INDUCED HYPOTENSION FOR RHINOPLASTIC SURGERY

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Bleeding in the surgical field will, all other factors equal, be related to the blood pressure. A considerable amount of time during a surgical procedure is spent in providing haemostasis. Hemorrhage can be so embarrassing during complicated surgical procedures, that a satisfactory outcome of the surgeons efforts is seriously at stake. Measures to diminish troublesome bleeding have therefore for several years been of concern to clinical anaesthesia.

The anaesthetic literature gives the definite impression of a certain, perhaps small, risk involved in hypotension induced by means of either arteriotomy, spinal anaesthesia, epidural anaesthesia or the use of ganglionic blocking agents.

The risk involved in a hypotensive procedure has to be weighed against what can be obtained. None of the four mentioned methods are tempting to apply to patients undergoing rhinoplastic surgery. An anaesthetic procedure for this kind of patients should be free from all sorts of risk, the surgical disorder and usually the prospective age of the patients taken into consideration.

Among physiologists and in clinical anaesthesia it has for many years been well known, that so called intermittent positive pressure ventilation, performed in an in-appropiate way is apt to give a moderate hypotension in the anaesthetized patient in supine position. This improper ventilation comprises an omission of the respiratory pause. This will result in an increase in the mean positive pressure applied to the alveoli during the whole respiratory cycle. This again will bring about a decrease in venous return to the heart, reflected in a fall in the arterial blood pressure.

Halothane has a certain hypotensive effect due to its action on the myocardium and the vasomotor centres.

Chlorpromazine is known to have a sedative effect and because of its effect on the peripheral vessels it is also causing a tendency to postural hypotension.

A combination of continuous positive pressure breathing, postural drainage and adequate premedication with chlorpromazine should therefore be expected to give attractive conditions for our particular purpose, rhinoplastic surgery.

After some experimentation the following anaesthetic procedure was established:

Premedication consists of chlorpromazine 1-1.5 mg/kg body weight 2 hours before induction, pethidine 1-1.5 mg/kg body weight plus atropine 0.4-0.6 mg 1 hour before induction.

For induction is either used thiopentone intravenously or inhalation anaesthesia with 4% halothane in a 4 plus 4 liter O_2 and N_2O flow on a semi-closed circle

system. Anaesthesia is maintained with 0.7-1.0% halothane in 50% oxygen-N_2O.
Muscle relaxation for intubation is procured with suxamethonium about 1 mg/kg body weight and topical analgesia with xylocain is applied to the larynx and the upper trachea. The tube is a non-kinkable latex-wired endotracheal tube with cuff. A wet gauge pack is placed in the hypopharynx and in the oral cavity.
The surgeon uses before the start of operation 10-20 ml ½% xylocain-noradrenalin (1 : 100.000) in the surgical field.
After an initial moderate drop the blood pressure usually stabilises around 100-120 mm Hg, and is unchanged when the operating table is tilted 6-7° in the head up position. The exact tilting is done under guidance of an exact protractor. We are careful not to overdo the tilting.
The so called positive pressure ventilation is performed under guidance of a water manometer included in the respiratory circle.
Manual ventilation of the patient is performed during the whole hypotensive period under constant observation of inspiratory and expiratory positive pressure and the tidal volume measured on a gasmeter.
For adequate ventilation a well anaesthetized patient needs an inflation pressure of 15-20 cm of water. Is the breathing bag released slowly a positive pressure of 5-10 cm water is easily maintained during the passive exhalation. Ventilation in this way brings about a moderate hypotension, 70-80 mm Hg in 3-4 minutes. And what is just as important, this hypotension is controllable. An increase in the expiratory pressure will decrease the arterial pressure further and a too vigorous response from the patients circulation is easily neutralized by release of the expiratory overpressure. In this case the blood pressure in 3-4 minutes uses to rise 20-30 mm Hg.
In most cases an EKG monitor has been attached to the patient, and we have had no worries at all. The patients pulse is kept under constant watch at the wrist.
The change in blood pressure is depicted in the following table:

Blood pressure variation during continuous positive pressure ventilation

	Preoperative	During CPPV
systolic	118 ± 18 mm	84 ± 12 mm
diastolic	72 ± 12 —	60 ± 10 —
	(Mean of 50 consec. ptts.)	

We have not been aiming at lower pressures but could easily have obtained them by increasing the expiratory positive pressure. And we do that sometimes for intracranial procedures.
The hypotensive period is usually of 40-60 minutes duration. Normal blood pressure is established by changing the ventilation to ordinary intermittent positive pressure breathing. Spontaneous breathing is obtained in 3-5 minutes depending on the intensity of the preceding hyperventilation.
In seven out of the first 238 cases the technique failed, probably because of inadequate premedication.
Most of our patients have been between 15 and 30 years of age. The oldest 60 years, the youngest 8 years.

Under these conditions the bleeding during a rhinoplastic procedure usually is between 50-100 ml and not cumbersome to the surgeon.
From our point of view the postoperative course has in all our patients been uneventful. They do wake up at the expected time as after an anaesthetic without the use of hypotension. Many of them read their newspaper in the evening and we very often see them in the lobby next day.
From the physiological point of view the procedure continuous positive pressure ventilation is interesting, as simple as it is.
Joint efforts with our clinical physiologists revealed interesting results.
In 7 patients scheduled for rhinoplastic or neurosurgical procedures, catheters were inserted through the femoral vein to the right atrium and through the femoral artery to the aortic arch. Different parameters were measured after 15 minutes steady state anaesthesia and repeated after 15 minutes continuous positive pressure ventilation.
A summary of our measurements follows below:

Summary of physiologic changes during CPPV under halothane anaesthesia.
(mean of 7 ptts.)

Pa CO_2 decrease: 51 —> 32 mm Hg
Systolic pressure change in aorta: 93.9 —> 68.9 mm Hg
Diastolic ,, ,, ,, ,, 64.1 —> 51.4 ,, ,,
Aortic mean pressure: 23% decrease
Cardiac output (dilution method): 50% decrease
Peripheral resistance: 43% increase
Pa O_2—Pv O_2: 100% increase
Mean pressure in right atrium: almost 100% increase
O_2 consumption: unchanged
Standard HCO_3: unchanged
Base Excess: unchanged

In a study by Eckenhoff and Enderby (Lancet 1968) a large series of psychologic tests were presented to patients before and after plastic surgery performed under hypotensive anaesthesia. Their findings were negative. It is also our opinion that the method involves no higher risk than ordinary clinical anaesthesia under normotension. If we had any other impression we would not have used the method for more than 350 ptts.
But it is surprising that such a simple procedure as continuous positive pressure ventilation can cause such profound and easily reversible circulatory changes.

SUMMARY

Systolic blood pressure of 80 mm Hg or less was obtained by combining chlorpromazine premedication, halothane anesthesia and 7° head up tilt with continuous positive pressure ventilation. This was performed under guidance of a water manometer and a gasmeter, both included in the respiratory circle on the anaesthesia machine.
The general anaesthesia was combined with local analgesia. Under these conditions only very modest bleeding occurred in the surgical field.
Continuous positive pressure ventilation causes a 50% decrease in cardiac output.
The method has been applied to more than 350 ptts.

RÉSUMÉ

La pression sanguine systolique de 80 mm de mercure au moins, a été obtenue en combinant une pré-médication à base de chloro-promazine à une anesthésie à l'halothane, sous ventilation à pression positive continue. La tête était redressée à 7°.
Le contrôle avec un manomètre à eau et un débimètre inclus dans le circuit respiratoire de l'appareil anesthésique.
L'anesthésie générale a été combinée avec une analgésie locale. Dans ces conditions un saignement très limité a été observé dans le champ opératoire.
La ventilation continue à pression positive entraîne une diminution de 50% de la pression artérielle.
Cette méthode a été appliquée sur plus de 350 patients.

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