

Long-Term Outcomes in Non-Penetrating Glaucoma Surgery

Strnad P.¹, Svačinová J.¹, Vlková E.¹, Littnerová S.²

¹Eye Clinic, University Hospital Brno Bohunice,

Head: prof. MUDr. Eva Vlková, CSc.

²Institute of biostatistics and analyses, MU Brno,

Head: doc. RNDr. Ladislav Dušek, PhD.

First author:

MUDr. P. Strnad

Eye Clinic, University Hospital Brno
639 00 Brno

e-mail: p.strnad@email.cz

SUMMARY

Objective: To evaluate the long-term compensation and efficacy after non-penetrating deep sclerectomy using different types of implants.

Methods: Patients were divided in 3 groups: deep sclerectomy without implant (DS): 34 eyes, deep sclerectomy with Staar implant (DS+STAAR): 31 eyes, deep sclerectomy with T-flux implant (DS+T): 27 eyes. Postoperatively was evaluated: IOP, therapy and efficacy.

Results: The data are described by the relative quantity, continuous data by median, 5th and 95th percentile, always in order of groups: DS; DS+STAAR; DS+T, resp. Age at the time of surgery was 65.6 (44.9; 77.9); 64.5 (44.8; 85.0); 72.1 (51.8; 77.0) years. Follow-up period was 84 (36; 145); 96 (36; 141); 81 (36; 134) months. IOP was 26 (20; 32); 26 (20; 34); 26 (21,34) mmHg postoperatively. IOP was 14 (4; 18); 14 (4; 22); 8 (2; 16) mmHg at 1 month postoperatively. IOP was 17 (13; 23); 17 (12; 21); 14 (12; 18) mmHg at 96 months. IOP was 18 (1; 20); 18 (10; 22); 15 (13;

16) mmHg at 132 months. Completely without therapy were 0; 7.1; 42.9 % of eyes at 120 months. Complete success rate was 0; 7.1; 18.2 % at 96 months. Qualified success rate was 87.5; 89.5; 100 % at 96 months.

Conclusion: Deep sclerectomy is a good surgical technique to reduce the IOP in patients with glaucoma. Use of T-flux implant provides the best results in our groups.

Key words: deep sclerectomy, intrascleral implant, acrylic non-absorbable T-flux implant, absorbable collagen implant Staar, complete success rate, qualified success rate

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INTRODUCTION

The evolution of non-penetrating filtration surgery was started by the endeavour of surgeons to reduce the incidence of complications which accompanied penetrating procedures in the preoperative and postoperative period (4, 63). Non-penetrating filtration procedures include sinusotomy, first performed in 1962 by Krasnov (25), also ab externo trabeculectomy developed by progressive modifications, first proposed by Laage de Meux and Kantelip (7) in 1976 and later by Zimmerman (67) in 1984. The currently used non-penetrating filtration procedures include deep sclerectomy (DS) and viscocanalostomy with modifications thereof, and also canaloplasty. The basis of DS and viscocanalostomy is the creation of a deep scleral bed beneath the scleral lamella in order to open up the Schlemm's canal and expose the Descemet's membrane, without opening the anterior chamber (AC) of the eye. The chamber fluid can then freely permeate through the trabeculo-Descemet's membrane (TDM)

(59). In the case of viscocanalostomy, first described by Stegmann (46, 47) in 1995, viscoelastic material is applied into the Schlemm's canal. DS was first described by Fyodor (12) and Kozlov (24). DS can be performed in several modifications: as simple deep sclerectomy, and in deep sclerectomy it is also possible to use various types of implants which are inserted into the deep scleral bed and serve as prevention against the occurrence of intrascleral fibrosis and failure of filtration (17, 19, 20, 22, 24, 27, 34, 39, 42, 44, 48, 49, 50, 51, 52, 53, 54, 55, 56, 60, 61, 62). Canaloplasty is essentially a modification of viscocanalostomy, in which a traction suture is placed in the Schlemm's canal, causing a tensile force on the trabeculum and easing the drainage of intraocular fluid (13, 28). It is generally known that non-penetrating filtration glaucoma surgery is burdened by a lower incidence of complications in comparison with penetrating filtration procedures (33), although the works of a number of authors demonstrate lower efficacy in the long-term monitoring of intraocular pressure (IOP) in comparison with trabeculec-

tomy (TRB) (18). This connects to the fact that the TDM also shares in the resistance of the drainage of intraocular fluid in the case of DS in comparison with TRB. However, if filtration of the intraocular fluid and the hypotensive effect is not sufficient, it is possible to influence the condition through the use of laser goniopuncture (32).

AIM OF STUDY

1. To evaluate and compare the long-term compensation of intraocular pressure in non-penetrating filtration glaucoma surgery performed by the DS technique with various types of intrascleral implants.
2. To evaluate and compare the necessity of repeated application of local antiglaucoma therapy in the postoperative period in non-penetrating filtration glaucoma surgery performed by the DS technique with various types of intrascleral implants.
3. To evaluate and compare the success rate of non-penetrating filtration glaucoma surgeries performed by the DS technique with various types of intrascleral implants.

METHODOLOGY

A total of 92 eyes with diagnosed glaucoma, operated on using the non-penetrating filtration technique of DS, were included in the observed study population. The study population comprised a total of 76 patients (34 men, 58 women). The median age at the time of operation was 68.2 years. Median of the observation period throughout the entire study population was 90 months. None of the patients had undergone a previous anti-glaucoma surgery or surgical procedure in the area of the conjunctiva (Table 1). The study population was divided into three groups depending on the modification of the performed surgery, determined by the presence and type of filtration implant placed preoperatively into the scleral bed. The first group underwent simple DS without insertion of a filtration implant (DS without) (34 eyes, 29 patients, median of age 65.6 years, median of the observation period 84 months, with diagnosis of 31 with primary open angle glaucoma (POAG), 2 eyes with diagnosis of pseudoexfoliation glaucoma (PEXG) and 1 eye with diagnosis of secondary glaucoma after implantation of intraocular lens). The second group underwent DS with a Staar® resorbable collagen implant (DS+STAAR) (31 eyes, 25 patients, median of age 64.5 years, median of the observation period 96 months, with diagnosis of 27 eyes with POAG, 2 eyes with diagnosis of PEXG, 1 eye with diagnosis of pigment glaucoma (PGL) and 1 eye with congenital aniridia). The third group underwent DS with a T-Flux® non-resorbable implant (DS+T) (27 eyes, 22 patients, median of age 72.1 years, median of the observation period 81 months, with diagnosis of 24 eyes with POAG, 1 eye with diagnosis of PEXG, 1 eye with diagnosis of PGL and 1 eye with juvenile glaucoma). According to the statistical comparison of the individual sub-groups, it ensues that no statistically significant difference was found between them in the observed characteristics (table 2). A filtration surgery using the DS technique was performed on all patients between 1998-2011 at the Eye Clinic of the University Hospital Brno. The surgical technique of the performance of DS contains the following steps. The conjunctival flap was open to the limbus in the eyes in our study population. There followed resection of the

Table 1: Characteristics of whole study population

Population, N = 92	
Number of eyes	92
Number of patients	76
Men	34 (37.0%)
Women	58 (63.0%)
Age at time of surgery	68.2 (44.9; 78.3) years
Observation period	90 (36; 142) months

superficial scleral lamella of a size of 5 x 5 mm up to 1/3 of the thickness of the sclera, leaving the corneal bridge. In the case of peroperative implantation of a non-resorbable acrylic T-Flux® implant it is appropriate to indicate the size of the superficial scleral lamella using a marker. The superficial scleral lamella should reach 1 mm into the transparent cornea, in order to enable uncovering of the Descemet's membrane in the later phase of the surgery. Resection of the deep scleral lamella is also performed beneath the superficial lamella, with a size of 4 x 4 mm. Upon intended implantation of a T-Flux® implant it is possible to choose a triangular shape of the deep scleral lamella with regard to its shape and size. The bottom of the DS is formed by the remaining 10% of the thickness of the sclera and the open Schlemm's canal, followed by the window of the Descemet's membrane. It is subsequently appropriate to perform thorough peeling of the endothelial lining of the Schlemm's canal. A filtration implant may be inserted

into the scleral bed in the next step, following the resection of the deep scleral lamella, in order to prevent occurrence of intrascleral fibrosis. In our study population anti-metabolites were not applied preoperatively. Following suture of the superficial scleral lamella there follows a close suture of the conjunctival flap. Eyes in which a rupture of the trabeculo-Descemet's membrane occurred to such an extent that it led to prolapse of the iris, making it necessary to perform conversion to a trabeculectomy, were excluded from the observed study population. No anti-metabolites were applied subconjunctivally also in the postoperative period in our study population. In the group with a T-Flux® implant, laser goniopuncture was performed in the case of necessity in the postoperative period.

STATISTICAL PROCESSING

Basic descriptive statistics were used for an analysis of the data set. Due to the asymmetry of the data, the median, 5th and 95th percentile were used for the continuous parameters. The representation of the individual categorical variables was described by their frequency and percentage representation. A comparison of the groups of patients according to the presence and type of intrascleral implant (DS without, DS+STAAR and DS+T) was conducted for the categorical variable by an ML chi-square test and for the continuous variables by a Mann-Whitney test always for a pair of groups. The curves of cumulative successes were evaluated using a Kaplan-Meier

Table 2: Characteristics and comparison of groups according to presence and type of intrascleral implant

	DS+STAAR ¹ N = 31	DS + T ¹ N = 27	DS without ¹ N = 34	p ²	p ³	p ⁴
Sex						
Male	10 (32.3%)	10 (37.0%)	14 (41.2%)	0.703	0.742	0.456
Female	21 (67.7%)	17 (63.0%)	20 (58.8%)			
Age at time of operation (years)	64.5 (44.8; 85.0)	72.1 (51.8; 77.0)	65.6 (44.9; 77.9)	0.404	0.064	0.462
Observation period (months)	96 (36; 141)	81 (36; 134)	84 (36; 145)	0.124	0.369	0.727

Key (notes) to table:

¹Categorical parameters are described by the number and relative number; continuous parameters by the median, the 5th and 95th percentile

^{2,3,4}Statistical significance of Mann-Whitney test evaluating differences between groups:

¹DS+STAAR v DS+T

³DS+T v DS without

⁴DS without v DS+STAAR

*statistically significant difference

estimator of survival function, and the individual curves were compared by a log rank test.

The analysis was conducted in the software IBM SPSS Statistics 19 for Windows (Release 19.0.1, © IBM Corporation 2010) and in the software R (R version 2.12.2 (20011-02-25), Copyright © 2011 The R Foundation for Statistical Computing), using the Thomas Lumley package (2011). Survival: Survival analysis, including penalised likelihood.

Standards in planning and evaluation of glaucoma surgery studies

In 2009 the World Glaucoma Association (WGA) published directives for the planning and evaluation of glaucoma surgery studies (40). Regulations, not standards, were recommended, which are intended to enable further research in the field of surgical treatment of glaucoma. An evaluation of the absolute and relative success of glaucoma surgery procedures was recommended. Absolute success in the postoperative period is defined according to the authors by the following parameters, which must be met simultaneously: IOP ≥ 6 mmHg whilst ≤ 21 mmHg, reduction of IOP as against the preoperative value by at least 20%, in which no anti-glaucoma therapy may be applied in order to attain the defined IOP. The authors recommend that relative success is evaluated as a condition in which the following parameters are simultaneously met: IOP ≥ 6 mmHg and ≤ 21 mmHg, reduction of IOP as against preoperative value by at least 20% and local therapy with max. 2 anti-glaucoma preparations. In the evaluation of glaucoma surgery studies the authors recommend the statistical methods which were used in the processing of our groups and are presented in chapter 6.4. In the evaluation of glaucoma surgery studies, however,

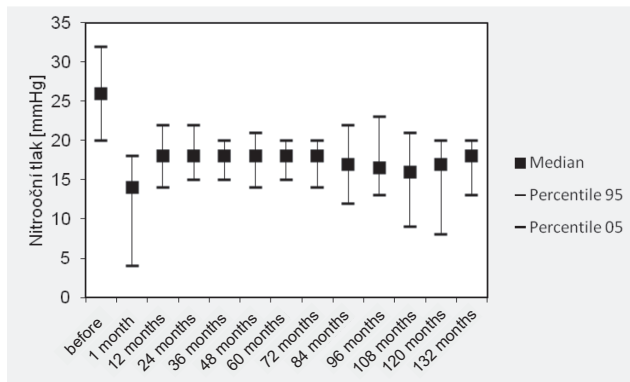
there is unfortunately no consensus on what the recommended regulations should be used to assist. None of the compared authors states as a condition of the definition of success a min. reduction of IOP as against the preoperative value (by 20%). Neither hypotonia (below 6 mmHg) is stated in any of the available publications as a condition excluding the success of a surgical procedure. In all the available published studies, success is merely defined by the max. limit of IOP ≤ 21 mmHg. None of the compared authors defines relative success by max. local anti-glaucoma therapy by 2 preparations. In all the available published studies the definition of relative success is ≤ 21 mmHg together with any anti-glaucoma therapy (some of the authors do not even state whether this concerns local or general therapy). Some authors have another max. IOP value defined in their evaluation of success. The lack of consensus among the authors in the evaluation of glaucoma surgery studies may partially be linked to the fact that the recommendations were not published until 2009. It is also evident that if success is defined by less stringent parameters, the resulting success rate is higher.

RESULTS

Results of compensation of intraocular pressure in non-penetrating filtration glaucoma surgery performed using the technique of deep sclerectomy with various types of intrascleral implants

In the group of DS without implant, a significant reduction of IOP was found 1, 12, 24, 36, 48, 60, 72, 84, 96, 108, 120 and 132 months following the surgery as against the IOP value before surgery ($p < 0.001$). Upon a comparison of consecutive checks, a significant increase in IOP was found in the group 12 months after as against 1 month after ($p < 0.001$) and 24 months after as against 12 months after the surgery ($p < 0.046$) (Graph 1, Table 3).

In the group DS+STAAR a significant reduction of IOP was found 1, 12, 24, 36, 48, 60, 72, 84, 96, 108, 120 and 132 months following the operation as against the IOP value before surgery ($p < 0.001$). Upon a comparison of consecutive checks, a significant increase in IOP was found in the group 12 months after as against 1 month after ($p < 0.001$) and 24 months after as against 12 months after the surge-



Graph 1 Results of intraocular pressure in the group of deep sclerectomy without implant

Table 3: Results of intraocular pressure in group of deep sclerectomy without implant

IOP group DS without [mmHg]							
	Before	1M	12M	24M	36M	48M	
Median	26	14	18	18	18	18	
95th percentile	32	8	22	22	20	21	
5th percentile	20	4	14	15	15	14	
	60M	72M	84M	96M	108M	120M	132M
Median	18	18	17	17	16	17	18
95th percentile	20	20	22	23	21	20	20
5th percentile	15	14	12	13	9	8	13

Table 5 Results of intraocular pressure in group of deep sclerectomy with T-Flux® implant

IOP group DS +T [mmHg]		1M	2 M
Before	1M	1	6
24M	36M	48M	
Median	26	8	1 6
16	16	16	
95th percentile	34	1	6
19	20	19	20
5th percentile	21	2	
10	12	12	13
	60M	72M	8 4 M
96M	108M	120M	132M
Median	16	16	1 5
14	15	14	15
95th percentile	19	1	9
21	18	18	1 7
16			
5th percentile	14	1	3
12	12	12	1 3
13			

Graph 4 Results of comparison of IOP values between groups of DS without vs. DS+STAAR before and after surgery

IOP median (mmHg)
DS without

DS+STAAR
before, 1 month, 12 months..... 132 months

Graph 5 Results of comparison of IOP values between groups of DS+T vs DS+STAAR before and after surgery

IOP median (mmHg)
DS without
DS+STAAR
before, 1 month, 12 months..... 132 months

Graph 6 Results of comparison of IOP values between groups of DS+T vs DS without before and after surgery

IOP (mmHg)
Median, Percentile 95, Percentile 05
before, 1 month, 12 months..... 132 months

Graph 7 Results of comparison of the number of patients without need for application of local anti-glaucoma therapy in postoperative period between groups of DS without vs DS+STAAR

Relative number of patients without

th. (%)
DS without
DS+STAAR
1 month, 12 months..... 132 months

Table 6 Comparison of IOP values between groups of DS without vs DS+STAAR before and after surgery IOP group DS without vs DS + STAAR [mmHg]

N/median (5th; 95th percentile)		1M	2 4 M
Before	1M	12M	2 4 M
36M	48M		
DS without	34/26 (20; 32)		
34/14 (4; 18)	34/18 (14; 22)		
34/18 (15; 22)	34/18 (15; 20)		
24/18 (14; 21)			
DS+STAAR	31/26 (20; 34)		
31/14 (4; 22)	31/18 (10; 24)		
31/18 (12; 22)	31/18 (12; 20)		
26/17 (13; 22)			
P	0.526	0.629	0.106
0.486	0.894	0.761	
N/median (5th; 95th percentile)			
60M	72M	84M	9 6 M
108M	120M	132M	
DS without	24/18 (15; 20)		
23/18 (14; 20)	19/17 (12; 22)		
16/17 (13; 23)	16/16 (9; 21)		
14/17 (8; 20)	12/18 (13; 20)		
DS+STAAR	26/18 (14; 22)		

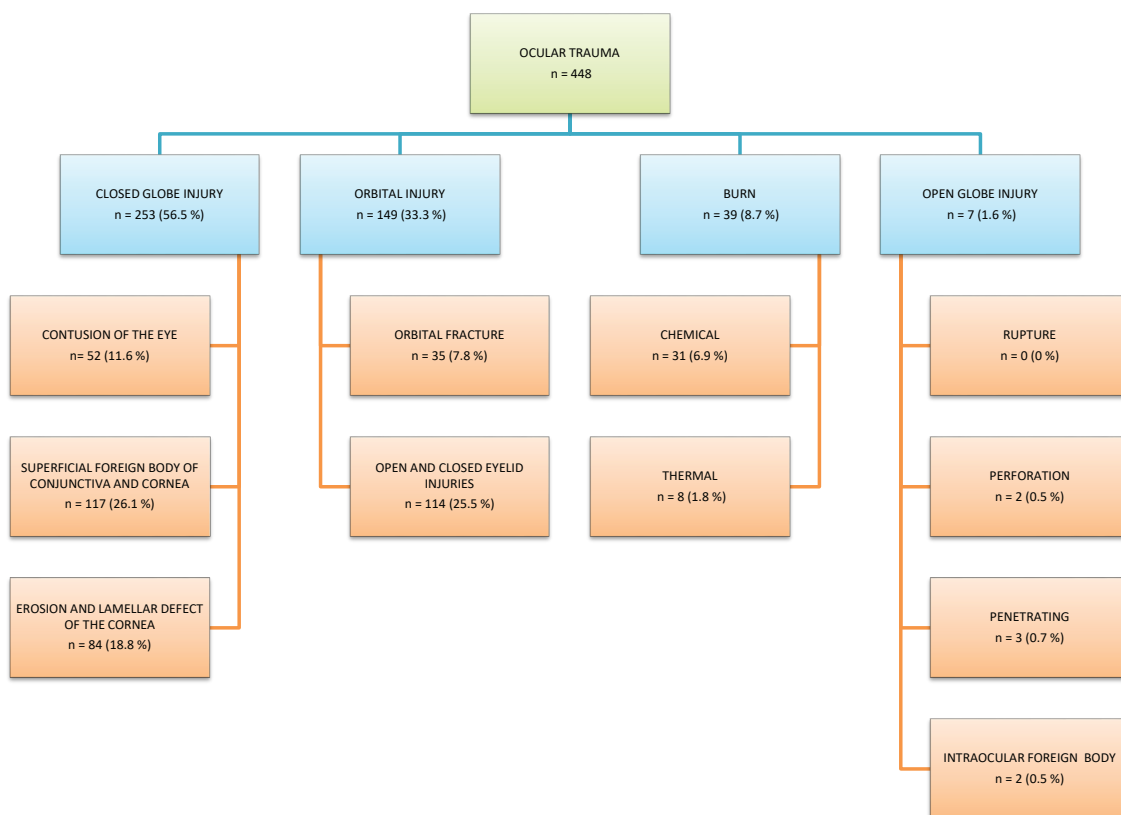
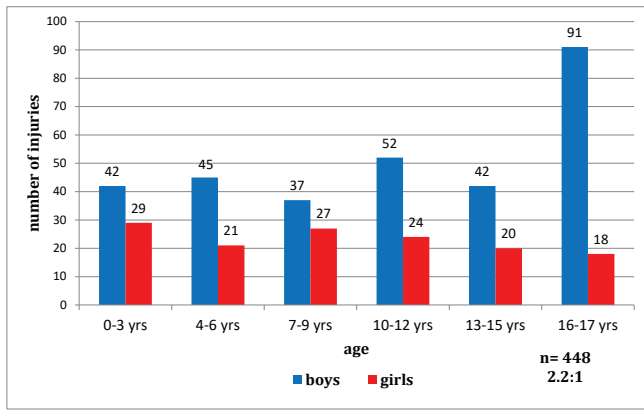
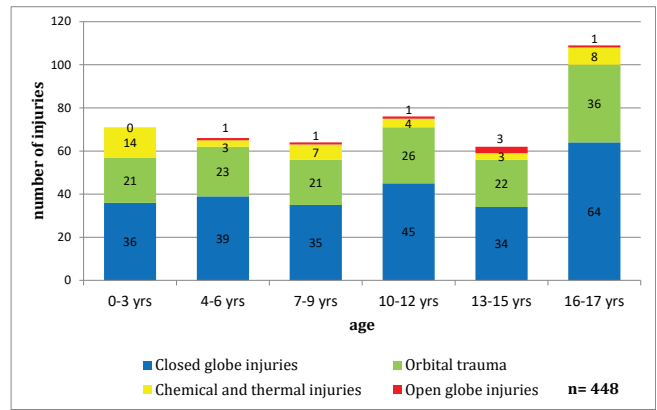


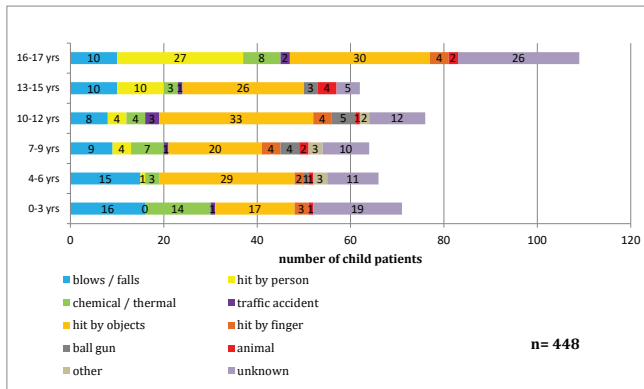
Table 1. Representation of individual types of traumas to the eye and periorcular area – a total of 448 paediatric patients were divided according to the type of trauma. The number of patients and the percentage are stated in each box. The Birmingham Eye Trauma Terminology (BETT) was used in the study, modified and extended by chemical and thermal injuries and orbital traumas [5, 6, 7, 10].



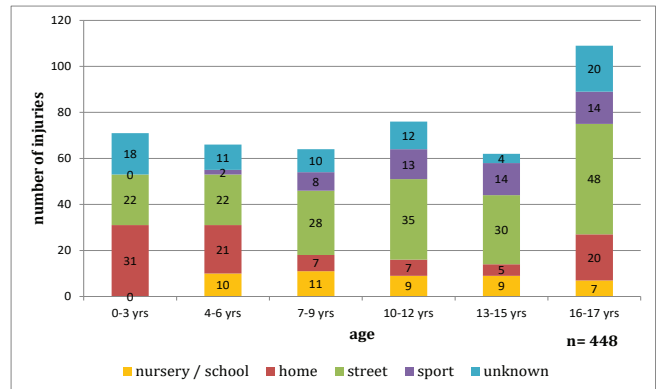
Graph 1. Distribution of ocular traumas according to age and sex in 448 children treated at University Hospital Ostrava in the period from 2007 to 2011



Graph 2. Distribution of individual types of ocular traumas according to age in 448 children treated at University Hospital Ostrava in the period from 2007 to 2011



Graph 3. Distribution of mechanisms of traumas according to age in 448 children treated at University Hospital Ostrava in the period from 2007 to 2011. The mechanism of the ocular trauma is variable, nevertheless a relationship exists between the mechanism and the age of the child.



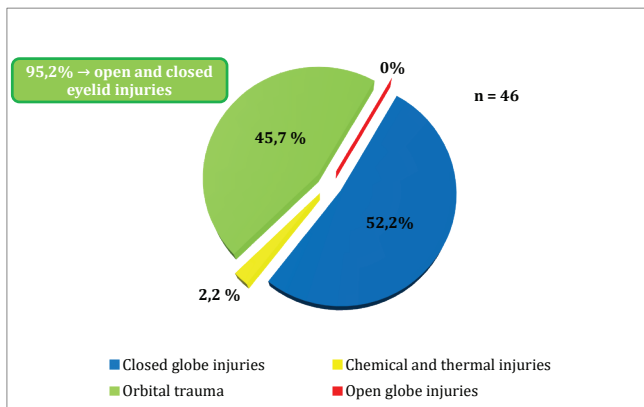
Graph 4. Location of traumas according to age in 448 children treated at University Hospital Ostrava in the period from 2007 to 2011

25/17 (12; 21)	24/17 (13; 20)
19/17 (12; 21)	15/17 (12; 22)
14/16 (11; 19)	9/18 (10; 22)
P 0.760	0.435 0.892
0.639	0.549 0.201 0.611

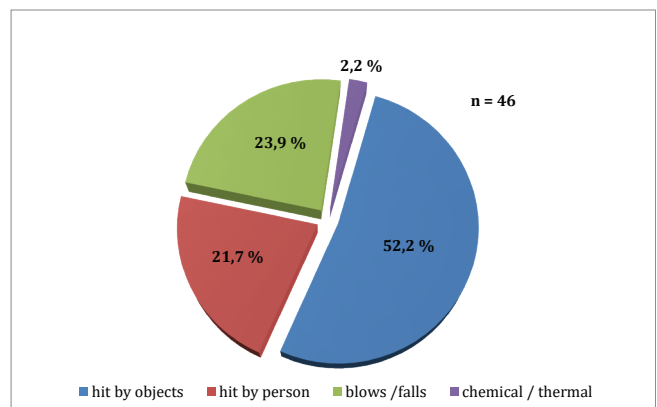
before and after surgery		
IOP group DS+T vs DS + STAAR [mmHg]		
N/median (5th; 95th percentile)		
Before	1M	12M 2 4 M
36M	48M	
DS+T	27/26 (21; 34)	27/8 (2; 16)
	27/16 (10; 19)	27/16 (12; 20)

20)	27/16 (12; 19)	20/16 (13; 20)
DS+STAAR	31/26 (20; 34)	31/18 (10; 24)
	31/18 (12; 22)	31/18 (12; 20)
	26/17 (13; 22)	
P	0.419	0.005* 0.002*
	0.007*	0.007* 0.018*

Table 7 Comparison of IOP values between groups of DS+T vs DS+STAAR



Graph 5. Distribution of individual type of ocular traumas at school and pre-school facility in 48 children treated at University Hospital Ostrava in the period from 2007 to 2011. The majority of orbital traumas (95.2%) included closed and open injuries to the eyelids.



Graph 6. Cause of ocular traumas at school and pre-school facility in 46 children treated at University Hospital Ostrava in the period from 2007 to 2011

N/median (5th; 95th percentile)			
60M	72M	84M	9 6 M
108M	120M	132M	
DS+T	18/16 (14; 19)	16/16 (13; 19)	14/15 (12; 21)
	11/15 (12; 18)	7/14 (13; 17)	2/15 (13; 16)
DS+STAAR	26/18 (14; 22)	25/17 (12; 21)	24/17 (13; 20)
	19/17 (12; 21)	15/17 (12; 22)	14/16 (11; 19)
	9/18 (10; 22)		
P	0.085	0.063	0.069
	0.040*	0.075	0.180

Table 8 Results of comparison of IOP values between groups of DS+T vs DS without before and after surgery IOP group DS+T vs HS without [mmHg]

N/median (5th; 95th percentile)			
Before	1M	12M	2 4 M
	48M		
DS+T	27/26 (21; 34)	27/8 (2; 16)	27/16 (10; 19)
	20	27/16 (12; 19)	20/16 (13; 20)
DS without	34/26 (20; 32)		
	34/14 (4; 18)	34/18 (14; 22)	

	34/18 (15; 22)	34/18 (15; 20)	
	24/18 (14; 21)		
P	0.713	0.007*	0.010*
	0.007*	0.002*	0.011*
N/median (5th; 95th percentile)			
60M	72M	84M	9 6 M
108M	120M	132M	
DS+T	18/16 (14; 19)	16/16 (13; 19)	14/15 (12; 21)
	11/15 (12; 18)	7/14 (13; 17)	2/15 (13; 16)
DS without	24/18 (15; 20)		
	23/18 (14; 20)	19/17 (12; 22)	
	16/17 (13; 23)	16/16 (9; 21)	
	14/17 (8; 20)	12/18 (13; 20)	
P	0.011*	0.011*	0.081
	0.020*	0.155	0.041*
		0.078	

Results of comparison of IOP values between groups before and after surgery

No statistically significant difference in IOP was found between the groups of DS without and DS+STAAR either before the surgery or at postoperative checks (Graph 4, Table 6).

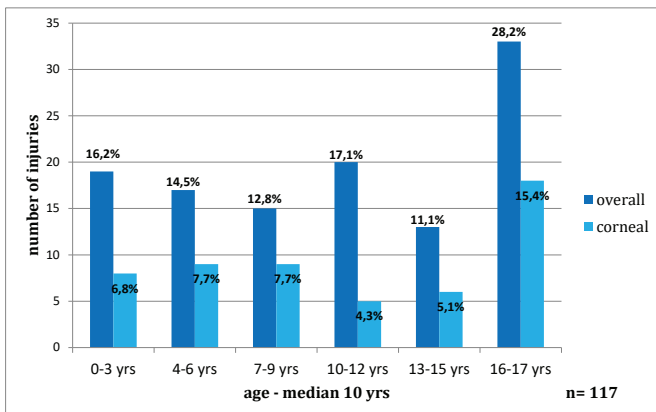
A statistically significant difference in IOP was found between the groups of

DS+T and DS+STAAR 1, 12, 24, 36, 48 and 96 months after the surgery. Before the surgery no statistically significant difference in IOP was found between the groups (Graph 5, Table 7).

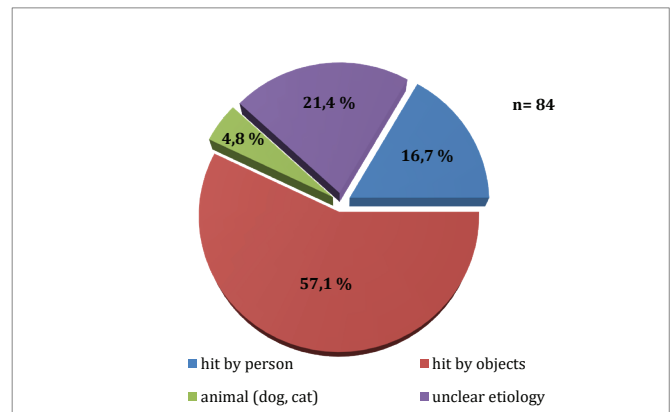
A statistically significant difference in IOP was found between the groups of DS without and DS+T 1, 12, 24, 36, 48, 60, 72, 96 and 120 months after the surgery. Before the surgery no statistically significant difference in IOP was found between the groups (Graph 6, Table 8).

Results of comparison of cumulative amount of local anti-glaucoma therapy at month 36 of observation between groups DS+STAAR vs DS+T vs DS without

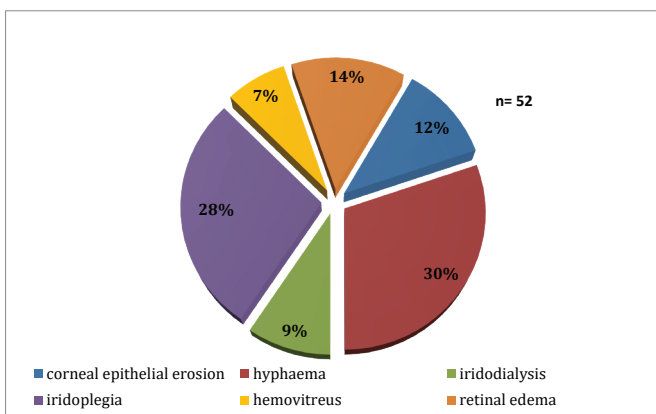
A statistically significant difference was found in the number of patients to whom it was not necessary to apply and local anti-glaucoma therapy up to the month 36 of observation between the groups DS+STAAR v DS+T (p = 0.001) and between the groups DS+T v DS without (p = 0.002) (Table 9).



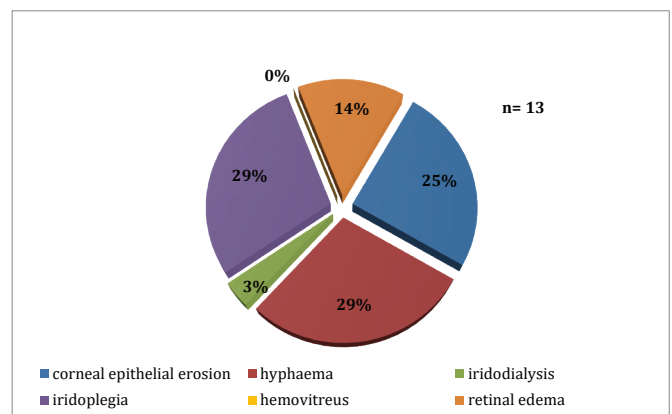
Graph 7. Distribution of foreign bodies on cornea and conjunctiva according to age in 117 children treated at University Hospital Ostrava in the period from 2007 to 2011



Graph 8. Spectrum of causes of superficial injury to cornea in 84 children treated at University Hospital Ostrava in the period from 2007 to 2011



Graph 9. Scope of affliction of eye following contusion in 52 children treated at University Hospital Ostrava in the period from 2007 to 2011



Graph 10. Scope of affliction of eye following contusion in 13 children after blow to eye from projectile from children's pellet gun in the period from 2007 to 2011

Table 9 Results of comparison of cumulative number of packages of local anti-glaucoma therapy at month 36 of observation

	0	1	2	3
4	5	6	7	8
9				
HS+STAAR	3 (9.7%)	0 (0.0%)	1 (3.7%)	4 (12.9%)
HS+T	17 (63.0%)	0 (0.0%)	1 (3.7%)	2 (7.4%)
HS without	5 (14.7%)	3 (8.8%)	1 (2.9%)	3 (8.8%)
	2 (5.9%)	3 (8.8%)	1 (2.9%)	3 (8.8%)
	1 (2.9%)	2 (5.9%)		

Results of comparison of number of patients without necessity of application of local anti-glaucoma therapy in postoperative period between groups A statistically significant difference was found in the number of patients to whom it was not necessary to apply and local anti-glaucoma therapy 1 and 132 months after the surgery between the groups DS without and DS+STAAR (Graph 7, Table 10).

A statistically significant difference was found in the number of patients to whom it was not necessary to apply and local anti-glaucoma therapy 1, 24, 36, 48, 60, 120 and 132 months after the operation between the groups DS+T and DS+STAAR (Graph 8, Table 11).

A statistically significant difference was found in the number of patients to whom it was not necessary to apply and local anti-glaucoma therapy 1, 12, 24, 36, 48, 60, 72, 84, 96, 108 and 120 months after the operation between the groups DS without and DS+T (Graph 9, Table 12).

Graph 8 Results of comparison of number of patients without need for application of local anti-glaucoma therapy in postoperative period between groups of DS+T v DS+STAAR
Relative number of patients without th. (%)

Relative number of patients without th. (%)
DS+T
DS+STAAR
1 month, 12 months..... 132 months

Graph 9 Results of comparison of number of patients without need for application of local anti-glaucoma therapy in postoperative period between

groups of DS+T v DS without
Relative number of patients without th. (%)

Relative number of patients without th. (%)

DS+T
DS without
1 month, 12 months..... 132 months

Table 10 Results of comparison of number of patients without necessity of application of anti-glaucoma therapy in postoperative period between groups DS without vs DS+STAAR
Number of patients without therapy in postoperative period – group DS without vs DS+STAAR

Number (relative number)	1 M	12M	24M	36M	48 M	60M
DS without	32 (94.1%)	11 (32.4%)	7 (20.6%)	3 (12.5%)	3 (12.5%)	7 (20.6%)
DS+STAAR	23 (74.2%)	4 (15.4%)	4 (15.4%)	4 (15.4%)	4 (15.4%)	8 (25.8%)
p	0.023*	0.543	0.821	0.854	0.625	0.949
Number (relative number)	7 2 M	84M	96M	108M	1 2 0 M	132M
DS without	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)

Table 2. Basic characteristics of 7 patients with open eye injury treated at University Hospital Ostrava in the period from 2007 to 2011

PATIENT	SEX	AGE	MECHANISM OF INJURY
1	F	4 years	Blow from metal letterbox
2	F	7 years	Stabbing with pocket knife
3	M	11 years	Explosion of fireworks in glass bottle
4	M	13 years	Blow from wooden stick
5	M	14 years	Explosion of home-made explosives
6	M	15 years	Explosion of an aluminium can containing explosive substance
7	M	17 years	Firing of projectile with suicidal intent

Table 3. The table summarises initial vision, scope of injury and condition of visual functions 6 months after the injury in 7 patients with open eye injury treated at University Hospital Ostrava in the period from 2007 to 2011. BCVA – best corrected visual acuity

PATIENT	BCVA – UPON ADMISSION	SCOPE OF INJURY	BCVA 6 MONTHS AFTER INJURY
1	Not possible due to age	Perforating injury to cornea	Unknown
2	Vision 6/18	Penetrating injury to sclera	Vision 6/9
3	Light sensitivity, projection incerta	Perforating injury to cornea and penetrating injury to sclera	Movement, projection downwards certa, otherwise incerta
4	2.5m/60	Perforating injury to cornea	Vision 6/18
5	Movement, light sensitivity, projection certa	Multiple penetrating injury to bulb with multiple intraocular foreign bodies, traumatic cataract	0.5m fingers, light sensitivity, projection certa
6	light sensitivity, projection certa	Perforating injury to cornea and penetrating injury to sclera, multiple intraocular foreign bodies	Without light sensitivity
7	Movement, light sensitivity, projection certa	Penetrating injury to sclera	Vision 6/9

DS+STAAR	3 (12.0%)	1 (4.2%)	1 (5.3%)	1 (6.7%)	1 (7.1%)
p	0.227	0.734	0.598	0.053	0.082
					0.044*

Table 11 Results of comparison of number of patients without necessity of application of anti-glaucoma therapy in postoperative period between groups DS+T v DS+STAAR

Number of patients without therapy in postoperative period – group DS+T v DS+STAAR

Number (relative number)	1 M	12M	24M	36M	48 M	60M
DS+T	2 (9.2%)	5 (40.4%)	17 (63.0%)	17 (63.0%)	9 (50.0%)	32 (94.1%)
DS+STAAR	23 (74.2%)	4 (12.9%)	4 (12.9%)	4 (15.4%)	4 (15.4%)	8 (20.6%)
p	0.025*	0.137	<0.001*	<0.001*	0.004*	0.011*

Number (relative number)	7 2 M	84M	96M	108M	120 M	132M
DS+T	5 (33.3%)	2 (16.7%)	4 (42.9%)	0 (0.0%)	3 (21.4%)	3 (21.4%)
DS+STAAR	3 (12.0%)	1 (4.2%)	1 (5.3%)	1 (6.7%)	1 (7.1%)	1 (11.1%)
p	0.052	0.060	0.181	0.186	0.019*	0.015*

Table 12 Results of comparison of number of patients without necessity of application of anti-glaucoma therapy in postoperative period between groups DS+T v DS without

Number of patients without therapy in postoperative period – group DS+T v DS without

Number (relative number)	1 M	12M	24M	36M	48 M	60M
DS+T	2 (9.2%)	5 (40.4%)	17 (63.0%)	17 (63.0%)	9 (50.0%)	32 (94.1%)
DS without	11 (32.4%)	3 (20.6%)	3 (12.5%)	3 (12.5%)	7 (20.6%)	7 (20.6%)
p	0.003*	0.002*	<0.001*	0.006*	0.015*	0.001*

Results of comparison of cumulative absolute success between groups (IOP ≥ 6 mmHg and ≤ 21 mmHg, reduction of IOP by min. 20%, 0 th., Kaplan-Meier estimator of survival function)

Upon a comparison of the curves of the absolute cumulative success using a log rank test, a significant difference was found between the groups DS+T v DS+STAAR (p = 0.019) and DS+T v DS in the postoperative period (p = 0.013) (Graph 10, Table 13).

Results of comparison of cumulative relative success between groups (IOP ≥ 6 mmHg and ≤ 21 mmHg, reduction

of IOP by min. 20%, max. 2 preparations of th., Kaplan-Meier estimator of survival function)

Upon a comparison of the curves of the relative cumulative success using a log rank test, a significant difference was found between the groups DS+T v DS+STAAR (p = 0.041) and DS+T v DS in the postoperative period (p = 0.019) (Graph 11, Table 14).

Graph 10 Results of comparison of cumulative absolute success between groups

Observation period (months)
DS+STAAR
DS+T
DS without

Graph 11 Results of comparison of cumulative relative success between groups

Observation period (months)
DS+STAAR
DS+T
DS without

Table 13 Results of comparison of cumulative absolute success between groups

Cumulative absolute success	Time frame	DS+STAAR	DS+T	DS without
1M	0.65 (0.79; 0.45)	0 (0.87; 0.53)	0 (0.72; 0.35)	7 (0.72; 0.35)
12M	0.79 (0.90; 0.62)	0 (0.72; 0.35)	0 (0.18 (0.32; 0.07)	5 (0.18 (0.32; 0.07)
24M	0.16 (0.31; 0.06)	0 (0.58; 0.23)	0 (0.15 (0.28; 0.05)	4 (0.15 (0.28; 0.05)

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