

# A CRITICAL ANALYSIS OF THE MANAGEMENT OF ACUTE POSTCATARACT SURGERY ENDOPHTHALMITIS IN THE GAMBIA

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## SUMMARY

**Objectives:** To report the pattern of presentation and the outcome of management of postcataract surgery endophthalmitis at the Royal Victoria Hospital (RVH), Banjul, The Gambia, and to critically analyse the methods employed.

**Methods:** The records of four consecutive cases of acute endophthalmitis following cataract surgery, seen over a one-year period (October 2000 to September 2001) at the eye unit of RVH, Banjul, were analysed.

**Results:** Early diagnosis of endophthalmitis, based on clinical signs only, was made within the first 14 post-operative days in all 4 patients (3 females and 1 male aged between 50 and 60 years.)

Prompt treatment with a variety of broad spectrum systemic, topical and subconjunctival antibiotics was administered to each patient. Despite this treatment, vision was eventually lost in all the eyes.

**Conclusion:** Because of the poor outcome of the treatment of these patients, one may conclude that the current management of acute postcataract surgery endophthalmitis in the Gambia does not seem to be effective.

A new evidence-based management protocol is proposed using the results of the Endophthalmitis Vitrectomy Study (EVS) as a guide.

**Key words:** cataract surgery, endophthalmitis, The Gambia

## INTRODUCTION

Endophthalmitis simply means intraocular

inflammation involving the vitreous cavity and anterior chamber of the eye. When it develops within 1-14 days of surgery or trauma it is said to be acute.<sup>1</sup> It can occur in clusters or in isolation.

Though rare, endophthalmitis has the potential of causing severe visual loss, therefore, it is the most feared complication from cataract extraction.<sup>2</sup> Once developed, early recognition and prompt treatment are required if useful vision is to be regained.

More than 5 decades ago, the reported incidence was 2%, now, it is less than 0.1% in most developed countries.<sup>3</sup>

In India, the incidence rates range from 0.032% to 0.66%.<sup>3</sup> This significantly low incidence of endophthalmitis in India was made possible by advances in clinical and basic research in understanding and managing endophthalmitis.

Due to controversy about the role of the various modalities available for the treatment of postcataract surgery endophthalmitis, a randomized clinical trial to investigate initial pars plana vitrectomy and intravenous antibiotic administration as methods of treatment (Endophthalmitis Vitrectomy Study-EVS) was initiated in 1989.<sup>4</sup> The results of this study have greatly revolutionized the management of endophthalmitis.

The Gambia runs a structured effective eye care programme which is a model in West Africa. High-volume, high-quality cataract surgery is available at the various levels where these services are offered.

Extracapsular cataract extraction followed by posterior chamber intraocular lens (IOL) implantation has been the method of cataract extraction used in the country since 1998.

In the Gambia, endophthalmitis is almost always diagnosed early and therapy promptly instituted.

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Surprisingly, however, in all such patients, in spite of a visual acuity of  $\geq$  hand motion at presentation, vision was eventually lost completely in the affected eye. No study has ever been carried out to determine the reason for this repeated visual loss in spite of early diagnosis and prompt treatment, probably because of the low frequency of occurrence.

The research questions, therefore, were:

- Was the right diagnosis made?
- If yes, were the right drugs used?
- If yes still, were the right dosages and delivery approaches employed?

This paper will report the pattern and outcome of management of acute postcataract surgery endophthalmitis in The Gambia, with a critical analysis of the management methods employed. It is also intended to remind the clinician of the need for periodic evaluation of his traditional patient-management methods in the light of evidence-based medicine. This should be done with the aim of altering his and often, others' practice methods accordingly.

**METHODS**

The records of all cases of isolated acute postcataract surgery endophthalmitis seen at the eye unit of the Royal Victoria Hospital, Banjul, over a one-year period from October 2000 to September 2001 were analysed.

All the patients included in this study had:

- ◆ their lids cleaned with 5% povidone-iodine solution before being draped;
- ◆ 5% povidone-iodine solution instilled into the eye and left for about 5 minutes, just before placement of bridge suture;
- ◆ the following postoperative medications: guttae gentamicin q.d.s. and guttae betnesol-N 2 hourly x 48 hours then q.d.s.

The only patient with posterior capsular rent, in addition, had tabs prednisolone 20mg tds x 3/7 and tabs Diamox 250mg tds.

- ◆ endophthalmitis diagnosed within 14 days of cataract surgery based on symptoms and clinical signs only (pain, lid and conjunctival oedema, drop in visual acuity and dim red reflex on fundoscopy); Neither an aqueous nor a vitreous tap/biopsy was done for microscopy, culture and sensitivity in any of the patients.
- ◆ on complaint of pain with associated drop in visual acuity, all patients were immediately started on:
  - Intravenous (IV) Ampiclox 1g stat then 500mg 6hrly for 72 hours
  - IV Metronidazole 500mg 8hrly for 72 hours

- IV Gentamicin 80mg 12hourly for 72 hours
- Guttae fortified Gentamicin 2hrly
- Subconjunctival Gentamicin 20mg dly x 3/7
- OC Chloramphenicol nocte

After 72 hours, all IV treatment, except Gentamicin, was changed to oral. In addition to the above, 2 of the patients received IV and oral Ciprofloxacin (ciprofloxacin) while a third had guttae ofloxacin. None of the patients received antibiotics or any other drug intravitreally.

- ◆ extracapsular cataract extraction with posterior chamber intraocular lens implant(except one who had a posterior capsular rent with no insertion of IOL) using the standard Fred Hollows' Foundation (FHF) technique.
- ◆ 20mg Gentamicin and 2mg dexamethasone given subconjunctivally, then topical Gentamicin 0.3% and Prednisolone 1% instilled before padding the eye after surgery.

All instruments used for surgery were adequately sterilized using the autoclave.

**RESULTS**

Four cases of isolated acute postcataract surgery endophthalmitis were seen out of the 500 cataract surgeries (0.8%) performed at RVH, Banjul, over a one-year period, from September 2000 to August 2001(see table 1). The 4 cases consisted of 3 females and 1 male with a mean age of 56 years (age range: 50-60 years).

One out of the 4 patients did not receive posterior chamber IOL because of the intraoperative complication of posterior capsular rent with vitreous loss.

The first symptom of endophthalmitis in all the patients was pain. Three of the patients (including the one that had intraoperative vitreous loss) first complained of pain on the second postoperative day.

The diagnosis of endophthalmitis in all the patients was based on classical signs of lid oedema, drop in visual acuity, chemosis, corneal oedema and intraocular inflammation within 24-48 hours of complaint of pain.

On the day of diagnosis of endophthalmitis, the vision in the affected eye was  $\geq$  hand motion (HM) in all the patients. The final visual outcome was  $\leq$  HM (3 had perception of light (PL) and 1 had HM).

**DISCUSSION**

This retrospective case-series study was carried out to report the pattern and outcome of management of acute postcataract surgery endophthalmitis at the Royal Victoria Hospital in The Gambia, and critically analyse the management methods employed.

**Table 1.** Summary of the 4 cases of acute-onset endophthalmitis following ECCE=PCIOL

Case	Age	Sex	Intraoperative Vitreous Loss	Presenting Complaint	Postoperative Day of Presentation	Visual Acuity (VA) at First Presentation	Presence of Hypopyon in Course of Disease	Treatment of Endophthalmitis	Final VA after Treatment
1	60 yrs	F	No	Ocular pain	2nd	6/24	Yes	<ul style="list-style-type: none"> <li>• IV &amp; oral Ampiclox</li> <li>• IV; guttae and s/c genticin</li> <li>• IV &amp; oral metronidazole</li> <li>• Guttae Ofloxacin</li> <li>• Guttae atropine</li> </ul>	PL
2	50 yrs	M	No	Ocular pain	2nd	6/24	No	<ul style="list-style-type: none"> <li>• IV &amp; oral Ampiclox</li> <li>• IV; s/c &amp; guttae genticin</li> <li>• IV &amp; oral metronidazole</li> <li>• Guttae atropine</li> </ul>	HM
3	60 yrs	F	Yes	Ocular pain	2nd	HM	Yes	<ul style="list-style-type: none"> <li>• IV &amp; oral Ampiclox</li> <li>• IV; guttae and s/c genticin</li> <li>• IV &amp; oral Ciproxin</li> <li>• IV &amp; oral metronidazole</li> </ul>	PL
4	55 yrs	F	No	Ocular pain	14th	HM	Yes	<ul style="list-style-type: none"> <li>• IV &amp; oral Ampiclox</li> <li>• IV; s/c and guttae genticin</li> <li>• IV &amp; oral metronidazole</li> <li>• IV &amp; oral Ciproxin</li> </ul>	PL

## Pattern of management

### Diagnosis

The diagnosis of endophthalmitis in this cohort was based purely on clinical recognition of diagnostic features. All the patients first complained of pain— 3 on the second and 1 on the fourteenth postoperative day.

Ocular examination revealed the classic signs of lid oedema, drop in visual acuity and chemosis, followed by corneal oedema, anterior chamber reaction and dim red reflex on funduscopy by the third postoperative day.

The patients in the EVS were also those diagnosed to have endophthalmitis within 6 weeks of cataract surgery or secondary lens implantation based on clinical features.

Initial diagnosis of endophthalmitis is always by recognition of diagnostic clinical features. Results of microscopy and culture of the vitreous specimens confirm it and also reveal the types of causative organisms (conjunctival smears are not of much value; the sensitivity of aqueous cultures is only 8%<sup>5</sup> while that of the vitreous cultures is 50%<sup>5</sup>).

The microbiology profile varies from place to place. The Endophthalmitis Vitrectomy Study recorded a predominance of gram-positive cocci (94.1%) and no fungi. The LV Prasad Eye Institute, Hyderabad, India<sup>6</sup> and Sankara Netralaya, Chennai, India<sup>7</sup> also recorded a predominance of gram-positive cocci and significant amounts of gram-negative bacilli and fungi.

There was no microbiologic confirmation in our cohort as neither a diagnostic aqueous nor vitreous tap was done on the patients. Without a microbiology profile of the causative organisms, specific treatment cannot be instituted. Empiric therapy gives a lot of room for treatment failure.

In using clinical features as the basis for diagnosing endophthalmitis, other simulating conditions such as retained lens fragments with uveitis, toxic reaction to drugs, exacerbation of pre-existing uveitis and phacolytic glaucoma have to be considered.

All the patients in our cohort complained of pain. This is contrary to the finding in the EVS, where three-quarters complained of pain while the rest did not.

The EVS had more patients in their cohort. This may explain the differences in the findings. It is pertinent to emphasize at this juncture that there may be differences in presentation. Therefore, even though the surgeon should constantly pay attention to complaints by postoperative patients to ensure early diagnosis and intervention, he should realise that pain is not a necessary component of endophthalmitis.

In addition, the EVS also reported that hypopyon is not a necessary component for the confirmation of endophthalmitis.

### Treatment

In our cohort, the following drugs and drug delivery approaches were employed:

- Intravenous: Ampiclox, Gentacin and Metronidazole; Ciproxin
- Subconjunctival: Gentacin
- Topical: Fortified Gentacin; +/- Ofloxacin
- Oral: Ampiclox, Metronidazole, +/- Ciprofloxacin.

### The EVS used:

- Intravitreal: Amikacin, Vancomycin
- Subconjunctival: Vancomycin, Ceftazidime (or amikacin if penicillin-allergic)
- Topical: Vancomycin, dexamethasone alternating with amikacin, cycloplegia, prednisolone acetate
- Oral: Prednisolone 30mg b.d. for 5-10 days; Ceftazidime or oral ciprofloxacin if allergic
- Intravenous: (If randomized to treatment): Amikacin (7.5mg/kg load; 6mg/kg 12 hourly; Ceftazidime or oral Ciprofloxacin if allergic)

## VISUAL OUTCOME

All the patients in our cohort eventually lost their vision (V/A:HM-PL). Only 20% of the patients in the EVS had a visual outcome of  $\leq 3/60$ . These studies are not comparable because of the differences in case definition, number of patients, methodology and treatment used.

A critical analysis of the drugs and drug delivery approaches used in The Gambia for the management of postcataract surgery endophthalmitis, shows that all but one of the drugs cannot be given intravitreally. Gentacin which can also be given intravitreally was only given intravenously, topically and subconjunctivally. It is well documented, however, that intravitreal antibiotics alone or in conjunction with pars plana vitrectomy are currently the mainstay of the treatment of postoperative endophthalmitis.

Gentacin, an aminoglycoside is typically chosen for gram-negative coverage. Retinal vascular infarction has frequently been reported after intravitreal injection of Gentacin and Amikacin.

Most of the drugs (Ampiclox, Gentacin, Ciprofloxacin, Metronidazole) in our cohort were given intravenously. Systemic drug administration is only useful for drugs that cross the blood-retinal barrier and are relatively non-toxic to ocular tissue.<sup>8</sup> The blood-retinal barrier restricts drug entry into the vitreoretinal interface, however, the presence or absence of inflammation alters the integrity of this barrier.

From the EVS,<sup>4</sup> intravenous antibiotics have not been shown conclusively to be effective in treating endophthalmitis even when introduced immediately after diagnosis. The fluoroquinolone Ciprofloxacin, which has broad antibiotic coverage with good coverage against gram-negative aerobes, including pseudomonas, has however, been shown to have a good intravenous therapy ratio.<sup>8-9</sup> It was only used for 2 of the patients in this cohort.

With topical drug administration, the major anatomic constraint for drugs intended for the posterior segment is corneal impermeability. Intraocular seepage of topical medication can, however, also occur through a fresh cataract wound.<sup>10</sup> This could justify the use of topical antibiotics in the treatment of postcataract surgery endophthalmitis.

Significant intraocular levels of antibiotic can also be achieved with frequent topical administration (every 15-30 minutes) of a highly concentrated solution. In our series, fortified gentamicin (13.5mg/ml) was given frequently, at least in the first 48-72 hours. This is useful in the management of this complication.

Intraocular penetration following oral administration of antibiotics is very poor. The oral administration of antibiotics is, therefore, not likely to achieve much when used in the treatment of endophthalmitis. Even though subconjunctival administration of drugs may afford higher drug concentrations in the aqueous and vitreous humour, no evidence exists to show that drug levels are sustained. Subconjunctival injections of Gentamicin, which were also employed in our series, may be of some use.

Metronidazole, a nitroimidazole antiprotozoal drug,<sup>11-12</sup> is typically chosen for the treatment of anaerobic or mixed intra-abdominal infection. Its use in the treatment of endophthalmitis is not documented anywhere in the literature. Logically, since it is not effective against any known causative organism for endophthalmitis, its use in its treatment should be discontinued.

Vancomycin<sup>8</sup> and cephalosporins (Ceftazidime or Cefazoline)<sup>8-9</sup> used in the EVS, both of which can be given intravitreally, are good choices for gram-positive and broad-spectrum coverage respectively.

A high concentration of antibiotics is delivered when given intravitreally and the ones commonly used maintain a concentration above the minimum inhibitory concentration (MIC) of 36-48 hours.

Since the intravitreal antibiotics are injected at a time when the causative organisms or their sensitivity profiles are not known, it is mandatory to cover for both gram-positive and gram-negative micro-organisms. Antibiotic combinations are generally used for initial treatment due to the fact that no single antibiotic can satisfactorily cover the wide range of gram-positive and

gram-negative organisms causing endophthalmitis. A commonly used combination is Vancomycin (1mg in 0.1ml) and an aminoglycoside (either Amikacin 400mcg in 0.1ml or Gentamicin 100mcg in 0.1ml).

An alternative antibiotic to the aminoglycosides for coverage of gram-negative organisms is the use of intraocular Ceftazidime (2.24mg in 0.1ml). Unlike gentamicin, it is not synergistic with Vancomycin in more rapidly killing gram-positive organisms.

In the EVS, pars plana vitrectomy with intravitreal injection of antibiotics was carried out when the visual acuity was < hand motion in the eye with endophthalmitis. Vitrectomy has the added advantage of reducing the load of causative organisms and their secreted toxins.

Intravitreal steroids were neither used in our series nor in the EVS. The potential advantages of co-administration of antibiotics and dexamethasone include reduction of the harmful effects of inflammation within the eye to preserve the integrity of the retina and other ocular tissues.<sup>8</sup> The potential disadvantages, however, include the possibility of suppressing mechanisms for infection control and the risk of drug toxic reaction from steroids, either alone or in combination with antibiotics.<sup>8</sup>

If there is obvious improvement in clinical signs after the initial injection of intravitreal antibiotics, steroids can be introduced.

#### **LIMITATIONS OF THE CURRENT RVH MANAGEMENT PROTOCOL FOR ACUTE POSTCATARACT SURGERY ENDOPHTHALMITIS**

1. An empiric therapy is employed for treatment and it is not based on any microbiology profile of the causative organisms from the culture of any ocular specimen in intraocular infection (whether conjunctival, aqueous or vitreous).
2. Systemic antibiotics are immediately introduced on diagnosis of endophthalmitis. Intravenous antibiotics have, however, not been shown conclusively to be effective in treating endophthalmitis. Even though oral fluoroquinolones have shown intraocular penetration; intraocular penetration of ampicillin and cloxacillin is not known.
3. The use of metronidazole in the treatment of postoperative endophthalmitis is not evidence-based. Since metronidazole is not effective against either bacteria or any known causative organism of endophthalmitis, its use in the management of this complication of cataract surgery should be discontinued.
4. The intravitreal approach to drug delivery is not employed at all, yet that is the only approach

whereby a high concentration of antibiotics can be introduced intraocularly and improvement expected within 24-48hours.

5. **Constraints**

- i. There is no retinovitreous surgeon in the whole country so the management of endophthalmitis is done by general ophthalmologists.
- ii. There is a functional vitrectomy machine, which no-one knows how to use.
- iii. There is a limited choice of drugs available in the hospital and the country as a whole.

**RECOMMENDATIONS FOR A NEW EVIDENCE-BASED MANAGEMENT PROTOCOL FOR ACUTE POSTOPERATIVE ENDOPTHALMITIS IN RVH, BANJUL (USING THE EVS AS A GUIDE)**

1. The general ophthalmologists should be taught how to use the vitrectomy machine.
2. Ophthalmologists should listen for and pay attention to complaints of pain and/or blurred vision by postcataract surgery patients.
3. Once endophthalmitis is diagnosed
  - Check patient's visual acuity
  - If  $\geq$  HM for vitreous tap; if  $<$ HM, for vitrectomy ideally.  
This is however, not possible at the moment in The Gambia. The only option therefore, is a vitreous tap.
  - Prepare intravitreal drugs:  
*Choices:*
    - a. Vancomycin 1mg/0.1ml + Gentamicin 400mg/0.1ml
    - or**
    - b. Vancomycin 1mg/0.1ml + Amikacin 0.4mg/0.1ml
    - or**
    - c. Vancomycin 1mg/0.1ml + Ceftazidime
  - Prepare and take patient to the theatre for vitreous tap and intravitreal injections of antibiotics.
4. Gently aspirate 0.3ml of vitreous 3.5mm from the inferior limbus and set aside.  
Administer intravitreal antibiotics using different syringes.
5. If there is no improvement after 48-72 hours, another round of intraocular injection of antibiotics should be repeated based on the sensitivity results.
6. Other medications to be given from the first day are:
  - Guttae fortified Gentamicin hourly x 1/7, then 2hourly x2/7, then 4 hourly x4/7
  - Guttae Ciloxan 2 hourly x 2/7, then 4 hourly x 4/7

- Guttae Atropine 1% t.d.s
- Tabs Prednisolone 30 mg b.d. x 5-10 days could be introduced after 48 hours on clinical signs of improvement with intravitreal antibiotics.

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