surgery in B group and after the last surgery it was 94%, in C group the retina was attached in the 74% after primary surgery and 99% after the last surgery.
Conclusion: The changing of spectrum indicated by primary retinal detachment surgeries for the last 15 years has not brought the expected major functional and anatomical improvement.
Key words: retinal detachment, surgery for retinal detachment, pars plana vitrectomy, pneumatic retinopexy, scleral impresing proceduries

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INTRODUCTION

Retinal detachment (RD) is a sudden and serious occurrence which endangers the sight of the afflicted patient. Timely diagnosis and appropriate surgical treatment plays a key role in terms of the prognosis. The introduction of improved diagnostic and therapeutic procedures in the last quarter of the 20th century markedly improved the results of the treatment of RD.

RD itself has been known for several centuries. Gonin is considered a pioneer in the clarification and treatment of RD. He was the first to clarify the role of tears and holes in the retina in connection with primary RD (5, 6, 10, 15, 22, 25, 28). In 1916 he was also the first to embark upon a solution to RD by means of closure of the tear/hole using thermocauterisation of the sclera ("ignipuncture"), which had a success rate of approximately 50%. He thus launched the modern stage of therapy and established the general principles of surgical treatment of RD (10, 15, 28). At present three fundamental types of operations and combinations thereof are used.

Scleral **impression techniques** rank amongst extrabulbar surgical techniques. The principle is impression of the sclera with an endeavour to adhere the walls of the eyeball to the detached retina. After 1950 these techniques were used as the most common surgical treatment for RD (4, 9, 15, 20, 24). Scleral plombage with a hard silicone implant, introduced by Custodis in 1949, was further developed by Schepens and his colleagues (22, 28, 29). In 1965, Lincoff et al. described the use of a soft silicone implant. Lincoff is also the founder of transscleral cryotherapy and the use of a silicone latex balloon temporarily inserted between the Tenon's capsule and the sclera (17, 28, 29). The fundamental aim of all scleral impression techniques is the closure of holes/tears in the retina in order to prevent the through flow of fluid from the vitreous cavity into the subretinal space. In Slovakia RD has been addressed by means of episcleral surgical procedures since 1958-1959, when Wachsmann and Oláh introduced lamellar sclerotomy into practice (27). Another of the most distinguished figures within the issue of retinal detachment surgery in former Czechoslovakia is Karel, who in the 1970s was the only surgeon to operate on all retinal detachments cryosurgically with the use of episcleral silicone implants (15).

Since 1990, **pneumatic retinopexy** in connection with targeted cryopexy has become widely established as an alternative to scleral impression techniques in certain specific cases (1, 7, 26). It was first introduced in 1985 by Hilton and Grizzard in the USA and Dominguez in Spain (26). Before these authors, air was used in RD surgery by Ohm in 1911 (21). Gas injected into the vitreous cavity is distributed by means of gravitation in such a manner as to ensure that it closes the hole/tear in the retina through the pressure exerted. Correct localisation of the gas is attained by positioning of the patient. The most important prerequisite for the success of this method is thorough selection of cases (7, 14, 26).

In 1970, **pars plana vitrectomy** (PPV) was first introduced by Machemer and Parel (2, 8, 11, 13, 18, 19). Before its introduction into clinical practice, cases of RD complicated by proliferative vitreoretinopathy (PVR), ocular traumas with affliction of the posterior segment, proliferative diabetic retinopathy (PDR) and many other clinical units were untreatable. PPV for complicated retinal detachments in combination with tamponade by silicone oil (SO) was first introduced within former Czechoslovakia by Karel et al. (16

METHOD

Patients with primary rhegmatogenous RD, operated on in the years 1994-1998, 1999-2002 and 2009-2010 at the Department of Ophthalmology at the Faculty of Medicine of Comenius University and the University Hospital in Bratislava were included in the evaluation. Patients with secondary RD, patients who had undergone the first operation at another workplace, as well as patients who had been operated on for RD in the afflicted eye before the given time interval and on whom re-operations were performed within the observed period, were not included in the study cohort. We divided the material into three groups.

A) The **prospective part** incorporated 346 eyes of 339 patients operated on during the course of the years 1999 to 2001. The average age was 58.5 ± 15.7 years, in which the oldest patient in the group was aged 99 years and the youngest 10 years. Inasmuch as this represented a prospective group, not all the included patients reported for the examination, with the result that 321 eyes of 314 patients were evaluated. In the study we referred to this group as Group A.

B) The **first retrospective part** incorporated and evaluated 464 eyes of 455 patients, who had been operated on during the period from 1994 to 1998. The average age was 61.2 ± 16.6 years. In the study we referred to this group as Group B.

C) The **second retrospective part** incorporated and evaluated 210 eyes of 197 patients operated on during the course of 2009 and 2010. The average age of the patients in these years was 61.24 ± 10.55 years, in which the oldest patient in the group was aged 88 years and the youngest 17 years. In the study we referred to this group as Group C.

The age profile did not change substantially in the observed groups. Group C appeared to be the group with the best prospects for reattachment of the retina on the basis of the time interval of the doctor's selection. In this group as many as 59% of the patients had reported to the department within 7 days of discovering the first symptoms of RD. In group A this was 48% of patients and in group B 35% of patients. According to the primary functional condition, we did not record any substantial difference between the groups. According to the initial values of visual acuity (VA), we could consider group B to be the group with the worst prognosis. This group contained the most patients with VA of less than 1/60 before the first operation, at the level of 51%, in comparison with 44% and 43% in groups A and C respectively. We also observed the incidence of myopia, the largest percentage was recorded in group C, at 48% in comparison with 47% and 42% in groups A and B respectively. We further examined the incidence of aphakia and pseudophakia, PVR and the incidence of clinically significant degenerations of the retina (grid degeneration etc.). We did not record a statistically significant difference in any of the above indicators, from the perspective of the entrance criteria these groups were comparable.

However, over the course of these years the indication of the individual surgical techniques changed markedly, in which there was a substantial shift towards primary PPV. In the period 1994-1998 impression techniques were used most frequently, in 69.4% of cases. In 1999-2001 PPV was most widely used, also in combination with impression techniques, in 54.6% of cases. In 2009-2010 PPV predominates markedly, also in combined procedures, in up to 90.4%. Table 1 presents the representation of the individual surgical techniques.

RESULTS

Anatomical condition at first follow-up

At the first follow-up examination, which took place at a time interval of up to 2 months after discharge following the first operation, we observed the incidence of recurring RD. Table 2 presents the anatomical results following primary RD surgery at the first follow-up. Inasmuch as the documentation from the years 1994-1998 did not contain precise data on the number of detached quadrants, we do not present these results in group B.

We evaluated the anatomical success of the individual surgical techniques at the first follow-up examination. Due to the low number we do not present the results following ALK and solo cryopexy. The success rate of impression techniques and pneumatic retinopexy was similar in group A, above 80%. In group B the anatomical success rate following

Table 1 Overall representation of surgical techniques in groups A, B, C.

Type of operation	*Group A*		*Group B*		*Group C*	
	N°	*%*	**N°**	*%*	**N°**	*%*
Solo ALK ev. exocryopexy	7	*2*	2	*0.4*	2	*1*
Impression techniques	88	*25.4*	322	*69.4*	14	*6.6*
Pneumatic retinopexy	62	*18*	12	*2.6*	4	*2*
Primary PPV	152	*44*	44	*9.6*	148	*70.4*
Combination of PPV and impression techniques	37	*10.6*	84	*18*	42	*20*
Altogether	**346**	***100***	**464**	***100***	**210**	***100***

Table 2 Anatomical results following primary operation for RD.

Condition of retina		*N°A*	*%A*	*N°B*	*%B*	*N°C*	*%C*
	Attached	240	*75*	337	*73*	*155*	*74*
	1 quadrant detached	10	*3*			*6*	*2.7*
	2 quadrants detached	43	*13.3*			*20*	*9.5*
	3 quadrants detached	8	*2.5*			*6*	*2.7*
	4 quadrants detached	20	*6.2*			*23*	*11.1*
	Detached	*81*	*25*	127	*27*	*55*	*26*
	Altogether	**321**	***100***	**464**	***100***	***210***	***100***

Table 3 Anatomical condition of retina at first follow-up depending on used surgical technique.

Condition of retina	*Surgical techniques*							
	Impression techniques		Pneumatic retinopexy		PPV and impression techniques		PPV	
Group 1999-2001	**N°**	***%***	**N°**	***%***	**N°**	***%***	**N°**	***%***
Attached	68	*87*	48	*81*	26	*74*	91	*64*
Detached	10	*13*	11	*19*	9	*26*	51	*36*
Altogether	**78**	***100***	**59**	***100***	**35**	***100***	**142**	***100***
Group 1994-1998	**N°**	***%***	**N°**	***%***	**N°**	***%***	**N°**	***%***
Attached	253	*79*	8	*67*	47	*56*	26	*59*
Detached	69	*21*	4	*33*	37	*44*	18	*41*
Altogether	**322**	***100***	**12**	***100***	**84**	***100***	**44**	***100***
Group 2009-2010	**N°**	***%***	**N°**	***%***	**N°**	***%***	**N°**	***%***
Attached	13	*93*	2	*50*	33	*76*	106	*72*
Detached	1	*7*	2	*50*	9	*24*	42	*28*
Altogether	**14**	***100***	**4**	***100***	**42**	***100***	**148**	***100***

pneumatic retinopexy was 67%. Upon thorough selection of cases, the success rate of impression techniques in group C was 93%. After PPV and combined PPV, a success rate was recorded in group A at above 60%, in group B this did not reach 60% and in group C this was above 70%.

Graph 1 and table 3 illustrate the anatomical success rate of the individual techniques within the observed groups.

Functional condition at first follow-up

We compared the visual acuity of patients before surgery and at the first follow-up examination, the results are presented in table 4.

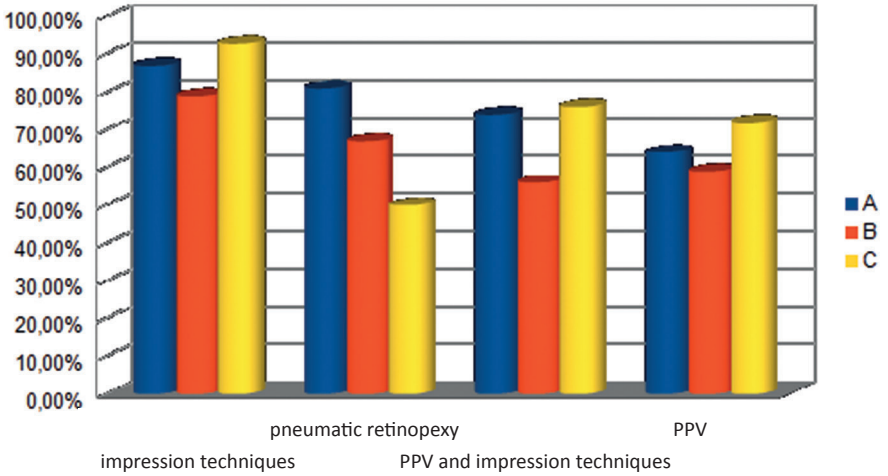
Before surgery, 28% of eyes in group A, 18% in group B and 30% in group C had visual acuity better than 6/36, at the first follow-up visual acuity better than 6/36 was recorded in 46% of eyes in group A, 34% in group B and 44% in group C. After the first operation the percentage representation of eyes with visual acuity better than 6/36 increased by more than 16% in groups A and B and by 14% in group C, which is comparable.

Resulting anatomical condition after final operation

Table 5 and graph 2 present the resulting anatomical condition in the observed groups following the individual operations. Enucleated eyes were counted as anatomically unsuccessful eyes with retinal detachment (presented via + in the relevant row).

An anatomically successful condition (reattached retina) was achieved in group A after the first operation in 75% of cases, after the fourth (and final) operation the success rate increased to 98%. In group B the anatomical success rate after the first operation was 72% and after the final operation 94%, in group C after the first operation 74%, increasing to 99% after the final operation. Graph 2 presents the resulting anatomical condition in groups A, B and C after all re-operations.

In group A, after the final operation SO was left permanently in 58.6% of applications, in 41 eyes out of 70 with primary SO tamponade. Two eyes were enucleated due to serious complications. SO was applied primarily in 70 eyes in group A, which represents approximately 20.2%. Discharge or retaining of SO was checked on average 72 months after the primary operation in groups A and B. In group B, SO was left permanently in 63.4%, 52 eyes, applied primarily in 82 eyes, which represents approximately 18%. The final anatomical success rate in group B after all operations was 94% of eyes, including eyes with SO retained permanently. In group C, SO was left permanently in the observed period, which represents 85.7%, in which it was applied primarily in 35 eyes, which represents 17%. However, the observation



Graph 1 Anatomical condition of retina at first follow-up depending on used surgical technique

Table 4. Visual acuity before surgery and at first follow-up

Visual acuity	*Before surgery*						*At 1st follow-up*					
	A		B		C		A		B		C	
	N°	%	N°	%	N°	%	N°	%	N°	%	N°	%
6/6 – 6/9	35	*10*	34	*7*	25	*12*	47	*15*	43	*9*	24	*11*
6/12 – 6/24	62	*18*	49	*11*	36	*17*	95	*30*	115	*25*	66	*31*
6/36 – 6/60	40	*12*	42	*9*	28	*13*	58	*18*	88	*19*	52	*25*
5/60 – 1/60	56	*16*	103	*22*	29	*15*	49	*15*	121	*26*	25	*12*
Counting fingers – hand movement	132	*38*	132	*41*	89	*42*	56	*17*	65	*14*	37	*18*
Light perception with and without localisation	21	*6*	190	*10*	3	*1*	12	*4*	25	*5*	6	*3*
Without light perception	0	*0*	0	*0*	0	*0*	4	*1*	7	*2*	0	*0*
Altogether	**346**	***100***	**464**	***100***	**210**	***100***	**321**	***100***	**464**	***100***	**210**	***100***

period in group C is shorter, i.e. 24 months. We expect that SO will be discharged in future in some patients in group C.

Resulting functional condition after final operation

We present the values of visual acuity which were determined at the last follow-up examination after the final operation as the resulting functional condition.

Resulting VA did not differ substantially from VA determined after the first operation at the first follow-up. In the sub-group of patients with SO left permanently, up to 57 – 62% of eyes in the individual groups had worse VA, or equivalent counting fingers and hand movement in front of the eye. A further 30 – 35% of patients with SO left permanently attained VA from 1/60 to 5/60. Only 8% or less of eyes with SO attained VA of 6/36 – 6/60. Table 7 presents an overview of eyes with an improved, equivalent or worsened functional condition in groups A, B and C.

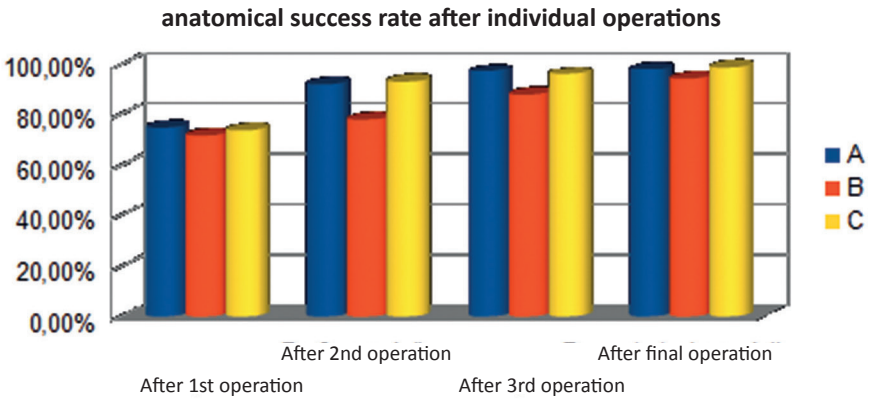
Deterioration of VA as against the primary condition occurred in 22% of eyes in group B, in 18.5% of eyes in group A and 15% of eyes in group C

DISCUSSION AND CONCLUSIONS

Evaluation of the results of surgical treatment of RD is very difficult, inasmuch as the image of each RD is pronouncedly individual and variable. There is no unified surgical procedure, and the planned surgical technique depends on a whole range of factors. However, it is possible to compare anato-

Table 5

Operation	Retina attached						Retina detached					
	N°A	*%A*	N°B	*%B*	N°C	*%C*	N°A	*%A*	N°B	*%B*	N°C	*%C*
After first	240	***75***	335	***72***	156	***74***	81	***25***	129	***28***	54	***26***
After second	296	***92***	362	***78***	195	***93***	25	***8***	101+1	***22***	15	***7***
After third	312	***97***	406	***88***	202	***96***	8+1	***3***	56+2	***13***	8	***4***
After final	314	***98***	438	***94***	207	***99***	5+2	***2***	22+4	***6***	3	***1***



Graph 2 Resulting anatomical condition after individual re-operations

Table 6 Comparison of initial VA, VA after first and final operation.

Visual acuity	Before surgery						At 1st follow-up						Resulting VA					
	A		B		C		A		B		C		A		B		C	
	N°	%	N°	%	N°	%	N°	%	N°	%	N°	%	N°	%	N°	%	N°	%
6/6 – 6/9	35	***10***	34	***7***	25	***12***	47	***15***	43	***9***	24	***11***	46	***14,4***	44	***10***	24	***11***
6/12 – 6/24	62	***18***	49	***11***	36	***17***	95	***30***	115	***25***	66	***31***	99	***31***	112	***24***	70	***33***
6/36 – 6/60	40	***12***	42	***9***	28	***13***	58	***18***	88	***19***	52	***25***	71	***22***	90	***19***	53	***25***
5/60 – 1/60	56	***16***	103	***22***	29	***15***	49	***15***	121	***26***	25	***12***	39	***12***	121	***26***	24	***11***
Counting fingers – hand movement	132	***38***	132	***41***	89	***42***	56	***17***	65	***14***	37	***18***	47	***15***	63	***13***	35	***17***
Light perception with and without localisation	21	***6***	190	***10***	3	***1***	12	***4***	25	***5***	6	***3***	14	***4***	27	***6***	4	***2***
Without light perception	0	***0***	0	***0***	0	***0***	4	***1***	7	***2***	0	***0***	5	***1,6***	7	***2***	0	***0***
Altogether	**346**	***100***	**464**	***100***	**210**	***100***	**321**	***100***	**464**	***100***	**210**	***100***	**321**	***100***	**464**	***100***	***210***	***100***

Table 7 Resulting visual acuity.

Resulting visual acuity			
Group	*Improved VA*	*Equivalent VA*	*Worsened VA*
A	54,7 %	26,8 %	18,5 %
B	58,2 %	19,8 %	22 %
C	57 %	28 %	15 %

mical and functional results of the operations for RD after a certain period of observation. As is evident from the results of our study, RD surgery is heading towards a uniform use of PPV. Nevertheless, the anatomical and functional results appear surprising in all three observed groups, which were comparable from the perspective of the entry criteria, with the exception of pronounced differences in the representation of the individual primary surgical techniques.

Over the last 15 years there has been a substantial shift of indications for primary surgery for RD towards primary PPV. Even despite this fact, however, no marked improvement of the anatomical success rate following the first operation was achieved in the individual groups. We had expected that the high percentage of primary PPV operations would correlate with a high percentage of anatomical success in group C following the first operation, but this was not confirmed on the basis of the determined results. According to the authors, the results of retinal reattachment following the first operation vary from 64% to 100%, following the final operation from 82% to 100% (12). Overall, in group A an anatomical success rate of 75% was achieved after the first operation, in group B 72% and in group C 74%. In the anatomical results we did not record any statistically significant difference despite the difference in the used surgical techniques. In group A, PPV was used in 55% of cases, in group B 28% and in group C in 90% of cases.

In the prognosis of the function success rate of the operations for retinal detachment, the most important fact appears to be correct indication for operation and VA following the first operation (3, 23, 28). This was confirmed also in our groups,

where although the anatomical success rate increased, VA did not change markedly. Since we consider an improvement of the functional condition to represent success which the patient perceives, in this parameter we attained approximately equivalent results in all three groups. In group A the functional condition improved in 55% of eyes, in group B 58% and in group C 57% of eyes. In our opinion, however, the final anatomical and functional results in the individual groups indicate that the use of each surgical method, upon strict selection and adherence to the indication criteria, may be successful and highly effective. Moreover, the use of impression techniques is justified in the case of uncomplicated, phakic cases of RD. In the case of untreatable and serious recurring cases of RD it is important to consider further surgical treatment. In the sub-group of patients with SO left permanently, it is not possible to consider the resulting functional condition to be satisfactory in the majority of these patients. Although the anatomical success rate increases with each further indicated re-operation, there is a lack of correlation with functional success, which is of fundamental importance for the patient.

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