ANAESTHETIC MANAGEMENT FOR THE REMOVAL OF PHAEOCHROMOCYTOMA WITH NEUROLEPTANAESTHESIA USING HIGH DOSE FENTANYL: A CASE REPORT

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SYNOPSIS

A patient presented with phaeochromocytoma and was managed with 0.43 mg/kg droperidol and high dose fentanyl. A loading dose of fentanyl 42.9 mcg/kg was given, followed by an infusion of 0.23 mcg/kg/min. The total dose of fentanyl given was 57.1 mcg/kg over approximately 1 hour 15 mins. Pre-operative preparation was with phenoxybenzamine and propanolol, and intra-operative fine control of blood pressure was achieved with an infusion of 0.01% Sodium Nitroprusside. The technique did not obtund the hypertensive response to manipulation of the tumour. The blood pressure however, remained very stable to other anaesthetic and surgical stimuli and no arrhythmias were noted.

INTRODUCTION

Although the pathophysiology of phaeochromocytoma is relatively well understood, the peri-operative care and anaesthetic management is still exciting because of its rarity. By itself, it is rare and less than 5% of cases are associated with Neurofibromatosis (Von Recklinghausen's Disease) (1, 2).

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Reports of successful management include the use of the usual thiopentone, muscle relaxant and narcotic technique (3), volatile inhalational agents (methoxyflurane (4), enflurane (5, 6), deep halothane (7, 8), isoflurane (9) total sympathetic blockage with epidural (10) and neuroleptanalgesia (11, 12). Neurolept techniques appear to be increasingly popular.

A patient with phaeochromocytoma is especially prone to stress of any kind, and any surgical stimuli, pain, hypoxia, hypercarbia, hypotension or the use of histamine releasing drugs can all bring about a hypertensive crises from the sudden release of endogenous catecholamines from the tumour (9, 13). This is report of a case managed successfully using droperidol and high dose fentanyl.

CASE REPORT

A 28 year old Chinese lady weighing 35 kg presented with neurofibromatosis and an acute complaint of cough and chest pain. ECG done showed inverted T waves and depressed ST segments in all the chest leads. Following admission, she had 2 episodes of hypotension (with cold and clammy signs) alternating with hypertension, with blood pressures reaching about 210 systolic. During a hypertensive crises, she developed left cerebral infarction (confirmed by CAT scan) but she recovered fully from her aphasia, facial palsy and right hemiparesis.

High urinary VMA results (17.3 mg, 16.3 mg, 17.7 mg) measured over 3 days helped to confirm the suspicion of a phaeochromocytoma. Roentgenographic studies revealed a tumour on the superior aspect of the left adrenal gland. Serum SGOT, LDH and creatinine kinase were elevated. Blood urea, electrolytes, glucose tolerance test, serum proteins, blood gas, serum calcium and phosphates, PT/PTT, white cell counts, urine, urine gravindex, and ECHO sounding of her heart were all normal. By the time she came for surgery, her Hb and haematocrit dropped from 13.7 Gm/dl and 40.2% to 12.9 Gm/dl and 38.2%8 respectively. She had been given plasma and crystalloids during the course of her resuscitation. Phenoxybenzamine 20 mg TID and propanolol 10 mg TID were started about 10 and 7 days respectively before operation.

ANAESTHETIC MANAGEMENT

The patient was premedicated with oral lorazepam 2 mg. and propanolol 10 mg about 2 hours prior to surgery. The last dose of phenoxybenzamine given was at 2200 hours the night before operation.

She was calm but complained of pain during the setting up of monitoring lines. She settled down with a dose of i.v. droperidol 5 mg. and fentanyl 0.1 mg. An arterial line was set up using the left radial artery and a 20G. catheter, and the blood pressure measured via a Hewlett Packard dome transducer (model 1290A) and monitor (model 80300A). Blood pressure was 120/60 and heart rate 60/min. She was induced with a further dose of droperidol 10 mg. and fentanyl 1.4 mg, with nitrous oxide and oxygen (2:1 ratio) over about 10 minutes. Pancuronium 4 mg. was given and the throat sprayed with 4% lignocaine before intubation with an Ohio cuffed ETT size 7.5 mm I.D. There was no change in the blood pressure or heart rate. Ventilation was achieved using a Manley Servovent. Two peripheral lines, an arterial line, and a CVP line were set up. When the table was tilted head down about 25 degrees for the CVP line insertion, the BP went up to 155/90 but returned to normal on levelling the table. CVP was + 8 cm. H20. The fentanyl infusion was then started at 9.7 mls/hr. (0.23 mcg/kg/min) via a syringe pump (Sage Instruments, model 341A).

As a precaution, before the surgical incision, phentolamine 1 mg. was given slowly and when the blood pressure and heart rate were seen to be stable, an infusion of sodium nitroprusside 0.01% was started at a low dose via an Infusomat II (B. Braun). The dose was stepped up when necessary during surgery, ranging from 5 to 30 mls/hr, keeping the blood pressure around 110 to 120 systolic. The BP shot up to around 180-190 systolic twice — once during the initial palpation and later during mobilisation of the tumour; each episode lasting not more than half a minute. It responded very well to bolus doses of Sodium Nitroprusside — the blood pressure would drop to 80-90 systolic momentarily before drifting along steadily at approximately 110 to 120 systolic (refer figure). No arrhythmias were seen at any time, and the sinus tachycardia of 120 to 130/min was not treated.

Halothane up to 0.5% was introduced to see whether if it would help decrease the hypertensive response to tumour manipulation. The blood pressure still shot up again (once — refer Fig. 1) but otherwise remained as manageable as before. No change in ECG pattern or arrhythmias were observed.

The Sodium Nitroprusside infusion was stopped about a minute just before venous ligation, with plasma, blood, nor-adrenaline and adrenaline infusion on standby. However, the blood pressure and heart rate remained rather stable with just an increase in infusion rate of 5% dextrose/saline. A few minutes later, the BP crept up to about 155 systolic, and fearing that there might be more than one venous drainage or tumour, the sodium nitroprusside was re-introduced briefly. Fortunately there was none and it was stopped. The BP finally settled at around 110/65, heart rate 70 per minute, and remained like so during exploration of the rest of the abdomen, and well into the post-operative period.

The tumour was a well encapsulated benign phaeochromocytoma, 5*5*4 cm in size. A left adrenalectomy was performed.

The total blood loss was about 150 mls. (swab weighing and suction bottle measurement). The total amount of fluid given was 500 mls. of 5% dextrose/saline. Urine output was 200 mls.

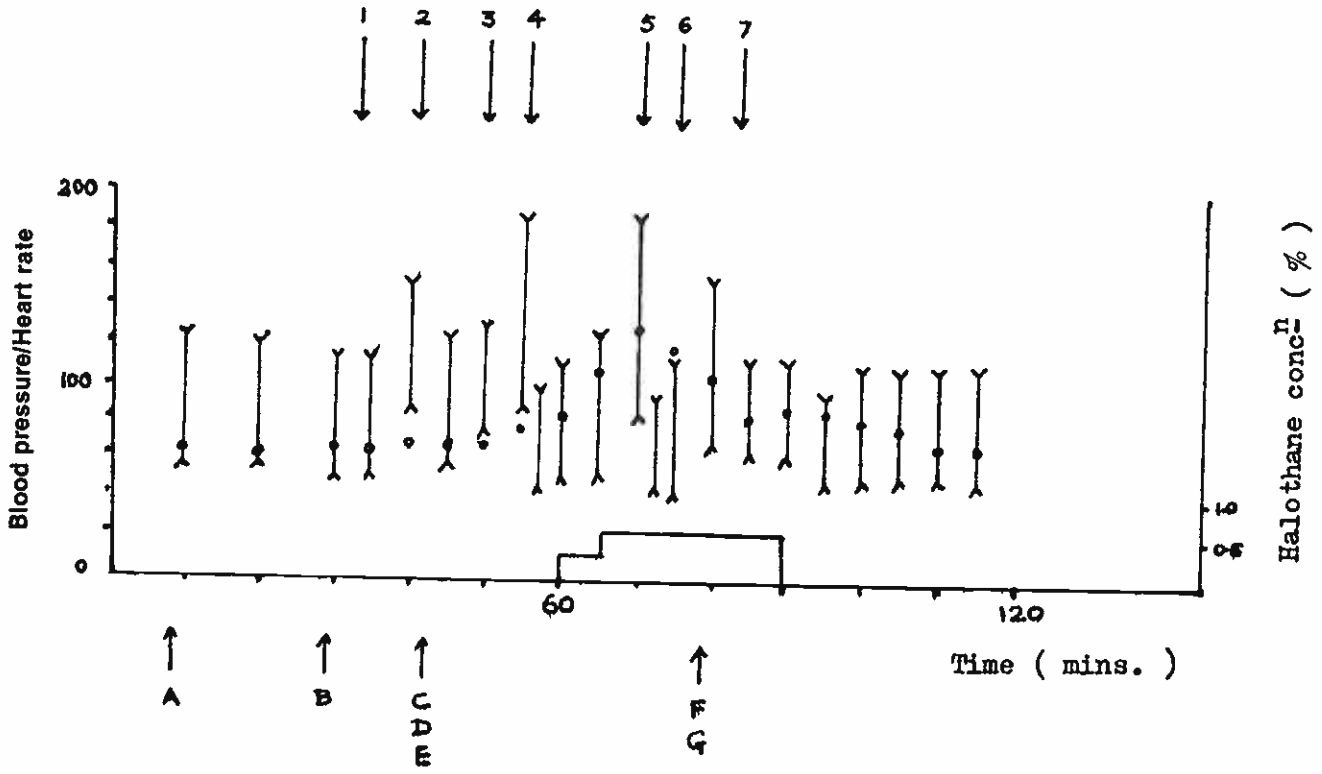
The fasting blood sugar before operation was 6 mmols/L (109 mg/dl); before venous ligation of the tumour was 22.3 mmols/L (405 mg/dl) and after venous ligation was 19.8 mmols/L (360 mg/dl).

She was ventilated in the Intensive Care Unit till she woke up one and a half hours later, and extubated 4 hours post — operatively. She made an uneventful recovery, and her ECG returned to normal approimately after a week.

DISCUSSION

This patient had presented with rather acute sypmtoms of phaeochromocytoma; there were two episodes of hypotension followed by hypertension and her myocardial ischemia was probably due to a chronic high level of circulating catecholamines. A predominantly adrenaline secreting tumour can produce such a picture (14) since adrenaline can cause a drop in peripheral resistance by stimulating the beta-receptors in the peripheral vascular beds. If laboratory facilities are available, it is important to determine the specific type of catecholamines being secreted as it would help in the location of tumour (2), as well as its treatment (15). Urine VMA measurement is not enough, and will pick up only about 80-85% of tumours (1).

Fig. 1



1 — Intubation
2 — CVP line insertion
3 — Skin incision
4 — Palpation of tumour
5 — Tumour mobilised
6 — Venous ligation
7 — Tumour removed
A — Droperidol 5.0 mg + Fentanyl 0.1 mg IV
B — Induction: Droperidol 10 mg + Fentanyl 1.4 mg + Pancuronium 4 mg
C — Fentanyl infusion started 0.23 mcg/kg/min
D — Phentolamine 1 mg. IV
E — Sodium Nitroprusside 0.01% infusion started. Total dose used was 20 mls
F — Sodium Nitroprusside re-introduced briefly
G — Pancuronium 2 mg. I.V.

Anaesthesia for the removal of phaeochromocytoma is difficult in that pharmacological blockage must not be so complete that undue hypotension occurs on removal of the tumour, with a sudden reduction of circulating catecholamines; or a hypertensive response is masked when attempting to locate other sites in cases where there is more than one tumour (16). At the same time, the technique must be able to obtund any surgical or anaesthetic stress, that can result in a hypertensive crises, cerebrovascular accident, myocardial infarction or even death.

Pre-operative preparation is most important, as such patients tend to have a decreased blood volume and high haematocrit, from a chronic vasoconstricted state. Gradual plasma and fluid replacement (16, 17) with the use of alpha-adrenergic blockers, (2, 3, 4, 15, 18) would help to stabilise blood pressures pre-operatively. This helped to explain the stable and manageable blood pressure of this patient. Propanolol was prescribed in the premedication in view of her myocardial ischemia. Any tachycardia or arrhythmias that arise may be detrimental. Phenoxybenzamine however, was omitted because of its long duration of action (more than 24 hrs.) and the fear that it may aggravate and prolong the hypotension following removal of the tumour. Intra-operative sinus tachycardia of 120 to 130 per minute was not treated for similar reasons — propanolol can produce severe bradycardia and cardiac failure. Thiopentone, succinylcholine, tubocurare, and narcotics such as morphine and pethidine were avoided during induction because they tend to release histamines. Pancuronium has less histamine releasing effects if any (19). It has sympathetic activity, but it has been shown that the level of circulating catecholamines is not raised (20).

Neuroleptanaesthesia has its attractiveness. Droperidol and fentanyl do not release histamines, and there is much cardiovascular stability (21, 22, 23, 24). Droperidol has also anti-arrhythmic effects (25). In a review of 102 cases of phaeochromocytoma handled, Desmonts et al (3) found that the group of patients given neurolept-analgesia had more stable and manageable arterial pressures, with less arrhythmias. Complications after operation were also less compared with techniques employing the usual thiopentone, muscle relaxant and narcotics. High dose fentanyl is defined as doses exceeding 20 mcg/kg (26). Using up to 50 mcg/kg, some authors (27) have found that the hyperglycaemic, cortisol and growth hormone response to surgery or trauma is abolished. The fentanyl however, must be given before the onset of surgical stimulation to be effective (28). Halothane anaesthesia on the other hand does not abolish such stress response. A patient with phaeochromocytoma is especially prone to stress of any kind, and it was hoped that high dose fentanyl would be beneficial to this patient.

This patient was given a total dose of 57.1 mcg/kg of fentanyl over just more than an hour of surgery. There was considerable cardiovascular stability, with no arrhythmias noted. The blood pressure was very manageable. However, high dose fentanyl did not seem to prevent the hypertensive response whenever the tumour was manipulated. Perhaps it could have been worse without it? Using doses ranging from 10 mcg/kg to 15 mcg/kg, other workers (11, 12, 29) have also successfully removed phaeochromocytoma. It seems that whatever the technique employed, be it the usual GA (thiopentone, muscle relaxant, narcotic), total sympathetic blockage with epidural, using volatile inhalational agents, or neuroleptanalgesia, it is not able to prevent the sudden increase in arterial blood pressure due to manipulation of the tumour during surgery.

Halothane at 0.5% as supplement did not seem to be able to obtund the rise in blood pressure either, and its use appeared to be unnecessary when employing high dose fentanyl. If any volatile inhalational agents is to be employed, perhaps enflurane (5, 6) or isoflurane (9, 30) may be better since they do not sensitise the myocardium as much to catecholamines.

Sodium Nitroprusside is a more favourable agent (31, 33) for the fine control of intra-operative blood pressure, being rapid and short acting. Hypotension after venous ligation of the tumour is more easily dealt with, blood or plasma being the first line of treatment. Why the blood pressure increased on cessation of the nitroprusside and following venous ligation is not clear. The use of sodium nitroprusside however, has been associated with a rebound phenomenon because of renin-angiotensin production (33, 34), and this may be the explanation. In retrospect, the phentolamine was unnecessary.

In conclusion, neuroleptanaesthesia using high dose fentanyl is a safe and reliable technique for the removal of phaeochromocytoma in this patient. It produced a remarkably stable cardiovascular state. It remains however, for excellent pre-operative preparation and a pair of good surgical hands for its gentle and safe removal.

ACKNOWLEDGEMENT

I must thank the DDMS, the Director of SGH, and Clinical Prof. S. H. Tan, Head of Dept. of Anaesthesia for their permission to publish this case. I must also thank Assoc. Prof. Rauff of the University Department of Surgery for his encouragement and permission to write up this case.

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