Anaesthetic Contribution to Deaths in the Operating Theatre at the University Hospital Kuala Lumpur - A Retrospective Survey

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Summary

From January 1980 to August 1992, there were 125 deaths occurring in the operating theatre at the University Hospital Kuala Lumpur. Out of these 125, six were judged to have been mainly 'due to anaesthesia.' In the same time period, there were a total of 155,000 anaesthetics given in the hospital. This gives an anaesthetic death rate (in the operating theatre) of six out of 155,000 or 0.39:10,000.

Key words: Anaesthesia, Complications, Mortality.

Introduction

Mortality studies are an essential part of audit in a quality assurance programme, together with audit of morbidity, morbidity and mortality meetings, and critical incident monitoring.

In order to determine the contribution of anaesthesia to patient mortality, a retrospective analysis of the deaths occurring in the operating theatre at the University Hospital Kuala Lumpur (UHKL) was carried out.

UHKL, besides being a tertiary referral centre, also accepts patients directly without referral. Hence there is a wide case mix of adult and paediatric patients, including trauma, cardiothoracic, and neurosurgical cases. Being a teaching hospital, anaesthetists also range in rank from junior medical officers to senior consultants and Professors.

The objective of this study is to encourage monitoring of mortality and morbidity as part of anaesthesia audit and quality assurance.

Materials and Methods

At the University Hospital Kuala Lumpur (UHKL), details of all deaths occurring in the operating theatre (OT) suite are recorded and kept in the OT. From 1st January 1980 to 31st August 1992, there were 125 such deaths. The case summaries and causes of death recorded at the time of death were reviewed, and where anaesthesia was thought to have a possible contribution to the death, the patient's records were retrieved from Medical Records Department.

The cause of death was divided into either 'mainly due to anaesthesia' or 'mainly due to pre-existing illness or surgery'. There was no attempt to distinguish between causes due to pre-existing illness and causes due to surgery, except for three cases which were likely to have been due to acute myocardial infarction.

Results

From January 1980 to August 1992, there were 125 deaths occurring in the operating theatre in UHKL. Out of these 125, six were judged to have been mainly 'due to anaesthesia.'

In the same time period, there were a total of 155,000 anaesthetics given in the hospital. This gives a death rate of six out of 155,000 or 0.39:10,000.

In the other group where death was thought to be 'mainly due to pre-existing illness or surgery', there were three deaths from probable acute myocardial infarction. One occurred pre-operatively and two intra-operatively.

Deaths 'mainly due to anaesthesia'

(Details are deliberately sketchy for various reasons).

Case 1. This was a young healthy male who presented for toilet and suture of a laceration on his right wrist. Soon after induction of general anaesthesia, he went into cardio-respiratory arrest. Although initially there was some doubt about whether there was oesophageal intubation, retrospective analysis of what happened pointed to anaphylaxis, possibly to alcuronium.

Case 2. A middle-aged man presented for cholecystectomy for cholelithiasis. He was markedly hypertensive and two weeks were required to gradually bring his blood pressure under control with multiple antihypertensive drugs. A combined general and epidural anaesthesia with local anaesthetic was used. Soon after induction the patient's blood pressure dropped, and a short while later he sustained a cardiac arrest unresponsive to resuscitation.

Case 3. A 70 year old man presented for open ureterolithotomy. His hypertension was not well treated pre-operatively, with a reading of between 140/90 to 190/110 mmHg. A combined general anaesthesia with epidural local anaesthetic technique was used. Soon after induction, the patient sustained a drop in blood pressure to 80 mmHg systolic, which responded to treatment. The subsequent intra-operative course was uneventful, and the patient woke up after reversal at the end of surgery. After half an hour in the recovery room, the patient sustained a sudden cardio-respiratory arrest, and did not respond to resuscitation. A pre-sumptive diagnosis of acute myocardial infarction was made.

Case 4. A young man with bronchiectasis presented for left pneumonectomy. A right-sided double-lumen tube was used. Half-way through the operation the patient sustained a cardiac arrest and could not be resuscitated. Subsequently the right lung was found to contain copious amounts of pus, which may have leaked from the left side.

Case 5. A neonate with tracheo-oesophageal fistula presented for fistula repair. Attempts at intubating the trachea failed as the tube kept on going into the fistula.

Case 6. A male adult with a gunshot wound to his face and neck presented for emergency operation.

After induction of general anaesthesia, the trachea could not be intubated because of trauma to the larynx. Attempted emergency tracheostomy also failed because the anatomy of the neck had been altered by the trauma to the larynx and trachea.

Deaths probably due to acute myocardial infarct

Case 1. A 69 year old man presented with a perforated peptic ulcer for laparotomy. He was known to have ischaemic heart disease with a history of unstable angina, right bundle branch block, and widespread inverted T waves on the ECG. Shortly after arrival in the reception area in the operating suite, he collapsed and could not be resuscitated, before any anaesthetic was given.

Case 2. A 73 year old man presented for laparotomy for a perforated duodenal ulcer. His preoperative ECG demonstrated an old anteroseptal myocardial infarct. After an apparently cardiovascularly stable induction, he collapsed after the abdomen was opened. A presumptive diagnosis of acute myocardial infarct was made.

Case 3. An 80 year old man with ischaemic heart disease presented for surgical drainage of a carbuncle on his back. After discussion with the anaesthetist, it was decided to proceed under local anaesthesia, with fentanyl 50 mcg and droperidol 5 mg for sedation. Eight ml of 0.5% lignocaine was infiltrated 1 cm from the indurated area. Soon after, ECG showed that the ST segments had become elevated, and the patient sustained a cardio-respiratory arrest, unresponsive to resuscitation.

Discussion

The above classification and comments are obviously controversial and open to debate. Note that no blame or error is implied by classifying patients into the group 'due mainly to anaesthesia'. For example, *Case 6* was classified here because induction of anaesthesia caused the patient's airway to be obstructed completely. No blame is suggested because even if tracheostomy had been attempted with the patient awake under local anaesthesia, it may have failed due to the altered anatomy. With hindsight, the only procedure which may (or may not) have saved the patient is a sternotomy and an intrathoracic tracheostomy. *Case 2* and *Case 3* illustrate the fact that the blood pressure of a hypertensive patient is unstable under anaesthesia, and may be more unstable under a combination of general and epidural anaesthesia. On the other hand, the patient's blood pressure may well have been just as unstable under general anaesthesia alone – we will never know.

These arguments illustrate one problem which all mortality studies have – the definition of what constitutes an 'anaesthetic death' and the classification of the causes of death[1]. Our classification is quite similar to that used by Hovi-Viander [2], where the 'main cause' is divided into anaesthetic, surgical, pre-existing disease, and others. Other authors have used widely varying classifications[1]. An international symposium on preventable anaesthetic morbidity and mortality in 1984[3] came up with the following definition for anaesthetic mortality: "A death which occurred before recovery from the effects of a drug or drugs given to relieve the pain of a condition or arising from an incident which occurred while the drugs were effective". The terms anaesthesia, anaesthetic, anaesthetist and operation are not mentioned, and virtually all deaths in hospital may be included by this definition.

The time span used in this study is the time that the patient was in the operating theatre, simply because data was available for that period of time only. Waters and Gillespie[4] also used this time frame. The problem with this approach is that it misses out patients who sustain an event during anaesthesia, are resuscitated, and die only later in the ward as a result of this event. Other authors have used widely varying time spans[2,4-9] (Table I).

Table I
Time span of anaesthetic mortality studies
(adapted from Derrington and Smith (1))

Study	Time Span
Dealy (5)	Death at operation or a few minutes after.
Waters and Gillespie (4)	Death in the operating room
Beecher and Todd (6)	All deaths on the surgical services
Hingson, Holden and Barnes (7)	Death within 24 hours
Harrison (8)	Death within 24 hours
Hovi-Viander (2)	Death within 3 days
Lunn and Mushin (9)	Death within 6 days

Other problems in comparing different studies include different patient populations in different hospitals (e.g., referral hospitals are more likely to anaesthetize sicker patients that non-referral hospitals); changing practice of anaesthesia over time (e.g., comparing studies done in the 1950's and studies done in the 1980's); and differing methods of data collection (e.g., prospective versus retrospective)[1].

In spite of these problems, rates of approximately one to two deaths per 10,000 anaesthetics have been found[10], except for more recent studies which seem to show a decline in mortality[3,5,7,8,11-18] (Table II). This possible recent decline has been attributed to enhanced safety awareness, recognition of the respiratory nature of much anaesthetic mortality and morbidity, and the use of monitoring of oxygenation and ventilation during anaesthesia[10].

Table II
Studies of anaesthetic mortality

Year	Authors	Deaths/10,000
1940-1959		
1944	Waters & Gillespie (4)	2.7
1954	Beecher & Todd (6)	3.7
1956	Hingson *et al* (7)	1.7
1960-1979		
1963	Clifton & Hotten (11)	1.6
1975	Bodlander (12)	0.7
1978	Harrison (13)	2.2
1980	Turnbull *et al* (14)	2.0
1980	Hovi-Viander (2)	2.0
1980-1992		
1984	Holland (15)	0.38
1985	Tiret *et al* (16)	1.3
1987	CEPOD (17)	0.05
1989	Zeitlin (18)	0.15
1992	University Hospital, KL	0.39

N.B. It may not be valid to compare figures from different centres due to varying definitions of "anaesthetic death", varying time frames of the study, and varying patient population.

Our figure of 0.39:10,000 includes only deaths occurring in the operating room, and the figure would be higher if the time span of the study had been increased. This was not possible because the classification of causes of death at the Medical Records Department is usually based on the presenting illness or pathology, and deaths due to therapeutic interventions (e.g. anaesthesia) may not be classified as such.

Conclusion

Anaesthesia mortality studies, with adequate confidentiality, can provide valuable information on standards of health care and contribute to an improvement in those standards[15].

The anaesthetic mortality rate at the University Hospital Kuala Lumpur seems to be acceptable. Nevertheless, there is still room for improvement (Table II). This may be achieved with ongoing audit of mortality and morbidity, better training and supervision, advances in utilization of monitoring equipment, and provision of adequate staff.

It is important for every department or discipline to undertake mortality studies as part of a quality assurance program. This knowledge will help us identify areas needing improvement, serve as a guide to avoid mistakes which may have occurred in the past, and show us where we stand with respect to other centres.

Acknowledgements

We wish to thank Sister Low (Anaesthetic Nursing Sister) for access to records of patient dying in the operating theatre suite and the Medical Records of University Hospital Kuala Lumpur, for helping to trace the deceased patients' records and microfilm.

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