Current Comment

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The Cost of Anesthesia with Fluroxene

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The expense of using fluroxene (trifluoroethyl vinyl ether, Fluoromar) with three different techniques was determined in patients who were given fluroxene as an anesthetic agent in a circle absorption system, equipped with an out-of-circle vaporizer. The first technique used a 1 liter/minute flow of oxygen with additional oxygen (usually 60 to 80 ml./minute) to vaporize the fluroxene. The second technique used 500 ml. each of nitrous oxide and oxygen per minute plus sufficient oxygen to vaporize the agent, and the third utilized a closed circle absorption technique which required approximately 300 ml. of oxygen per minute plus enough more to vaporize the agent. Due to poor mask fit and other variables the flow with "metabolic oxygen" was as high as 500 ml./minute on several occasions. The anesthetics were administered by residents and staff. Premedication was essentially the same in each group. A sleep dose of thiopental was given on induction with each of the three types of procedures.

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TABLE 1

Gas	Hrs. of Anesth.	Ml. Liquid Agent/Hr.	Cost/Hour
Oxygen, 1 liter/minute	307	27.7	$2.22
N_2O, 500 ml. + O_2, 500 ml./minute	276	16.7	1.34 plus .10 for N_2O* = 1.44
Oxygen, metabolic	415	15.6	1.25

* Expense of nitrous oxide was calculated on the basis of use from "G" tanks. At 500 ml./minute the cost of nitrous oxide was 10¢ per hour. The cost of oxygen, thiopental and relaxing agents are not included. The fluroxene was calculated as 8¢/ml.

RESULTS

Table 1 lists the different quantities of fluroxene used with the three techniques.

It is seen that a greater flow of oxygen than necessary for use by the patient results in loss of a significant quantity of fluroxene into the atmosphere. The cost of such a technique is obviously greater than one which approximates metabolic requirements.

Although total gas flow with nitrous oxide-oxygen (500 ml. of each/minute) was equivalent to one liter of oxygen, the amount of fluroxene required was much less with nitrous oxide than with oxygen alone.

When low oxygen flow was used to vaporize the liquid agent, the quantity of agent used was only slightly more than half that used with one liter flow of oxygen.

Nitrous oxide obviously contributed considerable analgesia. This study is considered to be a method of comparing the analgesic effect of nitrous oxide and fluroxene. In the light of these data, the opinion of Sykes (that nitrous oxide "cannot be used" at the altitude of Denver, 5,280 feet, atmospheric pressure = 630 mm. of mercury) requires modification. One may estimate the analgesic effect of nitrous oxide by comparing the liquid agent per hour when one liter flow of oxygen was used (27.7 ml.) with the quantity of agent used when 500 ml. each of nitrous oxide and oxygen were flowing (16.7 ml.). The difference, 11 ml. per hour, is saved by the use of 500 ml./minute of nitrous oxide in place of

500 ml./minute of the 1-liter flow of oxygen. The use of 500 ml./minute of nitrous oxide under these conditions was therefore equivalent to the use of 11 ml./hour of liquid fluroxene. Our previous results have shown this method to provide adequate oxygenation.

The Ohio Chemical Company furnished the Fluoromar used in these studies.

REFERENCES

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Continuous Intercostal Blocks

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To our knowledge, continuous intercostal blocks have never been reported previously. We performed this block on four patients with severe thoracic pain: three had pleuritis and one had fractured ribs. Intradermal wheals are raised over the lower edge of the selected ribs in the midaxillary line and the underlying costal periosteum is generously infiltrated. A 15 G Tuohy needle is introduced through the wheal until it reaches the bone. While pressure on the shaft of the needle retracts the skin downward, the tip is gently walked off the lower border of the rib. As soon as bony contact is lost, the needle is advanced about 0.5 cm. A distinct "release" is felt when the curved bevel snaps through the fascia of the intercostalis externus and enters the narrow compartment running between the internal and external intercostal muscles and fascia and containing the intercostal nerve and vessels. Paresthesias are usually elicited.

As soon as sensation of "give" and paresthesia suggest penetration of the correct plane, the needle is halted, its bevel rotated dorsally and a rigid BD 16 G vinyl catheter is introduced and advanced 2–3 cm. beyond tip of the needle. Easy insertion of the catheter is added evidence of good positioning. We have found soft or curled catheters difficult to implant.

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The epidural needle is then removed; a 25 G needle is inserted at the tip of the tube and covered with the blue rubber cap of a Venopak venoclysis set.

A silk suture is placed in the skin wheal and tied to the tube, some "Aeroplast" sprayed and the catheter taped to the thorax. A wide elastic bandage is wrapped around the chest to prevent the tubes from being rubbed off by the patient while he sleeps. In our experience, these precautions are necessary because the catheter is poorly anchored in the thin and loose intercostalis externus, its fascia and the subjacent skin.

Three to six catheters were simulataneously implanted in our patients; in each catheter, the intern on call injected 3 ml. of 1.5 per cent lidocaine with 1:200,000 epinephrine and 1:1,000 tetracaine at six hour intervals.

In every instance, complete pain relief occurred within three to five minutes of the first injection and persisted uninterrupted for forty-eight hours. An injection-free period of eight to ten hours was then maintained; if the pain warranted it, serial injections were resumed for another forty-eight hours. Our catheters were removed after two to four days.

Theoretical complications are infection, pneumothorax and damage to nerve and vessels. None of these was observed but more experience is necessary before the technique be adopted without reservation.

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