Title: Results at seven years after the use of Intracameral cefazolin as a prophylaxis of endophthalmitis in cataract surgery

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Version: 2 Date: 19 February 2011

Author’s response to reviews: see over
Results at seven years after the use of Intracameral cefalozine as an endophthalmitis prophylaxis in cataract surgery

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Key words: endophthalmitis, cataract surgery, cefazoline, prophylactic ophthalmic surgery, cephalosporines

Section. Reports of Clinical Studies

Disclosure:
Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper. No financial support was received.
Abstract

**Purpose:** To evaluate results after seven years using prophylactic intracameral cefazolin for the prevention of endophthalmitis in cataract surgery. To evaluate the seven years results after seven years of prophylactic intracameral cefazolin in preventing endophthalmitis in following cataract surgery.

**Setting:** Ophthalmology Service of Ophthalmology, Hospital Universitari de Sant Joan, Institut de Investigacions Sanitaries Pere Virgili (IISPV), Universidad Rovira i Virgili, Reus, Spain.

**Methods:** A prospective, observational study of all patients submitted to cataract surgery over the period January 1994 to December 2009. All cases of postoperative endophthalmitis over that period were Non-controlled retrospective observational study, all patients submitted to uncombined cataract surgery in the period from January 1994 to December 2009. All cases of postoperative endophthalmitis were related. The patients were classified in three-two groups: the first Group 1 (11696 patients) operated on between January 1996 to December 2002, with 11696 patients, the second Group 2 (3618-13305 patients) between January 2003 and December 2009 (in who a 1mg/0.1 bolus of intracameral cefazolin was instilled).

**Results:** During the study period, 76 cases of endophthalmitis were observed in Group 1, and seven in Group 2. The rate of postoperative endophthalmitis reduced from The rate of postoperative endophthalmitis lowered since from 0.63% to 0.05% with a cefazolin injection. The relative risk (RR) for endophthalmitis in Group 1 against group 2 was 11.45 (95% CI 5.72-22.84, p<0.001), p<0.00.

**Conclusions:** An intracameral bolus injection of cefazolin in cataract surgery showed prophylactic efficacy in reducing the rate of postoperative endophthalmitis in our hospital. Intracameral bolus injection of cefazolin in cataract surgery demonstrated showed prophylactic efficacy in diminishing reducing the rate of postoperative endophthalmitis in our hospital, at doses of 1mg in 0.1 ml solution.
Background.

Endophthalmitis remains a serious complication after cataract surgery, although prophylactic measures introduced in recent years have reduced the percentage of patients with this complication. Currently there are two streams of opinion towards the prophylaxis of endophthalmitis, the use of fourth-generation quinolones (gatifloxacin and moxifloxacin) topically (1-4), or the introduction of intracameral cephalosporins, the latter being last the cefuroxime (a second generation cephalosporin), which is the most widely used spread and accepted (5-10). But However, our study group (11), as well as the Garat et al (12, 13), prefers the use of cefazolin (a first-generation cephalosporin). Having previously studied the bacteria's that cause endophthalmitis in our environment, we prefer the use of cefazolin (first generation cephalosporin) instead of cefuroxime (second generation cephalosporin), due to the higher frequency of gram-positive bacteria's in our medium, and because it the best covered cefazolin infections such by such bacteria's. Furthermore, cefazoline demonstrated shows no corneal toxicity, at doses of 1 mg or 2 mg; and theits toxicity doses was established when doses of 5mg or more were injected. We assumed that the risk of an infection caused by a cefazolin-resistant bacterium was low, based in on the previous bacteria cultured bacteria's since 1994 and their antibiogram. We assume there not to be anythe risk of no coverage of gram-negative bacteria's by cefazolin, but and its incidence in endophthalmitis was low in our Health Care District.

Our group uses a concentration of 1 mg in 0.1 ml during for two years, and then we injected 2.50-mg/ml intracameral, similar to Garat et al (12), and. The results we obtained excellent results by us, and those of Garat et al are also excellent and comparable to the supporters of the use of cefuroxime. Our two groups are included in the Barcelona Endophthalmitis Group (GEB), formed by 38 public and private Hospitals of Catalonia (Spain), which who have been studying the epidemiological factors of postoperative endophtalmitis and assessing in the prophylaxis and treatment of endophtalmitis in our country since 2000. Appendix 1 gives a (The list of GEB participating hospitals and Ophthalmologists, that formed this group is
The aim of this study will present the results obtained after seven years of using intracameral cefazolin after cataract surgery with \textit{ata} doses of 1 mg in 0.1 ml.

**Methods.**

Since 1996, there has been an ongoing registration of all postoperative endophthalmitis \textit{patients} at \textit{Hospital St Joan Hospital} (Table 1). All cases of postoperative endophthalmitis were studied in the epidemiological unit of the hospital \textit{for in order to determining} their origin.

\textit{Design}: A non-controlled retrospective-prospective observational study. The population was comprised all patients submitted to un-combined cataract surgery in the period from January 1996 to December 2009. All cases of postoperative endophthalmitis were related. Only patients with phacoemulsification \textit{were} \textit{was} \textit{was included} in the study \textit{in order to} reduce the any possible bias introduced by the technical cataract surgery. Technical surgery includes \textit{a sutureless}, clear corneal incision of 3.2 mm, using a venturi (Millenium, Bausch Lomb\textsuperscript{®}) phaco unit.

\textit{For all patients included in our hospital,} \textit{The prophylactic measures to} \textit{for reducing the bacterial flora of the conjunctiva, for all patients included in our hospital} since 1996 were:

- Topical 10\% povidine-iodine in the skin of peri-orbital region
- Topical 5\% povidone-iodine on the conjunctiva and eyelashes for a minimum of 1 minute
- Draping of the peri-orbital region and eyelashes
- Postoperative use of eye drops with tobramycin 3.00 mg/mL associated to dexametasone 1.00 mg/mL instilled every 4 hours (these eye drops were gradually tapered after 1 week), and diclofenac every 6 hours. These drops were continued at week 3, and the topical diclofenac was used for 1 month after surgery.

The patients were classified in three groups:
• **The first group** included patients operated on since January 1996 to December 2002 (11696 patients), when the intracameral cefazoline was not used, and no other prophylactic antibiotic (subconjunctival or in infusion) was used.

• **The second group** formed by patients operated on since January 2003 to December 2009 (13305 patients) when we used 1.00 mg / 0.1mL intracameral cefazolin was used through the paracentesis at the end of cataract surgery.

**Antibiotic selection.**

The selection of cefazolin as the intracameral antibiotic was based on bacteria studies in endophthalmitis cases that have appeared since 1996 (Table 2), and the antibiogram (Table 3).

The table 3 was made the analysis of an antibiogram of 14,626 cultures obtained from samples of patients with community- and hospital- acquired and hospital- infections (urinary infections, pneumonia, sepsis, etc.), which occurred during 2002 year, in the population attended by our Health Care District. In the table we presented only the results obtained with the bacteria cultured in endophthalmitis observed in our area, and compared with the prophylactic antibiotics most frequently used for endophthalmitis in Spain (cefazolin, cefuroxime, vancomycin, and levofloxacin).

At this point we should to appoint that in our Hospital we used intracameral cefazolin or in cases of allergy to cephalosporines we used vancomycin.

The dose of cefazolin (1mg/0.1 ml) was based on our calculations, that an anterior chamber concentration of 3200 µg/ml of cefazolin exceeded the minimum inhibitory concentration (MIC) for susceptible bacteria.

**Inclusion criteria:**

Patients submitted to cataract surgery by the phacoemulsification technique by clear cornea incision in our dependent Health Care District

**Exclusion criteria:**

Patients submitted for extracapsular cataract surgery.
Patients with allergy to cephalosporins and those we used intracameral vancomycin.

Definition of acute postoperative endophthalmitis.
A diagnosis of presumed acute endophthalmitis was made by the ophthalmologist attending the Endophthalmitis Vitrectomy Study (EVS) criteria (14). If a positive culture of a vitreous sample was obtained, we defined the case as a proven acute endophthalmitis. In all proven and unproven cases, the patients' had swollen lids, pain, and an opaque vitreous (15).

Microbiological method.
Vitreous samples obtained by the ophthalmologist were immediately processed. A Gram stain was performed and the sample cultivated in petri dishes. The antibiogram susceptibility was made according to MENSURA (Mesa española de normalización de la sensibilidad y resistencia a los antimicrobianos) criteria (16, 17). MENSURA this group of study was composed by members of the Spanish Society of Chemotherapy and the Spanish Society of Infectious Diseases and Microbiology (15), with responsibilities equivalent to the National Committee for Clinical Laboratory Standards (18).

Statistical analyses for descriptive statistics were performed using SPSS statistical software (version 17.0), the data obtained were analysed with frequency and descriptive statistics. Values are expressed as mean ± SEM, and statistical significance was determined using the Student’s t-test for paired data.

Results.
Demographic results in the two groups of patients:
1. First group without intracameral instillation of cefazolin (11696 patients), with a median patient age of 69.8±7.55 years old (53-89 years old); 6785 (58.01%) of the patients were females.
The second group Group 2. With 1mg/ 0.1 mL intracameral instillation of cefazolin (13305 patients), with a median patient age was of 66.17±7.83 years old (53-81 years old); 7717 (58.00%) of the patients were females. The differences between groups were not statistically significant in the Student’s t-test.

Endophthalmitis cases.
In the first group Group 1 (11696 patients) appeared there were a total of 76 postoperative endophthalmitis cases, with a median elapsed time of 5.37±2.33 days after surgery. In 16 (69.77%) of those cases the cultures were positive for the following germs: bacteria: the gram-positive cultured bacteria were sub-classified thus: 9 cases (39.13%) of Staphylococcus epidermidis, 4 cases (17.39%) of staphylococcus aureus and 2 cultures positives (8.70%) positive for Streptococcus spp. The gram-negative bacterium was a culture positive for Klebsiella pneumoniae (4.35%). The final visual acuity achieved in 56.22% of patients was equal to or better than 20/40, and for 17.39% of patients the visual acuity was inferior to 0.1. Negative cultures were observed in 26 cases (34.21%).

In the second group Group 2, over the (13305 patients): 2003-2009 year period appeared a total of seven postoperative endophthalmitis cases appeared, in a median elapsed time of 5.41±2.29 days after surgery. The statistical study of differences with respect to first group 1 were significant at p<0.001, RR: 11.45 95% CI 5.72-22.84 p<0.001. The bacteria cultured were:

• The first case involved patients with diabetes mellitus type II treated with insulin and 30 years of duration, with macro vascular disease with symptoms of intermittent claudication, the culture resulted was positive for the Gram-negative bacteria (Klebsiella pneumoniae).

• The second case was presented in a patient who lives alone and with serious social problems; the patients also have domestic animals in their home the culture resulted was positive for the Gram-positive anaerobic bacteria (Corynebacterium).
• The third case, positive for *Proteus mirabilis*, occurred in a 68-year-old woman with type II diabetes mellitus of long evolution (22 years), with poor glycaemic control and peripheral vascular macroangiopathy.

• The fourth case, positive for *Proteus mirabilis*, occurred in a 77-year-old man with type II diabetes mellitus and poor glycaemic control.

• The fifth case, positive for *Pseudomonas aeruginosa*, occurred in a 73-year-old man with viral C–hepatitis.

• Negative cultures: two cases of negative cultures (28.57%) were observed in this period of time.

In the groups of patients who received intracameral cefazoline, no cases of toxic effects at corneal or retina levels were observed, and there were no hypersensitivity reactions appeared.

**Statistical analysis.**

The relative risk for presenting with endophthalmitis in Group 1 compared with Group 2 was 11.45 (95% CI 5.72-22.84) \( p<0.001 \). When limiting the analysis to proven cases (50 cases in Group 1, against 5 cases in Group 2), the estimators of the relative risk were 14.07 (95% 7.68 – 24.48) \( p<0.001 \).

**Visual acuity.**

1. In the first group of patients (period 1996-2002) 38/76 (50%) had a final visual acuity \( \text{VA} \) upper over 0.1 and six patients (7.9%) had \( \text{VA} \) >0.4 in on the Snellen charts. There were ten patients with no light perception were 10 patients (four cases with negative culture, one case produced by *Seratia marcescens*, and five cases by of *Streptococcus pneumoniae*). *Staphilococcus epidermidis* caused in 18 cases caused a final VA between 0.1 and 0.4, and in 14 cases a final VA between light perception and 0.1; the *Staphilococcus aureus* predominantly produced a final visual acuity \( \text{VA} \) between light perception and 0.1 (four cases) and only one case with final VA > 0.4 in on the Snellen charts.
2. In the second group of patients Group 2 (period 2003-2009) in four patients the final VA was of no light perception (two cases with gram-negative bacteria's, one case with negative culture and one case produced by gram-positive corynebacterium). In the other three cases, the final visual acuity VA were inferior to 0.1 in on the Snellen charts (two cases with gram-negative bacteria's and one with a negative culture).

Discussion

Peyman et al. publishedThe first report of successful prophylactic bolus injections of antibiotics into the anterior chamber was published by Peyman et al in 1977 (19). Despite of theirthe efficacy of the technique, it was forgotten. It is well-established that the source of most infecting agents is the patients' ocular flora, being the most frequently reported being bacteria gram-positive, coagulasena-negative, or positive staphylococcus.

Swedish physicians pioneered the use of intracameral cefuroxime since in 2002, showing excellent outcomes in 400,000 surgeries operations. When Montan et al. published reported the efficacy of cefuroxime 1 mg intracameral (20, 21), which practice permitted to lower the rate incidence of postoperative endophthalmitis since from 0.26% to 0.06%. The large, prospective, multi-centre study sponsored by the European Society of Cataract Refractive Surgeons (ESCRS)-sponsored study confirmed the Swedish experience, finding that an injection of cefuroxime at the end of the surgery reduced endophthalmitis rates to just 0.05% percent (8-10).

We elected chose cefazoline and not cefuroxime because that it is a first generation cephalosporin, and have has a major spectrum wide range of activity against the gram-positive bacteria's in our Health Care District, rather than cefuroxime, which than is a second-generation cephalosporin as cefuroxime. This is in concordance to the Department of Microbiology, and the Infectious Diseases Committee of our Hospital, agrees with the recommendations of the Department of Microbiology, and the Infectious Diseases Committee of our Hospital. We can appoint that into a study made-carried out in our Health Care District by Vila-Corcoles et al (22), which demonstrated an increased resistance of Streptococcus pneumoniae to cefuroxime but not to cefazolin.
As shown in Table 3, it is interesting to observe that cefazolin and cefuroxime present similar antibiotic resistance patterns, both with regard to bacteria’s gram-positive and gram-negative bacteria. Then, we still use think that cefazolin is a good option for an endophthalmitis prophylaxis. With the use of cefazolin, we assume there is a risk of no coverage of gram-negative bacteria not being covered. These lack of coverage of gram-negative bacteria is the reason that the majority of proven endophthalmitis in Groups 2 and 3 (4/5 cases were gram-negative bacteria), are caused by this type of bacteria and constitute a serious gap in the coverage of cefazolin in prophylaxis of endophthalmitis.

The preference for intracameral antibiotics in the prophylaxis of endophthalmitis is mainly due to its substitution for cefuroxime. We do not think to be important, to reduce the number of cases of endophthalmitis.

With the use of cefazolin, we assume the risk of no coverage of gram-negative bacteria’s. The lack of coverage of gram-negative bacteria’s, is the reason that the majority of proven endophthalmitis in groups 2 and 3 (4/5 cases were gram negative), are caused by this type of bacteria’s, and constitute a serious gap in the coverage of cefazolin in prophylaxis of endophthalmitis.

The lack of availability of eye-drops of fourth-generation quinolones in Spain is the most obvious reason for the preference of intracameral antibiotics in the prophylaxis of endophthalmitis. Since June 2010, an eye-drop of moxifloxacin has been available in Spain since June 2010, so the next step that perhaps, we will undertake should be the association of intracameral cefazolin with a topical moxifloxacin.

We can observe that the final visual acuity VA has been worse in the second Group 2. This is due to (0.1 mg/0.1 mL cefazolin) group of patients than in the first group (period 1996 to 2002), the explanation can be found in the type of bacteria, that caused endophthalmitis in the second group. (Corynebacterium, Klebsiella pneumonia, Pseudomonas aeruginosa, and Proteus mirabilis), all these bacteria’s were which are all poorly sensitive to cefazolin.

There were 34.21% of negative cultures in the first group and 28.57% in the second group. These percentages were
similar to other studies, such as the **Endophthalmitis Vitrectomy Study (EVS)**, with values next near to 30%.

The **limitations of the study include** was the small sample size, with 11696 patients in the first group, and 13305 patients in the second group. Anyway in the design of **European Society of Cataract Refractive Surgeons multicenter study (the ESCRs study)**, to having sufficient power to detect a 4-fold reduction of the risk with a significance level of 5%, a total of 8750 patients in each arm were needed; in the present study we have a number of patients higher than the ESCRs study in the two arms.

In spite of the results of the present study, the authors would cautioned about the limited number of patients studied, we think is needed more studies with a large number of patients, to determine the effectiveness of cefazoline and their no-toxicity at corneal endothelium level.

**Conclusions**

Intracameral bolus injection of cefazolin in cataract surgery demonstrated prophylactic efficacy in diminishing the rate of postoperative endophthalmitis in our hospital, at two doses of 1mg in 0.1 ml solution.

Furthermore we must to appoint that the close relationship closely with the Department of Microbiology and the Infectious Diseases Committee of our Hospital is essential for developing a proper antibiotic prophylaxis.

Further studies are needed with a larger number of patients in order to fully determine the effectiveness of cefazoline and its non-toxicity at corneal endothelium level.

**List of abbreviations used**

- **GEB** Grupo endoftalmitis Barcelona
- **MENSURA** Mesa española de normalización de la sensibilidad y resistencia a los antimicrobianos
- **EVS** Endophthalmitis Vitrectomy Study
- **ESCRS** European Society of Cataract Refractive Surgeons multicenter study
Competing interests
The authors report no conflicts of interest. The authors alone are responsible for
the content and writing of the paper. No financial support was received.

Authors’ contributions
Pedro Romero contributed to the study design, the researched data analysis,
discussion, manuscript writing and supervision of the manuscript.
Isabel Méndez obtained funding for the study, contributed to ophthalmologic
data collection, contributed to the discussion, made a critical review, and edited the manuscript.
Matias Almena contributed to the study design, systemic disease diagnosis
and laboratory analysis interpretation, the researched data analysis and the
discussion.
Javier Reyes-Torres contributed to the ophthalmologic data collection, and
the researched data interpretation.
Juan Fernandez contributed to the statistical analysis, the researched data
interpretation, and contributed to the interpretation of the study findings.

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0.5% moxifloxacin prevents endophthalmitis in an intravitreal injection rabbit
NM, Thomas MA, Mieler WF, Chi J, Prince RA. Penetration pharmacokinetics of


22.- Angel Vila-Corcoles, Ferran Bejarano-Romero, Elisabeth Salsench, Olga Ochoa-Gondar, Cinta de Diego, Frederic Gomez-Bertomeu, Xavier Raga-Luria,
Table 1. Description of cases of endophthalmitis since 1996

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases*</td>
<td>8</td>
<td>9</td>
<td>9</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>76</td>
</tr>
<tr>
<td>Percentage</td>
<td>0.637%</td>
<td>0.613%</td>
<td>0.629%</td>
<td>0.664%</td>
<td>0.634%</td>
<td>0.687%</td>
<td>0.692%</td>
<td>0.659%</td>
</tr>
<tr>
<td>Number of Surgeries of operations**</td>
<td>1256</td>
<td>1467</td>
<td>1430</td>
<td>1656</td>
<td>1892</td>
<td>1972</td>
<td>2023</td>
<td>11696</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Second period 2003-2009 with intracermrular cefazolin 1 mg/0.1 mL (Group 2)</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases*</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Percentage</td>
<td>0.058%</td>
<td>0.052%</td>
<td>0.055%</td>
<td>0.000%</td>
<td>0.101%</td>
<td>0.050%</td>
<td>0.049%</td>
<td>0.052%</td>
</tr>
<tr>
<td>Number of Surgeries of operations**</td>
<td>1707</td>
<td>1911</td>
<td>1812</td>
<td>1874</td>
<td>1967</td>
<td>1997</td>
<td>2037</td>
<td>13305</td>
</tr>
</tbody>
</table>

Cases* = number of cases of endophthalmitis (proven + unproven) succeeding occurring each year
Patients** = Number of cataract interventions realized-carried out each year
Table 2. Bacteria’s cultured in cases of endophthalmitis in the two groups.

<table>
<thead>
<tr>
<th></th>
<th>Number of cases (percentage) 1996-2002</th>
<th>Number of cases (percentage) 2003-2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative cultures</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>26 (34.21%)</td>
<td>2 (28.57%)</td>
</tr>
<tr>
<td>Gram positive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>96.00%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Staphylococcus</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>epidermidis</em></td>
<td>37 (74.00%)</td>
<td></td>
</tr>
<tr>
<td><em>Staphylococcus</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>aureus</em></td>
<td>5 (10.00%)</td>
<td></td>
</tr>
<tr>
<td>methicillin sensible</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Streptococcus</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>pneumoniae</em></td>
<td>2 (4.00%)</td>
<td></td>
</tr>
<tr>
<td><em>Streptococcus</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>viridans</em></td>
<td>1 (2.00%)</td>
<td></td>
</tr>
<tr>
<td><em>Bacillus</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>spp</em></td>
<td>3 (6.00%)</td>
<td>1 (14.28%)</td>
</tr>
<tr>
<td><em>Corynebacterium</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gram negative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.00%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>E Colli</em></td>
<td>1 (2.00%)</td>
<td></td>
</tr>
<tr>
<td><em>Serratia</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>marcensens</em></td>
<td>1 (2.00%)</td>
<td></td>
</tr>
<tr>
<td><em>Klebsiella</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>pneumoniae</em></td>
<td>1 (14.28%)</td>
<td></td>
</tr>
<tr>
<td><em>Pseudomona</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>aeroginosa</em></td>
<td>1 (14.28%)</td>
<td></td>
</tr>
<tr>
<td><em>Proteus</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>mirabilis</em></td>
<td>2 (28.57%)</td>
<td></td>
</tr>
</tbody>
</table>
Table 3. Final visual acuity in patients with endophthalmitis.

<table>
<thead>
<tr>
<th></th>
<th>Culture</th>
<th>No light perception</th>
<th>Light perception to &lt; 0.1</th>
<th>0.1 to 0.4</th>
<th>&gt; 0.4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group 1</strong></td>
<td><strong>Gram⁻m positive</strong></td>
<td>5</td>
<td>18*</td>
<td>19**</td>
<td>6**</td>
</tr>
<tr>
<td><strong>(Years: 1996-2002)</strong></td>
<td><em>(Strp. Pneumoniae, Bacillus spp.)</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Gram⁻m negative</strong></td>
<td>1</td>
<td>(Serratia marcesens)</td>
<td>1</td>
<td><em>E. Colli</em></td>
<td></td>
</tr>
<tr>
<td><strong>Negative culture</strong></td>
<td>4</td>
<td>10</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Group 2</strong></td>
<td><strong>Gram⁻m positive</strong></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>(Years: 2003-2009)</strong></td>
<td><em>(Corynebacterium)</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Gram⁻m negative</strong></td>
<td>2</td>
<td>(Klebsiella pneumoniae, Pseudomonas aeruginosa)</td>
<td>2</td>
<td>(Proteus mirabilis)</td>
<td></td>
</tr>
<tr>
<td><strong>Negative culture</strong></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

18* = 14 cases of *Staph. Epidermidis* and 4 cases of *Staph. Aureus*
24** = 18 cases of *Staph. Epidermidis* and 1 case of *Staph. Aureus*
6*** = One case of *Strp. Viridans*, and four cases of *Staph. Epidermidis*
NA = No patients with negative culture endophthalmitis in Group 1, and no patients in Group 2 with Gram−-positive bacteria endophthalmitis.
Table 4. Sensitivity to the antibiotics of the most frequent bacteria’s of in our Area in 2002.

<table>
<thead>
<tr>
<th>Gramm</th>
<th>Germen</th>
<th>Cefazolin</th>
<th>Cefuroxime</th>
<th>Levofloxacin</th>
<th>Vancomycin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gramm positive</td>
<td>Staphilococcus Aureus</td>
<td>100% (≤2 ≥4)</td>
<td>96% (≤2 ≥4)</td>
<td>65% (≤0.5 ≥8)</td>
<td>66% (≤4 ≥32)</td>
</tr>
<tr>
<td></td>
<td>Staphilococcus Aureus MARSA</td>
<td>54% (≤2 ≥4)</td>
<td>48% (≤2 ≥4)</td>
<td>17.64% (≤0.5 ≥8)</td>
<td>99.02% (≤4 ≥32)</td>
</tr>
<tr>
<td></td>
<td>Staphilococcus Epidermidis</td>
<td>100% (≤2 ≥4)</td>
<td>97% (≤2 ≥4)</td>
<td>27% (≤0.5 ≥8)</td>
<td>97% (≤4 ≥32)</td>
</tr>
<tr>
<td></td>
<td>Streptococcus Pneumoniae</td>
<td>96% (≤2 ≥8)</td>
<td>79.15% (≤0.12 ≥2)</td>
<td>89% (≤2 ≥8)</td>
<td>100% (≤1.4* )</td>
</tr>
<tr>
<td>Gramm negative</td>
<td>E. Colli</td>
<td>85% (≤4 ≥32)</td>
<td>87% (≤4 ≥32)</td>
<td>71% (≤0.5 ≥8)</td>
<td>90% (≤4 ≥32)</td>
</tr>
<tr>
<td></td>
<td>Pseudomonas Aeroginosa</td>
<td>18% (≤4 ≥32)</td>
<td>15% (≤4 ≥32)</td>
<td>65% (≤2 ≥8)</td>
<td>65% (≤4 ≥32)</td>
</tr>
<tr>
<td></td>
<td>Proteus Mirabilis</td>
<td>79% (≤4 ≥32)</td>
<td>82% (≤4 ≥32)</td>
<td>70% (≤0.5 ≥8)</td>
<td>100% (≤4 ≥32)</td>
</tr>
<tr>
<td></td>
<td>Klebsiella Pneumoniae</td>
<td>75% (≤4 ≥32)</td>
<td>79% (≤4 ≥32)</td>
<td>100% (≤0.5 ≥8)</td>
<td>95% (≤4 ≥32)</td>
</tr>
</tbody>
</table>

(≤2 ≥4)* = MIC (minimum inhibitory concentration) = Critical concentrations in µg/ml (critical concentration of susceptibility, critical concentration of resistance), attending according to the recommendations of the measured MENSURA to the interpretation of antibiogram.
* = Unknown, we do not know the mechanisms of resistance, and we not knownor the measure for resistance.

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05. Hospital General d'Hospitalet: Dra. Magela Garat
06. Hospital Germans Trias i Pujol (Can Ruti): Dr. Anglada
08. Mutua de Terrassa: Dra. Silvia Freixes
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