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Contents

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Guide for Authors
The Bulletin of the Hong Kong College of Anaesthesiologists

Manuscripts should be sent to:
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About the Bulletin of the Hong Kong College of Anaesthesiologists
The Bulletin is an official publication of the Hong Kong College of Anaesthesiologists (HKCA). Acceptance of manuscripts submitted to *Bull HK Coll Anaesthesiol* is based on significance, originality, and validity of the material presented. Types of submissions accepted include reviews, clinical and laboratory investigations, case reports, technical communications, letter to the editor and other special articles describing the historic, social and current trends in anesthesia, intensive care and pain medicine.

Manuscript Preparation and Submission
Manuscripts must be prepared and submitted in the manner described in "Uniform Requirements for Manuscripts Submitted to Biomedical Journals, www.icmje.org. The manuscript cover letter must stipulate that all persons listed as authors have contributed to preparing the manuscript. Authors will be asked to transfer copyright of articles accepted for publication to the Hong Kong College of Anaesthesiologists. A Copyright Transfer form, signed by the authors, may be faxed or mailed to the Editorial Office at the time of submission. The form can be downloaded from the College's website.

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Document files should be prepared in "A-4" paper. Manuscripts should be double spaced (to allow room for editing) throughout, including references and table and figure legends. By inserting a manual page break, begin each of the following sections on separate pages: title page, summary and key words, text, acknowledgments, references, tables, and legends. (Each table, complete with title and footnotes, should be on a separate page.) Number pages consecutively, beginning with the title page.
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Ethics approval
No manuscripts describing investigations performed in humans will be accepted for publication unless the text states that the study was approved by the authors' institutional human investigation committee and that written informed consent was obtained from all subjects or, in the case of minors, from parents. This statement should appear at the beginning of the Methods section. Human subjects should not be identifiable. Do not use patients' names, initials, or hospital numbers. Similarly, manuscripts describing investigations in animals will not be accepted for publication unless the text states that the study was approved by the authors' institutional animal investigation committee.

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The title page should contain the title of the article, which should be concise but informative. First and last name of each author, with all relevant academic degree(s) including fellowship and affiliations.

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Summary and Key Words
The second page should have an abstract. All articles (except editorials) must include unstructured abstracts consisting of one complete paragraph. Summary should be no more than 300 words for all articles including case reports and reviews.

The summary should state the purposes of the investigation, basic procedures, main findings and the principal conclusions. Emphasize new and important aspects of the study or observations. Below the abstract, provide (and identify as such) 3 to 10 key words that will assist indexers in cross indexing the article.

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The text of observational, experimental, and general articles is usually but not necessarily divided into sections with the following headings: Introduction, Methods, Results, and Discussion.

Introduction: State the purpose of the article. Summarize the rationale for the study or observation.
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Abbreviations and Units of Measurement
Units of measurement: Measurements of distance/length and weight must be expressed in metric units only. Clinical laboratory and hematologic data must be expressed in SI units with, if desired, present conventional metric units in parentheses. Continue using abbreviations consistently; do not revert to the spelled-out term.

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All references must be available to all readers. Cite only references to books and articles or abstracts published in peer-reviewed journals. Number references consecutively in the order in which they are first mentioned in the text. Double-space between all lines of each reference and between references when typing the reference page. Identify references in text, tables, and legends by arabic numerals. References must be verified by the author(s) against the original documents, and the entire list must be checked for nonduplication. Use the style of the examples below:
Examples:
Standard journal articles (List all the authors when four or less; when five or more, list only the first three and add *et al*.): Lam DW, Chui PT. A prospective evaluation of a microcoagulation analyzer. Bull HK Coll Anaesthesiol 2005;14:9-12.
Personal author(s) of books and monographs: Myles PS, Gin T. Statistical Methods for Anaesthesia and Intensive Care. Oxford: Butterworth Heineman, 2000.
Chapter in a book: Chui PT, Low JM. Acute hypotension and vasodilators. In: Oh TE, ed. Intensive care manual. Oxford: Butterworth Heineman, 1997:153-62.

Tables
Type each table double-spaced on a separate sheet. Number tables consecutively and supply a brief title for each. Give each column a short or abbreviated heading. Place explanatory matter in footnotes, not in the heading. In footnotes, define all abbreviations that are used in each table. Repeat definition if the abbreviation is used in a subsequent table. For footnotes, use lower-case italicized letters in alphabetical order. Cite each table in the text in consecutive order.

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Computer generated figures are satisfactory for publication but authors should be aware that most figures will be reduced in size and should design their illustrations accordingly. Each figure should be identified by number. Color figures may be published at the discretion of the Editor-in-Chief. Figures should be cited in the text in consecutive order. If a figure has been published, acknowledge the original source and submit written permission from both the author and the publisher to reproduce the material. Define all abbreviations used in each illustration. Repeat definition if the abbreviation is used in a subsequent legend.

Editorials

Bull HK Coll Anaesthesiol 2005;14:63

Why Publish in the *Bull HK Coll Anaesthesiol*?

There are a number of reasons that you have to publish in the *Bull HK Coll Anaesthesiol*. As an official publication of the Hong Kong College of Anaesthesiologists, the *Bulletin* is distributed to over 600 individuals working locally and aboard. We have an active plan to extend our distribution beyond the memberships to other institutions and libraries. Articles published in the *Bulletin* are more likely to be read by fellows and members than any other journals published overseas. Eventually, your work will improve our way in practicing anesthesia, intensive care and pain medicine.

The *Bull HK Coll Anaesthesiol* is accredited by the College CME Sub-committee. Normally, the first six authors of any scientific articles published in *Bulletin* will receive credits points under the category of "Publications". The first author of each paper is credited with ten points while the remaining authors are credited with five points.

We welcome manuscripts from different aspects of our specialty. Currently, we publish **Featured Articles** that describe the practice in our neighborhood. **Clinical and Laboratory Investigations** are designed to publish important observations, audits or results of clinical trials and experiments. We also welcome **Reviews** and **Case Reports** for experience sharing. There is also **Letters to the Editor** for us to exchange ideas and to discuss papers published in the *Bulletin*. Manuscripts submitted to *Bulletin* are reviewed by our "friendly" editorial board and published promptly. The *Bulletin* is also published online in the College website.

I hope you will agree with me that a publication in the Bulletin worth a lot more than any other journals!

Dr Matthew Chan
Editor-in-Chief

Bull HK Coll Anaesthesiol 2005;14:63-6

Forced Air Warming using Hospital Blankets: *Best for Less*?

Unintentional perioperative hypothermia (body temperature < 36°C) occurs in approximately 50% of all surgical patients.[1-3] The contributing factors include impaired thermoregulation from various forms of anesthesia, cold operating room environment, intravenous fluids, antiseptic solutions for skin preparation and open body cavities.[4]

Inadvertent perioperative hypothermia predisposes to many adverse effects on patient recovery. It is associated with cardiac morbidities,[5] excessive surgical blood loss,[6] increased incidence of surgical wound infections and prolonged hospital stay.[7] It also contributed to reduced metabolism and clearance of numerous drugs.[8,9] More importantly, shivering as a consequence from hypothermia is most uncomfortable for the patient.[10]

Forced air warming is an effective and non-invasive active warming system. The electrically

powered heater and blower unit transfers over 50W of heat across the skin surface by convection. The patient cover also reduces radiative heat loss.[11]

The efficacy of forced air warming to maintain normothermia has been well documented.[12,13] In this issue of *Bull HK Coll Anaesthesiol*, the studies by Ma and Lim again confirmed its effectiveness.[14,15] Ma and coworker introduced a "perioperative warming protocol" to prevent inadvertent hypothermia in 361 elderly patients.[14] In a two-months survey, only ≤ 1% of patients suffered from hypothermia. Interestingly, they employed the forced air warming technique using the hospital blankets. The forced air warming unit was set at 38ºC (medium warming). No thermal burn was recorded despite the fact that most elderly patients had decreased cutaneous blood flow and may be at a greater risk of burns.

In a laboratory investigation, it was shown that forced air delivery within the hospital bed sheets were heated twice as effective as the commercial blankets.[16,17] Clinically, standard hospital blankets heated to 38ºC by a forced air warming unit produced similar efficacy compared with the commercial blankets heated to 43ºC.[18] Furthermore there was no record of thermal injury.

Nonetheless, special precautions have to be taken to protect the patients from burns. The area to be warmed should be covered with a hospital blanket and a second blanket is placed over the first one. The hose has to be supported to direct the airflow upward towards the ceiling, thus creating a tent of air within which warmed air is circulated.[18]

This technique is not the same as "hosing", for which hot air is blown directly over the skin. Indeed, the hospital blanket contains many "pores" so that warm air can be distributed evenly. There is no concentrated heat in any single pore. The hospital blanket also conforms to the shape of the body may explain its effectiveness.

However, there is a concern that forced air warming with hospital blanket could become a potential source of nosocomial infection.[19] Avidan et al sampled the air stream from nine Bair Hugger warming units and one Warm Touch Unit (Mallinckrodt Anesthesia Products). They found that four of these plates grew potential pathogenic organisms. The hose was colonized in three instances. Organisms could not be detected if the warmers were set to blow through a perforated commercial blankets or an extra microbial filter is attached to the distal end of the hose.

Interestingly, the brand new commercial blanket also contains bacteria. Sigg *et al*. identified contamination in 3 out of 30 sites (10%) over the newly opened coverlet. However, this is still within the sampling error of the study. The frequency of contamination increased by three times to 17 out of 57 sampled sites (31.5%) following one single use.[20] Baker *et al.* also detected heavy growth of bacteria in swab samples taken from both exterior and interior of the machine and from the distal end of the hose.[21]

Despite all these potential risk of contamination, it has been shown that colony counts in the air decreased rapidly after the start of surgery.[22,23] Presumably, this is due to a decrease in staff movement, and thus resulting in less air turbulence. Nevertheless, the resistant viruses, such as the SARS coronavirus, can live on inanimate surfaces for up to 24 hours.[24] Therefore, proper disinfection of the warming unit, regular changes of microbial filter and use of disposable blanket are considered important.

Cost analysis can be an important exercise.[25] The immediate perioperative costs related to the use of forced air warming included the amortized costs of the warming unit (HK$ 6.4 per use) and the commercial blanket costs HK$ 208. If the hospital blanket is being used for delivering the tent of warm air, potentially over HK$ 200 can be saved for each use (HK$ 7.4 per blanket based on laundry and replacement costs).

It appears that the use of hospital blanket is an effective alternative to disposable commercial blanket, and will allow cost saving. The remaining issue is the risk of wound contamination with airborne bacteria. Further

microbiology and clinical studies are therefore required to demonstrate the safety of using hospital blanket for forced airway warming.

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Congratulations!!

The Prize of the Intermediate Fellowship Examination, March/April, 2005, was awarded to Dr Amy KONG (KWH). Dr Kong also received a *Merit Certificate* from ANZCA for her achievement in the Primary Examination, March/April, 2005.

The Prize of the Final Fellowship Examination, April/May, 2005, was awarded to Dr Katherine Lam (PWH)

Outside Qualified Anaesthesiologists Working In China (1)

[1]Anne Kwan

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Bull HK Coll Anaesthesiol 2005;14:67-70

After 1997, it has become a reality or even necessity for the medical professional qualified in Hong Kong to engage in clinical work in China. The healthcare development in Hong Kong has followed the British system closely and a lot of adjustments are required for the Hong Kong trained doctors to practice in Mainland. The differences in health care are the result of the unique nature of the political system in China, the vastness of the country, the extremes of wealth distribution and the language medium in teaching and day to day communication.

Despite the introduction of Closer Economic Partnership Arrangement (CEPA), medical professionals qualified in Hong Kong are not granted with recognition and full registration with the relevant medical bodies in China. However, it is still possible to perform clinical work in there by having limited registration. The registration can be arranged by a receiving unit. The unit which is usually a hospital or the Red Cross, after vetting the qualifications of the doctor then issues a letter of invitation. The letter of invitation would specify the name of the invitee, nature of the work and the period. Most of the work is on a voluntary basis as the pay of a doctor in China is still not attractive as compared to that in Hong Kong. Before one commences work, it is sensible to obtain medical protection cover for clinical malpractice. The cover can usually be arranged by the individual's own medical protection organization such as the Medical Defense Union or the Medical Protection Society before leaving Hong Kong. If the duration is not too long, the additional cover is usually provided free as part of one's existing insurance package.

Despite Putonghua being the official spoken language, it is likely that one would come across many local dialects and communication can be a real problem even if you are proficient in Putonghua. The official written language is simplified Chinese characters. It is not unusual for the local to look puzzled when traditional Chinese characters are used. The staff at the major teaching hospitals in the big cities would know English but on the other hand having an interpreter around could be helpful. It is also a good idea to learn about the hospital one is going to work in. Apart from the physical environment, it is important to know the qualification and experience of the staff. The information on availability and charge of the medical equipment, drugs and blood and/or products are also helpful for one to get to know the system quickly.

Although most parts of China are still rather slow and under developed, rapid progress is being made in improving the living standards of her people. The improvement in the health care sector is noticeable but the downside is that of high health care cost. Health care service in China is not free. Patients are paying an

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escalating fee for the service. In order to avoid payment defaults, a deposit of substantial amount is required on admission to the hospital, including emergency admissions. The cost is calculated on the number of days stay, the type of hospital ward, the use of drugs and other equipment, the number of investigation procedures and nature of operation. The total cost can mount up to an astronomical amount. Some patients actually opt not to be treated because of the high and unaffordable cost.

My interpretation of the Chinese medical system may not reflect the places I have not been to as China is obviously a vast country with varying health care set ups and clinical practices. I would like to also mention that there are a few anaesthesiologists in Hong Kong, who go up to China to observe, work, and help with the training of local specialists for short periods of time on a regular basis like me. Although the hospitals we went to might be similar, we might have slightly different experience and interpret our experience in a different manner. I would like to further point out that most of the hospitals I worked in were in the Henan province. Henan province is the second largest province in China and it has a population of 100 million. Before I go on to share my limited experience of my clinical practice in China, I would like to briefly explain the few unique systems in there. China has unique setup for the hospital system, the training of specialists, and the billing of patients. Also, one must appreciate the special Chinese social culture in order to make your work and stay more enjoyable there.

The hospital system

There are different types of hospitals in China. Although the hospitals are not classified into public and private hospitals as such, they are all essentially private hospitals as all patients are billed for the health care services they receive. All the services are itemized and I would further explain how billing is done in the other section of this article.

Generally, there are two types of hospitals, the Western medicine hospitals and the Chinese medicine hospitals. However, it is not uncommon to have a department of Chinese medicine in the western medicine hospitals and vice versa. Some of the pharmacy departments have two divisions, namely the western drug division and the Chinese herbal division. If one wonders around the hospitals, be it named as western or Chinese medicine hospital, one can follow the smell of herbs and find clay pots with herbs on the hot stoves. Some hospitals offer high tech herbal medicine dispensing by preparing the herbs in electrically heated urns for the patients before hand and have them distributed in plastic containers to take home for consumption.

The other naming system one often finds is the use of names such as people's hospital, military hospital, factory hospital, union hospital and Red Cross hospital. All these hospitals are public hospitals (or should we call them private hospitals). The names reflect the association of the hospitals with the founding organizations. The association could have been broken some years back and the name remains. Hospitals called by the name of the city then followed by a number (first, second or third etc.) are hospitals built by the government or they were renamed after the culture revolution. Some hospitals are run by the locals with a team of medical experts from overseas and they are referred as the collaboration hospitals.

The clinical classification of the hospitals is most easily understood by the ABC categorization. All hospitals are categorized into one of the followings: AAA, AAB, AAC, ABB, ABC, ACC, BBB, BBC, BCC, or CCC. "A" denotes the best in its class and "C" the lowest level. A major teaching hospital must be an AAA institution and a local small hospital with only a few run down clinics would be a CCC health care centre. The hospitals have to meet the performance targets before they are granted the level of competence they claimed. Inspection is carried out periodically to see if the criteria are met. Some of the criteria the authority looks for are the provision of accident and emergency service, cardiovascular surgery and neurosurgery. Other criteria are the procession of hardware such as all sorts of endoscopies, CT

scan and MRI. It is interesting that one can often find advertisements and banners posted all over the place including along the highways by the hospital administration to advertise the high standard achieved by the hospital in order to attract patients to the hospital. Often service development of the hospital also goes along that line. Visits by overseas medical experts to the hospital are most welcome as that reflects the service provided by the hospital is of a higher and well known level.

The specialty classification is perhaps the easiest to understand. Some hospitals provide only one of the specialty services such as gynecology and obstetrics, maxillofacial, cardiac, and pediatrics. The type of specialty service would be reflected by the names of the hospitals. Although one rarely hears of a hospital for the hepatic specialty, one can find hospitals for liver diseases. Hospitals for the combined specialty of eye, ENT and maxillofacial can also be found.

The training system

It is not enough to just know about the hospital one is going to work in. In order to provide a safe and efficient service, it is mandatory to know how one's co-workers are trained and their clinical competence. There are so many ways a doctor can be trained to become a specialist that one needs to carefully work out their qualifications and experience. There are highly qualified and immensely experienced colleagues around doing very impressive works. However, there are some who are trained as "technicians" and unable to cope with difficult or unusual cases. The differentiation may be hard initially as some of them may be experts in their field but remain so humble that they would not reveal how much they know. However some of them, although not so well qualified, would tackle every case their own way. If one's intention is to provide the best care for the patients and learn from each other, it is not too difficult to learn how much they know and one would try to fit in. Sooner or later one can break down the barrier.

Students in China can be qualified as "medical practitioners" through various channels. The quickest way is to go through medical technical schools which provide a four year course for the students who have graduated from junior or senior high schools. Most of these practitioners go to the village to work in the health care clinics. It is unlikely that they would be accepted to train in the specialty field. Most medical practitioners are trained in the medical schools of universities or medical schools affiliated to hospitals. They then get send to a hospital and stay in the specialty they are assigned. While working as residents, they receive training and with time they become specialists. Some lucky ones may spent a year or so in a larger teaching hospital in a big city and return to their own hospital to stay working until they are allowed to retire at about age of 50 years or so. The really bright or lucky ones would be encouraged and arranged to go overseas for specialty training for a period of time. United States of America is obviously the place of choice. Some do come to Hong Kong to learn. It is getting increasing popular for some of the smarter younger doctors to go through a Doctor of Medicine (MD) program in order to qualify in a specialty. Apart from intensive clinical training, research activities are part of the requirements in getting a MD. Only until about three years ago, there was no uniform clinical examination for practicing doctors in China. Recently a post graduate written examination has become compulsory for the younger doctors to pass before they are allowed to continue to practice. This in some ways serves as some form of continuing medical education rather than specialist qualification assessment. The examination consists of multiple choice questions of all specialties. The across the country compulsory specialist assessment for all specialties are in the preparatory stage. It was hope that a more uniform approach would bring a higher standard of training and specialist qualifications that are recognized all over China. At present some of the specialist qualifications can only be recognized within the same city or even the training institute. It is possible as one can fast tract and turn oneself into a "specialist" about eight years after junior high school. Whereas some medical graduates may take

formal training for almost 10 years after universities.

After mentioning that the most prepared way of starting practice in China comes after learning more about the place, I actually did not do any of that when I first went to work in a small country hospital in China about 7 years ago. Subsequently, I have worked in over half a dozen hospitals of various sizes and standards. Most of the time, I enjoyed my short stay up there but at times it was nerve racking. As I was and still am an anesthesiologist by profession, I mainly anaesthetized patients while I was working in China. Most of my patients had plastic procedures (cleft lips and palates or scar from burns) or orthopedic operations because most times I went with a group of plastic or orthopedic surgeons who worked with and provided training for the local surgeons.

In my next article, I would share my experience in working in the operating theatres and the problems of using anesthetic drugs in China.

Comparison of Effectiveness between Upper and Lower Body Forced Air Warming during Open Abdominal Surgery

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SUMMARY

Many studies have shown that forced air warming is effective in preventing unintentional preioperative hypothermia. However, there are few data evaluating the optimal site for forced air warming. In this prospective study, 87 patients undergoing prolonged open abdominal surgery were randomized to receive either upper or lower body forced air warming. Nasopharyngeal and rectal temperature was recorded in both groups from induction of anesthesia to 3 hr after induction, the upper body forced air warming group showed significantly higher temperature reading. The differences started from 1 hour after induction (0.39 and 0.29 °C respectively), and persisted for 3 hours (0.73 and 0.60 °C respectively). This study showed that for patients undergoing prolonged abdominal surgery, forced air warming is more effective when applied to the upper body than that of the lower body.

Keywords: Hypothermia, Force air warming, anesthesia

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Without the use of warming devices, hypothermia is common in patients undergoing surgery. It is now recognized that even mild hypothermia can lead to adverse consequences. These include myocardial ischaemia[1], platelet dysfunction, coagulopathy causing increased blood loss[2], wound infection[3], delayed postanaesthetic recovery,[4,5] postoperative shivering and thermal discomfort[6].

The efficacy of forced air warming to prevent hypothermia is well proven. It is superior to other commonly used warming methods such as radiant heaters, fluid warmers, airway humidification, and circulating water blankets.[7-10] This has lead to the widespread use of forced air warmers, especially for major operations where the risk of hypothermia is substantial. Its effectiveness has been proven for a wide variety of surgical procedures, when applied to either the upper or lower part of the body[11,12]. However there is no study that directly compares the effectiveness of forced air warming applied to these two sites. Therefore the application of forced air warming to the upper or lower body in patients undergoing abdominal surgery has largely been the preference of clinicians or institutional practice.

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The aim of this study is to evaluate the relative effectiveness of forced air warming in preventing intraoperative hypothermia, when applied to the upper or lower body in patients undergoing prolonged open abdominal surgery.

Materials and Methods

A prospective, randomized, single-blinded study was conducted to compare the relative effectiveness of upper and lower body forced air warming in patients undergoing prolonged open abdominal surgery of more than 2 hours duration.

Power analysis was based on a type I error of 0.05 and a type II error of 0.2 using the Power and Precision computer software (Biostat, Inc., Englewood, NJ, USA). According to the results of previous studies[13,14], we calculated that at least 42 patients per group is required to demonstrate a mean difference in core body temperature of 0.5°C with a standard deviation of 0.8 °C.

Approval by the hospital ethics committee of the study was obtained. Eighty seven adult patients, older than 18 years, American Society of Anesthesiologists physical status I to III, undergoing open abdominal surgery with an expected duration of more than 2 hours, were recruited in this study. Simple randomisation of patients into two groups of either the upper or lower body warming was performed. Exclusion criteria included pre-existing hypothermia (core temperature < 36°C) or hyperthermia (> 38°C), patients undergoing abdominal aortic surgery, burn injury or multiple traumatic injuries, and surgery in lithotomy position.

Preoperatively, demographic data were recorded and tympanic membrane temperatures of patients were recorded by infrared probe (ThermoScan Pro 1, Braun AG, Germany).

All patients received general anaesthesia with tracheal intubation. Nasopharyngeal and rectal thermistor temperature probes (Datex model 16561, Helsinki, Finland) were inserted after induction of anesthesia. The nasopharyngeal and rectal temperatures of patients were continuously monitored during surgery using the temperature-monitoring module (model M-ESTPR 00-02) and displayed on a Datex AS/3 anesthesia monitor. The initial readings and further readings at 15-minute intervals were recorded after induction of anesthesia until the end of surgery.

After baseline recordings, forced air warming using Warm Touch model 501-5800 (Mallinckrodt Medical, St Louis, MO, USA) was applied to all patients for the whole intraoperative period. For the upper body group, an "upper body blanket" (Warm Touch model 503-0820) was applied to cover the upper trunk and limbs. For the lower body group, a "lower body blanket" (Warm Touch model 503-0830) was applied to cover the lower limbs up to the middle of the thighs. The forced air warmers were initially set to the "high" setting for both groups. The warmer settings were reduced to medium or low if the core temperature exceeded 37.5°C.

All intravenous and irrigation fluids used were warmed in fluid warming cabinet prior to use. Circle anesthetic circuits with soda-lime absorbers were used. The use of additional warming devices such as heat and moisture exchangers, intravenous fluid warming coils or circulating water mattresses were recorded. The ambient temperature in the operating theatre was set to 21°C, and the temperature at the start and end of the surgery was recorded using an ordinary alcohol thermometer.

Statistical analysis of temperature readings was performed using two-tailed factorial analysis of variance with repeated measures. Analysis of demographic data was performed with χ^2 test for categorical variables and Student's t-test for continuous variables.

Results

The 87 patients enrolled in the study were randomized into 45 patients in the upper body group and 42 patients in the lower body group. The summary of patient characteristics is shown in Table 1. No difference was found between the groups in demographic characteristics, preoperative temperature, type of surgery, ambient operating theatre temperature and

Table 1. Patient characteristics. *Data are presented as mean ± SD, or number of patients. ASA = American Society of Anesthesiologists; OT = operating theatre; HMW = heat and moisture exchanger; CWM = circulating water mattress.*

	Upper Body	Lower Body	*P* value
Number of patients	45	42	
Age (years)	62.1 ± 14.9	61.0 ± 16.5	0.74
Sex (Male/Female)	21/24	20/22	0.93
Weight (kg)	53.8 ± 10.7	54.7 ± 9.6	0.67
ASA Class I/II/III	14/24/7	15/19/8	0.75
Type of surgical procedure			0.68
Upper gastrointestinal	11	10	
Lower gastrointestinal	12	16	
Hepatobiliary	13	10	
Gynecological	9	6	
Elective/Emergency procedure	37/8	33/9	0.67
Ambient OT temperature (°C)			
Start of surgery	20.3 ± 0.9	20.2 ± 0.7	0.67
End of surgery	20.6 ± 0.9	20.7 ± 0.8	0.53
Preoperative patient temperature (°C)	37.5 ± 0.6	37.3 ± 0.6	0.21
Intraoperative blood loss (ml)	477.1 ± 531.7	475.2 ± 556.1	0.99
Time Interval (min)			
Induction - Warmer application	14.0 ± 6.9	13.2 ± 7.2	0.59
Induction - Skin incision	19.5 ± 6.6	19.0 ± 6.6	0.69
Induction - Wound closed	185.9 ± 78.4	209.0 ± 96.8	0.22
Additional warming equipment used			0.93
Warming coil, HME, CWM	6	7	
Warming coil, CWM	9	9	
HME, CWM	6	4	
CWM	24	22	

intraoperative blood loss. The time intervals from induction of anesthesia to application of warmer, from induction to incision, and from induction to the end of surgery were similar between groups. There was also no difference in the use of additional warming equipment between groups.

Changes of nasopharyngeal temperature in both groups are shown in Figure 1. Thirty-four patients in the upper body group and 37 patients in the lower body group had surgery that lasted over 2 hours. For the remaining 16 patients, their procedure ended up taking less time than initially anticipated. However, based on the intention to treat, data from all patients that were initially enlisted in the study were analysed, up till the end of their procedure or the 180-minute interval, whichever is earlier. The upper body group showed a significantly higher mean nasopharyngeal temperature compared with the lower body group, beginning from 60 minutes post induction of anaesthesia, and persisting till 180 minutes post induction.

Changes of rectal temperature during surgery are shown in Figure 2. In common with the nasopharyngeal temperature, rectal temperature in the upper body group was significantly higher compared to the lower body group, from 60 minutes post induction till 180 minutes after induction of anesthesia. However, there was a difference in the number of patients

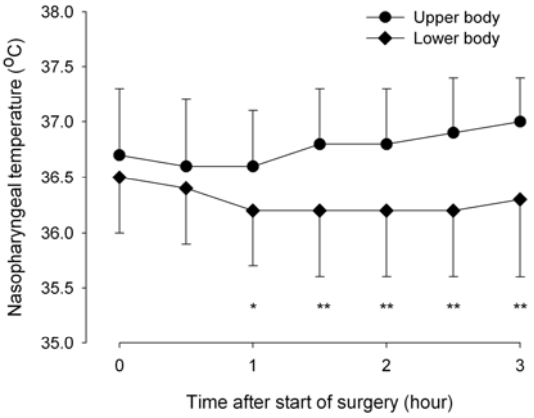

Figure 1. Changes of nasopharyngeal temperature after the start of surgery. **P* = 0.001; ***P* < 0.001.

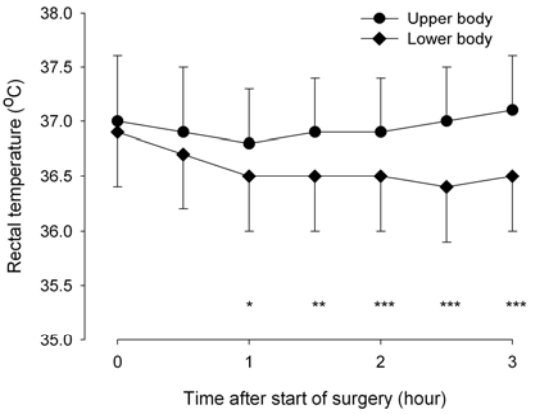

Figure 2. Changes of rectal temperature after the start of surgery. **P* = 0.02; ***P* = 0.001; ***P < 0.001

because the rectal thermistor probe was dislodged in 3 patients in the upper body group.

Discussion

With the increased awareness of possible adverse effects with inadvertent hypothermia, there has been widespread adoption to the use of forced air warming. Although there have been many studies that proved the effectiveness of forced air warming over other methods of patient warming, few have compared he relative effectiveness of the sites of applications.

This study showed that, in patients undergoing prolonged open abdominal surgery, forced air warming is more effective when applied to the upper part of the body than the lower part. After an initial decrease in temperature after anesthesia, it stabilized and returned to normothermia by 30 to 60 min in the upper body group. In contrast, the temperature in the lower body group increased only gradually 60 min after induction. At 1 hour after induction, the mean nasopharyngeal temperature was 0.39°C higher in the upper body group. This difference increased to 0.73°C 3 hours after induction.

The body surface area covered by the upper or lower body forced air warming blankets was similar in this study. It is postulated that the increased effectiveness of upper body forced air warming might be related to the better perfusion of the upper limbs and trunk compared with the lower limbs, especially since patients undergoing open abdominal surgery tended to be older.

Patients undergoing prolonged open abdominal surgery were selected for this study because with exposure of the intestines, the likelihood of developing hypothermia increased. Therefore, there is a better chance to detect a difference in effectiveness between the upper and lower body forced air warming.

Although all patients in this study received general anesthesia, the actual conduct of anesthesia was not standardized. This was deliberately so, because we intended to test the effectiveness of forced air warming in two different sites during daily and highly variable clinical practice. It is also considered inappropriate to standardize the use of additional patient warming methods, but they were recorded and analysed as confounding variables. Notwithstanding this, most patients in this study received general anesthesia with intravenous induction, followed by maintenance with low flow inhalational anesthesia using sevoflurane or isoflurane with nitrous oxide and oxygen mixture, supplemented with intravenous opioids and muscle relaxants.

One previous study evaluated the site of warming. Motamed *et al* randomized 26 patients undergoing abdominal surgery into upper and lower body force air warming. Normothermia was obtained significantly faster with lower body forced air warming[13]. This is in contrast to our findings. But there was no mention on any significant difference at any time points between groups.

Even after prolonged application of forced air warming at the high temperature setting, none of the patients in this study sustained any burn injury or other adverse events. Although there have been few reported cases of burns due to the use of forced air warming in the literature[1,5,16] most of these cases can be attributed to improper use of the equipment. Considering the widespread use of forced air warmers worldwide, even in patients at increased risk of burn injury, i.e. those with diabetes or peripheral vascular disease, adverse events are rare.

In conclusion, this study showed that for patients undergoing prolonged abdominal surgery, forced air warming applied to the upper part of the body is more effective in preventing hypothermia than the lower body.

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Combined Spinal Epidural Anesthesia versus Spinal Anesthesia for Cesarean Section: Effect on Maternal Hypotension

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SUMMARY

Sixty healthy parturients scheduled for elective cesarean section were randomly allocated to receive spinal anesthesia (*n*=30) or combined spinal epidural anesthesia (CSE, *n*=30). In the spinal group, 2.2 ml 0.5 % heavy bupivacaine and 10 μg fentanyl was injected into $L_{2/3}$ space through 26G Quincke needle. In the CSE group, 1.5 ml 0.5% heavy bupivacaine and 10 μg fentanyl were injected intrathecally using a needle through needle CSE set (26G Quincke and 18G Tuohy needle) at $L_{2/3}$ space. Operation started when T_6 level was reached. Additional 1.5 ml of 0.5% plain bupivacaine per unblocked segment was added epidurally to achieve T_6 level if necessary. Demographic data, side effects, neonatal outcome were similar between groups. Two patients in the CSE group and none in the spinal group developed inadequate analgesia. Hypotension occurred in 93% of parturients in the spinal group and 73% in the CSE groups (P = 0.08). Lowest systolic arterial pressure developed later in the CSE group than the spinal group (P = 0.04). Ephedrine consumption was greater in the spinal group (P = 0.03). We concluded that CSE anesthesia provided surgical anesthesia in cesarean section as effective as spinal anesthesia using 7.5 mg bupivacaine with 10 μg fentanyl. CSE also reduced the incidence of hypotension.

Keywords: Combined spinal epidural anesthesia, fentanyl, hypotension

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Regional anesthesia is a popular technique for elective cesarean delivery. It avoids the risks of failed intubation and aspiration associated with general anesthesia. There are also increasing number of parturients who wish to be awake during their operations. Choice of regional techniques includes spinal anesthesia, epidural anesthesia and combined spinal epidural anesthesia (CSE).[1]

Spinal anesthesia has the advantages of simplicity of technique, requiring small doses of local anesthetic, producing faster onset, intense and reliable block. However, the problems of unanticipated extensive block, limited duration of anesthesia, hypotension and postdural puncture headache cannot be ignored. Epidural anesthesia can be extended to provide post-operative pain relief, but takes up more time

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and involves a higher incidence of inadequate and superficial block.

Combined spinal epidural anesthesia (CSE) was introduced by Brownridge in 1981.[2] It has the advantage of both epidural and spinal anesthesia and may reduce many of the disadvantages. It may be a preferred choice for cesarean section. Different techniques for CSE have also been described.[3-5]

Previous study by Rawal *et al* showed that surgical analgesia and muscular relaxation following CSE were superior to those seen after epidural anesthesia for cesarean sections.[6] Moreover, the incidence of hypotension was lower following CSE anesthesia as compared to epidural anesthesia. Thoren *et al* demonstrated that spinal anesthesia and sequential CSE provided good surgical analgesia and muscle relaxation for cesarean section with the same incidence of hypotension.[7] As Thoren used bupivacaine only for spinal anesthesia, it is uncertain whether the addition of fentanyl to bupivacaine will produce different analgesic efficacy and complications profile of CSE. We compared the quality of block between spinal and CSE anesthesia for cesarean delivery.

Methods and Materials

After obtaining approval from Local Ethics committee, 60 healthy (American Society of Anesthesiologists Physical Status Class 1 or 2), full term parturients, scheduled for elective cesarean section were recruited for the study. All patients weighted 50 to 90 kg, had single fetus and uncomplicated pregnancies. Informed written consent was obtained. Patients with bleeding tendency or receiving anticoagulants, and those with deformities of the spine or infection around the injection site were excluded from the study. We also excluded patients with history of allergy to local anesthetics or fentanyl, and had major cardiorespiratory diseases, sepsis or uncontrolled diabetes mellitus..

All patients received 0.3 M sodium citrate solution 30 ml orally 30 minutes before anesthesia. They were then randomized by random number allocation to two groups of 30 patients (spinal and CSE group). Before anesthesia, 15 ml/kg of acetated Ringer solution were infused intravenously over a period of 15-20 min. The solutions were pre-warmed to 37°C. Baseline arterial pressure was measured when the patient lying supine with lateral tilt in the operation table. The urinary bladder was catheterized. Oxygen 4 L/min was administrated through a nasal catheter. All regional blocks were performed by the same anesthetist.

Spinal group

Patients received spinal anesthesia in right lateral position under aseptic technique. After infiltrating the skin with 1.5% lignocaine, a 26G Quincke needle (Spinocan, B. Braun, Germany) was introduced by midline approach at $L_{2/3}$ interspace. The bevel was faced laterally to the left. This was taken as the starting time of regional block. A total of 2.2 ml 0.5% heavy bupivacaine with 8% glucose (Astra, Australia) and fentanyl 10 μg (Janssen Pharmaceutica, Belgium) was injected intrathecally. The patient was then placed in the supine position with a left lateral tilt, and this signified the end of regional block.

CSE group

Similarly, patients in the CSE group received CSE block under aseptic technique in the right lateral position. An 18G Tuohy needle (Espocan, B.Braun, Germany) was introduced at $L_{2/3}$ level in the midline, with bevel facing cephalad. Epidural space was identified by loss of resistance to air. A 26G extra long Quincke needle was then inserted through the Tuohy needle into the subarachnoid space. A total of 1.5 ml 0.5% heavy bupivacaine with 8% glucose and fentanyl 10 μg was injected intrathecally. The spinal needle was then withdrawn and the epidural catheter was inserted 4 cm into the epidural space. The patient was immediately turned to supine with a left lateral tilt.

The spread of the sensory block was tested by response to pinprick bilaterally. Dermatomal level was tested every min for the first 10 min and then every 5 min for the remaining 50 min after resuming the supine posture. Operation was allowed to start once the sensory blockade reacheds T_6 level.

In the CSE group, if the sensory level did

not reach T_6 after 10 minutes, additional 0.5 % plain bupivacaine (Astra, Australia) was injected epidurally. This was achieved by an initial test dose of 2 ml 0.5% plain bupivacaine, and additional 1.5 ml per unblocked segment was injected epidurally until T_6 level was reached within 20 minutes.[4]

During surgery, surgical analgesia was graded by the patients as excellent, good, fair or poor. If patients complained of pain during surgery, increments of fentanyl 50 μg IVI was given as required.

Monitoring included automatic oscillometric device (Narkomed 4E, North America), electrocardiograph (Vitalert 2000, North America) and pulse oximetry (Narkomed 4E, North America). After resumption of the supine with lateral tilt position, maternal arterial pressure was measured at one minute interval for first 10 min and then at 5 minutes' interval for 50 minutes thereafter. Hypotension was defined as a decrease in systolic arterial pressure more than 20% of baseline or < 100 mmHg. This was treated with boluses of ephedrine 5 mg IVI and rapid fluid infusion up to 10 ml/kg. Respiratory depression, defined as respiratory rate less than 10 per minute or SaO_2 < 90%, was treated by increasing inspired oxygen concentration and intravenous naloxone in 0.1 mg boluses.

Post-operatively, sedation score, respiratory rate, arterial pressure, pulse rate and oxygen saturation were monitored for three hours. Respiratory depression, pruritus, nausea and vomiting were recorded and treated accordingly. Indomethacin suppository 100 mg (Lifepharma, Italy) was given to the patients for pain relief during this period. Patients were followed up and the occurrence of post dural puncture headache (PDPH) was recorded. Apgar scores and umbilical blood gases sampling results were also collected.

Statistical Analysis

Parametric data was analyzed using 2-sample *t* test. X^2 test was used to compare the incidences of complications including hypotension, nausea and vomiting, pruritus, shivering, PDPH, as well as inadequate analgesia between the two groups. Apgar scores were analyzed by Mann Whitney test. Data were presented as mean ± standard deviation.

Results

The spinal and CSE groups were not different in age, weight, height and gestation (Table 1). There were no differences between groups in the maximal analgesic level achieved as well as the analgesic level at 10 minutes after completion of regional block. The volume of intravenous fluid given was also similar.

Patients in the spinal group achieved the maximal analgesic level in 5.8 ± 0.4 min, and was significantly faster (P = 0.05) than CSE, 8.0 ± 1.1 min.

Times spent in performing the CSE was significantly longer than that required in spinal anesthesia (Table 1). The time interval from start of regional block to skin incision was also significantly longer for CSE. The time interval from uterine incision to delivery was similar between groups, whereas the time interval from skin incision to delivery was longer in the spinal group.

The incidence of hypotension was higher in the spinal group (93%) than CSE group (73%) but the difference did not reach statistical significance (P = 0.08). Lowest systolic arterial pressure developed faster in the spinal group than CSE group (P = 0.05, Table 2). Percentage of maximal drop of systolic blood pressure was also similar between groups. Patients in the spinal group required significantly more ephedrine (17.5 ± 1.8 mg) than those in CSE group (12.0 ± 1.6 mg, P = 0.03). In those patients who needed ephedrine, the time to first dose of ephedrine was similar between groups.

All patients in the spinal group had adequate surgical anesthesia for the cesarean section. Two patients in the CSE group developed inadequate surgical anesthesia. One patient had analgesic level of T_6 but reported discomfort after delivery and required intravenous fentanyl. The other patient had analgesic level of T_{10} after 10 minutes and

Table 1. Patient characteristics and performance of regional block. *Values are mean ± SD; Levels are expressed as median (range)*

	Spinal group (n = 30)	CSE group (n = 30)	P Values
Patient characteristics			
Age (year)	31.0 ± 0.9	32.8 ± 0.8	0.89
Body height (cm)	155.4 ± 1.2	155.7 ± 1.5	0.91
Body weight (kg)	65.8 ± 1.3	65.1 ± 1.5	0.96
Maturity (weeks)	38.5 ± 0.2	38.4 ± 0.2	0.87
Performance of regional block			
Maximal dermatomal level [median (range)]	T_4 (T_{2-5})	T_4 (T_{2-6})	0.85
Level at 10 min [median (range)]	T_4 (T_{2-5})	T_4 (T_{2-10})	0.99
Time to maximal level after completion of block (min)	5.8 ± 0.4	8.0 ± 1.0	< 0.05
Performance time (sec)	217.8 ± 23.1	336.5 ± 4.0	0.01
Start of block to skin incision time (min)	10.3 ± 0.5	13.9 ± 1.2	0.01
Start of block to delivery time (min)	20. 0 ± 0.7	22.2 ± 1.3	0.16
Skin incision to delivery time (min)	9.7 ± 0.5	8.2 ± 0.5	0.05

required an epidural top up.

Incidence of complications was tabulated in Table 4. There were no statistically difference in the occurrence of nausea, vomiting, pruritus and shivering between groups. No patients in the spinal group but three in the CSE group developed PDPH. One required epidural blood patch. There was no evidence of accidental dural puncture by 18G Tuohy needle in all three patients. The first patient had cesarean section for breech presentation. She developed severe PDPH on day 1 after delivery. She refused blood patch and was treated conservatively. Her headache subsided five days afterwards. The second patient had cesarean section for macrosomia. She developed PDPH on day 1. She received epidural blood patch on Day 2. Headache completely resolved afterwards. The third patient received cesarean section for transverse lie. She developed PDPH on day 2. She requested conservative treatment and the headache resolved on day 5. No further headache was reported in these patients after discharged from hospital.

There was no difference in Apgar scores in 1 and 5 minutes between the 2 groups (Table 2). None of the neonates had Apgar score below 7. The results of fetal blood gas were similar in both groups. Patient assessment of anesthesia was also similar in both groups (Table 3).

Discussion

CSE combines the advantages of epidural and spinal anesthesia. It provides a more intense block that is reliable and faster than epidural anesthesia. CSE is more flexible because it provides a means for extension of the block through the epidural route. Hence smaller doses of local anesthetic can be administered intrathecally. This may reduce the incidence and severity of hypotension. CSE can also be extended to provide postoperative pain relief.

Hypotension is one of the major hazards of regional anesthesia for cesarean section. Severe hypotension induces maternal or neonatal morbidity.[8] Prophylactic measures against hypotension included fluid preloading, maternal positioning to minimize aortocaval compression and vasopressors like ephedrine. Hypotension may also be reduced by using smaller intrathecal dose of local anesthetics. The subarachnoid doses of hyperbaric bupivacaine for cesarean section had been reviewed previously.[9,10] Various bodily parameters were found to correlate with anesthetic dose for

Table 2. Complications and neonatal outcomes after spinal or combined spinal and epidural block. *Values expressed as mean ± SD.*

	Spinal group (n = 30)	CSE group (n = 30)	P Values
Hypotension (number, %)	28 (93%)	22 (73%)	0.08
Percentage of maximal decrease in systolic pressure	30.4 ± 1.6	26.8 ± 1.9	0.15
Time to develop the lowest SBP (min)	4.5 ± 0.8	9.3 ± 2.3	0.05
Dose of ephedrine consumed (mg)	17.5 ± 1.8	12.0 ± 1.7	0.03
Time to first dose of ephedrine (min)	2.8 ± 0.4	3.1 ± 0.3	0.52
Nausea and vomiting (number)	10	10	1.00
Pruritus (number)	1	0	0.50
Shivering (number)	2	2	1.00
Postdural puncture headache (number)	0	3	0.12
Apgar score			
at 1 min [median (range)]	8 (7-9)	8 (7-9)	0.44
at 5 min [median (range)]	9(8 - 10)	9(8 - 9)	0.72
Cord blood analysis			
pH	7.31 ± 0.01	7.32 ± 0.01	0.38
Carbon dioxide tension (kPa)	5.6 ± 0.2	5.8 ± 0.1	0.49
Oxygen tension(kPa)	3.5 ± 0.2	3.5 ± 0.2	0.86
Bicarbonate concentration (mmol/L)	21.2 ± 0.6	21.3 ± 0.5	0.18
Base excess (mmol/L)	-4.7 ± 0.6	-3.6 ± 0.4	0.15

spinal anesthesia. Patient height is most commonly taken into account when determining the dose of spinal anesthesia.[11] Recent studies showed that the vertebral column length was an important factor in dose selection.[12,13] Satisfactory block has been reported with smaller doses of hyperbaric bupivacaine ranging from 7.5 to 12.5 mg. This was associated with 33 % hypotension.[6]

CSE allows the use of smaller dose of local anesthetics for the spinal component as the epidural catheter can be used to supplement inadequate block if necessary. It is still controversial whether CSE is associated with less hypotension than spinal or epidural anesthesia. Earlier study by Rawal *et al* showed a lower incidence of hypotension in CSE compared with epidural anesthesia for cesarean section.[6] In this study, the incidence of hypotension is high with respect to the dose administered, 73 % of patients in CSE group *versus* 93 % of patients in spinal group developed hypotension.

Fentanyl has bupivacaine sparing effect and may reduce the incidence of hypotension.[14,15] Fentanyl has been added to the subarachnoid bupivacaine to enhance surgical analgesia and prolong the duration of anesthetic block.[16-18] Fentanyl produced many of its clinical effects very early after intrathecal administration in the intraoperative periods. Earlier study by Sergio *et al* (17) showed that the combination of bupivacaine and a low dose of fentanyl (0.25

Table 3. Patient assessment of surgical anesthesia. *Data were number of patients (%).*

	Spinal group (n=30)	CSE group (n=30)
Excellent	10 (33.3%)	11 (36.6%)
Good	20 (66.6%)	18 (60%)
Fair	0	1 (3.3%)
Poor	0	0

μg/kg) provided excellent surgical anesthesia. Adverse effects were minimal but postoperative analgesia was short lasting. Thus the addition of fentanyl to subarachnoid bupivacaine may reduce bupivacaine requirement. This in turn reduces the incidence of hypotension. In our study, patients in the CSE group received hyperbaric bupivacaine 7.5 mg and fentanyl 10 μg intrathecally. Twenty-eight patients (93 %) reported satisfactory surgical analgesia with this combination alone and only two patients had inadequate block. Our study would suggest that the dose regime is sufficient to provide surgical anesthesia for most patients.

The incidence of PDPH in CSE group ranges from 0.3-2.5%.[6,19,20] It is difficult to compare the incidence of PDPH across different studies because of the varying techniques and needles used.[3-5] Several workers commented on the very low incidence or lack of PDPH after CSE anesthesia. Dennison reported only two PDPH out of 400 patients who received CSE for cesarean section,[21] while Kumar reported 2 cases of mild headache in 300 cesarean delivery patients.[22] However, Collis *et al* reported high incidences of PDPH (2.3 %) in CSE technique in 300 mothers using single-space needle-through-needle technique with 16 gauge Tuohy and 27 gauge extralong spinal needles.[19] For CSE used for labour pain relief, Norris *et al* suggested that it might not be associated with an excessive incidence of PDPH.[20] The incidence and severity of PDPH is closely associated with the size of needle puncture, character of the needle tip and experience of the performers. In our study, we had no report of PDPH in the spinal group but three patients in the CSE group developed PDPH. All of them received single space, needle through needle, CSE anesthesia with Espocan CSE set (18G Tuohy needle with 26G Quincke spinal needle). The reason of this unexpected high incidence of PDPH was not clear. It might be due to catheter puncture of the dura or inadvertent shift of the Tuohy needle during injection for spinal anesthesia. There was no evidence of CSF leak either from needle or catheter at any stage. It could also occur by chance because of the small sample size.

Some authors have commented that combined spinal epidural anesthesia appeared cumbersome and the use of smaller dose of local anesthetic intrathecally in CSE will delay in the establishment of satisfactory analgesic level.[23] Our study confirmed that it took longer time to perform CSE. Majority of spinal anesthesia could be performed within 2-5 minutes, whereas CSE will require 3-7 minutes. However, the difference would be small when the start of regional block to delivery time was considered. There was no difference in neonatal outcomes between groups despite the longer performance time of CSE. It suggested that CSE anesthesia can be performed within a reasonable time interval by experienced anesthesiologists and it produces similar neonatal outcomes as spinal anesthesia. Therefore, CSE can be considered as a choice of anesthetic technique for emergency cesarean sections.

Conclusion

CSE anesthesia provided comparable surgical anesthesia in cesarean section as spinal anesthesia. It was associated with less severe maternal hypotension. The dose of heavy bupivacaine could be reduced to 7.5 mg when fentanyl is being used together. Both spinal and CSE anesthesia were associated with good neonatal outcome.

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Low-dose Subcutaneous Ketamine Infusion: a Dose Finding Study for Post-operative Analgesia

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SUMMARY

In this double-blinded, randomized controlled trial we determined the optimal dose of subcutaneous ketamine infusion required for post-operative analgesia after major abdominal surgery. Patients were randomly allocated to receive either 0.9% saline or one of three ketamine doses (0.05, 0.1, 0.2 mg/kg/h), given as subcutaneous infusion. All patients were given intravenous morphine for postoperative analgesia using the patient-controlled analgesia pump. A total of 50 patients completed the study. Five patients (one had ketamine 0.05 mg/kg/h; 2 received 0.1 mg/kg/h and 2 had 0.2 mg/kg/h) developed severe psychomimetic adverse reactions that significantly compromised their safety. Postoperatively, there were no differences among groups in subjective assessment of analgesic efficacy, pain scores at rest and on movement, opioid consumption and other adverse reactions. We observed a trend of lower PCA morphine consumption among the ketamine groups. We concluded that the use of low-dose subcutaneous ketamine infusion for post-operative analgesia is not recommended until further information regarding side effects profile is available.

Keywords: Ketamine, Patient controlled analgesia, Anesthesia, Dose finding study

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Ketamine is a well know anesthetic agent for over three decades. It has analgesic properties at sub-anesthetic doses.[4-12,14,16] This is related to a non-competitive antagonism at the N-methyl-D-aspartate (NMDA) receptor at the level of spinal cord dorsal horn.[1-3] NMDA receptors have an important role in the development of wind-up phenomenon and long-term central sensitization of the pain pathway.[2]

The use of sub-anesthetic, low dose ketamine as an analgesic has been investigated. Several reports have produced positive results, without the occurrence of dose-dependent psychomimetic side effects.[4,5,17,18] Effects on cardiovascular and respiratory systems are also minimal at this range of doses.[4,5,7,10,12,17,18] The reported analgesic efficacy is comparable to that of morphine and pethidine without the common side effects such as respiratory depression,[5,8,11,12]

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urinary retention, sedation, pruritus and tolerance.[4,13] The incidence of nausea and vomiting is less than or equal to that of opioids.[4,13] When used as an adjunct, ketamine has an opioid-sparing effect.[4] A ketamine subcutaneous infusion of 0.1 mg/kg/h has been shown to produce similar analgesic efficacy as a morphine infusion of 0.03 mg/kg/h sub-cutaneously.[5] In this regard, adequate analgesia with fewer side effects will result in quicker recovery and fewer complications. Thus, in the long run, ketamine administration should reduce costs and potentially opioid tolerance, dependence, and chronic pain syndrome. Various routes of administration, including subcutaneous, have been examined and are effective in providing analgesia. However, the optimal dose range of subcutaneous ketamine infusion for analgesia has not been found. Subcutaneous infusion is simple to administer and does not require an intravenous access. This study aims to provide clinicians with information on a useful alternative or adjuvant to postoperative analgesia.

Methods

After obtaining hospital ethics committee approval, patients admitted for elective abdominal surgery involving a midline incision were invited to participate if they had chosen IV patient controlled analgesia (PCA) for post-operative pain relief. With written, informed consent, 50 patients were randomly allocated into four groups receiving either 0.9% saline (Group S) or one of three ketamine doses (0.05, 0.1 and 0.2 mg/kg/h, Group Ket 0.05, Ket 0.1, and Ket 0.2, respectively) given as a subcutaneous infusion. All patients were provided with PCA morphine. The pumps were programmed to deliver morphine 1 mg bolus, lockout interval of 8 min and 4 hourly limit of 0.25 mg/kg. Premedication was not prescribed. General anesthesia consisted of induction with thiopentone, maintenance with isoflurane in 70% nitrous oxide/oxygen mixture. Tracheal intubation and intra-operative paralysis were facilitated by either atracurium, cisatracurium or rocuronium. We gave morphine and/or fentanyl for intraoperative analgesia. The actual conduct of anesthesia was left to the discretion of the attending anesthetists. A subcutaneous bolus of ketamine (0.2 mg/kg) was given immediately prior to the infusion while patients in the group S received equivalent volume of 0.9% normal saline. The infusion was commenced immediately after induction of general anesthesia prior to surgical incision. The anterior chest wall was used as the infusion site because it caused minimal interference with the surgery and provided easy access for inspection and reposition during study period. The infusion was given via a 25G subcutaneous infuser needle of known volume, and the syringe driven by a syringe pump (Terumo Corporation, Tokyo, Japan). List anesthetists, recovery room nurses, ward staffs, and patient assessors were blinded to the treatment used.

Data collection was started at induction of general anesthesia and lasted for 72 hours after commencement of PCA use. Ketamine was infused for the first 48 hours. Ward nurses experienced in looking after continuous infusions and PCA pumps monitored the patients. Patients suffering from nausea and vomiting were treated with metoclopramide 10 mg IVI, as requested and those showing psychomimetic symptoms were treated with diazepam 2 mg IVI every 8 hours, as indicated. Patient demographic data were recorded. Intraoperative data included type and duration of surgery, length and dermatomal range of incision, and total opioid dose. Recovery data included length of hospital stay, total opioid dose. Pain scores were recorded using a 11-point verbal rating scale (VRS: 0 = no pain, 10 = worst pain imaginable) at rest and on movement. Postoperatively, 2 hourly nursing observations including pain scores, sedation scores (0 = alert, 4 = unarousable), presence of nausea, vomiting, PCA consumption, volume of study drug infused, heart rate, arterial pressure, respiratory rate, and pulse oximetry reading. The acute pain service also assessed the patients twice daily for the presence of hallucination, vivid dreams, and other psychomimetic side effects such as paranoia and delusion. At the end of the 48-hour infusion, patient were asked to give a satisfactory score of the effectiveness of

Table 1. Patient demographics and operative data. *Data presented as mean (SD), or number (n).*

	Group S	Ket 0.05	Ket 0.1	Ket 0.2
Number of patients	12	10	15	13
Age (year)	61 ± 9	67 ± 13	66 ± 12	62 ± 11
Sex, M/F (n)	9 / 3	6 / 4	9 / 6	8 / 5
Weight (kg)	53 ± 6	48 ± 12	54 ± 11	53 ± 11
ASA Status (n)				
I	0	0	0	3
II	12	10	15	10
Type of surgery (n)				
Upper gastrointestinal	6	6	7	6
Colorectal	6	3	8	6
Gynecological	0	1	0	1
Length of incision (cm)	21 ± 3.5	19 ± 3.3	19 ± 1.9	19 ± 2.3
Intraoperative morphine doses (mg)	13.5 ± 4.8	10 ± 3.3	11.5 ± 3.3	12.5 ± 4.3
Recovery room morphine doses (mg)	9 ± 8.6	9 ± 4	7 ± 5.8	6.5 ± 7.9
Duration of surgery (min)	258 ± 80	221 ± 82	255 ± 65	254 ± 44
Duration of recovery stay (min)	96 ± 36	78 ± 22	75 ± 30	69 ± 29

analgesia that they had received (1 = poor, 5 = excellent).

Outcome measures were compared using the general linear model. Complication frequencies were compared using χ^2 test.

Results

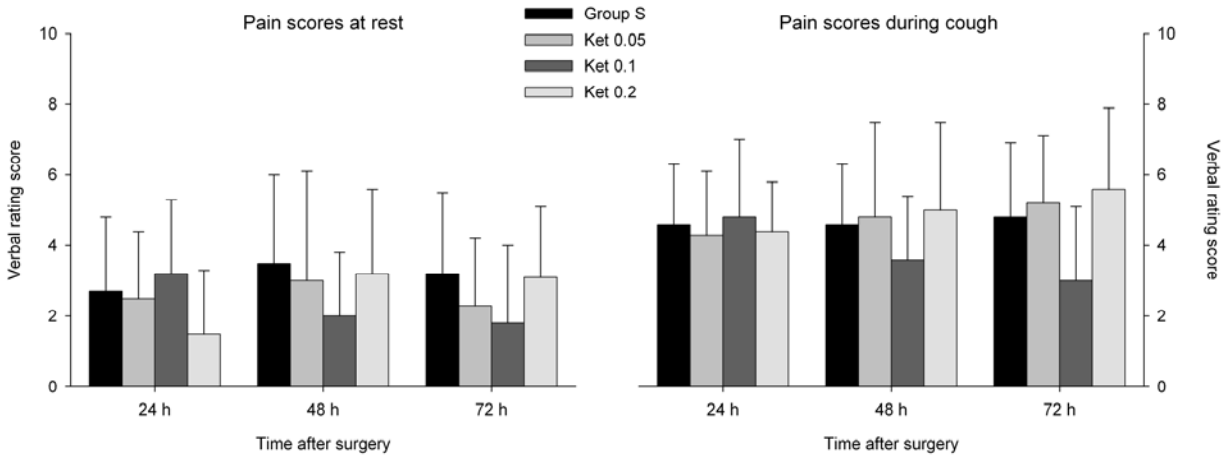
A total of 50 patients received the allocated study medication according to protocol. Patient characteristics were comparable among groups (Table 1). Fifteen patients developed psychomimetic reactions (Table 2). All had vivid dreams, nine out of 15 also had hallucinations (visual and/or auditory). Five of these 9 patients developed severe psychomimetic adverse reactions (1 in group Ket 0.05; 2 in group Ket 0.1; 2 in group Ket 0.2). They presented with paranoid delusions, disturbing visual and/or auditory hallucinations, acute agitation and delirium. Symptoms were severe enough to warrant physical restraints, treatment with diazepam and subsequent stopping of study drug infusion. These adverse reactions caused significant compromise to the patients' safety and postoperative management. All 5 patients developed acute delirium during the last 12 hours of study drug infusion. They suffered from severe agitation, four of them pulled out the surgical drains, all pulled out intravenous catheters repeatedly, three required physical restraints and 1 attempted to leave the ward without success. Moreover, three patients developed paranoid delusions (2 in Ket 0.2 group, 1 in Ket 0.1 group) requiring treatment with diazepam. All 5 patients were asymptomatic 24 hours after stopping of study drug infusion. On subsequent interview, all had only partial recollection of the events and details of the hallucinations. Four claimed the experience to be stressful and frightful. However, all 5 patients reported good analgesia during the study period.

Most of the 50 recruited patients rated their analgesia as good (Table 2). There were no differences between the groups with respect to subjective assessment of analgesic efficacy, pain scores at rest (Figure 1) and on movement (Figure 2), opioid consumption and adverse reactions. We also observed a trend of smaller morphine consumption among the ketamine groups.

Discussion

In this study, we were unable to determine the optimal dose of subcutaneous ketamine for analgesia in patient recovering from major

Figure 1. Pain scores [*verbal rating scale (0 = no pain, 10 = worst pain imaginable)*] at rest and during coughs after surgery.



abdominal surgery. We encountered severe psychomimetic sided effects and yet were not able to reproduce the analgesic effect demonstrated by previous studies. Nevertheless there was a trend towards lower PCA morphine consumption among patients in the ketamine groups (Table 2).

In a recent review, the incidence of psychomimetic effects varied from 5% to greater than 30% after high dose ketamine anesthesia.[15] Several factors were found to be associated with psychomimetic effects. These include advanced age, subjects who normally dream or have a history of psychopathology, high doses of ketamine (> 2 mg/kg) and rapid intravenous administration (> 40 mg/min). Apart from

Table 2. Postoperative outcomes and incidence of adverse reactions. *Data are presented as numbers (%) and mean ± standard deviation.*

	Group S	Ket 0.05	Ket 0.1	Ket 0.2	*P* Values
Number of patients	12	10	15	13	
Satisfactory score of analgesia at 48 h (1=poor, 5=excellent)	4 (3-5)	4 (2-5)	4 (1-5)	4 (2-5)	0.87
PCA Morphine use (mg/24 h)					
0-24 h	32 ± 17	25 ± 17	27 ± 13	29 ± 28	0.76
24-48 h	25 ± 22	16 ± 19	17 ± 10	17 ± 17	0.61
48-72 h	19 ± 16	14 ± 16	14 ± 13	15 ± 15	0.73
Total used (mg)	76 ± 21	55 ± 18	58 ± 17	61 ± 22	0.87
Average sedation score over 48 h (1=alert, 4=unarousable)	1 (1-3)	1 (1-3)	1(1-3)	1(1-3)	0.92
Adverse Events					
Nausea	6 (50%)	4 (40%)	7 (47%)	5 (38.5%)	0.86
Vomiting	4 (33.3%)	3 (30%)	4 (26.7%)	3 (23.1%)	0.91
Dizziness	8 (66.7%)	5 (50%)	10 (66.7%)	11 (84.6%)	0.37
Hallucination	2 (16.7%)	1 (10%)	3 (20%)	3 (23.1%)	0.87
Vivid dreams	4 (33.3%)	3 (30%)	3 (20%)	5 (38.5%)	0.75
Paranoid delusions	0 (0%)	0 (0%)	2 (13.3%)	1 (7.7%)	0.41
Acute confusion	1 (8.3%)	0 (0%)	2 (13.3%)	2 (15.4%)	0.63

advanced age (mean age > 60), our subjects did not fit into the above profile. Previous studies have examined the psychiatric effects of low-dose ketamine administered to healthy volunteers and the combined results showed an intravenous infusion rate of < 0.15 mg/kg/h (predicted plasma concentration < 50 ng/ml) did not produce hallucinations or impairment of cognitive functioning.[17,18] At higher doses and plasma concentrations (50-200 ng/ml), the incidence of cognitive and memory impairments, psychiatric symptoms, illusionary experiences and other adverse effects increases in a linear fashion.[13,17,20] Our results showed a 10% to 23% incidence of hallucination among the ketamine groups, even at doses < 0.15mg/kg/h. We designed the dose regimens according to the pharmacokinetic data of subcutaneous infusion in healthy volunteers (Tucker A, unpublished data). Infusion rates of 0.05, 0.1 and 0.2 mg/kg/h yielded steady state plasma concentrations of 30, 60 and 120 ng/ml, which fell partially within the range of linear association. This could partly explain the occurrence of psychomimetic effects in our subjects. However, the severity of the reactions was not clearly explained by any specific factor. A more recent study showed cognitive impairment in terms of visual-conceptual and visuomotor tracking happening at even lower doses of ketamine.[19] Estimated average ketamine infusion in that report was < 0.04 mg/kg/h, which was lower than the smallest dose used in this study (0.05 mg/kg/h).

Subcutaneous infusion of drugs results in the formation of a depot that is absorbed subsequently according to local perfusion. In the postoperative setting, especially after surgery with significant fluid shift, haemodynamics and perfusion may be compromised. This may result in uneven absorption and unexpectedly high plasma ketamine concentrations. Incidentally, two of the five patients who had documented severe adverse reactions were found to have other concurrent post-operative complications. One patient developed atrial fibrillation and the other had pneumonia. One patient who suffered no psychomimetic adverse reaction had a perioperative myocardial infarction.

Ketamine goes through phase 1 hepatic metabolism and is breakdown into norketamine. This is an active metabolite, which is further hydroxylated to inactive metabolites for excretion in urine. The relative plasma concentrations of ketamine and norketamine during subcutaneous infusion remain steady and correlate positively with clinical analgesia from 50 to 200 ng/ml.[13,17,20,24] Potentially, accumulation of ketamine or norketamine could lead to prolonged and exaggerated side effects. However, in a study by Per Kristian Eide *et al*, there was no evidence of accumulation of ketamine or norketamine after 7 days of subcutaneous infusion in the same range of doses.[24] Impaired drug metabolism, which usually occurs late in patient with hepatic disease, can lead to drug accumulation when hepatic function is severely deranged. None of our subjects had significant hepatic derangement.

Elderly patients (age > 65) have a higher incidence of postoperative confusion. Incidence varies widely from 10% to 60%.[21] In the general surgical population, the incidence is between 10-15%.[22] Our incidence was 8.3-15.4%. The main disorders of acute delirium are cognitive function, thinking, and memory.[23] Disturbed perception results in illusions or hallucinations. These are often visual or auditory. The hallucinations tend to be vivid and frightening. Patients in delirium have disorganized and incoherent thinking and delusions may be present. Short-term memory is impaired. Patients are usually disoriented in regard to time. In more severe delirium, patients are disoriented to place and person. These patients are drowsy during the day whereas at night, awake and agitated. Although no formal mental state testing was performed in our study, all five patients fulfilled the criteria of delirium. Nevertheless, it is unclear whether ketamine was the cause of adverse reactions in our patients. It is however interesting to note that the two patients who suffered the most severe reactions received the highest ketamine dose. We suggest that the combination of elderly patients, postoperative states and ketamine may results more severe reactions.

Conclusion

In summary, we observed severe psychomimetic adverse reactions after subcutaneous ketamine infusion. We do not recommend the use of ketamine for postoperative pain relief until more information on side effect profile of such regime is available.

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An audit of Perioperative Hypothermia in the Elderly Patients

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SUMMARY

We conducted an audit of temperature management in the perioperative period. Core temperature was recorded in the elderly patients using a tympanic thermometer during reception to the theater suite, 1 and 3 hours after of surgery and upon admission to and discharge from the recovery room. We found that the use of force air warming device with hospital blanket reduce the incidence of hypothermia from 7% to less than 1%. There was no evidence of thermal injury. We concluded that force air warming with hospital blanket is an effective, efficient way to maintain perioperative normothermia.

Keywords: Geriatric; anesthesia, hypothermia, perioperative phase, force air warming

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Hypothermia is defined as core temperature less than 36°C.[1-6] Inadvertent hypothermia is associated with a number of serious consequences.[6-8] Patient experienced hypothermia have increased incidence of wound bleeding and infection, decreased cardiac function, delayed recovery from anesthesia and a longer stay in the operating room.[7,8] In March, 2000, we found that 7% of all patients undergoing elective surgery had hypothermia during their stay in the operating room. In this survey, we noted that elderly patient are especially vulnerable because they have less subcutaneous fat, decreased metabolic rate and impaired cold sensation.

In the literature, a number of interventions are shown to be effective in preventing hypothermia. Warmed intravenous fluid, cotton blanket and heated airway humidification were techniques that are commonly applied in our hospital.[9-15] In this audit, we evaluated the use of forced air warming to prevent perioperative hypothermia in elderly patients scheduled for general surgical procedures. The objective of the program was to limit the occurrence of perioperative hypothermia to less than 7% among our target group of patients.

Methods and Materials

The study was performed in the operating theatre of the North District Hospital. The perioperative nursing team got together and formulated an action plan.

Target patient group selection

The team recognized patients more than 60 years, of either gender, undergoing elective

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surgery with general, spinal or combined general and regional anesthesia are at risk of inadvertent hypothermia.

We have developed a standard protocol with the use of warmed intravenous fluid, cotton blanket and heated airway humidification according to the temperature of patient. We use the tympanic thermometer as a tool to monitor patient temperature.[16] Five readings during the perioperative period were recorded. The first reading was taken on arrival to the theater holding areas. The second and third readings were measured intraoperatively at 1 and 3 hours after skin incision, respectively. The fourth and fifth readings were measured during admission to and discharge from the recovery bay, respectively.

Standard protocol for the prevention of hypothermia in elderly patients

(1) In the holding area body temperature was recorded. The room temperature was maintained at 21°C.

(2) After the patient was transferred to the table, patient was covered with warmed blankets. Body exposure was minimized when applying physiologic monitors.

(3) During the operation, a force air warming device (Bair Hugger Model 500 Warming Unit, Augustine Medical, Eden Prairie, MN) was applied. The area to be warmed was covered with one hospital blanket. The edges were tucked around the operating room (Figure 1). Extremities were entirely covered with warm towel or blanket. Warm intravenous fluid was also used. If hypothermia (< 35°C) was detected during surgery, we used blood warming device with warming coil to administrate intravenous fluid. Another forced air warming device was used at the bed end and the theatre room temperature was adjusted to 24°C

(4) Postoperatively, the patient body was immediately covered after surgery was completed. The skin was clean with warm cotton pad and was dried it up at once.

This audit was conducted for two consecutive months. The study was approved by the hospital theater management committee and ethics review board. Informed consents were obtained from all patients.

Differences in temperature over the various time points were tested by analysis of variance with repeated measures. We also analyzed the effect of anesthesia and age on perioperative temperature.

Figure 1. Forced air warming technique using the hose of a Bair Hugger Model 505 Warming Unit The area to be warmed was covered with one hospital blanket. Care was taken not to direct the air stream toward the patient. A second hospital blanket was placed over the first.

Results

A total of 361 patients were recruited for the study. The mean core temperature is sown in Figure 2. There were only 2 patients with temperature < 36°C. They recorded during reception in the theater holding area (Figure 2). Our data suggested that the force air warming device using hospital blanket is effective in preventing hypothermia. There were no correlation between age or anesthetic type and perioperative temperature (Figure 3).

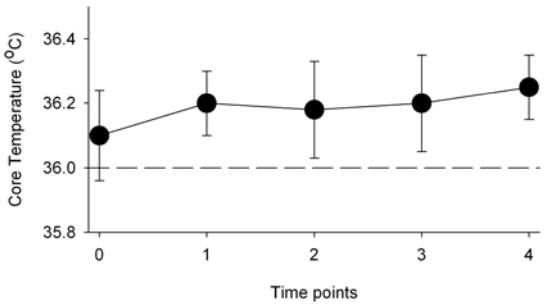
Upon discharge from the recovery room, no patient had evidence of redness, swelling, or blisters (as signs of thermal injury).

Discussion

The result of our audit suggested that a standard warming protocol was effective, safe and efficient in preventing perioperative hypothermia among elderly patients. The number of patients with hypothermia was reduced from 7% to less than 1%. The protocol ensured no wasting of resource in patient without need because warming device was applied according to patent's condition. This protocol also protected patient from the complication of hypothermia and reduce their anxiety by providing warmth.

In the present study, we used the forced air warming device with hospital blanket. Air temperature was set as 38˚C. Kabbara *et al* compared the use of forced air warming with hospital blanket with commercial blanket and found that both are effective in maintaining normothermia and no thermal injuries was reported. Given the cost of commercial blanket; we recommended that hospital blanket can be used as an alternative.[17]

Figure 2. Changes of core temperature over time. *Time points are: 0=preoperative holding area, 1= one hour after surgery, 2=3 hours after surgery, 3 and 4=admission and discharge from recovery room, respectively.*



Misuse of warming device, however can cause complications including burns. According to the manufacturer, airflow of the forced air warming unit should not be directed to the patient's skin surface. The risk of thermal injuries is higher if the warming unit is set > 43˚C.

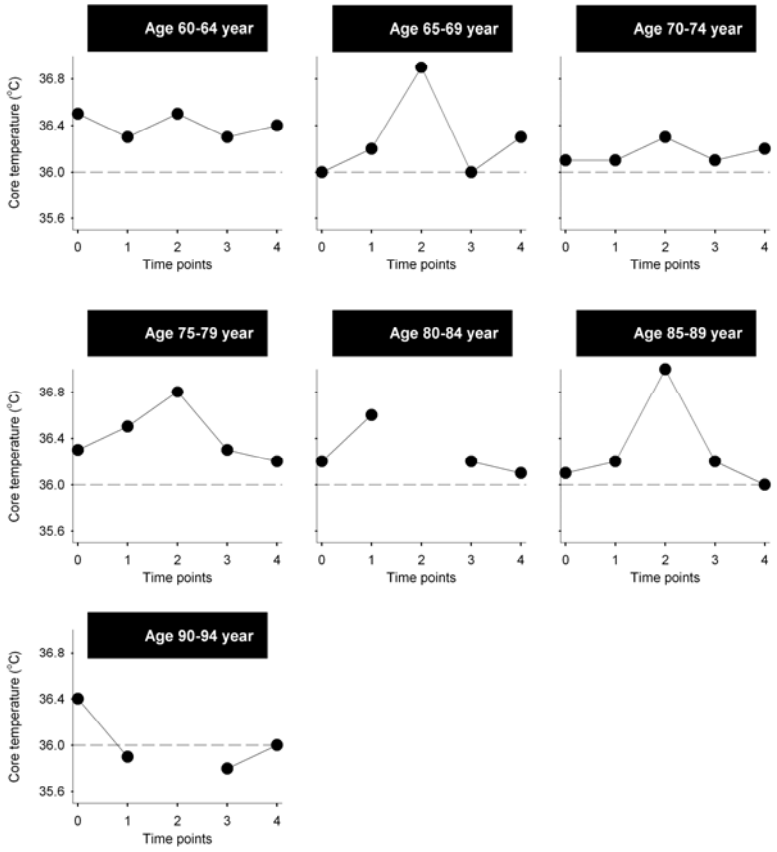


Figure 3. Changes of temperature over time in different age groups.
Time points are:
0 = preoperative holding area,
1 = one hour after surgery,
2 = 3 hours after surgery,
3 and 4 = admission and discharge from recovery room, respectively.

Rapid increase in body temperature may also induce vasodilation leading to adverse haemodynamic effect.[18] Healthcare professionals should familiarize themselves with the correct instruction of the forced air warming unit. Standardized the temperature setting and the use of the unit can improve patient safety and clinical outcome. Caution should be taken throughout the perioperative period in the setting of the force air warming unit. The ideal setting should be medium (around 38°C) and nurses should check for any accidental changes of the setting, alarming of overheating, or unintended dislodgement of the hose from the cotton blanket. During the implementation of the protocol, we found that application of force air warming unit can cause discomfort to patient. For patient under regional anesthesia, nurses should ask patient for their feeling on any overheating or discomfort during operation.

Our audit revealed that most of the nursing staff are cooperative and are capable to implement the protocol with care. One of the main reasons for the success of the program is the team spirit of our staff. It was also reflected that all the health care workers were very alert in keeping patient warm in the operating theatre.[19] We believe nursing staffs are accountable for the prevention of perioperative hypothermia and should therefore share the heavy workload of the busy anesthetists in providing high quality clinical service.

Conclusion

In this study we concluded that force air warming with hospital blanket is an effective, efficient way to maintain perioperative normothermia.

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Important Announcement

HKCA Final Fellowship in Intensive Care
Amendment of Examination Format

During the Board of Intensive Care meeting in April 2005, it was resolved that amendments in the examination format may be made in the future. These amendments reflect the growth and maturation of Intensive Care in Hong Kong and may provide a more objective and structured examination format. Each change will be introduced gradually in stages and the effects of each amendment closely monitored.

As of 2005 an OSCE format will be used to replace the Investigation table. It is expected that there will be 10 questions in the OSCE. Suggested aspects for the test may include ECG's, X-rays, investigation results including blood gases, biochemistry, microbiology and hematology, clinical waveforms, equipment, resuscitation, crises management, communication station, clinical short cases and others.

The OSCE, like the investigation paper it replaces, will contribute 10% of the overall marks.

An Epidural Abscess Following Catheter Insertion

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SUMMARY

We report a case of an epidural abscess following catheter insertion in a 72-year-old woman scheduled for an abdominal operation. A thoracic epidural catheter was inserted into the $T_{8/9}$ intervertebral space under strict aseptic technique. Adequate postoperative analgesia was achieved and the catheter was removed on day five following surgery. An epidural abscess was diagnosed on day fourteen as the patient slowly developed both sensory and motor neurological deficits after catheter removal. She underwent an emergency decompressive laminectomy and received a full course of intravenous antibiotics. The organism obtained at surgery was methicillin resistant *Staphylococcus aureus* (MRSA). The diagnosis, clinical presentation, management and prevention strategies of catheter related epidural abscess are discussed.

Keywords: Anesthesia: Regional, Epidural, Complication: Abscess, Neurological

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Epidural abscess is a rare complication following catheter insertion. It carries a significant risk of developing permanent neurological deficits despite prompt recognition and treatment.[1] There has been an increasing number of reported cases recently following the widespread use of epidural analgesia for postoperative pain relief. The diagnosis must be made promptly in order to initiate appropriate management.[2] However, the variability of clinical presentation often makes diagnosis difficult. We report a case of epidural abscess related to catheter insertion.

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Case Report

A 72-year-old woman with non-insulin dependent diabetes mellitus was scheduled for right hemicolectomy for colonic carcinoma. Combined general anesthesia with epidural analgesia was planned.

Prior to induction of general anesthesia, a thoracic epidural catheter was inserted with the patient lying in the lateral position *via* a paramedian approach. The $T_{8/9}$ epidural space was identified by using an 18G Tuohy epidural needle (BD™ Medical Systems-Anesthesia, New Jersey, USA) using loss of resistance to saline. Asepsis was maintained throughout the procedure. The patient's back was prepared by 10% povidine solution for approximately one minute before needle insertion. The procedure was completed after a single attempt without

difficulty and the catheter was left *in situ* for perioperative pain relief. The catheter was taped at skin level at 10 cm with 4 cm inside the epidural space. The catheter exit site was taped with a clear water-proof dressing (Tegaderm, 3M healthcare, UK) and an antibacterial filter was connected within the drug delivery system. General anesthesia then followed and surgery was completed without complication.

On the fifth postoperative day, the epidural catheter was removed. At the skin puncture site, it was noted to be erythematous with some purulent discharge. The patient was otherwise asymptomatic with no evidence of fever or back pain. There was no local tenderness and her white cell count was normal. Daily inspection with dressing change was carried out by the acute pain service team for the subsequent four days after removal of the catheter. The patient remained asymptomatic and was discharged from our care.

Seven days after catheter removal, the patient complained of nausea and vomiting. Two days later, she developed acute urinary retention and required catheterization. Mild weakness (active movement against gravity with some resistance) was documented in both hips and knees with numbness to the level of her umbilicus. This quickly progressed into complete paralysis over the next 24 hours with a sensory deficit of up to T_{10} bilaterally. She continued to remain afebrile and her white cell count was again normal. She began to complain of mild back pain along her lower thoracic spine around the skin puncture site.

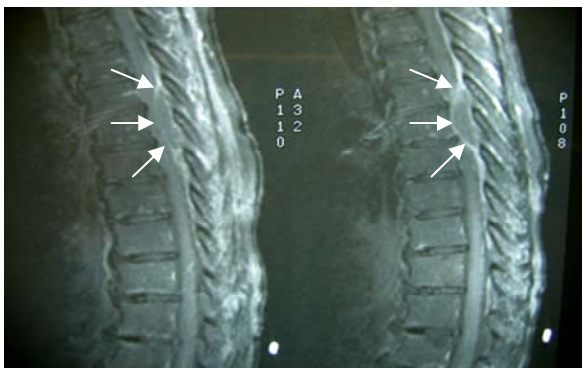
Methylprednisolone 30 mg/kg was started immediately by the attending orthopedic surgeon in suspicion of acute spinal cord compression followed by a continuous infusion of 5.4 mg/kg for the next 24 hours. An urgent magnetic resonance imaging (MRI) scan was carried out and showed an enhanced posterior dural collection at $T_{6\text{-}8}$, in keeping with the diagnosis of an epidural abscess (Figure 1).

Emergency decompressive laminectomy at multiple levels was performed without further delay. The diffuse abscess containing pus and granulation tissue was drained. Methicillin resistant *Staphylococcus aureus* (MRSA) was subsequently isolated. A full course of intravenous vancomycin was prescribed for the next 4 weeks. Her lower limb neurological status improved gradually over the next few months. Her muscle power returned to active movement against gravity with some resistance and she was able to walk with a frame, six months after her original surgery. She regained bowel control but self catheterization was still required for persistent urinary retention secondary to neurogenic bladder.

Discussion

There has been an increasing number of reports on catheter related epidural abscess but the true incidence remains unknown.[3] It has been reported to vary between 1:1,930 and 1:5,000 per epidural catheter insertion.[4,5] This can be partly explained by the growing number of epidural block performed, increasing number

Figure 1. T2W magnetic resonance imaging showing an epidural abscess at T6-8 levels (marked by the white arrows).



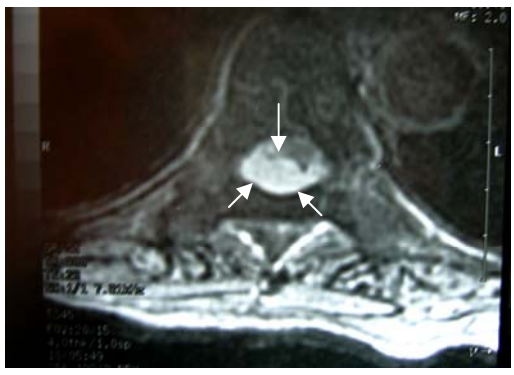
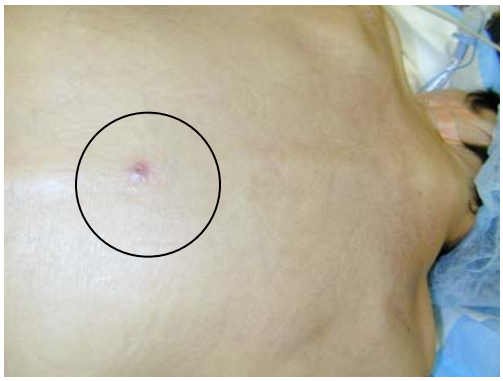


Figure 2. Skin puncture site with pus discharge (circle). This photograph was taken at the time of decompressive laminectomy.



of voluntary reporting and more liberal use of imaging diagnostic tool including MRI scan.[5,6]

There are numerous etiologies in the development of an epidural abscess. Hematogenous spread of the causative bacteria to the epidural space seems to be the commonest cause where patients are very often nursed in an overcrowded ward. The bacteria can then travel from the skin puncture site into the epidural space over the next few days following catheter insertion.[7] The spread of bacteria during the process of epidural catheterization *via* a contaminated needle or catheter is also a possible mechanism.[8,9] As in our patient, it is highly likely that her local skin infection noted upon removal the catheter was the origin of the bacterial spread. Despite the skin had been cleaned with 10% povidine solution before needle insertion, colonization of bacteria to the catheter and subsequent infection could still occur.

Various species of bacteria have been isolated. The commonest pathogen found is *Staphylococcus aureus*. It is responsible for 60% of abscesses following catheterization.[4] Other possible organisms include *Staphylococcus epidermidis*, *Pseudomonas aeruginosa*, *Streptococcus pneumoniae* and *Enterococcus* species.[4,10] MRSA is an uncommon offending organism and only four cases have been reported in the literature.[11,12] It is also a potential pathogen in immunocompromised patients undergoing major surgery and the spectrum seems to be broadening.[11]

The immunological status of the patient is considered an important factor in developing an epidural abscess. The possible risk factors include malignancy, diabetes mellitus, steroid administration, chronic alcoholism and chronic renal insufficiency.[4,13] Our patient has large bowel tumor as well as diabetes mellitus for many years.

Heuser first described the clinical presentation of an epidural abscess in 1948.[14] Four different phases were described. Phase I is back pain occasionally associated with local tenderness and fever. Phase II occurs over 2 to 3 days and is featured by radicular pain and fever. Phase III is considered a late stage accompanied by neurological deficit and sphincter dysfunction. Progression from Phase III to IV may be very rapid and signifies complete paralysis within the next 24 hours.

However, not all these classical symptoms manifest in every patient. It is only found in 37% of them. Motor deficits are absent in up to 29% of patients.[6] Epidural abscess is first suspected in only about 40% of cases.[15] Other presenting features that may be helpful include inflammation of the catheter site, headache, stiff neck, nausea and abdominal pain.[11] The inflammatory markers are useful but nonspecific.[4] In our patient, changes in phases I and II were subtle. It was not until the patient presented with urinary retention and subsequently lower limb weakness (phase III) that spinal cord compression was suspected.

Symptoms of abscess formation can occur at various times, ranging from one day to five months after catheter placement.[11] Kindler *et al* noted that 52% of epidural abscess occurred at or sooner than five days.[4] In another report, the incidence of infection following the use of tunneled catheters varied from 5.4% to 9.7%.[16,17] Furthermore, 58% of patients showed symptoms after removal of the epidural catheter.[11] The highly variable presentation often makes diagnosis difficult. A high index of suspicion is therefore vital in early detection of an epidural

abscess. Communications between the acute pain service, ward clinicians and nurses are critical.

The definitive diagnosis relies on imaging studies. MRI scan of the spine with or without galolinium enhancement is now the gold standard.[18,19] Both the extent and location of the abscess can be clearly defined. MRI scan is superior to computerized tomographic (CT) myelography as the former allows direct multiplanar imaging and visualization of soft tissue including the spinal cord and the paraspinal musculature. However, not all hospitals in Hong Kong has a 24-hour MRI service and very often, as in this case, the patient has to be transferred to another hospital for imaging. This often creates further delay in diagnosis and treatment.

Once the diagnosis of an epidural abscess is made, an expedited management strategy must be initiated. The mainstay of treatment involves emergency multilevel decompressive laminectomy, evacuation of pus and parenteral antibiotics. Empirical broad spectrum antibiotics with bactericidal activity against *Staphylococcus aureus* and gram negative organisms must be chosen. They should be continued for no less than four weeks regardless of the requirement of surgery followed by oral therapy for at least two more months.[6,20] The duration of antibiotic therapy is determined by the clinical response, biochemical markers and radiological resolution of the lesion. Further treatment is required when there is concomitant osteomyelitis, persistently elevated inflammatory markers and bacteremia.[6]

In some cases, patients can be treated conservatively without surgical decompression.[21,22] The nonsurgical approach can be considered for patients with severe medical comorbidities, absence or minimal neurological symptoms, extensive abscess precluding surgery and paraplegia of more than 72 hours when the chance of neurological improvement after surgery is minimal.[7,23] If the conservative approach is chosen, serial MRI scans with regular and frequent neurological examinations are essential. Further surgical intervention can then be initiated if necessary. High dose intravenous steroid therapy is relatively contraindicated as it may exacerbate the ongoing infection and sepsis.[24]

The neurological outcome is closely related to the time between the development of symptom to surgical decompression. In a study investigating long term outcome after neurosurgery for epidural abscess following catheter insertion, only 31% of the patients referred to neurosurgery improved after surgery.[1] Only 20% with paraplegia made a complete recovery without deficits at hospital discharge. Long term follow up revealed that 55% of patients with paraplegia had experienced some improvement in motor function at some stage but 44% still suffered from bladder and, or bowel dysfunction.[1] Our patient had some improvement in motor function after discharge but still suffered from bladder dysfunction six months after her initial surgery.

Infection control measures aiming at minimizing the risks of infection following epidural catheter insertion have been recommended.[25,26] The guidelines include:

(1) strict aseptic technique;
(2) closed delivery system;
(3) use of a 0.22 μm bacterial filter within the system;
(4) inspection of the epidural punctured site every eight hours;
(5) change of filter, infusion line and infusate at 96 hours or discontinue use and
(6) preparation of the infusate under sterile conditions in the pharmacy.[26]

In our case, the infusate was prepared in 500 ml bag by the anesthesiologist in a clean but not sterile condition and the catheter site was inspected only once a day by our acute pain service team.

Furthermore, more isolates from cultures were obtained following skin disinfected with 10 % povidine iodine than in those disinfected with 0.5% chlorohexidine in 80% ethanol.[27] It has also been recommended that the disinfectant should be left in contact with skin for at least one minute before skin puncture. Our hospital has now replaced all povidine solution by 0.5% chlorohexidine in 80% alcohol as disinfectant in

all operating rooms and our rule of strict aseptic technique while performing any invasive regional procedure is further emphasised.[12]

If an infection is suspected, the catheter tip and any discharge at the puncture site should also be sent for culture. If neurological signs are present, an urgent MRI scan must be ordered and antibiotic therapy initiated so that surgical evacuation, if necessary, can be planned promptly.[25] A recent report has also suggested that an urgent MR scan is required if the patient presents with systemic and local signs of infection even in the absence of neurological signs and symptoms.[22]

In summary, epidural abscess remains one of the most serious complications of epidural catheter insertion. Prevention of its development is critical. We must emphasize the importance of asepsis during catheter insertion and the vigilance of frequent regular follow up by the acute pain service. Attending clinicians and nurses must also have a high index of suspicion to make an early diagnosis and to initiate treatment promptly in order to prevent further deterioration of symptoms.

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Novel Use of Endobronchial Tube in Management of a Patient with Giant Lung Bulla

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SUMMARY

The management of a patient with anticipated difficult airway and a giant lung bulla in the right upper lobe, presenting with respiratory failure is described. Ventilation of the patient's lungs was facilitated by isolation of the right-upper lobe using a left sided double-lumen endobronchial tube.

Keywords: Giant lung bulla; Anesthetic equipment; Intubating laryngeal mask airway; Double lumen tubes; Selective ventilation.

Bull HK Coll Anaesthesiol 2005;14:101-5

Double lumen endobronchial tracheal tube (DLT) placement is a technique employed for isolation or independent ventilation of the lungs. These tubes are designed to minimize occluding the upper lobe of the endobronchial side. Anatomically, the right upper lobe is particularly susceptible and consequently right sided DLT's have an additional opening in the endobronchial cuff to ensure right upper lobe ventilation. However, we encounter a situation where it was therapeutic to occlude the right upper lobe, while allowing the middle and lower lobes to be ventilated, using a DLT designed for left endobronchial placement.

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Case Presentation

A 65 year old male (60 kg) presented to the Intensive Care Unit (ICU) with respiratory failure secondary to pneumonia. He suffered from nasopharyngeal carcinoma ten years previously and had been treated with nasopharyngectomy and radiotherapy. He also had a history of previous pulmonary tuberculosis and chronic obstructive pulmonary disease (COPD), complicated by a giant bulla in the right upper lobe zone.

On admission to ICU, he was obtunded and in respiratory distress. His respiratory rate was 38 min^{-1}, arterial blood pressure was 100/70 and heart rate was 100 min^{-1}. His electrocardiogram showed sinus rhythm without cor pulmonale or evidence of acute ischemia. His arterial blood gas results showed type II respiratory failure with carbon dioxide tension of 13 kPa. His chest radiograph (CXR) revealed a right giant bulla occupying half of the hemithorax and dense haziness in the left lung field and remaining right lung, in addition to underlying COPD changes (Figure 1).

A decision was made to initiate mechanical ventilation and assessment of his airway suggested

Figure 1. Line showing the lower limit of the right upper lobe bullae.

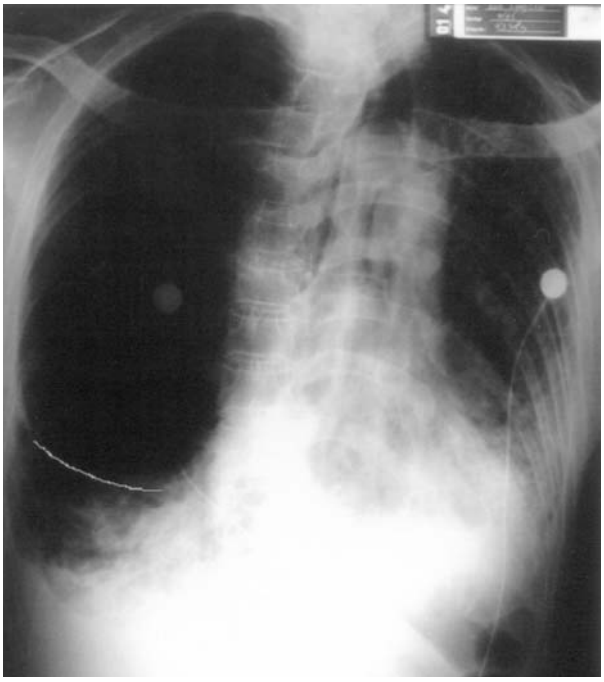
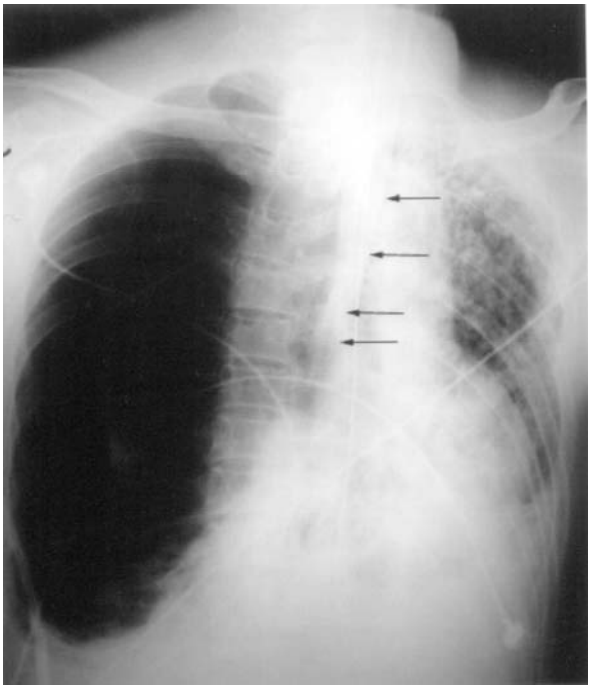


Figure 2. Double lumen tube in position within the right main bronchus (arrows).



possible difficult direct laryngoscopy due to limited mouth opening (2 cm), a full set of teeth, limited range of motion of his neck (partly due to very fibrotic anterior neck tissues) and thyromental distance of 5 cm. Tracheal intubation was achieved using a size 4 intubating laryngeal mask airway (FastTrach, Euromedical for Maersk Medical, Kedah Malaysia) through which was passed an 8 mm internal diameter endotracheal tube (Sims Portex Limited, Hythe Kent, United Kingdom). Propofol 50 mg IVI and succinylcholine 100 mg IVI were used to facilitate tracheal intubation as he was struggling and clamping his mouth tightly shut.

His pneumonia continued to worsen, with arterial oxygenation maintained at only 84% despite an inspired oxygen fraction of 1.0 and optimization of ventilatory parameters (cycle time, tidal volume and positive end expiratory pressure, PEEP). Serial CXRs revealed an apparent increase in size of the bulla. It was thought that his gas exchange might be improved with isolation of the bulla while ventilating as much as possible of his remaining lung tissue.

Following intubation, he was ventilated manually for several minutes with 100% oxygen. An adult sized airway exchange catheter (Cooks Tube exchanger with rapifit adaptor, Cook Critical Care, Bloomington, In, USA) was passed through the tracheal tube and connected to a Manujet (Medizintechnik GMBH, Sulz, W. Germany). His arterial oxygen saturation was maintained at about 94% with the intermittent positive pressure manual jet ventilation. The tracheal tube was then withdrawn over the airway exchange catheter and a 37 French double lumen tube (Malincrodt Medical, Athlone, Ireland) was then threaded over the catheter such that it passed through the bronchial lumen of the DLT. The airway exchange catheter was subsequently removed and the DLT was connected to a ventilator (Siemens Servo 300, Siemens-Elema Electromedical Systems Division, Solna, Sweden). Fibreoptic bronchoscopy was used to guide the DLT into the right bronchus and the position was confirmed by ensuring that the right upper lobe bronchial lumen was not visible through the opening of the bronchial lumen. Subsequent chest radiograph further confirmed the location of the DLT (Figure 2).

Afterwards, his oxygen saturation improved to 92% without significant increase in airway pressure or size of the bulla (Figure 3). Table 1 shows his

Table 1. Arterial blood gas, hemodynamic and ventilator parameters before and after double lumen tube insertion. *SaO_2 = Oxygen saturation, PaO_2 = Arterial oxygen tension, $PaCO_2$ = Arterial carbon dioxide tension, PEEP = positive end expiratory pressure, fiO_2 = inspired oxygen fraction, PC = pressure control mode, PRVC = pressure regulated volume control mode*

	Before DLT	After DLT
Blood Gas		
pH	6.98	7.31
SaO_2 (%)	83.8	92
PaO_2 (kPa)	8.5	7.2
$PaCO_2$ (kPa)	22.3	8.8
Ventilator		
Mode/fiO_2	PC/1.0	PRVC/1.0
Airway Pressure (cmH_2O)	41	28
Pressure Support (cmH_2O)	28	20
PEEP(cmH_2O)	10	6
Hemodynamics		
Average mean arterial pressure (mmHg)	68	110
Average heart rate (min^{-1})	110	90

oxygenation, hemodynamic and ventilator parameters before and after DLT insertion.

Unfortunately, he eventually succumbed 48 hours later as a result of sepsis induced multiorgan failure.

Discussion

Lung bullae are thin walled, air filled spaces resulting from destruction of alveolar tissue. They can be classified according to their aetiologic origins i.e. bronchogenic, postinfective, infantile and emphysematous. The walls of lung bullae usually comprise visceral pleura, connective tissue septa and compressed parenchyma.

Lung bullae have a tendency to increase in size with age, which may be a result of a one way valve effect. They represent areas of increased compliance, which then form the path of least resistance during positive pressure ventilation. Since they do not take part in gaseous exchange, there is a resultant increase in alveolar dead space. The gradual increase in size of bullae during positive pressure ventilation may lead to compression of adjacent normal lung tissue resulting in further worsening of ventilation/perfusion mismatching and hence greater hypoxemia.

A variety of complications, including gradual decrease in effort tolerance of the patient, recurrent infections and pneumothoraces can occur when bullae enlarge. Giant lung bullae constitute one of those thoracic diseases that usually results in an improvement in lung function following resection, although often preceded by exceedingly poor lung function in the preoperative period.

Some of the accepted indications for bullectomy include incapacitating dyspnea, giant size at presentation, repeated pneumothorax and compression of a significant volume of otherwise normal lung tissue. The complexity of the management of lung bullae for volume reduction surgery or in the immediate postoperative period is dependent on whether the disease is unilateral or bilateral. The latter may require resorting to extra-corporeal oxygenation during the procedure itself and carries with it the added risks of anticoagulation.

The main principles of anesthetic and intensive care management of patients with

unilateral bullous disease include avoidance of nitrous oxide and positive pressure ventilation, wherever possible. If positive pressure ventilation cannot be avoided, it is recommended that small tidal volumes and rapid ventilatory rates be used, so as to maintain adequate minute ventilation. The aim is to keep the airway pressures at or below 10 cmH_2O. In some cases, high frequency jet ventilation has been used. Since there are no randomized controlled studies to compare the outcomes using different ventilatory strategies in bullous disease, it is difficult to postulate which are the superior methods.

In patients with unilateral bullous disease, endobronchial intubation is a treatment option. The primary objective of which is to isolate and selectively eliminate ventilation to the affected lung or lobe.

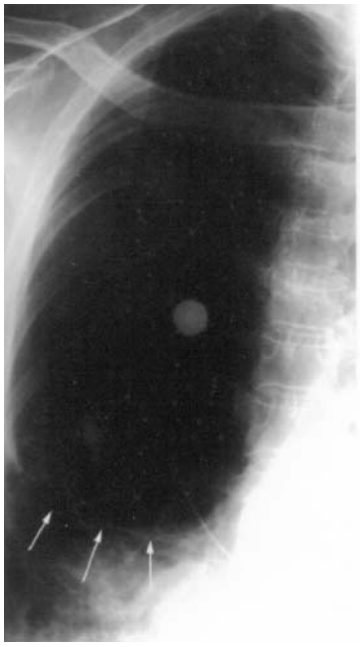
The choice of technique used for lung isolation depends on factors including the nature of the pre-existing pathology, urgency of the situation, anatomical considerations and the knowledge and expertise of the user. Isolation techniques are associated with complications such as trauma to the airway, malpositioning and hypoxemia. To minimize the risks of malpositioning, several methods are available for checking the positioning of the tube. These include the use of fibreoptic bronchoscopy and chest auscultation. In general, the consensus is that for left-sided tubes, bronchoscopy is not always necessary. On the other hand, when using right sided tubes, it is recommended that positioning be routinely checked with the help of a fibreoptic bronchoscope.

The main problems of this patient included the presence of a giant bulla resulting in disparity in lung compliance between the bulla and the remaining lung tissue resulting in *'steal'* of inspired lung volumes. The consequence was a progressive increase in minute ventilation requirements in order to maintain arterial carbon dioxide tensions. Ventilation of the bulla not only represented 'wasted' ventilation, but posed a big risk for barotrauma and sudden pneumothorax. The occurrence of this would surely have further compromised his already precarious clinical status. Other factors that affected this patient's treatment options included: a potential difficult airway from his previous radiotherapy and the necessity to maintain uninterrupted ventilation whilst substituting tracheal tubes.

The ventilatory aims for this patient were to isolate and occlude the right upper lobe, while allowing continued ventilation of the remainder of his right lung. Previous reports have found an improvement in ventilation/perfusion mis-match[2-3] and hence oxygenation when severely diseased lung is isolated from ventilation, or indeed when the lungs are subjected to differential ventilation.

Besides DLT's, other methods available to achieve lung isolation include bronchial blockers such as the 'Univent' system, Foley[4] or Fogarty catheters and simultaneous intubation with two DLT's. All of these methods are of course rendered more reliable by means of fiberoptic endoscopic visualization and guidance[5]. This is particularly so with the right main bronchus due

Figure 3. Close-up of bulla 24 hours after Double lumen tube insertion. Noted that there is no worsening of bulla (lower limit arrowed).



to its anatomy and the proximity of the right upper lobe bronchus to the carina.

As a result of these anatomical considerations and his labile oxygenation, it was not possible to subject the patient to protracted manipulations using a bronchial blocker. A right sided DLT would be inappropriate since it is designed with the intention of avoiding occlusion of the right upper lobe, by having an orifice in the bronchial cuff.

Some of the potential problems with our technique of using a left sided DLT to achieve right endobronchial intubation is kinking of the tube with increase in airway pressures. This can be avoided during insertion by ensuring that the DLT is inserted with the major convexity facing the intubator, such that the preformed left curvature now faces the right of the patient. Although this patient did not demonstrate any increase in airway resistence[6] as demonstrated by the airway pressure remaining the same as when using a single lumen tracheal tube, this is still a theoretical possibility especially if the curvature of the DLT is straightened.

The method reported above for isolation of the right upper lobe bronchus of this patient offers an effective approach to management of a patient with right upper lobe bulla, in the face of labile oxygenation status. Since most anesthetists are familiar with DLT placement, this technique has the advantage of being expeditiously performed, avoiding protracted manipulation inherent in other techniques in patients with labile arterial oxygenation.

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WORKSHOPS ORGANISED BY THE INSTITUTE OF CLINICAL SIMULATION

A Collaboration between the Hong Kong College of Anaesthesiologists and the North District Hospital

(Application form can be downloaded from the College website: *www.hkca.edu.hk*)

Anaesthetic Crisis Resource Management (ACRM)

Date:	First Saturday of each month - slots available from March 2005 (3 September, 10 September, 5 November and 3 December, 2005)
Time:	08:00 – 18:00
Venue:	The Institute of Clinical Simulation
CME points:	HKCA 10 points
Max participants:	4
Fee:	HK$2000 per head
Format:	Each registrant will participate in (1) An introduction on the METI Simulator, the anesthetic machine for use in the workshop and the theories of crisis management (2) Allocated time for hands-on crisis scenario management on the METI Simulator, rotating through different roles and handling different scenarios (3) A group debriefing session at completion of each scenario

"Group" registration welcome if you can find your own partners to form a group of four. Mutually agreed dates may be arranged. Sessions will be videotaped. All participants in the workshop will be required to sign a confidentiality statement.

Difficult and Advanced Airway Management (DAAM) Workshop

Time:	22 October 2005
Venue:	Institute of Clinical Simulation
CME points:	HKCA 4.5 points
Max participants:	16
Fee:	HK$1,200 per head

Objectives:

(a) Recognition of patients with potential difficult airway or impossible tracheal intubation
(b) Practice of Airway Algorithm on situations of failure to oxygenate patients
(c) Description and application of suitable ventilatory techniques to oxygenate patients with predicted and unpredicted difficult airways.

Programme:

(1) Lectures on basic knowledge of airway management
(2) Videotapes on different techniques of recent and advance airways
(3) Tutorial discussion on common causes of airway problem
(4) Skill stations on various techniques
(5) MCQ and OSCE assessment after the course

Highlights of interesting techniques and skill stations:

(1) Virtual bronchoscopy training on computer model
(2) Practice bronchoscopy on pig's lung
(3) Different gadgets on one-lung ventilation in difficult situations (Univent, Arndt's wire-guided endobronchial blocker)
(4) Bullard laryngoscope workstation
(5) Cricothyrotmy sets and techniques

THE HONG KONG COLLEGE OF ANAESTHESIOLOGISTS

Minutes recording the proceedings of the 16th Annual General Meeting of the Hong Kong College of Anaesthesiologists, held in the Hospital Authority Building, on 28th June 2005 at 18:45 hours

Present Prof. Tony Gin (President and Chairman)
Dr PT Chui Dr Joseph Lui Dr John Liu
Dr YF Chow Dr PP Chen Dr Edward Ho
and 9 other Fellows and Members

In Attendence Mr Daniel Tso, Administrative executive, HKCA

The president welcomed all in attendance to the 16th Annual General Meeting of the Hong Kong College of Anaesthesiologists,

AGM 16.01 Confirmation of minutes of the 15th annual general meeting held on 21st June 2004
The minutes had be previously circulated and tabled.
Proposed by Dr John Liu and seconded by Dr John Low. The minutes was accepted.

AGM 16.02 Matters arising from the minutes
Nil

AGM 16.03 Report of the Council
The President highlighted a number of issues:
(a) A vote of thanks to the outgoing Council members.
(b) The College has revamped the training programs.
(c) There were a number of changes in prospective examinations in relation to the arrangements of external examiners. There will be courses introduced to local examiners. They will be conducted by overseas experts in the fields of education and training.
(d) The Boards of Pain Medicine and Intensive Care Medicine had been created and the Boards are working to revamp their programs in relation to training and examinations.
(e) The Board of Accreditations had conducted a revalidation of all training units and recommendations were made.
(f) The Board of Education had implemented the *new modular training system*, periodic reviews will be in place.
(g) The College will provide secretarial support to ANZCA in relation to the ANZCA Examinations held locally.
(h) The College will maintain continual participation with the Conference of International Reciprocating Examination Boards in Anesthesia (CIREBA) to keep an active role in the international scene.
(i) Council members had visited Beijing with the Ministry of Health in the Academy level and the anesthetic counterparts at Peking Union Medical College Hospital.

Proposed by Dr John Liu, and seconded by Dr Edward Ho. The report was approved.

AGM 16.04 Auditor Report for the year ended 31st December 2004
The Auditors report includes the Income and Expenditure Accounts and Balance Sheets (.
The report was tabled at Council and had been previously circulated to the entire membership before the meeting. The Honorary Treasurer gave a summary of the accounts.
Proposed by Dr TW Lee, and seconded by Dr John Low. The report was accepted.

AGM 16.05 Council Election 2005 - 2007

At the close of nominations on 18th March 2005, there were 16 nominations from fellows, and one from members. Dr John Liu was elected unopposed as he was the only nominated candidate by members. *(By-law 4.1.3 "... one member of the Council, being a Fellow, shall be nominated and elected by the class of Members only").* Fellows were asked to elect 14 Council members from the remaining 15 nominations. By the deadline (5:00 PM on 13 May 2005), a total of 112 returns were received at the College office.

The following are the elected members for the Council 2005 - 2007

CHAN, Kin Cheong Simon	HO, Tat Fai Edward
CHAN, Tak Vai Matthew	CHEN, Phoon Ping
CHEUNG, Po Wah	CHOW, Yu Fat
CHUI, Po Tong	GIN, Tony
HUI, Theresa Wan Chun	IRWIN, Mike
JOYNT, Gavin	KOO, Chi Hung
KWAN, Anne Siu King	LEE, Tsun Woon
LIU, Tak Chiu John	

The election report was accepted.

AGM 16.06 To adopt the resolution of Council to confer Honorary Fellowship to Professor Teik E Oh

Dr YF Chow informed members that Professor Teik Oh has agreed to come again this year for the Honorary Fellowship, for which he was unable to attend last year.

Proposed by Dr TW Lee and seconded by Dr Edward Ho. The resolution was passed.

AGM 16.07 Appointment and Fixing of Remuneration of Auditors

Kadir and Co was re-appointed as auditor. The fixing of their remuneration was left to Council.

AGM 16.08.01 Approval of the subscription for 2005

Members and fellows approved Council's recommendation of the subscriptions for 2006:

Local Fellow	HK$2,500
Local Member	HK$1,250
Overseas Fellow	HK$ 625
Overseas Member	HK$ 313
Senior Member/Fellow	HK$ 50

AGM 16.09.01 Any Other Business

President reported that there was no other business. The meeting closed at 19:05 hour.

Approved Formal Project

CHU, Annie SY	Randomized control trial to evaluate the use of patient-controlled sedation in inguinal hernia repair surgery under local anaesthesia
WONG, CM	Determination of an optimal dose of Fentanyl for use with Propofol when inserting the laryngeal mask airway
LOW, Kevin	Arterial Carbon Dioxide Tension, Intracranial Pressure and Neurosurgical Operating Conditions
CHENG, Dawn	A Survey of Ambulatory Laparoscopic Cholecystectomy at Tuen Mun Hospital
TSANG, Kristie	Performance of BIS® XP during simulated high frequency electrocautery interference
LEE, Sunny	The effect of Trendelenburg position on the cross-sectional area of the right internal jugular vein
WONG, NM	VIPoma and its Perioperative Management
KWAN, Gladys	Postoperative neuropathy after combined spinal-epidural anaesthesia in a patient undergoing Pelvic tumour resection
LAM, Brian	Tracheal rupture complicated with tension pneumothorax during transhiatal esophagectomy: a case report
HUI, Grace	Post-dural puncture headache: incidence and risk factors in Hong Kong obstetric patients
SO, Frankie	A case report of being awake at bispectral index of 40
WAI, CK	Perioperative management of a patient with Devic's disease undergoing lower segment caesarean section

Basic Science Course in Anesthesiology 2005

The Basic Science Course in Anesthesiology organized by the Hong Kong College of Anaesthesiologists will commence on 10th September, 2005. This course consists of 32 hours of lecture time on Saturday mornings over 9 weeks. The venue is either at PWH, QEH or QMH. Knowledgeable tutors are invited to give the lectures. It is targeted for first to third year anesthesia trainees.
The final schedule will be posted up at the HKCA web site as soon as it is available.

Course fee: HK$ 1,000 for HKCA members
HK$ 2,000 for non-members

Interested trainees should complete the application form and send it to Dr CH Koo, Basic science course coordinator, Department of Anaesthesia, QEH, together with exact payment (crossed cheque payable to "The Hong Kong College of Anaesthesiologists") before 4th September, 2005.

Application forms are now available from SOTs of your department, Administrative Executive of the College or can be downloaded from the HKCA website (http://www.hkca.edu.hk).

Updated information is also available at the HKCA website.

Board of Examination

Successful candidates

Final Fellowship Examination in Anaesthesiology March/ April 2005

CHEUNG Suk Yan Olivia	CMC
LAM Cheung Kwan	PMH
LAM Kar Yee Katherine	PWH
NG Yuen Chong	PWH
TANG Yee Kwan	PYNEH
WU Wai San Janet	QEH
YU Lin Yau	PWH

Seven out of 14 candidates passed the examination. The HKCA Final Fellowship Examination Prize was awarded to Dr Katherine LAM of the Prince of Wales Hospital. The College is grateful to Dr. Hazel Adams of RCA, and Professor Peter Klineberg of ANZCA for their assistance as External Examiners during the examination.

Examination Dates, 2005

Final Fellowship Examination in Intensive Care 2005
Examination Fee: $10,000

	Date
Written	17 October 2005(Mon)
Oral/Clinical/OSCE	2-3 December 2005(Fri/Sat)
Closing Date	20 September 2005(Tue)

Diploma of Pain Management (HKCA) Examinations 2005
Examination Fee: $5,000

	Date
Written	4 November 2005 (Fri)
Closing Date	4 October 2005 (Tue)

Exit Assessment Date for Year 2005

13 October 2005 (Thur)

Trainees who are qualified to apply for fellowship are recommended to have their respectively applications received at the HKCA office ***at least 21 days before*** *the scheduled Exit Assessment dates, to allow ample time for processing.*

PT Chui
Chairman, Board of Examination

2005 Report on the Final Fellowship Examinations in Intensive Care: A Historical Perspective

Introduction

The inaugural Final Fellowship Examinations in Intensive Care was conducted in 1997. Since then, much work continues in order to maintain the examination as a reasonable means of assessment in the training of Intensive Care. Because the number of eligible trainees is small, no examinations were conducted in 2000, 2001 and 2002.

Successful candidates

The successful candidates till date have been

1997	Dr Cheung Po Wa
1998	Dr Claudia Cheng Ai Yu
1999	Dr Victor Yeo
2003	Dr Chau Chin Man and Dr Kwok Keen Man
2004	Dr Wilson Lee Hon Ming

Examination Reports

Each year the number of examination candidates is small and while each of the examination reports have been sent to the supervisors of training, the reports will not be made public.

Pass rate

The pass rate for each year is as follows:

	Number of Candidates	Number Successful
1997	2	1
1998	3	1
1999	1	1
2003	2	2
2004	1	1

The overall combined pass rate is 66.7% (range 33.3 to 100%).

Examination Format

The Final Examinations consist of several parts. The weight of each part as a percentage of the overall mark is presently released for the first time. This weighting system has been in use so far, but is currently subject to further review and may be amended without notice.

Written Papers

Short answer question paper (15 questions, 150 minutes)	20%
Long answer question paper (2 questions, 120 minutes)	20%

Clinical/Practical Papers

Investigations (30 minutes)	10%
Clinical Medicine (60 minutes)	30%
Oral examinations (2 tables of 30 minutes each)	20%

Examination Past Papers: Written

The past papers for the written section have been published in the College website for reference.

General Performance

In general, over the last few years, similar strengths and weaknesses tended to be seen in our examination candidates. The written papers are generally well answered. However, the clinical medicine paper would represent one of the more difficult paper parts of the examination. Commonly seen problems include making simple errors in bedside physical examination, for example failure to adequately expose the patient, or missing the presence of a physical sign. In addition, weakness in the integration of theoretical knowledge is another commonly seen problem. Candidates must ensure that the relevant infection control practice must be adhered to; time will be allotted for this and marks may be deducted if this is of a poor standard.

Upcoming Changes

During the Board of Intensive Care meeting in April 2005, it was resolved that amendments in the examination format may be made in the future. These amendments reflect the growth and maturation of Intensive Care in Hong Kong and may provide a more objective and structured examination format. Each change will be introduced gradually in stages and the effects of each amendment closely monitored.

As of 2005 an OSCE format will be used to replace the Investigation table. It is expected that there will be 10 questions in the OSCE. Suggested aspects for the test may include ECG's, X-rays, investigation results including blood gases, biochemistry, microbiology and hematology, clinical waveforms, equipment, resuscitation, crises management, communication station, clinical short cases and others.

The OSCE, like the investigation paper it replaces, will contribute 10% of the overall marks.

A workshop comprising of a mock OSCE will be arranged and the date will be announced soon.

External Examiners

The Hong Kong College of Anaesthesiologists wishes to thank the following external examiners

1997	Dr Richard Lee, Joint Faculty of Intensive Care Medicine
1998	Dr Peter Morley, Joint Faculty of Intensive Care Medicine
1999	Dr Loretta Yam, the Hong Kong College of Physicians
2003	Dr John Myburgh, Joint Faculty of Intensive Care Medicine
2004	Dr Chan Wai Ming, the Hong Kong College of Physicians

In gratitude

The Hong Kong College of Anaesthesiologists would also like to thank Dr Tom Buckley for serving as chief examiner from 1997 till 2002, in particular, for organising the inaugural examinations which represent a landmark for intensive care training in Hong Kong, and for providing a well organised system for further growth.

Dates of next examinations

The 2005 examination dates are as follows:

Written papers	Monday 17th October 2005
Clinical/Practical papers	Friday-Saturday 2-3rd December 2005

The closing date for applications is Tuesday 20th September 2005.

Dr Peggy Tan
Chief of Examinations in Intensive Care

Board of Pain Medicine

1. The BoPM would like to remind all new trainees for Dip Pain Mgt to register before starting training. It is possible that your training time may not be recognized if you have completed the training without being registered as a Dip Pain Mgt trainee with HKCA.
2. The BoPM would like to announce that Dr Steve Onsiong had resigned from the Board. The Board would like to thank Dr Onsiong for his contributions over the years and wish him well in his future endeavour. On another note, the BoPM would like to welcome Dr MC Chu and Dr Timmy Yuen appointments to the Board following approval of the HKCA Council. Dr MC Chu is also our new Dip Pain Mgt Training Officer.
3. At the recent inspection in March 2005, both UCH and QEH have been successfully accredited as training centers for Dip Pain Mgt (HKCA) for another 5 years.
4. The next DPM examination will be held on 4th November 2005. Dr Roger Goucke will be invited as the external examiner.
5. The BoPM is organizing a full-day seminar entitled "The Essentials of Pain Management" on 4 December 2005 at the Miramar Hotel. There is a multidisciplinary faculty of overseas and local speakers. Please see poster for more information.
6. The BoPM is also planning a workshop on patient evaluation skills on 5 November 2005. The workshop will include skills stations on radiological imaging, neurophysiological tests, neurological examination, spine evaluation, etc. Watch out for notice of the workshop.

PP Chen
Chairman, Board of Pain Medicine

Admission to Fellowship by Examination, FHKCA

CHENG, Tsang Dawn	CHENG, Yat Hung
CHEUNG, Ning Michelle	CHU, Suk Yi
HO, Sin Shing	HO, Yau Leung
HUI, Kit Man Grace	KWAN, Wai Man Gladys
LAM, Cheung Kwan Brian	LEE, Yuk Ming Sunny
LEE, Yeuk Ying Samantha	LOW, Kai Ngai Kevin Yves
SO, Chi Long	SO, Ching Yee
WONG, Chak Man	TSANG, Ho Sze

Admission to Fellowship *ad eundem*, FHKCA(IC)

CHAN Kin Wai
GOMERSALL, Charles David

Michael Irwin
Chairman, Board of Censor

Recent Meetings: Anaesthesia, Intensive Care & Pain management

Local meetings 2005

2-5 September, 2005	**THE CHINESE SOCIETY OF ANAESTHESIOLOGISTS, ANNUAL MEETING** Venue: International Conference Centre of Dong Fang Hotel and China Hotel. Guangzhou. Contact: Email: csa8@china.com
22 October, 2005	**DIFFICULT AND ADVANCED AIRWAY MANAGEMENT WORKSHOP** Venue: The Institute of Clinical Simulation, North District Hospital Contact: Administrative Executive, HKCA, Phone: 2871 8833. Fax: 2814 1029, Email: office@hkca.edu.hk
4 December, 2005	**PAIN SEMINAR: THE ESSENTIALS OF CHRONIC PAIN MANAGEMENT** Venue: Miramar Hotel, TST Contact: HKCA, Room 807, Hong Kong Academy of Medicine Building, 99 Wong Chuk Hang Road, Aberdeen, Hong Kong Phone: (852) 2871 8833. Fax: (852) 2814 1029, Email: office@hkca.edu.hk, website: www.hkca.edu.hk
25 February, 2006	**HKAM INTER-COLLEGIATE CONGRESS 2006** Theme: Disaster Management Venue: Hong Kong Convention and Exhibition Center Contact: HKAM

Overseas Meetings 2005-2006

Gold Coast, QLD AUSTRALIA *24-27 September, 2005*	**64TH NATIONAL SCIENTIFIC CONGRESS OF THE AUSTRALIAN SOCIETY OF ANAESTHETISTS** Venue: Gold Coast Convention and Exhibition Centre. Contact: Organisers Australia, PO Box 1237, Milton Qld 4064. Tel: 07 3369 7866 Fax: 07 3367 1471 Email: asa2005@orgaus.com.au Website: www.asa2005.org.au
Adelaide, SA AUSTRALIA *20-23 October, 2005*	**30TH ANZICS/ACCCN ANNUAL SCIENTIFIC MEETING ON INTENSIVE CARE** Contact: ANZICS, Level 3, 10 Ievers Terrace, Carlton VIC 3053. Tel: 03 9340 3400 Fax: 03 9340 3499 Email: asm@meetingplanners.com.au Website: www.anzics.com.au
SINGAPORE *24-25 September, 2005*	**4TH SCIENTIFIC MEETING OF THE ASIAN SOCIETY OF PAEDIATRIC ANAESTHESIOLOGISTS** Venue: KK Women's and Children's Hospital. Contact: Ms Jessie Tan. Secretariat, c/o Department of Paediatric Anaesthesia, KK Women's and Children's Hospital, 100 Bukit Timah Road, Singapore 229899. Tel: 65-63941091 Fax: 65-62912661 Email: jessiet@kkh.com.sg Website: http://www.aspa-2000.com
Haroi VIETNAM *23-25 November, 2005*	**14TH ASEAM CONGRESS OF ANAESTHESIOLOGISTS** Contact: Professor Nguyen Thu or Dr Cong Quyet Thang. Anesthesiology Department, Viet Duc Hospital, 40 Trang Thi Street, Hanoi, Vietnam. Tel: +84 4 9286149 Fax: +84 4 8248308 Email: nguyen_thugmhs@hmu.edu.jn or cqthang@fpt.vn

New York
USA
9-13 December, 2005

NEW YORK STATE SOCIETY OF ANESTHESIOLOGISTS 59TH POSTGRADUATE ASSEMBLY IN ANESTHESIOLOGY
Venue: New York Hilton Hotel, New York. Contact: NYSSA, Kurt G. Becker, 85 Fifth Avenue, 8th Floor, New York, NY 10003. Tel: 1 212 867 7140 Fax: 1 212 867 7153
Email: kurt@nyssa-pga.org Website: www.nyssa-pga.org

San Diego, USA
14-18 January, 2006

6TH ANNUAL INTERNATIONAL MEETING ON MEDICAL SIMULATION
Venue: San Diego Sheraton. Contact: Society for Medical Simulation, PMB 300 223 N. Guadalupe, Santa Fe, NM 8750 USA. Tel: 1 505 983 492 Fax: 1 505 983 5109
Email: info@SocMedSim.org Website: www.socmedsim.org

Queensland
AUSTRALIA
20-24 October, 2006

65TH NATIONAL SCIENTIFIC CONGRESS OF THE AUSTRALIAN SOCIETY OF ANAESTHETISTS
Contact: Organisers Australia. PO Box 1237, Milton, Qld 4064. Tel: +61 (0)7 3371 0333 Fax: +61 (0)7 3371 0555

Adelaide, SA
AUSTRALIA
13-17 May, 2006

2006 ANZCA ASM
Theme: All in a Day's Work? Venue: Adelaide Convention Centre.
Contact: Mr Christopher Boundy, South Australian Postgraduate Medical Education Association Inc (SAPMEA)
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Panel of Examiners with successful candidates in the Final Fellowship Examinations, April/May, 2005. The external examiners were Dr Hazel Adams (left three, front row) and Assoc. Professor Peter Klineberg (right four, front row).

The Hong Kong College of Anaesthesiologists

Pain Seminar -

The Essentials of Chronic Pain Management

December 4 , Sunday, 2005
0900-1600 h
Venue - Miramar Hotel, Tsim Sha Tsui

Target Audience - Doctors, nurses, physiotherapists, occupational therapists, clinical psychologists, health administrators.....

Objectives - Participants will learn about epidemiology, the concepts of pain, the principles of chronic pain management, and about clinical management of chronic pain conditions including chronic headache and migraine, neuropathic pain, low back pain ,etc. presented as series of lectures and clinical case panel discussion.

Faculty

Professor Michael Nicholas-	Clinical Psychologist, University of Sydney, Australia
Dr Roger Goucke-	Pain Specialist, Sir Charles Gairdner Hospital, Perth, Australia
Professor Jacobus KF Ng-	Anaesthesiologist, Queen Mary Hospital, University of Hong Kong, HKSAR
Dr TH Tsoi-	Neurologist, Pamela Youde Nethersole Eastern Hospital, HKSAR
Dr Anne Kwan-	Anaesthesiologist, United Christian Hospital, HKSAR
Dr Theresa Li-	Anaesthesiologist, Queen Elizabeth Hospital, HKSAR
Dr Joseph Lam-	Neurosurgeon, Prince of Wales Hospital, HKSAR
Dr Kenneth MC Cheung-	Orthopaedic Surgeon, Queen Mary Hospital, University of Hong Kong, HKSAR
Ms Polly Lau-	Physiotherapist, Queen Elizabeth Hospital, HKSAR
Dr PP Chen-	Anaesthesiologist, New Territories East Cluster Hosptials, HKSAR

Academic Accreditations

College of Anaesthesiologists	6 CME	College of Nursing	6 CNE
College of Family Physicians	5 CME	HKMA CME	5 CME
College of Orthopaedic Surgeons	3 CME	Hong Kong Doctor Union	5 CME
College of Physicians	2 CME	Occupation Therapists	6 CPD
College of Psychiatrists	6 CME	Physiotherapists	5 CPD
College of Surgeons	6 CME	Clinical Psychologists	6 CE
MCHK CME	5 CME		

Secretariat

The Hong Kong College of Anaesthesiologists, Rm 807, Hong Kong Academy Jockey Club Bldg., 99 Wong Chuk Hang Road, Aberdeen. Tel : 2871-8833, Website : www.hkca.edu.hk
Registration fee- $300 (non-refundable, tea and lunch included).
Cheque should be made payable to "Hong Kong College of Anaesthesiologists" and send to Secretariat. Registration form and programme details can be downloaded from HKCA College website.

Main Sponsors

Pfizer

Medtronic
Alleviating Pain · Restoring Health · Extending Life

Registration Deadline- October 31, 2005

The Hong Kong College of Anaesthesiologists

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