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Analysis of 148 Cases of Endophthalmitis Treated at a Tertiary Referral Hospital in Italy from 2011 To 2019

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Abstract

Purpose of the Study: To evaluate epidemiology, causes and visual outcomes related to management timing of endophthalmitis cases in Ophthalmic Hospital of Rome from 2011 to 2019.

Methods and Methods: 148 patients (80 Male 68 female, mean age 71,75 ± 12,51) with endophthalmitis diagnosis have been studied. Demographic, seasonality, clinical and laboratory data were collected. Visual improvement has been evaluated.
Study Design: Case series

Main Outcome Measures: Visual improvement

Results: First cause of endophthalmitis was cataract surgery, then blebitis. Endophthalmitis following cataract surgery arise after few days, those following blebitis could arise even after years from surgery. The third cause of endophthalmitis was trauma. Staphylococcus epidermidis was the most frequent bacterium found in culture test, then streptococcus pneumoniae and staphilococcus hominis. Considering only after cataract surgery endophthalmitis, results are similar to general data. There is a significant statistically difference in visual improvement of patient underwent vitrectomy before 24 hours from entrance to the emergency room .

Conclusions: An early vitrectomy is suitable for visual function, few hours of delay in vitrectomy can result in lower visual acuity improvement.
It should be recommended to perform vitrectomy as soon as possible to achieve better functional rehabilitation.

Brief summary statement: We have analyzed 148 cases of endophtalmitis. First cause was cataract surgery. Staphylococcus epidermidis was the most frequent bacterium found. There was a significant statistically difference in VA improvement of patient underwent vitrectomy before 24 hours from arrive in emergency room. Early vitrectomy is suitable for visual function.

Keywords: Endophthalmitis; Time of Vitrectomy; Visual Acuity

Introduction

Endophthalmitis is a serious complication of many events, such as eye surgery and traumas, even also ocular and systemic infections, which can have as a result a irreversible vision loss in spite of prompt and appropriate management [1,2]. However, better surgical technique, patient education, and use of perioperative antiseptic for sterilizing the surgical field can control endophthalmitis incidence.

Many microorganisms are responsible of endophthalmitis development and different ones can result in different visual outcomes.

Most frequent bacteria in endophthalmitis are coagulase-negative staphylococci, in particular staphylococcus epidermidis, staphylococcus aureus and gram-negative bacteria such as pseudomonas aeruginosa [3,4].

In last years there is a decrease to 0,039% of cases of postoperative endophthalmitis due to better sterility practices applied during ophthalmic surgery, as cefuroxime injection in anterior chamber [5,6].

This study evaluates epidemiology, causes and visual outcomes related to management timing of endophthalmitis cases in Ophthalmic Hospital of Rome from 2011 to 2019 to see if there are any differences in visual outcome based on the time of surgery.

Materials

148 patients (80 Male 68 female, mean age 71,75 ± 12,51) with endophthalmitis diagnosis were evaluated. Demographic, seasonality, clinical and laboratory data were collected.

Methods

All cases were divided for year and for month to evaluate the possibility of a higher risk in a particular season. The cause of endophthalmitis for every case was recorded (e.g. surgery, traumas, ocular or sistemic infections).

Study Design

This is a retrospective and observational study of cases admitted at Ophthalmic Hospital Emergency Department of Rome, Italy, with endophthalmitis diagnosis from January 2011 to December 2019.

We did not consider the 2020 data because the numbers were small due to the dramatic reduction in ophthalmic surgery for the pandemic.

Procedures

Achieved the diagnosis in Ophthalmic E.R. (Emergency Room) Department, surgery service is immediately actived to perform a Vitrectomy according to ESCRS European Society of Cataract and Refractive Surgeons) guidelines [7]. PDMS (Polydimethylsiloxane) silicone oil was be used in most cases to replace the vitreous umor after vitrectomy surgery. A acqueous and a vitreous sample are taken to perform microbiological analisys. At least 80% of vitreous is removed and an intravitreal injection of vancomicin (0,1 cc 10 mg/ml) and ceftazidime (0,1 cc 22,5 mg/ml) was performed.

Vitrectomy was performed within 24 hours in 108 cases, between 24 and 48 hours in 15 cases, between 48 and 72 hours in 4 cases, over 72 hours in 9 cases.

A sistemic therapy with Piperacillin (4 gr) three times a day and ciprofloxacin 400 mg twice a day and a topical therapy with ofloxacin drops, gentamicin drops, netilmicin drops and atropina 1% drops every hour have been prescribed.

A previous ocular disease is considered as an exclusion criteria for visual outcome analysis.

All patients underwent an ophthalmic examination with visual acuity assessment before vitrectomy and 6 months after silicon oil removal.

We studied a possible correlation between the visual improvement and the time from the diagnosis in ER Department and Vitrectomy. We also research a possible correlation between type of microorganism and visual outcomes.
Informed consent was obtained from all the patients , we received ethical approval, this study adheres to the Declaration of Helsinki.

Results

148 eyes of 148 patients (70 right eyes and 78 left eyes) were evaluated. In Table 1 and graph 1 all cases are divided for year. There is a variable number of cases per year, with a relative decrease.

All cases are splitted by months of diagnosys (Table 2).

YEAR	CASES	%
2011	25	16,49
2012	19	12,83
2013	11	7,43
2014	22	14,86
2015	12	8,10
2016	21	14,15
2017	16	10,81
2018	6	4,05
2019	16	10,81

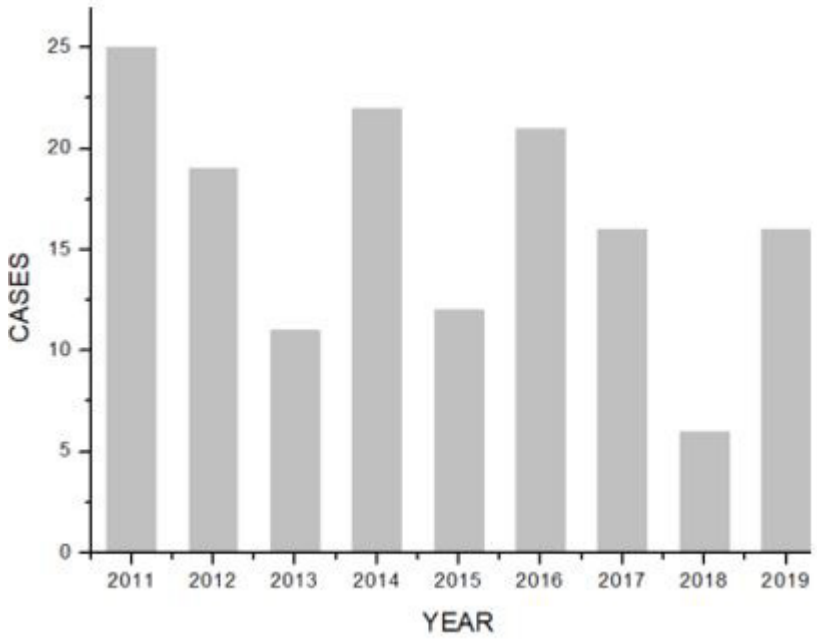


Table 1: Cases divided for year

There's not a significative difference between months and seasons.

Most of patients come from metropolitan area of Rome (74 patients), and from close area (57 patients); others are from center or south of Italy.

First cause of endophthalmitis is cataract surgery, despite the ESCRS recommandations for prophylaxis, then blebitis. Endophthalmitis following cataract surgery arise after few days, those following blebitis could arise even after years from surgery. The third cause of endophthalmitis are trauma. In a particular case endophthalmitis has developed after 1 month from yag laser capsulotomy and it was probably caused by a staphylococcus ludgunensis released after the capsulotomy. All causes are shown in Table 3.

MONTH	CASES	%
January	12	8,10
February	11	7,43
March	15	10,13
April	14	9,45
May	10	6,75
June	16	10,81
July	12	8,10
August	13	8,78
September	7	4,72
October	15	10,13
Novembre	9	6,08
December	14	9,54

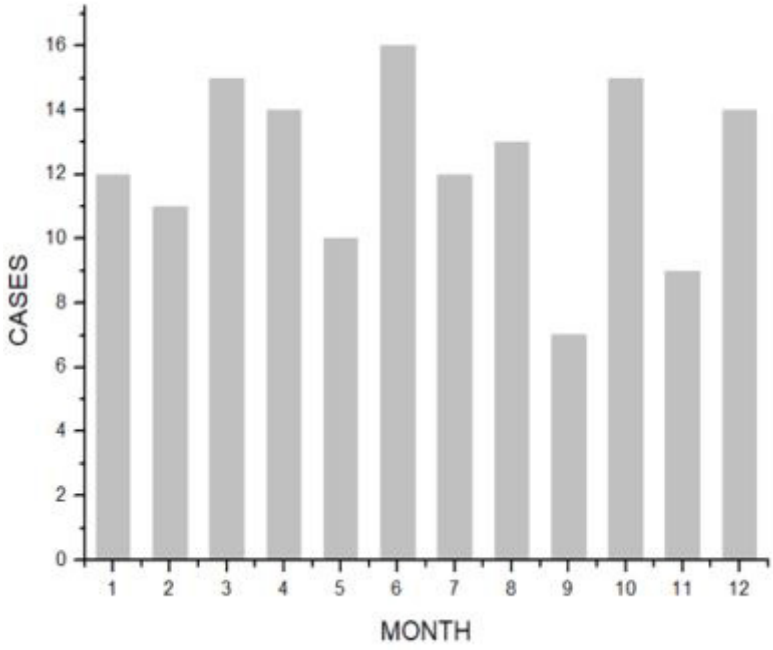


Table 2: cases splitted by months of diagnosys

Staphylococcus epidermidis was the most frequent bacterium found in culture test, then streptococcus pneumoniae and staphilococcus hominis. No growth results in 40 cases. 0

No growth results 11 times in 2011, 6 in 2012, 0 in 2013, 6 in 2014, 6 in 2015, 2 in 2016, 5 in 2017, 0 in 2018 and 4 in 2019. The cause of decrease of "no growth result" could be in more accuracy in samples performance.

Considering only endophthalmitis following cataract surgery, we found Staphilococcus epidermidis in 15 cases, Streptococcus pneumoniae in 6 cases and Staphilococcus hominis and Streptococcus sanguinis in 5 cases. 4 endophthalmitis after cataract surgery follow a single surgical session and we found Streptococcus sanguinis in all cases, probably due to a defective surgical instruments sterilization process.

Cases are shown in Table 4 and 5.

Table 3: Causes of endophthalmitis

CAUSES	NUMBER OF CASES	%
Cataract surgery	86	58,11
Blebitis	14	9,46
Intravitreal Injection	11	7,43
Perforating trauma	9	6,08
Vitrectomy	7	4,73
Endogenous	4	2,70
Corneal suture removal	3	2,03
Endothelial keratoplasty	2	1,35
Corneal abscess	2	1,35
Corneal ulcer	2	1,35
Iris melanoma surgery	1	0,68
Keratotomy wound leak	1	0,68
Silicone oil removal	1	0,68
corneal wound	1	0,68
IOL reposition	1	0,68
Valve tube extrusion	1	0,68
Yag laser Capsulotomy	1	0,68
Abscess on previous keratoplasty	1	0,68

We compared etiology of our endophthalmitis with other studies in different countries: microorganisms found in our study are similar to UK and China findings (Table 6). How affirmed in a Swedish study, Cefurozime in anterior chamber at the end of cataract surgery modified endophthalmitis etiology

136 of 148 patients (91%) admitted in Emergency Department of our Hospital from 2011 to 2019 with endophthalmitis diagnosis underwent vitrectomy with silicon oil injection as in ESCRS guidelines (7): 108 of 136 within 24 hours, 15 between 24 and 48 hours, 4 between 48 and 72 hours and 9 over 72 hours. In one case after cataract surgery we performed enucleation due to Phthisis bulbi from Escherichia coli infection, in 2 cases we performed evisceration for perforated corneal ulcer caused by pseudomonas aeruginosa in blind eye.

Table 4: Cases related to different microrganisms

MICROORGANISM	NUMBER OF CASES	%
Staphylococcus epidermidis	23	15,54
Streptococcus pneumoniae	10	6,76
Staphylococcus hominis	8	5,41
Pseudomonas aeruginosa	5	3,38
Streptococcus sanguinis	5	3,38
Staphylococcus aureus	4	2,70
Staphylococcus haemolyticus	3	2,03
Enterococcus faecalis	2	1,35
Escherichia coli	2	1,35
Granulicatella adiacens	2	1,35
Serratia marcescens	2	1,35
Staphylococcus lugdunensis	2	1,35
Streptococcus gordonii	2	1,35
Aspergillus fumigatus	1	0,68
Bifidobacterium species	1	0,68

Candida parapsilosis	1	0,68
Corynebacterium pseudodiphtheriticum	1	0,68
Haemophilus influenzae	1	0,68
Morganella morganii	1	0,68
Staphylococcus lentus	1	0,68
Streptococco oralis and Streptococco mitis	1	0,68
Streptococcus agalatiae and Enterobacter aerogenes	1	0,68
Streptococcus parasanguinis and Neisseria suppurans	1	0,68
Streptococcus pyogenes	1	0,68
Streptococcus viridans	1	0,68
Abiotrophia defectiva	1	0,68

All patient were divided for waiting time from Emergency Department admission and vitrectomy are shown in Table 7a and divided for year in Table 7b.

In last years waiting time decreased consistently, probably due to a better organization.

We observed the relationship between waiting time from admission to vitrectomy and visual improvement. However we don't know the exact time between endophthalmitis onset and hospital admission.

Table 5: Cases related to different microrganisms after cataract surgery

MICRORGANISM	NUMBER OF CASES	%
Staphylococcus epidermidis	15	28,30
Streptococcus pneumoniae	6	11,32
Staphylococcus hominis	5	9,43
Streptococcus sanguis	5	9,43
Pseudomonas aeruginosa	3	5,66
Enterococcus faecalis	2	3,77
Serratia marcescens	2	3,77
Staphylococcus aureus	2	3,77
Staphylococcus haemolyticus	2	3,77
Staphylococcus lugdunensis	2	3,77
Streptococcus gordonii	2	3,77
Aspergillus fumigatus	1	1,89
Candida parapsilosis	1	1,89
Granulicatella adiacens	1	1,89
Morganella morganii	1	1,89
Staphylococcus lentus	1	1,89
Streptococcus oralis ans Streptococcus mitis	1	1,89
Abiotrophia defectiva	1	1,89

Considering only after cataract surgery endophthalmitis, results are similar to general data, as shown in Table 6 a-b. There is a significant statistically difference in visual improvement of patient underwent vitrectomy before 24 hours (*P*=0.03), more than patients that underwent surgery between 24 and 48 hours (*P*=0.07); the difference between patients operated before and after 48 hours is dramatically significant (p<0,0001). Mean value of visual improvement of patients operated before 24 hours is quite higher that in patients operated between 24 and 48 hours, though with a high standard deviation.

Some patients operated before 24 hours had a visual improvement from "light perception" to 20/20, others of the same group show no visual improvement.

Table 6: Etiology of our endophthalmitis compared with other studies in different countries

MICROBES	EVS	UK	NETHERLANDS	INDIA	INDIA	CHINA	OUR STUDY (ALL CASES)	OUR STUDY (POST-CATARACT SURGERY)
GRAM-POSITIVE		93,4			53,1	73,9	83,5	77,8
CNS	70	62,3	53,6	18,6	33,3	45,5	43,5	46,3
S. AUREUS	10	4,9	12	11,4		12,4	4,7	3,7
STREPTOCOCCUS SPP	9	19,6	19	2,9	10,3	6,2	27,0	27,8
ENTEROCOCCUS SPP	2	3,3	1,8	1,4		7,2	2,3	3,7
OTHER GRAM-POSITIVE	3	3,3	5,2	10		2,6		
GRAM-NEGATIVE	6	6,6	6	42	26,2	13,4	15,3	18,5
FUNGAL				7,1	16,7	12,7	2,3	3,7

In Table 8 is shown the percentage of patients underwent vitrectomy before 24 hours with visual improvement.

We could assert that lower delay in time of vitrectomy surgery offers higher possibilities of visual improvement. It should be recommended to perform vitrectomy as soon as possible to achieve better functional rehabilitation.

Table 7a: patients divided for waiting time from Emergency Department admission and vitrectomy

WAITING TIME (hours)	NUMBER OF CASES	%
< 24	108	79,41
> 24, < 48	15	11,03
> 48, < 72	4	2,94
> 72	9	6,62

Table 7b: Patients divided for waiting time from Emergency Department admission and vitrectomy and for years

YEAR	WAITING TIME (hours)	NUMBER OF CASES	%
2011	< 24	12	8,82
	> 24, < 48	5	3,68
	> 48, < 72	2	1,47
	> 72	5	3,68
2012	< 24	8	5,88
	> 24, < 48	6	4,41
	> 48, < 72	2	1,47
2013	< 24	10	7,35
2014	< 24	21	15,44
	> 24, < 48	1	0,74

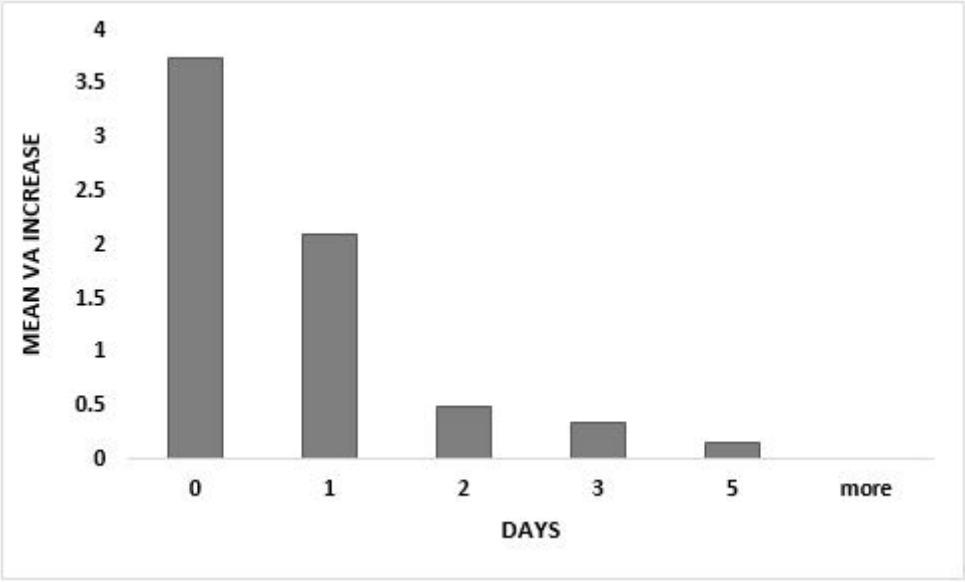
2015	< 24	10	7,35
	> 24, < 48	1	0,74
2016	< 24	14	10,29
	> 24, < 48	2	1,47
	> 72	3	2,21
2017	< 24	14	10,29
	> 72	1	0,74
2018	< 24	5	3,68
2019	< 24	14	10,29

Patients were classified in different groups based on visual acuity improvement; we analyzed mean vitrectomy delay for every group. Datas from all patients and from post-cataract patients in Table 9,10 and 11.

Results confirm that an early vitrectomy is more suitable for visual function, as recommended by ESCRS guide lines; few hours of delay in vitrectomy can result in lower visual acuity improvement.

Table 8: Relationship between waiting time from admission to vitrectomy and visual improvement

DAYS	MEAN VA INCREASE
0	3,74 ± 3,02
1	2,1 ± 2,01
2	0,5 ± 0,96
3	0,34 ± 0,25
5	0,16 ± 0,26
more	0



A possible correlation between visual impairment and type of microorganism was researched: we investigated only bacteria found in at least three cases, although we could consider statistically significant results for microrganisms found at least 5 times.

We could conclude that there is not a correlation between bacterium type and visual prognosis, even if we suppose it could be conditioned by microrganism virulence. Analisys cannot be performed for some microorganisms because few data. Results are shown in Tables 12.

Table 9: Relationship between waiting time from admission to vitrectomy and visual improvement after cataract surgery

DAYS	MEAN VA INCREASE
0	3,97 ± 2,93
1	2,42 ± 2,04
2	0,67 ± 1,10
3	0,27 ± 0,31

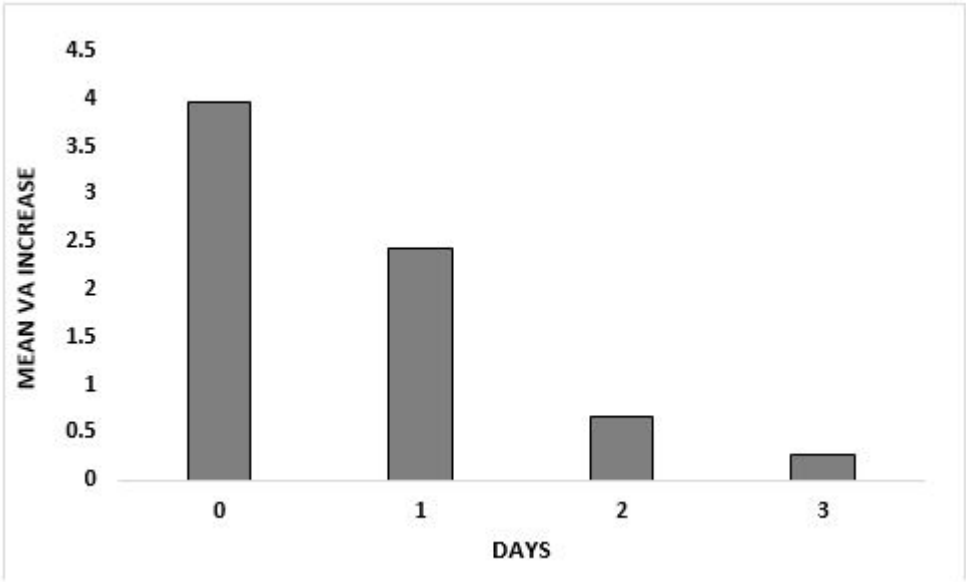


Table 10: Percentage of patients underwent vitrectomy before 24 hours with visual improvement

PATIENTS OPERATED BEFORE 24 HOURS	
VA INCREASE (SNELLEN)	% OF PATIENTS
9	1,03
8	8,25
7	6,19
6	9,28
5	10,31
4	13,40
3	8,25
2	8,25
1	6,19
<1	13,40
0	15,46

Table 11: Visual acuity improvement correlation to vitrectomy delay

MEAN VA INCREASE	MEAN DAYS FROM ADMISSION TO VITRECTOMY
>5	0
4	0,08 ± 0,08
3	0,3 ± 0,3
2	0
1	0,5 ± 0,83
<1	0,65 ± 1,03
0	0,14 ± 3,02

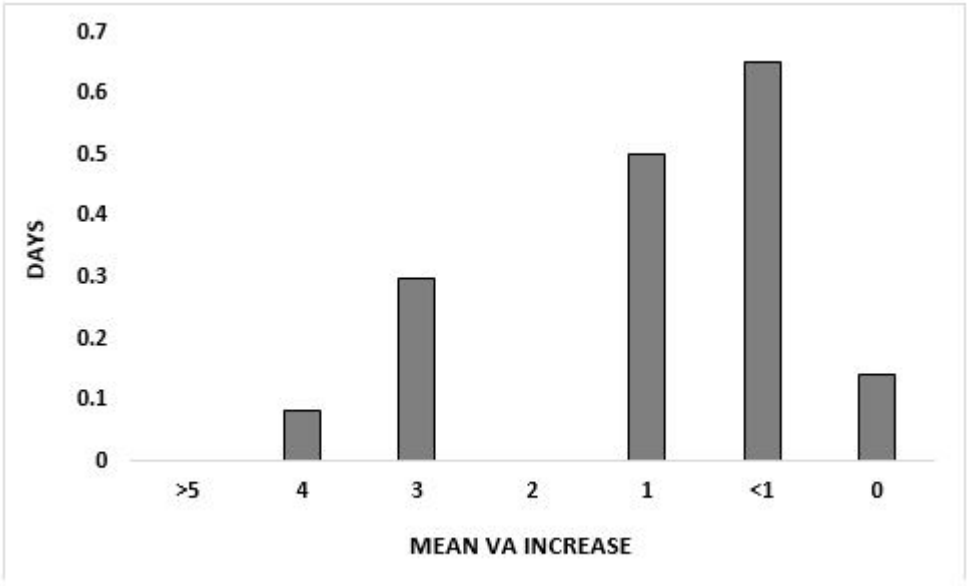


Table 12: Correlation between visual impairment and type of microorganism

MICROORGANISM	VISUAL ACUITY INCREASE	*p*
Staphylococcus epidermidis	4,20 ± 2,66	0,257
Staphylococcus hominis	1,90 ± 2,06	0,051
Streptococcus pneumoniae	3,99 ± 3,16	0,433
Streptococcus sanguinis	1,81 ± 2,47	0,059

In a particular case, three patients were admitted in the same day: they all came from the same hospital and they underwent cataract surgery in the same surgical session. In all three cases we found Streptococcus sanguinis, an unusual bacterium in endophthalmitis.

Discussion

Endophthalmitis is the most dangerous postoperative complication of ophthalmic surgery, ocular infection and trauma with serious visual impairment.

Studies on autopsy reports show the presence of microorganisms in lens capsule after cataract surgery in patients that didn't develope endophthalmitis in almost 20% of cases [8].

Although cefurozime in anterior chamber at the end of the cataract surgery, a significant number of cataract surgery developes endophthalmitis, how shown in Table 1.

In eyes with endophthalmitis, retina is more breackable and vitrectomy must be performed with more caution and attention; despite it, no retinal detachment developed after silicon oil removal.

Silicon oil is an important barrier against bacterial growth. In selected rare cases, we decided to don't use silicon oil but only gas. We never removed intraocular lens and lens capsule.

Conclusions

Final visual function probably depends by promptness of diagnosis, therapy and surgery and perhaps by microorganism virulence [9]. Otherwise most of our patients come from other hospitals, so we cannot know exact time from endophthalmitis development and admission in our department and this could be a limitation of the study. Considering the significant statistically difference in visual improvement between patients underwent vitrectomy before and after 24 hour from Department admission, we suggest to wait as little time as possible to perform surgery.

We cannot assert that different microorganism can result in different visual impairment, but we cannot exclude this possibility.

Filtering blebs can develope a blebitis and endophthalmitis even after years: therefore there is not a risk decrease after years from surgery as for cataract surgery.

Most part of patients are directed to our Hospital from clinics of a large area even far from us: an efficient collaboration network should be planned to reduce as much as possible the time from endophthalmitis development to diagnosis and surgery.

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