SODIUM NITROPRUSSIDE FOR ANEURYSM SURGERY IN PREGNANCY

Report of a case

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SUMMARY

A 25-year-old woman in the 7th month of pregnancy was operated upon for a ruptured cerebral aneurysm. Sodium nitroprusside was used to achieve effective controlled hypotension. Signs of foetal distress were transient. Subsequent delivery was spontaneous and uneventful. Development of the child at 2 yr was satisfactory. The various physiological aspects and the action of nitroprusside on both mother and foetus are discussed.

Sodium nitroprusside has been used widely to induce arterial hypotension during surgery for intracerebral aneurysms and arteriovenous malformations (Siegal, Moraca and Green, 1971). Although the indications for the use of this agent appear to be increasing, no information is available in the literature concerning its use in human pregnancy.

A report is presented in which sodium nitroprusside was administered during craniotomy for the repair of an intracranial aneurysm in a patient who was 7 months pregnant.

CASE REPORT

A 25-year-old woman, in the 7th month of pregnancy, was admitted to hospital as an emergency. She had enjoyed good health previously. She had a previous uneventful pregnancy and delivery; the present pregnancy was normal. Four days before admission, the patient experienced sudden excruciating headache followed by vomiting. Clinical examination of the nervous system and lumbar puncture confirmed the suspected diagnosis of subarachnoid haemorrhage. Cerebral angiography revealed the presence of an aneurysm of a branch of the right middle cerebral artery; the pregnancy was continuing normally. Intracranial surgery was decided upon because of the obvious danger of rebleeding.

The patient was premedicated with diazepam 10 mg i.v. and atropine 0.5 mg i.v. Following the injection of thiopentone 300 mg (2.5%) and pancuronium bromide 6 mg i.v. and 5 min administration of oxygen intubation of the trachea was performed. Anaesthesia was maintained with nitrous oxide in oxygen (40%) plus halothane 0.5% (intermittently). Mannitol (20%) 100 g was administered i.v. and ventilation of the lungs was adjusted to keep Pco₂ at 3.33 kPa.

After opening the dura, the area around the aneurysm was recognized by the presence of a limited intracerebral haematoma which surfaced. The haematoma was evacuated and the vessel identified. During the dissection of the arachnoid around the artery, sodium nitroprusside was administered since high concentrations of halothane alone did not effect sufficient arterial hypotension. Arterial systolic pressure was kept at 70–80 mm Hg. During the manipulation of the aneurysm itself and the ligation of its neck, a small rent in its dome occurred. To prevent excessive bleeding, the arterial systolic pressure was reduced further to 50 mm Hg by administering nitroprusside. Immediately following the excision of the aneurysm, sodium nitroprusside was discontinued and the systolic pressure returned to 120 mm Hg within 2 min. The total dose of sodium nitroprusside was 12.5 mg.

Thirty minutes after the operation, the foetal heart rate, as recorded on a foetal heart rate monitor, was 90 beat/min and there was loss of beat to beat variations. Two hours after operation, the foetal heart rate had returned to normal (greater than 120 beat min⁻¹). Subsequent records of the foetal pulse were normal.

The patient was discharged from hospital in a good condition on the 8th day after operation. Two months later she delivered a healthy female baby by a normal vaginal delivery. The baby weighed 3.2 kg and the Apgar score was 9.

At the age of 2 yr the child’s growth was normal, weight and height in the 50th percentiles and head circumference in the 25th percentile; physical examination was normal. Bayley Development Scales...
for both motor and mental development were appropriate for chronological age. On psychological testing the child appeared to be exceptionally verbal and sociable, showed a high tolerance for frustration and had excellent fine motor co-ordination for her age.

**DISCUSSION**

The aims of anaesthesia during pregnancy are to ensure the recovery of the mother and the normal continuation of pregnancy without damage to the foetus. Cerebral aneurysms are known to present as emergencies during pregnancy. The need for surgery is frequently demanding, even though associated with risk to the foetus. Such risks are probably not greater than those in open heart surgery (Mannix and Mahajan, 1967) or in repair of coarctation of the aorta (Barash et al., 1975).

A variety of anesthetic agents and techniques has been studied, mainly in regard to their action in the third trimester of pregnancy. The effects of extradural analgesia were investigated in relation to uterine contractions, foetal heart beat and foetal condition in the perinatal period (Vasicka et al., 1964; Bonica, Berges and Morikawa, 1970).

Uterine blood flow has no autoregulatory mechanism. It depends chiefly on perfusion pressure, that is on maternal arterial pressure (Lander et al., 1970; Assali and Brinkman, 1973). Either hydralazine or spinal anaesthesia cause hypotension, thereby lowering uterine blood flow (Assali and Brinkman, 1973). This causes foetal bradycardia and distress (Hon, 1968). The concomitant administration of vasoconstricting agents such as adrenaline causes a decrease in uterine activity and does not prevent the hypotension (Matadial and Cibils, 1975).

Sodium nitroprusside acts directly on the smooth muscle of blood vessels. This results in peripheral vascular dilatation independent of the autonomic nervous system (Johnson, 1929). Therefore it reduces perfusion pressure. Sodium nitroprusside in hypotensive doses does not cause uterine relaxation in either gravid or non-gravid rabbits and dogs (Page, 1955).

A well-recognized hazard from the use of sodium nitroprusside is its degradation to cyanogen which is transformed to thiocyanate by the enzyme rhodanase in the liver. Hepatic insufficiency or deficiency of B12, which is the enzymatic co-factor, may cause cyanide intoxication (David et al., 1975). An unknown factor relating to the use of sodium nitroprusside in pregnancy is the ease with which it is detoxified in the liver of the foetus.

Very recently, marked placental permeability to sodium nitroprusside has been demonstrated in ewes (Naulty, Cetalo and Rodkey, 1976). Moreover, the biotransformation of nitroprusside has been shown to be slow so that high concentrations of cyanide developed in foetal blood, causing foetal death. This information had not been published at the time of the reported anaesthetic.

It seems, therefore, that the use of sodium nitroprusside during pregnancy should be confined to extreme emergencies such as rupture of an aneurysm during craniotomy or hypertension of eclampsia (Paull, 1975). Such use should be limited both in dose and time of administration. Further studies and experience may elucidate the "safety" of this valuable agent.

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**REFERENCES**


SODIUM NITROPRUSSIDE IN PREGNANCY


LE NITRO PRUSSIATE DE SOUDE POUR LA CHIRURGIE D'UN ANEVIRME AU COURS D'UNE GROSSESSE

*Rapport d'un cas particulier*

RESUME

Il a été effectué une intervention chirurgicale sur une jeune femme de 25 ans, enceinte de 7 mois, qui souffrait de la rupture d'un anévrisme cérébral. On a utilisé le nitroprussiate de soude pour obtenir une hypotension contrôlée efficace. Les signes de dérangement éprouvés par le fœtus n'ont été que transitoires et l'accouchement qui eut lieu par la suite s'est effectué spontanément et sans difficulté. Le développement de l'enfant à l'âge de 2 ans est satisfaisant. On expose dans cet article les divers aspects physiologiques et l'action du nitroprussiate sur la mère et sur le fœtus.

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NITROPRUSSIDNATRUM FÜR ANEURYSMA-OPERATION WÄHREND SCHWANGERSCHAFT

*Krankengeschichte*

ZUSAMMENFASSUNG


NITROPRUSIDA SODICO PARA CIRUGIA DE ANEURISMA DURANTE EL EMBARAZO

*Informe de un caso*

SUMARIO

Una mujer de 25 años de edad con siete meses de embarazo fue operada por la rotura de un neurisma cerebral. Se empleó nitroprusida sódico para producir una hipotensión efectiva controlada. Las señales de angustia fetal fueron pasajeras. El parto posterior fue espontáneo y sin problemas. El desarrollo del niño a los dos años de edad fue satisfactorio. Se discuten los diversos aspectos fisiológicos y la acción de la nitroprusida, tanto en la madre como en el feto.