Prophylactic measures used for the prevention of postoperative endophthalmitis after cataract surgery

A survey of routine practice in Yemen

Mahfouth A. Bamashmus, *FRCSEd, FRCOphth,* ***Saleh A. Al-Akily,*** *MBBS, MD,* ***Mahmoud F. Saleh,*** *MSc, MD.*

ABSTRACT

الأهداف: توثيق الممارسة الحالية للطرق الوقائية المحيطة بالجراحة المستخدمة لجراحة الماء الأبيض في اليمن و التحقق أيضاً من الممارسة الروتينية في استخدام المضادات الحيوية والمطهر لمنع حدوث التهاب داخل العين بعد الجراحة.

الطريقة: أجريت مقابلة هاتفية مع 100 جراح عيون من مختلف المحافظات في اليمن في سبتمبر 2008م. تم استخدام استبيان لسؤال جراحي العيون.

النتائج: قمنا بالتواصل مع ممارسات 100 طبيب عيون. لم يجري 5 طبيب عيون جراحة الماء الأبيض بشكل روتيني. أجرى 95 من المستجيبون عملية استخراج الماء الأبيض بالطريقة الجراحية، وقام 5 أيضا بعملية استخراج الماء الأبيض بالفاكو باستخدام الموجات الصوتية. استخدمت المضادات الحيوية الموضعية قبل الجراحة بشكل روتيني في 12 (12.6%) من المستجيبين. قبل بدء العملية، استخدم 21 (22.1%) من الجراحين 10% بوفيدون–ايودين لتحضير الجلد و5 (5.3%) بوفيدون–ايودين في كيس الملتحمة. لم تعطى المضادات الحيوية في الحجرة الأمامية أو في المحلول من قبل أي جراح. أعطى جميع الجراحين مضاد حيوي تحت الملتحمة. استخدم (26.3%) 25 من الجراحين مزيج قطرة الاستيرويد مع المضاد حيوي، و استخدم 70(73.7%) قطرة الاستيرويد منفصلة عن قطرة المضاد الحيوي، و استخدم 39 (41.1%) من الجراحين المضادات الحيوية الجهازية.

خاتمة: أظهرت هذه الدراسة وجود تباين واسع في التدابير الوقائية المستخدمة من قبل أطباء العيون اليمنيين. استخدم جميع الجراحين خلال العملية حقنة الجنتاميسين تحت الملتحمة و قطرة المضاد الحيوي بعد العملية. فشل معظم الجراحين (94.7%) استخدام حقن بوفيدون ايودين في كيس الملتحمة قبل العملية، على الرغم من القبول الواسع لها كطريقة انتقائية مثبتة و مقنعة. تعكس الممارسات الروتينية المأخوذة التفضيل الشخصي، وليست بالضرورة أن تكون مستندة على البرهان.

Objectives: This study documents the current practice of perioperative prophylactic methods used for cataract surgery in Yemen. It investigates the routine practice in antibiotic and antiseptic use in preventing postoperative endophthalmitis.

Methods: This is a non-comparative survey. A telephone interview survey was conducted with 100 ophthalmologists' from different governorates in Yemen in September 2008. A questionnaire was used to ask the ophthalmic surgeons.

Results: The practices of 100 ophthalmologists were contacted. Five ophthalmologists did not perform cataract surgery routinely. Of the remaining 95 respondents, all performed extracapsular cataract extraction and 5 also performed phacoemulsification. Preoperative topical antibiotics were routinely prescribed by 12 (12.6%) cataract surgeons. Before the start of the procedure, 21 (22.1%) used 10% povidone-iodine to prepare the skin and 5 (5.3%) instilled 5% povidone-iodine in the conjunctival sac. Intracameral antibiotics or antibiotic in the irrigating fluid were not given by any of the surgeons. All gave subconjunctival antibiotics mostly gentamicin. Postoperatively, 25 (26.3%) used a combination steroid and antibiotic eyedrop and 70 (73.7%) gave a separate eyedrop and 39 (41.1%) gave systemic antibiotics.

Conclusion: This study reveals a wide variation of prophylactic measures used by Yemeni ophthalmologists. All surgeons used intraoperative subconjunctival gentamicin and postoperative topical antibiotic. A significant majority (94.7%) are failing to use preoperative conjunctival povidone-iodine, despite its widespread acceptance as the only convincingly proven prophylactic method. The routine practices adopted reflect personal preferences, and were not necessarily evidence-based.

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From the Department of Ophthalmology, Faculty of Medicine and Health Sciences, Sana'a University, Yemen, Magrabi Eye Hospital, Sana'a, Yemen, Department of Ophthalmology, Faculty of Medicine, Al-Azhar University, Egypt.

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Address correspondence and reprint request to: Dr. Mahfouth A. Bamashmus, Faculty of Medicine and Health Sciences, Sana'a University, PO Box 19576, Sana'a, Yemen. Tel. +967 733270277. Fax: +967 1210021. E-mail: bamashmus@y.net.ye

Postoperative endophthalmitis (POE) is one of the most devastating complications of cataract and other intraocular surgery. The reported incidence is very low and therefore prevention is difficult to investigate.[1,2] Clinical research on rates, risk factors, and prevention of endophthalmitis is very difficult to perform because of the rarity of POE and because the multiple potential variables are involved. Perioperative prophylactic therapies for patients having intraocular surgery are diverse and variety of approaches to prophylactic measures are used to prevent endophthalmitis following cataract surgery.[1,2] Using multiple different approaches to preoperative use of topical antibiotics and antiseptics, intraoperative and/or postoperative delivery of antibiotics, and type and location of wound construction and closure shows the tremendous variability in behaviors by ophthalmic surgeons. Such variations exist across individual centers, regions and countries. Postoperative endophthalmitis carries a poor prognosis and there is no sufficient evidence to form a consensus and researchers still have not reached the effective prophylactic methods in reducing the incidence of POE.[3] Unfortunately, standardized prophylaxis procedures for infection prevention do not exist at the current time and most cataract surgeons have adopted a variety of prophylactic measures. Establishing sound and evidence-based practice patterns to prevent POE is therefore essential. Most endophthalmitis prophylaxis guidelines, leave the details of antibiotic use to the individual surgeon's choice, although in all state, the use of povidone-iodine 5-10% solution for periocular skin and into the conjunctival sac prior to surgery is mandatory.[4,5] The European Society of Cataract and Refractive Surgeons (ESCRS) guidelines on prevention of POE recommend intracameral cefuroxime and do not encourage subconjunctival antibiotics or infusion antibiotics.[6] The American Society of Cataract and Refractive Surgeons (ASCRS) 2007 survey revealed that majority of surgeons use infusion antibiotics and not using intracameral antibiotics but would like to do so if a commercial preparation were available.[7] The objective of this study was to evaluate the prophylactic measures and document the current trends in antibiotic and antiseptic prophylactic methods used by Yemeni ophthalmologists for patients having cataract surgery. Also to identify the variations in practice and to compare with current guidelines on the prevention of POE.

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Methods. A telephone interview survey was conducted with 100 ophthalmic surgeons randomly chosen from different governorates across the country in September 2008 (**Table 1**). An up to date list of all practicing ophthalmic consultants and specialists who are members of the Yemeni Ophthalmic Society were obtained from the Yemeni Syndicate and the Yemeni Ophthalmic Society.[8] A questionnaire was used to ask the ophthalmic surgeons (*__Appendix 1__). Telephone calls were made by the same individual (MAB) and if no answer or the mobile phone was switched off a reminder call was made a week later. Most Yemeni ophthalmologists work in both governmental and private eye clinics and the survey was checked for duplication. This study took place in the University of Science and Technology, Ibn Al-Haitham Eye Hospital, Sana'a, Yemen. The survey takes 5-10 minutes, multiple choice questionnaire that included questions relating to

Table 1 - Description of surveyed ophthalmologists and governorates in Yemen.

Governorate	Male	Female	Total
Capital (Sana'a City)	36	9	45
Aden	9	6	15
Taiz	10	0	10
Hadramout	8	1	9
Hodeidah	7	1	8
Dhamar	2	0	2
Ibb	2	0	2
Shabwa	2	0	2
Sana'a	1	0	1
Amran	1	0	1
Al-Dhale	1	0	1
Abyan	1	0	1
Sada'a	1	0	1
Al-Mahweet	1	0	1
Lahj	0	1	1
Al-Baida	0	0	0
Hajja	0	0	0
Al-Mahara	0	0	0
Mareb	0	0	0
Al-Jawf	0	0	0
Reima	0	0	0
Total	**76**	**24**	**100**

Note: Five governorates (Sana'a, Aden, Taiz, Hadramout and Hodeidah) had 84.7% of the practicing ophthalmologists in Yemen.[10]

*The full text including Appendix is available in PDF format on Saudi Medical Journal website (www.smj.org.sa)

surgeon or hospital practice patterns. Questions asked on antibiotic and antiseptic prophylactic methods used for cataract surgery preoperatively, intraoperatively, and postoperatively. Preoperative measures were defined as those used before the cataract operation commenced and included preoperative antibiotics, skin disinfection, and povidone-iodine in the immediate preoperative period. Intraoperative measures referred to antibiotics given in the infusion or irrigating fluid, as an intracameral injection, subconjunctival injection or as topical antibiotic/antiseptic at the end of the operation. Postoperative measures were those used after the patient leaved the operating table.[9] The respondent could also add their own answer when applicable to a category of questions. The surgeons were reassured to preserve anonymity and the survey will not be linked to names of surgeons, clinics or hospitals. As the study was considered a quality assurance project, it did not require ethical approval. The Research and Ethical Committee of Ibn Al-Haitaham Eye Hospital, University of Science and Technology, Sana'a, Yemen approved the conduction of this study.

We used Excel 2003 program in collecting the data.

Results. One hundred ophthalmologists were ascertained. Five of them did not perform cataract surgery routinely. Of the remaining 95 respondents, all performed extracapsular cataract extraction and 5 also performed phacoemulsification. Clear corneal incision was preferred by 75 cataract surgeon (78.9%) and corneoscleral incision by 20 surgeons (21.1%). All of them used 10/0 nylon to suture in extracapsular cataract surgery cases while no suture was used in the majority of phaco-emulsification surgeries.

Table 2 - Prophylactic methods used routinely in the operating room during cataract surgery by 95 ophthalmologists in Yemen.

Prophylactic measure	Number of surgeons (%)
Trimming of eyelashes	19 (20.0)
Saline irrigation	36 (37.9)
Methylated spirit as skin preparation	74 (77.9)
Povidone-iodine as skin preparation	21 (22.1)
Povidone-iodine in conjunctival sac	5 (5.3)
Covering sheet draping lashes and lid margins	7 (7.4)
Antibiotics in the irrigating fluid	0 (0.0)
Intracameral antibiotic injection	0 (0.0)
Subconjunctival antibiotic injection	95 (100)
Postoperative instillation of povidone-iodine	5 (5.3)
Postoperative antibiotic ointment before padding the eye	90 (94.7)
Use of eye shields (Cartella shields)	19 (20.0)

Preoperative prophylactic methods. Preoperative topical antibiotics eye drops were routinely prescribed by 12 (12.6%) respondents. Ciprofloxacin was the most common preoperative topical antibiotic used. The antibiotic was used from 24-48 hours preoperatively. None of the respondents used systemic preoperative antibiotics or nonsteroidal anti-inflammatory drugs (Voltaren, diclofenac). In the immediate preoperative preparation, 21 surgeons (22.1%) used 10% povidone-iodine to prepare the skin and 5 surgeons (5.3%) instilled 5% povidone-iodine in the conjunctival sac. **Table 2** shows the various methods used for prophylaxis in the operating room.

Intraoperative prophylactic methods. The predominant form of intraoperative prophylaxis was subconjunctival antibiotic. All operating surgeons gave subconjunctival antibiotics most commonly gentamicin. Intracameral antibiotics or antibiotic in the irrigating fluid were not given by any of the surgeons. Five surgeons (5.3%) used 1-5 % povidone-iodine drops in the conjunctival sac at the end of the procedure. Before application of dressing at the end of cataract surgery, antibiotic ointment was used by 90 surgeons (94.7%).

Postoperative prophylactic methods. Postoperatively, all surgeons used antibiotic drops. Twenty-five (26.3%) used a combination eyedrop containing steroid and tobramycin or neomycin and 70 (73.7%) gave a separate steroid and antibiotic eyedrop namely fluoroquinolone. Thirty-nine (41.1%) gave systemic antibiotics routinely postoperatively and most commonly used ciprofloxacin tablets. Twenty-five (26.3%) used antibiotic ointment at bed time for their cases. All surgeons doing cataract surgery used the antibiotic and steroid eyedrops for the duration of 4 weeks.

In the case of vitreous loss, all surgeons changed their prophylactic regimen by adding another antibiotic eye drop, increase the frequency of the drops, and examine the patient more frequently over the early postoperative period to detect and treat potential endophthalmitis more effectively. Phacoemulsification surgeons add a stitch to the corneal wound and those not using systemic antibiotic, they usually add it at the first postoperative day.

Discussion. During 2003, a total of 31,258 cataract surgeries were performed by 203 ophthalmology specialists and residents. The cataract surgical rate was 1560 operations per million inhabitants per year.[10] Yemen has 203 practicing ophthalmologists, however, only 154 (75.9%) are Yemeni. Based on population of Yemen (19.5 Million) for the year 2003 there is one ophthalmologist per 96,000 populations.[11] At the present time as in other developing countries the Republic of Yemen has not a favorable ratio of

ophthalmologists per population (1:96,000) where problems of regional maldistribution are present with high ratios of ophthalmologists per population in major urban areas and lower ratios or absent in rural areas. Five governorates (Sana'a, Aden, Taiz, Hadramout and Hodeidah) had 84.7% of the practicing ophthalmologists in Yemen. Three governorates have 2-3 practicing ophthalmologist, 7 governorates have one practicing ophthalmologist and 6 governorates have no practicing ophthalmologists[10] (**Table 1**).

Postoperative endophthalmitis is a serious intraocular infection and its low incidence makes prevention difficult to investigate.[1,2] Postoperative endophthalmitis is rare, but it is a severe disease that results in severe structural and functional damage to the eye.[12,13] No prophylaxis measure has been shown to definitely decrease the rate of POE. Many surgeons use a variety of prophylactic techniques despite the lack of definitive evidence-based information supporting the use of these measures. Postoperative endophthalmitis carries a poor prognosis with only one third of patients achieving visual acuity better than 20/40.[2] We present up-to-date information on prophylactic antibiotic and antiseptic use in cataract surgery in Yemen. The survey provides the first data on the use of prophylactic antibiotics and other measures to prevent endophthalmitis after intraocular surgery in Yemen. It allows immediate clarification of answers and possible uncertainties and usually this method achieves a high response rate. This survey collected data on the methods used for prophylaxis of POE by ophthalmologists practicing in ophthalmic units including governmental, university and private; some of these centers offer also training. A sample of this size is likely to be an accurate reflection of current cataract surgical practice in Yemen. The most common known source of bacteria in POE is the patient's own ocular surface flora.[14] The 2 main opportunities for bacteria to gain access to the inside of the eye, either at the time of surgery or the early postoperative period, before epithelialization of the wound. The 2 main approaches used to prevent POE are reducing ocular surface flora and eradicate bacteria that enter the eye during surgery. The first target is achieved by applying antiseptic and antibiotic preparations preoperatively. The second target is achieved by topical, subconjunctival, intracameral or systemic antibiotic use. All cataract surgeons did extracapsular cataract surgery with intraocular lens implantation and 78.9% did clear corneal incision. Unfortunately, only 5 cataract surgeons (5.3%) did phacoemulsification, which indicates that majority of surgeons are lagging behind and they need to improve their skills and introduce new technology with better cataract surgery results. Majority indicated that they are planning to learn and introduce phacoemulsification in their practices in the near future.

Preoperative prophylaxis. Preoperative topical antibiotics (ciprofloxacin) were used by only 12 (12.6%) of cataract surgeons. The predominant practice of not using a preoperative antibiotic is supported by the fact that one drop of 5% povidone-iodine preoperatively is equivalent to topical antibiotic used 3 times a day for 3 days in reducing ocular surface flora.[5,15] There have been few, prospective, controlled clinical trials demonstrating a reduced incidence of POE with preoperative antibiotic use.[16,17] A recent study showed that treatment with povidone-iodine 5.0% alone was effective in preoperative reduction of conjunctival bacterial colonization. Adding topical moxifloxacin 0.5% to povidone-iodine 5.0% had no significant effect on further reduction in the bacterial colonization rate.[18] Povidone-iodine solution is used for preparation of the skin as a 10% solution in Europe and USA,[19,20] and 21 (22.1%) of the ophthalmologists' surveyed use it routinely. There is good evidence that the use of 10% povidone-iodine in the preparation of ocular surface is superior to the use of irrigation and methylated spirit.[3] The topical application of 5% povidone-iodine in the conjunctival sac was the first convincingly proven prophylactic measure in reducing the rate of POE.[3,14] Povidone-iodine achieves 96.7% bacterial kill within one minute of application and the released free iodine molecules, provide a wide spectrum of bactericidal effects that last as long as one hour.[5] One of the main advantages of povidone-iodine is the minimal toxicity and low cost so it is an ideal antiseptic agent to reduce the bacterial recovery rate and to lower the rate of POE. However, in our survey the majority of the surveyed ophthalmologists (94.7%) were reported as not employing this essential prophylactic measure. This is in contrast to the recommended guidelines by the ESCRS and ASCRS.[6,7]

Intraoperative prophylaxis. Trimming the eye lashes, irrigating the eye with saline before the start of surgery and putting a covering eye drape to remove the eyelashes from the field of surgery was used by 19 (20.0%), 36 (37.9%), and 7 (7.4%) surgeons respectively. Most surgeons (75/95) do clear corneal incision cataract surgery, which has a higher risk for POE than corneoscleral incision.[20] Subconjunctival gentamicin was the most commonly used means of intraoperative prophylaxis in this survey. Retrospective studies in the UK and Canada have shown an association between non-administration of subconjunctival cefuroxime and POE but still no well-designed prospective clinical trials in its favor, and large literature reviews have not recommended it as effective prophylaxis.[21-23] Both intracameral antibiotics and antibiotics in the

infusion were not used by any surgeon in our study. All surgeons were concerned on the risks of "home-made" intracameral antibiotic preparations and most surgeons refused using them because of unavailability of approved, reasonably priced, and commercially prepared antibiotics for intraocular use. "Home-made" intracameral or infusion antibiotics have the risk of dilution errors, bacterial contamination or toxic anterior segment syndrome (TASS). In the 2007 ASCRS survey, 14% of the respondents have experienced complications from using "home-made" intracameral antibiotic.[7]

The safety and kinetics of intracameral cefuroxime have been well evaluated.[24] In the UK, intracameral antibiotics or antibiotics in the irrigating fluid is not a choice for majority of surgeons,[4,18,19] while the ESCRS multicenter, prospective, randomized partially-blind study showed a 5-fold reduction in endophthalmitis rates with intracameral cefuroxime use.[6] The predominant intraocular use of antibiotics in the US is as an antibiotic in the irrigating fluid, most commonly vancomycin and majority of surgeons are resistant of using intracameral antibiotics.[7,25]

Postoperative antibiotics. Topical antibiotic eye drops was the most commonly used antibiotic prophylaxis in this group of surgeons. All interviewed surgeons used the postoperative antibiotic eye drops and the duration of antibiotic use was for 4 weeks. The majority (75/95) use it in combination with steroid as tobramycin or neomycin, but also some surgeons (20/95) use a separate antibiotic namely fluoroquinolone. Topical antibiotics target the ocular surface flora and some such as ofloxacin and fluoroquinolones penetrate the cornea and achieve significant intraocular levels.[26,27] Fourth-generation fluoroquinolones (gatifloxaxin or moxifloxacin) are not commercially available in Yemen, but are widely used in the US and part of Europe as the main topical postoperative antibiotic.[2,7,28] The main aim of using postoperative antibiotic eye drops is to reduce ocular surface bacterial contamination and achieve bacteriostatic and bactericidal anterior chamber levels, potentially eliminating postoperative microcontamination and preventing POE. A retrospective study showed that commencing topical antibiotics on the day of surgery, rather than the following day, significantly reduced POE rates.[29] It has been suggested that postoperative antibiotic drops be limited to one to 2 weeks to prevent the emergence of antibiotic resistance,[29] and the ESCRS guidelines recommend no more than 2 weeks unless medically indicated. The prolonged use of postoperative topical antibiotics may contribute to the emergence of resistant strains.[30,31]

The main limitation of this study is that we did not classify the surveyed ophthalmologists to low-to high-volume surgeons, the period they have been doing cataract surgeries and also we did not clarify the number of postoperative endophthalmitis every surgeon encountered over a period of a year. Also the multiple-choice format has some limitations as some surgeons may have preferred to give more differentiated answers. However, this simplification is necessary to standardize answers.

In conclusions, we present the first survey of antibiotic and antiseptic prophylaxis use by Yemeni cataract surgeons to prevent postoperative endophthalmitis (POE) and we cannot draw definitive conclusions from a survey because there are many potential biases in the response. We analyzed the findings in the context of current knowledge on the efficacy of various forms of POE prophylaxis. The surveyed ophthalmologists indicated a strong preference for subconjunctival gentamicin and postoperative topical antibiotic as the predominant antibiotic prophylaxis. A significant majority (94.7%) are failing to use preoperative conjunctival povidone-iodine, despite its widespread acceptance as the only convincingly proven prophylactic method. Yemeni ophthalmologists should adhere to the current guidelines that recommend povidone-iodine 10% be used for periocular skin and povidone-iodine 5% for conjunctival sac sterilization for at least 3 minutes before intraocular surgery. Intracameral antibiotics and antibiotics in the irrigating infusions are not used by any of the surgeons surveyed because of the absence of commercial preparation of these antibiotics and the fear from using "home-made" antibiotic preparations.

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