Dog 1 developed ventricular asystole and apnoea thus followed a cardiac death. In the remaining 5 dogs apnoea preceded cardiac standstill. The blood gas values in all 6 animals made it unlikely that failure of the respiratory centre occurred because of primary pulmonary pathology. In animals 5, 8 and 9, cardiac output and mean systemic arterial pressure were adequate; thus, by exclusion, apnoea was due to toxicity of the central nervous system. Death from oxygen toxicity was, therefore, cardiac in origin in 4 of the dogs, and central nervous system in origin in the remaining 2. Histological examination of the lungs revealed no remarkable changes.

Much of the gross pulmonary pathological changes reported by previous workers may reflect mainly terminal or postmortem change. In the spontaneously breathing animal, changes in respiratory pattern indicating central nervous system involvement occur early, while changes in $P_{O_2}$, $A-a$ $O_2$ gradient and pulmonary shunt ratio are relatively late manifestations of oxygen toxicity. Death from oxygen toxicity, in the pressure range 1-2.5 ATA, seems more easily attributable to progressive disturbance of the central nervous system and of the myocardium than to primary pulmonary pathological changes.

**REFERENCES**


**CORRESPONDENCE**

**BLOOD LOSS IN VAGINAL SURGERY**

Sir,—The article on “The effect of anaesthesia, hypotension, and epidural analgesia on blood loss in surgery for pelvic floor repair” by J. R. Donald, published in the February issue (Brit. J. Anaesth. (1969), 41, 155-166) has been of interest to me.

Although the type of anaesthesia affects blood loss in any operation, at least on theoretical grounds, yet I believe that hypotension is not the most important determining factor in this respect. The discovery of the proper fascial plane is of paramount importance in these operations. I have witnessed practically bloodless repair operations done by Professor Mahfouz, M.Ch., F.R.C.P., F.R.C.O.G., and I think the secret of his success in fistula operations is similarly due to location of the proper fascial plane.

Even surgeons who inject locally dilute adrenaline solution may get bleeding more than expected. This I call (wrongly but expressively) The Adrenaline Paradox. I think the successful effect of adrenaline in pelvic floor operations is not due so much to adrenaline as it is due to the saline that opens up the fascial planes. If the injection is given into the improper plane, and this be coupled with diuresis in the less favourable plane bleeding is bound to occur. Those who have experience in giving subcutaneous saline for children are aware of the existence of a plane of least resistance into which the injection is best given.

Besides, differentiation can be made clinically between patients who are likely to bleed, and patients who are unlikely to bleed, by testing for the adherence of the vaginal skin to the underlying structures. If the vagina is adherent, a solution of saline with hyaluronidase rather than adrenaline may circumvent the trouble of vascular oozing.

**N. G. MUSSELLI Chatham**

Sir,—I am glad that Dr. Mussalli has found my paper to be of some interest but it must be emphasized that the anaesthetic technique did not significantly affect blood loss except where hypotension was induced by one or other of the methods employed.

I would be inclined to reserve judgement on the influence of surgical techniques on blood loss until some evidence is available to support this hypothesis. In this particular series there was no significant difference in blood loss between patients operated on by experienced and relatively inexperienced surgeons. This observation might suggest a different conclusion. Also there was no relationship between operating time, which may reflect surgical difficulty, and blood loss.

The effect of locally injected adrenaline has been documented elsewhere (Lazar and Kreiger, 1959). My colleague, Dr. D. D. Moir, who is also interested in this subject (Moir, 1968), initiated a study of the effect of locally injected agents in which saline was used as a control solution. The immediate effect of injection of saline was oedema of tissues with blanching of the vaginal skin, but this was followed rapidly by a reactive hyperaemia. This appeared to cause increased bleeding and marked surgical difficulty, and the trial was abandoned in the interest both of the patient and of the surgeon-anaesthetist relationship (Moir, personal communication, 1969).

It is generally accepted that neither surgeon nor anaesthetist can predict which patient will bleed excessively. This is reflected in the pre-operative routine of cross-matching blood for patients subjected to any major surgery, when in fact, relatively few will receive a transfusion. An accurate method of predicting blood loss in pelvic floor repair or any other type of surgery would have a considerable effect in conserving scarce supplies of stored blood, and would be widely practised. A reliable method of reproducing the bloodless field we all see occasionally would be universally applied if it was available.

**REFERENCES**


**J. R. DONALD**