# PHAEOCHROMOCYTOMA AND POSTOPERATIVE HYPOGLYCAEMIA

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PHAEOCHROMOCYTOMA is a tumour of the chromaffin cells of the adrenal medullary tissue which secretes catecholamines. About 50 per cent of patients with phaeochromocytoma are hyperglycaemic,[1] of whom almost half are insulin-dependent.[2]

Treatment is by the surgical excision of the tumour and the main complications occurring during anaesthesia are uncontrolled hypertension, cardiac arrythmias and hypotension following the removal of the tumour.[3]

A complication only recently described in the medical literature[4,5] is postoperative hypoglycaemia after removal of the phaeochromocytoma. We report one such case here.

## CASE REPORT

A 21-year-old woman weighing 57 kg was hospitalized for investigation of hypertension. Her symptoms were headache, palpitations and flushing, heartburn, trembling and anxiety. Physical examination was normal except for the blood pressure, which was 23.9/14.9 kPa (180/110 mm Hg) and the pulse rate, 100 per minute.

A 24-hour urine specimen showed:
Vanillylmandelic acid (V.M.A.) = 28.64 mg (N = up to 6.5 mg).
Metanephrine = 10.23 mg (N = up to 1.3 mg).
Free catecholamines = 5.828 mg (N = up to 100 µg).

Blood sugar was 6.38 mmol/litre (115 mg/dl). The phentolamine test was positive, 0.5 mg of phentolamine intravenously producing a fall of blood pressure from 22.6/15.9 kPa (170/120 mm Hg) to 17.3/10.6 kPa (130/80 mm Hg) within five minutes. Phentolamine has no effect on the level of blood pressure in essential hypertension. Angiography showed a highly vascular tumour medial to the superior pole of the left kidney.

The blood pressure was controlled with α-blockers (phentolamine and phenoxybenzamine) and the patient was also given propanolol 80 mg daily by mouth. The medication was stopped 12 hours before operation.

Premedication was diazepam 10 mg by mouth one hour before operation followed by pentobarbitone 100 mg and scopolamine 0.4 mg intramuscularly one half hour before operation. Before the induction of anaesthesia blood pressure was 21.3/13.3 kPa (160/100 mm Hg) with a pulse rate of 105 per minute. Under local anaesthesia a canula was introduced percutaneously into a radial artery and a central venous pressure line into the right internal jugular vein. Anaesthesia was induced with Innovar® 2 ml, diazepam 20 mg, enflurane two per cent and pancuronium bromide 6 mg. Five minutes later, after topical analgesia of the larynx and an intravenous injection of lidocaine 60 mg, an orotracheal tube was passed. The systolic pressure increased to 27.9 kPa (210 mm Hg). Two injections of phentolamine 1.0 mg reduced the systolic pressure to 19.3 kPa (145 mm Hg). Anaesthesia was maintained with a mixture of nitrous oxide and oxygen (70:30) and enflurane two per cent.

The blood pressure again increased to 22.6/15.9 kPa (170/120 mm Hg) when the left adrenal gland was manipulated and an infusion of sodium nitroprusside 0.01 per cent was started to keep the blood pressure within the normal range. Before the excision of the tumour, the patient received 2.7 litres of fluid consisting of three units of packed cells, one litre of 0.9 per cent NaCl and 800 ml of dextrose 5 per cent in lactated Ringer's solution. The operation lasted two hours and forty minutes, and the patient received a total of 3.9 litres of fluid of which one litre was dextrose five per cent in lactated Ringer's solution. After removal of the tumour the infusion of sodium nitroprusside was stopped and blood pressure fluctuated within a range of 15.9/9.9 kPa (120/75 mm Hg) to 18.6/10.6 kPa (140/80 Hg). At the end of anaesthesia relaxation was reversed with prostigmine 2.5 mg and atropine 1.2 mg. The trachea was extubated and the patient left the operating room with an infusion of dextrose five per cent in 0.45 per cent NaCl at a rate of 125 ml/hour.

On arrival in the recovery room the patient was

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awake, opening her eyes on command. Forty minutes later she was drowsy and did not obey commands, but responded to painful stimuli. A blood specimen was sent to the laboratory for determination of blood sugar, electrolytes and blood gases. Thirty minutes later she was comatose and did not respond to painful stimuli. The vital signs were within a normal range (blood pressure 14.6/8 kPa (110/60 mm Hg), pulse 100/minute) and she was not sweating. Dextrose 50 per cent, 100 ml, was then given intravenously with immediate improvement in the conscious state. The laboratory examinations done previously showed a blood sugar of 1.88 mmol/litre (34 mg/dl). Electrolytes and blood gases were normal.

Blood sugar determinations were repeated in the hours following that episode and varied between 4.16 mmol/litre and 4.71 mmol/litre (75 to 85 mg/dl).

The patient was discharged six days after the operation with a normal blood pressure. The histological examination of the tumour confirmed the phaeochromocytoma and the 24-hour urine values for V.M.A., metanephrines and free catecholamines became normal.

## Discussion

Hyperglycaemia is frequently associated with phaeochromocytoma. The catecholamines secreted by this tumour inhibit the release of insulin by stimulation of the α-receptors of the pancreas.[6,7] In fact, it is known that stimulation of the α-receptors inhibits the release of insulin, and that stimulation of the β-receptors increases the release of insulin by the pancreatic cells.[6]

The catecholamines also stimulate lipolysis[8] and the free fatty acids released contribute to increasing the blood sugar concentration by providing another source of energy and by decreasing the sensitivity to insulin.[9,10]

The hyperglycaemic effect of surgical stress is also well known.[11,12] The mechanism is related to the increase of diabetogenic substances: cortisol, adrenocorticotropic hormone, growth hormone, thyrotropic hormone and adrenocortical hormones.[13,14]

After the excision of the tumour, the level of catecholamines drops quickly, with the disappearance of their hyperglycaemic effects. Moreover, it has been shown that after an infusion of epinephrine is stopped there is a sudden and marked rise in insulin output.[15] This is more obvious if the infusion was in conjunction with treatment with propanolol.[6]

Treatment with α-blockers (phenoxybenzamine and phentolamine) enhances the release of insulin in response to glucose infusion.[7] When these are used in conjunction with β-blockers that diminish the sympathetic tone secondary to stress[16,17] they provide another factor tending to produce hypoglycaemia following excision of the tumour.

After the removal of a phaeochromocytoma, about 70 per cent of the patients who were hyperglycaemic no longer present any problem of diabetes.[2] Thirty per cent still remain hyperglycaemic and the reason for this is still obscure.[2] Hypoglycaemia following the removal of the tumour is probably a rare event (we report here the fourth case in the literature), occurring only in the immediate postoperative period. However, it may be a fatal postoperative complication and it may be masked by treatment with β-blockers.[18] Blood sugar must be monitored during the operation and in the postoperative period.

## Summary

A case of hypoglycaemia following the removal of a phaeochromocytoma is reported and the mechanisms that influence the blood sugar before and after the removal of that tumour are discussed.

## Résumé

Nous rapportons un cas d'hypoglycémie post-opératoire suivant l'excision d'un phéochromocytome, et nous discutons les mécanismes physiologiques qui influencent la glycémie avant et après l'excision de cette tumeur.

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