

An improved technique of anaesthesia for Caesarean section

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Introduction:

EVER SINCE JENNERIAN vaccination was widely adopted in the control of smallpox in many endemic countries, attention had been focussed on its complications. With the virtual eradication of smallpox in many Western countries, these complications have raised major controversies about the very usefulness of vaccination in controlling outbreaks of smallpox. We have now sufficient knowledge of smallpox from many epidemiological studies to justify a proper assessment of the exact place of vaccination.

Malaysia has been free from smallpox since the last outbreak in Kedah in 1946-47 when 599 cases were reported with 293 deaths. In the middle of September 1971, a suspected case of smallpox seen in the University Hospital, Petaling Jaya, aroused the fear of imported smallpox in Klang, followed

by a mass vaccination campaign. This paper presents the results of a study of the complications seen following the mass vaccination, and reviews the present role of vaccination.

Materials and Methods

Between 15th and 19th September 1971, 186,329 people of all ages were vaccinated in Klang. All doctors in the hospital and in private practice were asked to look for complications and to refer patients to the hospital for this study. Forty cases were studied in detail. Where necessary, patients were treated as in-patients.

Results

The following complications were seen during the study.

1. Generalised vaccinia

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2. Toxic erythema	12	cause little constitutional disturbance and clear in
3. Auto-inoculation	4	3-5 days. Sarkany and Caron (1962) described
4. Erythema exudativum	2	toxic erythema, erythema nodosum, pityriasis rosea,
5. Local necrosis	1	eczema and granuloma annulare after vaccination.
6. Miliary eruption	1	Of these, toxic erythema was the commonest type
7. Herpes zoster	1	seen in the present study.
8. Angio-neurotic edema	1	(c) <i>Erythema exudativum</i> : This is a more severe
9. Steven-Johnson syndrome	1	form of toxic erythema with generalised bullous
10. Eczema vaccinatum	1	formation, fever and protracted course, often des-
11. Encephalomyelitis	3	cribed in dermatological literature. Three of our
12. Vaccinia in newborn	1	patients had this complication.

Discussion

Complications of smallpox vaccination may be broadly classified into three types:

1. Cutaneous complications
2. Neurological complications
3. Miscellaneous complications.

Cutaneous Complications:

1. *Secondary Bacterial Infections*: These are quite common, especially in children. Being a minor complication, few were referred to the hospital. Local application of an antibiotic cream, such as achromycine, usually heals most lesions.

2. *Local Necrosis*: This can occur as a result of severe secondary bacterial infection or severe pustulation itself. In the case seen in this study, severe necrosis in a Malay male, aged 27, was accompanied by brawny edema of the whole upper limb.

3. *Auto-inoculation*: This follows scratching and transfer of the vaccine material to other parts of the body or to another person in close contact with the vaccinated person. This usually occurs during the first 9 days after vaccination.

Case 1. A 38-year-old Chinese female developed typical vesicles over the upper and lower eyelid with edema of the surrounding area, on the fifth day after vaccination. Recovery was uneventful.

Case 2. A recently vaccinated mother brought her 8-month-old child with typical vesicles over the back of the child's neck, due to auto-inoculation while carrying the child on her left arm.

4. *Toxic Eruptions*: These were the commonest cutaneous complication seen, accounting for 15 cases.

(a) *Miliarial eruptions*: One patient presented with miliarial eruptions along the lymph channels leading from the site of vesiculation.

(b) *Erythema Multiforme*: This is a very common complication, occurring usually 7 to 10 days after vaccination, sometimes up to the 14th day. The eruptions may be localised or generalised,

cause little constitutional disturbance and clear in 3-5 days. Sarkany and Caron (1962) described toxic erythema, erythema nodosum, pityriasis rosea, eczema and granuloma annulare after vaccination. Of these, toxic erythema was the commonest type seen in the present study.

(c) *Erythema exudativum*: This is a more severe form of toxic erythema with generalised bullous formation, fever and protracted course, often described in dermatological literature. Three of our patients had this complication.

Case 1: A Malay female, aged 60, had localised bullous eruptions over the deltoid with echymotic areas.

Case 2: A 9-year-old Malay girl was admitted to the hospital, 8 days after vaccination, with high fever and vomiting. She had developed generalised erythematous eruptions, affecting the whole body, including the soles and palms, with multiple

only thing surgically different is it means that "all the water comes his (surgeon's) way".

5. Position for Intubation.

The patient lies in a horizontal plane. Her head rests on a headring with the neck flexed and head extended in a position most suitable for intubation.

6. Rapid and Safe Intravenous Induction ("short gun" or "crash" technique).

a. Methohexitone 1 — 1.5 mg per kg as administered into the drip tubing injector to produce a "bolus" effect. Half the dose in a 10 ml syringe is first given and flushed through.

b. Then suxamethonium about 75 — 100 mg in a 2.5 ml syringe is given through the rubber injector with the 2nd half of the methohexitone. This gives the effect of "premixed methohexitone-suxamethonium" mixture and yet does not give any chance of consciousness of fasciculations or awareness. (Liew 1972). Or the second half dose of methohexitone is premixed with the suxamethonium in a 5 ml syringe and given after the first half dose. This is likened to the premixed thiopentone-suxamethonium mixture for rapid intubation (Khawaja 1971). Others (Bradford 1969) used Propanidid for elective Caesarean section, while Baraka (1971) preferred propanidid to thiopentone.

No prior inflation of the lungs using the mask is required. For obstetrics anaesthe-

sia, intermittent positive ventilation is an important cause of regurgitation!

- c. Adequate suction is ensured first.
- d. Intubation is performed using the self-applied cricoid pressure technique (Liew 1972). The anaesthetist has previously felt the exact position of the cricoid cartilage before induction and marks it with a ballpen. The patients were intubated with the balloon of the endotracheal tube "ready inflated" technique. The lungs are immediately checked for air entry and adventitious sounds.
- e. Hypertensive response to intubation. This methohexitone-suxamethonium intubation technique always cause a rise in blood pressure and tachycardia, which tends to offset any fall in blood pressure after induction of anaesthesia.

Initial Hyperventilation

For the first 5 minutes, hyperventilation with 70% nitrous oxide at a minute volume of 8 — 9 litres will ensure the establishment of amnesia-analgesia before the amnesia effect of the barbiturate wears off.

Maintenance of Anaesthesia

- a. In four patients, the speed of surgery resulted in delivery of the babies before the return of muscular activity following suxamethonium. One patient had two doses of suxamethonium for a trial of forceps, which proceeded to Caesarean section. The anaesthetist watches for any return of muscular activity and also places his fingers on the cricoid cartilage to feel for first sign of swallowing, spontaneous respiration, while his eyes are on the operation site surveying the colour of the blood at the wound and the amount of blood loss. Thereafter for maintenance, di-allyl-nor-toxiferine (Alloferine) 0.25 mg per kg was administered.
- b. Concentration of Nitrous Oxide/Oxygen mixture for maintenance: A flow of 2 litres/min of oxygen, 5 to 5.25 litres/minute nitrous oxide giving 27 — 28.5% oxygen will provide, through the Manley Ventilator (minute volume divider), adequate oxygenation and depth of anaesthesia with little chance of awareness (triad of anaesthesia, Gray, 1960).
- c. Once the placenta is delivered, the operation table is set level again.
- d. Oxygen flushing: This was not done. Also the effect of nitrous oxide wash-out to raise the

foetal muscle p_{O_2} comes only after 1 minute and longer in the presence of foetal distress (Althabe, 1967).

- e. Mild Hyperventilation: Since marked hyperventilation produces foetal acidosis in some animals (Morishima 1965) (Motoyama, 1967) and in patients (Scott 1969) but not well proven, the author only uses mild hyperventilation till this problem is better understood. Studies done on gas flows with the Manley ventilator (Liew, 1972) showed the arterial p_{CO_2} to be in the region of 28 — 32 mmHg. Subsequent to delivery of the infant, Morphine 5 mg I/V or omopon 10 mg I/V or pethidine 25 mg I/V is given. Morphine 5 mg I/M or pethidine, 25 mg I/M or at extubation) is given to the mother.

Others administer 0.5% halothane in 50% oxygen throughout the operation (Moir 1970), or 0.1% methoxyflurane (Crawford 1971) after the baby is delivered.

- f. Intra-operative aspiration (Vandam, L. R. 1965): None of the patients required aspiration during operation to empty the stomach. Gastric aspiration was done for testing in 2 patients (emergency Caesarean section) which showed a gastric pH of 5 and 5.4 respectively (Astrup pH meter 27). This is a safe pH even if pulmonary aspiration occurs. The danger pH range is 2.5 and less.

Position for Extubation and Technique of Extubation.

All the patients, but one for emergency operation, were turned to the left lateral side. Reversal was then given, nitrous oxide turned off and the patient extubated with continuous suction applied to the left buccal cavity. The patients usually become conscious with 20 — 25 breaths of pure oxygen (since the blood gas solubility coefficient of nitrous oxide is 0.47) from the non-rebreathing circuit of the Manley ventilator for an operation lasting less than one hour.

The one heavy patient for emergency Caesarean was extubated supine and horizontal, but oropharynx suction was given before reversal. The heavy weight of the patient is a factor against left lateral extubation, during which the patient may also fall from the operation table.

The author used an endotracheal tube one size smaller than required usually 7.5 — 8 mm with the cuff optimally inflated. Extubation is done in a curved direct (the direction of the curved tube) during inspiratory stroke of the Manley ventilator. Too early washingout of nitrous oxide with oxygen

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before administering reversal will result in a conscious but paralysed patient in pain and fear.

Post-operative Recovery in the Recovery Room

The patient is nursed in the left lateral position till fit to return to the ward or labour room.

Post-operative interview

All the patients were interviewed within 36 hours. They were questioned on the period of amnesia, and recall or pain during operation; pleasantness immediately after operation. All of them remembered only up to time the oxygen mask was placed on the face, only to come round in the ward. Since the intravenous cannula drip was inserted under local analgesia on the dorsum of the hand, it also gives comfort to the hand and allows free movement of patient in bed. None had a sore throat and all except one patient were analgesic till she was up in bed.

All patients described the anaesthetic and operation as very pleasant and amnesic. This was a period in their lives they "never wish to know or remember". Two patients, who had previous Caesarean sections, described the experience as more pleasant.

The lack of pain along the arm on injection of methohexitone through the rubber tube was probably due to dilution by the free flowing drip. One patient anaesthetised previously for a D & C experienced severe pain in the arm on I/V injection but not this time.

The Baby

The resuscitation officer in the University Hospital is the paediatrician.

Discussion

The confidence of these 5 patients (all doctors) was great when they knew (some requested) that their wellbeing was in the care of a competent obstetrician and anaesthetist.

Maternal mortality from anaesthesia remains a serious problem. For every death, several non-fatal accidents occur contributing to serious maternal morbidity. The anaesthetists are also increasingly concerned with intra-operative problems of the foetus.

Magnesium Trisilicate BPC 1968 mixture used in the University Hospital contains the following:-

Light magnesium carbonate	5 g
Magnesium trisilicate	5 g
Sodium bicarbonate	5 g
Peppermint water	100 ml

The magnesium trisilicate BPC (1968), which differs from the 1963 formula, needs to be given 15 ml 2-hourly and not 10 ml 2-hourly, to ensure that the pH of gastric HCl will be kept above 2.5 or 3 (Williams and Crawford J.S. 1971). If such contents are aspiration, the acid-aspiration syndrome will be mild if it at all develops. The author is presently using also Gaviscon and Digene. These lighter-than-water, anti-foaming demulcents and antacids combination will neutralise HCl and forms a stop-cock foaming mixture at the cardiac sphincter rendering it more competent.

Scopolamine (Hyoscine) 0.4 — 0.6 or even 0.8 mg causes drowsiness, euphoria, amnesia, together with an increase in the respiratory rate, minute volume and heart rate. Used with morphine (10 — 15 mg), omnopon (20 mg), or pethidine (100 mg), it does not cause excitement, restlessness and hallucinations or delirium seen with hyoscine alone.

Morphine is given 5 mg or omnopon 10 mg intravenous after the baby is born; and 5 mg or 10 mg respectively intramuscular at extubation. It relieves pain, discomfort and is anxiolytic and euphoric. This "omp follows scop" combination tends to decrease the incidence of awareness and recall.

Pethidine similarly produces analgesia, sedation and euphoria. It is given 25 mg I/V after the baby is out and 25 — 50 mg at extubation. The tachycardia and hypotension due to increased peripheral blood flow is minimal with the small intravenous dose.

The problem of awareness and factual recall has been accentuated under light anaesthesia with the use of relaxants (Lancet, 1968). Proper choice of drugs, especially premedication (Wilson, 1969) has an important function in light relaxant anaesthesia to prevent any form of operative awareness, though other factors may be important such as parity, preoperative tension, previous unpleasant operation, level of nitrous oxide narcosis, nitrous oxide wash-out with oxygen, degree of hyperventilation, use of intravenous analgesics or inhalation anaesthesia.

The periods during operation which offer scope for study of awareness (Wilson 1969) may include: Predelivery under light relaxant anaesthesia, often intermittent suxamethonium; during incision of uterus and delivery of baby under oxygen augmentation or nitrous oxide wash-out with oxygen; thereafter, when anaesthesia is deepened by use of adjuncts; twilight phase during recovery from anaesthesia.

The act or effect of hyperventilation was found

to have analgesic properties (Robinson & Gray, 1961). The author is presently looking into the degree of hyperventilation possible in obstetric anaesthesia, as it has been suggested that it is difficult to lower the arterial pCO₂ by more than 10 mm Hg by mechanical ventilation! (Scott, 1969).

Normally pain is not a feature in recall. Opiate premedication within 6 hours of operation is effective (Wilson, 1969), but since it is not advisable in obstetrics, we have to rely on other venues like use of hyoscine benzodiazepine drugs.

Aorticaval compression by the uterus in late pregnancy and in labour occurs in 3% of pregnant women. The uterus virtually divides the maternal circulation into two zones.

- (1) a caudal zone, distal to the obstruction which is both venous (inferior vena cava) and partly arterial (aorta). This area therefore has low arterial blood pressure with reduced blood flow and high venous congestion and relatively anoxic area.
- (2) The cephalad zone proximal to the obstruction has a hyperkinetic circulation. Uterine contractions and maternal hypotension from other causes (e.g. ante-partum haemorrhage)

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greatly enhance these obstructive effects, with the inferior vena cava totally obstructed and aorta partly compressed and displaced laterally, (Bieniarz, 1968) as studied by angiograms. Other vessels may be occluded or kinked (e.g. common iliac artery, renal vessels).

The University Hospital so far has treated two cases of pulmonary aspiration. Both had magnesium trisilicate 15 ml, and the mild pneumonitis responded rapidly to the usual lines of management in the intensive care unit. Our Caesarean section rate is 8 — 10 operations per month.

It is suggested that anaesthetic care for the obstetric patient consists of total care from the time the patient is listed for operation to throughout the intraoperative and postoperative period. The anaesthetist chooses the technique he is most familiar with, incorporating the various recent advances in obstetric anaesthesia. The worst situation is when both anaesthetist and obstetrician are in distress. Only trainee-anaesthetists, with more than one year's experience, should be allowed to give obstetric anaesthetics alone. The ideal anaesthetic for operative obstetrics does not exist (Utting and Gray, 1968)

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*Gaviscon tablet contains alginic acid, sodium alginate, mag. trisilicate, sodium bicarbonate, aluminium hydroxide and mannitol. It is a gastric reflux suppressant. Digene contains antacids and dimethylpolysiloxane.