

Lifting the Fog in Endoscopic Surgery

By Jan Legeros, RN & Collette De Schutter, CRCST

In 1994, St. Boniface General Hospital (SBGH) Operating Room, a 14 theatre tertiary care facility, began preparing for the 1996 phase out of the use of Chlorofluorocarbons or CFCs, as mandated by the Vienna Convention.¹ One of the measures taken in preparation, was to review purchases for new equipment and where ever possible, choose equipment that could withstand steam as opposed to using Ethylene Oxide sterilization. The article that follows describes a problem encountered in addressing the phase out of CFCs, the subsequent reduction in the use of low temperature sterilization modalities and the move towards greater utilization of steam sterilization.

The ban of CFCs drastically changed the way processing of sterile supplies and equipment is per-

formed in Hospitals. Operating Rooms and Central Processing departments had typically utilized two main methods of sterilization:

- 1.) Steam Sterilization
- 2.) Ethylene Oxide Sterilization (which utilizes a mixture of 12% Ethylene Oxide and 88% Freon).²

Ethylene Oxide sterilization is a low temperature sterilization process. Items with rubber or plastic components, glued parts and fragile items such as telescopes historically could not withstand the high temperatures required for steam sterilization.

The required temperature for Ethylene Oxide sterilization is between 37 and 55 degrees Celsius. Steam sterilization temperatures range from 121 to 135 degrees Celsius.

In response to the Vienna Convention mandate, alternative methods of low temperature sterilization were designed over time, which did not use CFCs.

¹ In 1985 the Vienna Convention for the Protection of the Ozone Layer established an international framework that controls the production and consumption of Ozone Depleting Substances such as Chlorofluorocarbons or CFCs and Hydrochlorofluorocarbons or HCFCs. In 1992 the Vienna Convention set a target date of January 1, 1996 to phase out the use of CFCs.

² Freon is an Ozone Depleting Substance; specifically a Chlorofluorocarbon (CFC).

Authors

Jan Legeros, RN, is the Product Review, Evaluation and Standardization Coordinator with Urban Shared Services Corporation in Winnipeg. She is also a graduate of the Manitoba Operating Room Technician Program. Collette De Schutter, CRCST, is Supervisor, Instrument & Equipment Processing, Operating Room, St. Boniface General Hospital, Winnipeg.

However, the new sterilizers had a significantly smaller capacity due to restrictions in the safety and efficacy of the chemicals employed. The smaller capacity units could not meet all of the processing demands for large operating rooms. Clearly it was necessary to decrease the demand for low temperature sterilization. Companies began to offer equipment designed to withstand steam sterilization to meet this need. Rigid telescopes, which were in high demand for use in Endoscopic surgery were one of the first redesigned to withstand steam sterilization.

St. Boniface began using the new steam sterilizable telescopes in 1994. Coincidentally, problems with visual acuity during Endoscopy procedures began to occur. This caused serious delays intraoperatively. The surgical images were continually "foggy".

Initially, numerous possible causes for the foggy image were cited. The first step was to identify everything that could affect the surgical image. During Endoscopic surgery, several interconnected pieces of equipment provide the visual effect. Starting from the sterile field and working to the outer unsterile area, these are: trocar, telescope, light source cable, light source, camera head, camera cable, camera control module, monitor, VCR, and printer. Other variables that could affect the surgical image include all procedures and processes involved in reprocessing, such as chemicals employed in the processing of linen wrappers, sterilization agents, sterilization methodologies, and steam production.

Documenting Results

The investigation began by methodically evaluating the equipment one item at a time, assessing and documenting the results. In addition to the new telescopes, SBGH had purchased a new camera system for Endoscopy. We were initially elated when we found and corrected one problem with the camera head but the "foggy" images persisted.

Next we looked at reprocessing procedures. The processing staff diligently cleaned and visually inspected the telescopes prior to sterilization but the intraoperative complaints of foggy images continued. We decided to try using the higher magnification and stronger light of the camera system to inspect the telescopes prior to sterilization to ensure that they were clean. As soon as we hooked up the camera, we could visualize a translucent film that appeared etched into the lens of the telescope. The impact of the film on visual acuity was immediately apparent. The image was "foggy".

In consultation with the manufacturer of the tele-

scopes, we instituted a new cleaning procedure post-operatively. This consisted of soaking the scopes immediately after use beginning in the theatre, using an enzyme cleaner. The enzyme cleaner is designed to dissolve the tenacious protein deposits found predominantly in Orthopedic surgery. However, this protocol did not consistently alleviate the problem.

The last area to be tested was the steam sterilization process. In an effort to insure the integrity of the test, we sent all of the telescopes to the manufacturer to have the lenses professionally cleaned and polished. Upon return, we tested the visual acuity of the scopes utilizing the camera system. Visual acuity was perfect. The lenses were clean and free of film. We prepared the scopes for surgery in the usual manner by subjecting them to the steam sterilization cycle. We examined the scopes again, upon completion of the cycle. A film was apparent on all of the telescope lenses. We concluded that the problem somehow involved the steam sterilization process. We requested assistance from departments outside the Operating Room and formed a committee of multidisciplinary professionals within our facility consisting of Laundry Services, Infection Control, Chemistry and Physical Plant.

With assistance from our committee members, we explored and tested procedures and chemicals employed in reprocessing of linen used to wrap the telescopes for sterilization. We used glass plates to mimic the lenses of the telescopes. The results showed that the film was apparent on the glass plates when sterilized with and without linen wrappers.

Cleaning Agents and Protocols Tested

We reviewed cleaning agents and the cleaning protocol used for the interior of the sterilizers. We examined the drains in all of the steam sterilizers to rule out the possibility of abnormal bacteria counts. Unfortunately these efforts did not provide any clues.

In Winnipeg, the water is derived from Shoal Lake. In the summer "Algae Blooms" occur. At the time of the "bloom" the numbers of impurities in the water are at their highest. SBGH Physical Plant advised us that filtering takes place as the water enters the hospital. As well, chemicals called conditioning agents, are added to the pipes that transport water and ultimately the steam to the sterilizers during the Algae Bloom peak as a precaution. Because these chemicals were added at the same time as the purchase of the new telescopes, we investigated the possible impact of the chemicals in steam processing. First, we removed all of the conditioning agents from the

system and processed new glass plates in the steam sterilizer. A film was present on all of the plates. We added the conditioning agents back one at a time. After each conditioner was added, we sterilized new glass plates. No appreciable difference was observed with or without the conditioning agents.

The steam process and ultimately the quality of the water used to produce the steam remained the primary suspect. Somehow a clean telescope went into the sterilizer and a "foggy" telescope resulted. In consultation with the company who manufactured the telescopes used at SBGH, we obtained a list of other hospitals who had also purchased steam sterilizable telescopes. We conducted a survey to determine if they had experienced this problem and if so, how was it resolved. At each hospital we contacted three departments: OR, Central Processing and Physical Plant. We found that the majority of hospital ORs were using ETO to sterilize even though the telescopes could be steam sterilized. (Using ETO was thought to prolong the life of the telescopes due to the exposure to lower temperatures.) One hospital, Rockyview General, Calgary, was using steam sterilization for their telescopes and had not experienced problems with visual acuity. They were intrigued by our dilemma and expressed an interest in the outcome. We agreed to keep them informed.

Our committee suggested that an analysis of the film might bring us a step closer to resolution. New glass plates were steam sterilized to obtain and transport the sample of the film. We sent the plates to an outside agency for analysis. The analysis revealed Calcium and Magnesium deposits greater than .1 micron on the glass plates. The filters in the water lines at SBGH were not designed to filter out impurities so minute.

Testing the Water Supply

Focus on the water as the source of the problem continued. To prove our theory that impurities in the water supply were causing the film, we needed to run a test using a steam sterilization process that incorporated a pure water source. The SBGH committee discussed the use of distilled water to produce steam. Because of the mineral depletion required to distill water, the water becomes very aggressive in nature. It essentially tries to recover the lost minerals. It will attack anything it comes in contact with in an effort to regain these lost minerals. Therefore, in order to use distilled water for steam production, all of the materials such as the pipes and pipe fittings, used in transport of the water must be stainless steel. Because

of this, using distilled water was a cost prohibitive option for us even on an experimental basis

A Winnipeg Dentist, Dr. J. Bassey was intrigued by our investigation and offered his assistance. In his office, distilled water is used to generate the steam in portable stainless steel sterilizers. This method of sterilization met our criteria for testing. After sterilization using distilled water, the glass plates were completely clear and free of any film or deposits. On the basis of this test the committee concluded that when using purified or distilled water to generate steam in the steam sterilization process, the glass plates are free of deposits.

We called Rockyview to share the information gathered to date and to ask if they had ever experienced problems with their water supply. They had not. However, as part of the installation of the sterilizers, at Rockyview, filters were connected to the steam lines. The filters are located immediately adjacent to each sterilizer. Further research into the function of these filters revealed that they were capable of filtering out particles .1 micron or greater.

Significance of the Filters

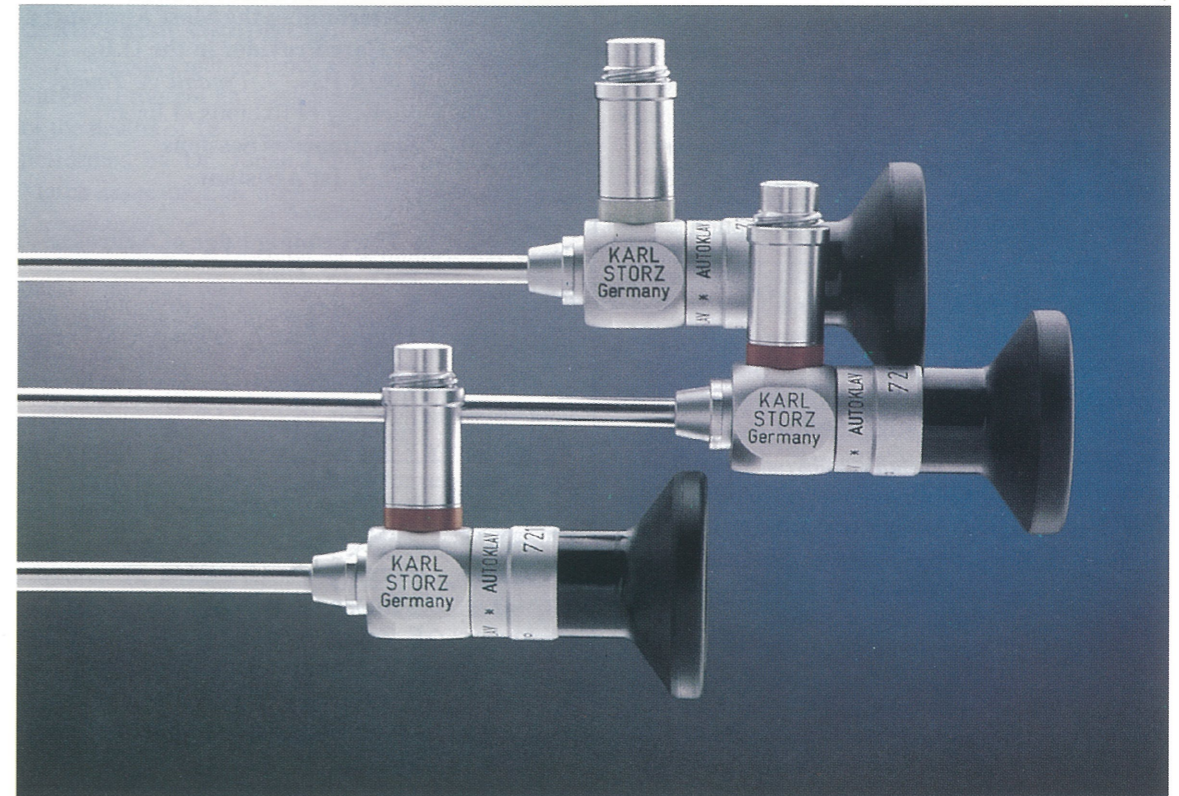
We had found the cause of the "foggy" telescopes. Our committee had established that the deposits were Calcium and Magnesium greater than .1 micron. Now we knew that these deposits came from the water supply. The significance of the filters used at Rockyview became apparent. Working with our committee, we researched and found filtration systems that would prevent these minerals from entering the sterilizer and contacting the telescopes during steam penetration. SBGH installed a filtration system capable of filtering out solids of .1 micron or greater on each sterilizer. With careful, regular maintenance of the filters, the Calcium and Magnesium deposits on the telescope lenses were eradicated.

The fog lifted!

Acknowledgments

The authors gratefully acknowledge the assistance of the following: N. Ingram, OR, Rockyview General Hospital, Calgary. Dr. J. Bassey, Winnipeg. SBGH staff includes: D. Brandenburg Chief Engineer, Physical Plant; K. Ferreira, CSR; G. Keena, Supervisor Buildings & Equipment, Physical Plant; C. Lapointe, Engineer, Physical Plant; N. MacFarlane, Infection Control; Dr. R. Meatherall, Associate Clinical Chemistry; S. Ritz, Central Processing; and G. Plamondon, Manager, Laundry. D. McPherson & R. Patrick, Service Reps, Getinge Castle Canada Inc. B. Scales, Health Devices Inspector, Health Protection Branch, Health Canada

The Gold Standard Autoclavable HOPKINS® telescopes



For more than 30 years, HOPKINS® telescopes from Karl Storz have had an impeccable reputation for superior optical quality, depth of field and clarity. Not content to simply rest on our laurels, Karl Storz has made several improvements to the original HOPKINS® design.

These improvements enhance both diagnostic and surgical visualization by providing greater brilliance, higher resolution and a wider field of view. Plus, many of our telescopes are now completely autoclavable,

ensuring a sterile instrument for every case.

And because these improvements are backed by the Karl Storz name, you can be assured no compromises were made in the manufacturing process, design and quality control. It's our pledge to you... that the HOPKINS® telescope will continue to represent the gold standard of endoscopic imaging.

For more information or a demonstration, please call your sales representative or contact Karl Storz directly at **(800) 268-4880**.

KARL STORZ GmbH & Co.
Mittelstraße 8, D-78532 Tuttlingen, Germany
Postfach 230, D-78503 Tuttlingen, Germany
Telefon: (07461) 70 80
Telefax: (07461) 70 81 05

KARL STORZ Endoscopy-America, Inc.
600 Corporate Pointe
Culver City, CA 90230-7600
Telephone: (310) 338-8100
(800) 421-0837
Telefax: (310) 410-5530

KARL STORZ Endoscopy-Canada, Inc.
438 University Avenue, Suite 1800
Toronto, Ontario, Canada M5G 2K8
Telephone: (416) 596-9900
(800) 268-4880 (English)
(800) 361-7388 (Français)
Telefax: (416) 596-9333

KARL STORZ Endoscopia Latino America
815 N.W. 57th Ave., Ste. No. 480
Miami, FL 33126-2042, USA
Telefono: (305) 262-8980
Telefax: (305) 262-8986

E-mail: karlstorz-marketing@karlstorz.de
Internet: http://www.karlstorz.de
http://www.karlstorz.com

STORZ
Karl Storz Endoscopy
www.karlstorz.com