

prevent "miliary atelectasis" until the incisional pain had been minimized and the patient could take large breaths spontaneously; (6) the opportunity to allay the patient's pain with adequate narcotics and still be certain of adequate ventilation.

One possible disadvantage of the technique we used is the prolonged tracheal intubation. This, however, has been shown to be relatively safe in the patient with a normal larynx,<sup>4</sup> provided high humidity is maintained in the airway.

The decision to avoid spinal anesthesia was made because of the following potential disadvantages: (1) difficulty in performing the lumbar puncture; (2) difficulty in predicting the level of anesthesia; (3) markedly obese patients have been shown to have low compliance, high airway resistance and a tendency to hypoventilate<sup>5,6</sup> (it is this type of patient who should have respiratory assistance during anesthesia, and this is not easily accomplished during spinal anesthesia); (4) in the immediate postoperative period, the ability to initiate an effective cough might be compromised due to residual abdominal muscular relaxation, leading to atelectasis and pneumonia.

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FIG. 1.

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## Anesthesia for a Jehovah's Witness with a Low Hematocrit

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Jehovah's Witnesses, whose religion forbids them to receive blood transfusions in any form, almost invariably assume personal responsibility for consequences of this compelling religious conviction. While this thera-

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peutic limitation "does not leave an experienced physician with no alternate course to pursue,"<sup>1</sup> it frequently poses serious moral, ethical and legal implications, despite the physician's sincere respect for the wishes of his patient. An example of this situation is cited by Fitts and Orloff.<sup>2</sup> A 34-year-old man, following palliative resection of the colon, developed massive postoperative hemorrhage re-

quiring immediate intervention. The patient's hemoglobin was 3.6/100 ml. At what low level of hematocrit and hemoglobin can an anesthesiologist in good conscience administer an anesthetic to a Jehovah's Witness without predetermined resort to the use of blood? Obviously, the decision is conditioned by the oxygen-carrying capacity of the patient's blood and the reliable assumption of optimal  $P_{O_2}$ , hemoglobin saturation and circulating blood volume. Despite the apparent simplicity of being able to predict (from tables, nomograms, etc.) minimum oxygen needs of certain tissues (brain, heart) and the oxygen content of whole blood at various  $P_{O_2}$  and hemoglobin levels, reasonably safe lower limits of the latter remain uncertain on the basis of actual clinical experience.

#### CASE REPORT

A 26-year-old white man entered Harbor General Hospital on December 20, 1967 because of painless rectal bleeding of one day's duration. His blood pressure at this time was 120/70 mm. Hg, temperature 98.2° F., pulse rate 76, respiration 18, hemoglobin 10.7 Gm./100 ml. Seven hours after admission the hematocrit fell to 28 per cent. The patient adamantly refused transfusion with blood or blood products. Ringer's lactate solution was administered intravenously.

On December 23 the hematocrit was 18 per cent, blood pressure 117/70 mm. Hg, pulse 120, respirations 28, temperature 102° F. At this time one liter of clinical dextran was administered. On December 24 the blood pressure was 120/70 mm. Hg, pulse rate 144, respirations 32, temperature 104° F. The patient was confused and had a syncopal attack, followed by emesis of 200 ml. of dark blood. The hematocrit was 13 per cent. Surgical intervention was decided upon after joint discussion of all aspects of his extremely critical situation. Prior to coming to surgery the patient received four units of clinical dextran. No premedication was given.

Immediately prior to induction the blood pressure was 115/70 mm. Hg, pulse 120 and regular, respiration 22, temperature 105° F., hematocrit 10 per cent. The patient was rational, the extremities were cold. The trachea was intubated with the patient conscious, using a 38 Magill cuffed tube. He was given 100 per cent oxygen and anesthesia was induced with 125 mg. thiopental in divided doses. This did not affect the blood pressure. Nitrous oxide-oxygen, two liters each, was administered with a halothane flow of 25 ml. of oxygen through the copper kettle. Twelve mg. *d*-tubocurarine were given after the start of operation. The patient received a total of 51 mg. *d*-tubocurarine for the operation, which lasted 110

minutes. At no time did complete respiratory paralysis occur. Breathing was assisted throughout. During surgery, serial hematocrits varied from 8 to 10 per cent. Central venous pressure was maintained at 10 to 13 cm. H<sub>2</sub>O. Blood pressure and pulse rate remained constant. Blood pressure was approximately 110-120 mm. Hg systolic and 60-70 mm. Hg diastolic; pulse between 110-130 beats per minute. During surgery the patient was on a cooling blanket which gradually reduced his temperature (rectal) to 101.6° F. by the end of operation, at which time he was awake and breathing spontaneously at a rate of 22 per minute with a tidal exchange of 375 ml. He had received 700 ml. dextran during surgery. Blood loss was estimated at 200 ml. A bleeding benign leiomyoma was resected from the cardia of the stomach.

On the third postoperative day a roentgenogram of the chest revealed borderline congestion, suggesting congestive heart failure for which he was treated appropriately. Hematocrit at this time was 11 per cent and central venous pressure was 23 cm. H<sub>2</sub>O. The patient became confused. His speech was incoherent even during administration of 100 per cent oxygen. He was transferred to the hyperbaric chamber at the U. S. Naval Terminal Island installation.

Initially, he was given 100 per cent oxygen at 2 atmospheres for 160 minutes, following which he became lucid and showed improvement. This was followed by 30 minutes of 100 per cent oxygen at 1.33 atmospheres, then 30 minutes of room air at 1 atmosphere, then 30 minutes of 100 per cent oxygen at 1 atmosphere, then 30 minutes of room air at 1 atmosphere, then 30 minutes of 100 per cent oxygen at 1 atmosphere. This cycle was modified gradually over the next four days until the patient could tolerate room air at 1 atmosphere without difficulty when he was returned to Harbor General Hospital. On the second of January, the hemoglobin was 3.8 Gm./100 ml.; hematocrit 14 per cent. The patient continued to improve and was discharged on January 10, 1968, with a hematocrit of 26 per cent.

#### CONCLUDING COMMENT

A 26-year-old white man, a Jehovah's Witness, underwent anesthesia and major surgery with apparent complete recovery even though his hematocrit and hemoglobin values were continuously below normally-accepted minimally safe levels.

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