week autopsy revealed multiple pulmonary hemorrhages. When death occurred six to twenty-four hours after anesthesia, acute pulmonary edema was evident. Those dying within ten minutes showed massive pulmonary hemorrhage.

Other observations were directed toward respiratory and circulatory reactions. In accord with clinical reports the respiratory rate was increased, though breathing became more shallow. Coughing was seen frequently and cyanosis was noted. Arterial blood pressure decreased and the pulse rate became accelerated.

The intravenous administration of paraldehyde as recommended for clinical anesthesia is not without danger.

R. D. D.

RHOADS, JONATHAN, AND LEE, WALTER ESTELL: *The Advantages of Combining Local Infiltration Anesthesia with Controlled Fractional Spinal Anesthesia in Substandard Surgical Risks.* Ann. Surg. 115: 156–158 (Jan.) 1942.

Occasionally, in the practice of most surgeons, celiotomy must be performed upon patients who are bad risks for any type of anesthesia. When the character and the site where the proposed procedure is to be carried out are accurately known, it is usually possible to employ local anesthesia, which most physicians will agree entails the least risk for the patient.

Unfortunately, it is sometimes impossible to arrive at an exact diagnosis preoperatively and there are other cases in which one can feel reasonably certain of the diagnosis but in which the possibility of error persists. In such instances, and in bad risk patients, one is confronted with the following dilemma: On the one hand spinal anesthesia may be employed which will provide adequate exposure for whatever is encountered but entails considerable risk for patients with impaired circulation. On the other hand, local anesthesia may be used which will too frequently have to be supplemented with an inhalation anesthesia if the exposure and relaxation are not adequate. This often means a deep ether anesthesia with a difficult induction after the peritoneum is opened.

The use of Lemmon's apparatus for controlled fractional spinal anesthesia makes it possible to avoid the dilemma. The spinal part is done, the point of the needle is left in place within the subarachnoid space, and the other end connected by rubber tubing to a syringe containing 500 mg. of procaine hydrochloride dissolved in 10 cc. of spinal fluid. However, none of this solution is administered at once. Instead, the operation is begun under local anesthesia, exposing the patient to the minimum risk in opening the abdomen. After the abdomen is open, if the procedure can be satisfactorily completed under local anesthesia, no spinal anesthesia is given. If, on the other hand, the necessary procedure requires extensive exploration and more relaxation, spinal anesthesia may be given in its safest form and maintained during such part of the procedure as is necessary. If it does cause a substantial drop in blood pressure, and this cannot always be avoided when the patients are on the verge of shock, the withdrawal of spinal fluid will usually shorten its action. We have used continuous spinal anesthesia for nearly all abdominal cases except appendectomy during the past fifteen months. There have been no table deaths, relaxation has been as perfect as with nupercaine, the anesthesia has been conducted as long as four and one-half hours, patients have been encountered who required several hundred mg. of procaine hydrochloride, while others have been anesthetized to the costal margin with

as little as 75 mg. 5 illustrative case records.

A. W. F.

LONG, CARROLL H.; MICKAL, ABE, AND OCHSNER, ALTON: *Use of Pentothal Sodium for the Induction of Anesthesia in Thyrotoxicosis.* Am. J. Surg. 55: 71–74 (Jan.) 1942.

In a series of 50 consecutive thyroidectomies, 25 patients received anesthesia induction by intravenous pentothal sodium supplemented by one or more of the anesthetic gases by inhalation. The remainder were anesthetized by inhalation anesthesia alone.

A statistical study of these patients demonstrates in the group receiving the intravenous barbiturate a constantly lower pulse rate and temperature level during the postoperative period.

Unexpectedly, the accumulated data reveal a shorter postoperative reaction time in the group receiving the pentothal sodium. 3 references.

A. W. F.

RICHARDS, R. K.; KEUTER, K., AND KLATT, T. J.: *Effect of Vitamin C Deficiency on Action of Different Types of Barbiturates.* Proc. Soc. Exper. Biol. & Med. 48: 403 (Nov.) 1941.

We have studied the effect of vitamin C depletion upon the action of different barbiturates, using barbital as a long-acting member, nembutal as a short-acting drug and pentothal sodium as an example of ultra-short action. The barbiturates were administered intraperitoneally to guinea pigs and their sleeping time observed. The animals were then placed on a vitamin C-free diet for thirty-three days and during this period the effect of injection of the barbiturates was re-determined.

There was no significant change with either barbital or pentothal, but under nembutal the sleeping time was prolonged by vitamin C deficiency. In these latter animals administration of vitamin C promptly restored normal sleeping times.

Since it is known that vitamin C deficiency causes depletion of liver glycogen, we investigated whether or not low glycogen might have been responsible for the changes observed. Marked fatty changes in the liver are also known to follow vitamin C lack. In our hands, there appeared to be no correlation between low glycogen content or high fat and prolonged sleeping time. Nor were we able to find any histological changes in the livers of our vitamin C deficient animals such as can be demonstrated after administration of such substances as chloroform or carbon tetrachloride.

We have therefore reason to believe that vitamin C may be directly or indirectly connected with the destruction of the short-acting barbiturates such as nembutal. It is possible that failure of liver enzymes accounts for the slower destruction of these drugs, but as yet no evidence is available on the point.

The experiments further substantiate the belief that the metabolism of pentothal is essentially different from that of nembutal and related compounds, and that the liver plays little part in this process.

R. D. D.

BATTEN, DOUGLASS H.: *Hypoxia—The Hazard of the Operating Room.* Am. J. Surg. 55: 83–87 (Jan.) 1942.

From the practical standpoint there are six factors which are of paramount importance in the prevention of hypoxia:

1. The avoidance of the promiscuous use of respiratory depressant drugs.

2. Nitrous oxide should never be given with less than 20 per cent of oxygen. If sufficient depth of anesthesia cannot be obtained with this mixture another agent should be employed.