ADVANTAGES OF INDUCED HYPOTENSION*

S. L. VANDEWATER, M.D., F.R.C.P. (C)**

THE TOPIC "Advantages" would have been easier to discuss if this were 1950, rather than 1955, as everyone was much more enthusiastic, and almost eulogistic in some cases, about induced hypotension. In the interim, there have been various suggestions about complications of the technique, but no paper has been more horrifying, from a statistical viewpoint, than that of Little (1), containing the results of the Yale University survey on induced hypotension in Great Britain and America. I might even say, as I am sure many anaesthetists do, that there are no advantages in using induced hypotension.

However bad the statistics on morbidity (1 in 31) and mortality (1 in 291) reported in the above survey, I do not think we should be stampeded into an outright condemnation of the technique. I should like to suggest that there has been a little over-exuberance in the use of hypotension. Oddly enough, very little outward exuberance is shown in Edinburgh where the clinical use of induced hypotension was first, and still is, practised. Dr. John Gillies (2) points out that inexperience and lack of knowledge of physiology are the main contraindications to the use of the technique, and now holds short courses, didactic and clinical, for the interested visitors.

Having been assigned the topic "Advantages," then, I must consider the question: Are there really any advantages? I should like to distinguish between advantage and indication. According to the Oxford Dictionary, advantage means "a stronger position, superiority, gain, favourable circumstance." Indication stands for "something pointed out, made known, shown, or be a sign of." The former implies a benefit to the patient, but not necessarily the latter. Induced hypotension, in most instances, increases the hazards of surgery, and there must be some definite justification to have the patient run this calculated risk.

My personal experience with induced hypotension is with a relatively small series of cases, as shown in Table I. However small the series is, all patients have been selected as to suitability to withstand hypotension; for example, under 60 years of age, haemoglobin above 75 per cent, and free from cardiovascular disease and hypovolemia. From this series, containing a reasonably wide range of case types, I should like to draw my conclusions as to the advantages, and what type of case might be suitable for induced hypotension.

NEUROSURGERY

I doubt whether induced hypotension ever prevented death, although the converse is certainly true. However, there are certain neurosurgical operations

*From a Round Table discussion on "What is the Place of Induced Hypotension in Anaesthesia?" under the direction of Dr. Wesley Bourne, held at the Annual Meeting of the Canadian Anaesthetists' Society in the Banting Institute of the University of Toronto, June 20, 21, and 22, 1955

**University of Toronto and Toronto General Hospital, Toronto, Ontario.

TABLE I
INDUCED HYPOTENSION, 1952-5

<i>Cases</i>			
Intracranial—		Plastic	14
Aneurysms	25	Neck Dissections	11
Tumours	11	Bone and Joint	8
A V Malform	5	Thoracic	6
	41	Breast	6
Pelvic	19	Gland Dissections	3
Abdominal	17	Parathyroid	2
Spine and Back	16	E N T	2
Thyroid	15	Sympathectomy	2
		TOTAL	173
<i>Method</i>			
1. Ganglion Blocking Drugs	C6 (Hexamethonium)		113
	Arfonad		46
2. Total Spinal (1/400 Nupercaine)			14
		TOTAL	173

where induced hypotension has been of definite value and helped to increase the survival rate. In the opinion of the neurosurgeons of this centre, the direct approach on a cerebral aneurysm, and clipping or ligaturing its neck, is technically possible only under induced hypotension. The surgical treatment of berry aneurysms, with or without subarachnoid haemorrhage, in the acute stage, has been disappointing in all centres, with no appreciable change in the mortality rate as compared to conservative medical treatment (about 50-1). The opinion here, although based on only 25 cases under induced hypotension, is that the salvage rate has been definitely increased. This view is also held by Olivecrona (3) in Stockholm. It is felt that hypotension from the time the dura is opened allows an approach onto the aneurysm, with a much reduced brain tension, requiring less brain traction, with less risk of rupture. Under hypotension, if bleeding occurs from the aneurysm, it is of less force and magnitude and is more easily controlled, allowing the operator to place a clip accurately without damaging surrounding important nervous or vascular structures. At present, we have gone one step further, and now operate on cerebral aneurysms, no matter in what condition they are, under induced hypothermia with or without induced hypotension, with positive control of bleeding by compression of carotids and vertebrals, previously exposed, if necessary.

Induced hypotension has a definite place in the excision of arteriovenous malformations, and the highly vascular cerebral tumours. In both these cases, bleeding can be extremely profuse and even fatal, and proper excision can be hampered by a blood-filled field.

REGIONAL DISSECTIONS AND TISSUE DIFFERENTIATION

The best example of induced hypotension being an advantage in tissue differentiation in anatomical dissections, is exploration of the neck for a parathyroid

adenoma. The parathyroid glands are often hard to find, but with a dry field and in the absence of oozing, they can be differentiated from the thyroid by colour.

If your surgeons believe in widespread excision of organs, and dissection of regional glands for cancer—for example, radical mastectomy with dissection of axilla, pelvic exenteration, Wertheim hysterectomy—then induced hypotension may be of considerable value in allowing the surgeon to differentiate important structures and do a safer and wider dissection.

Induced hypotension has been widely used and acclaimed in orthopaedic, plastic, and E.N.T. surgery. The advantages are said to be reduction in blood loss, protection of the patient from traumatic surgery, and a smoother post-operative course. To use induced hypotension purely to conserve blood, is, I believe, wrong, for the risks are too great to justify its use on that basis alone. With the above-mentioned exceptions, there is no operation, done by a reasonably skilled and careful surgeon, where blood conservation by induced hypotension should be resorted to. If the argument is used that the patient has a low blood volume to start with, and induced hypotension is used to conserve what he has, then one is just asking for trouble, because of the lack of knowledge of basic physiological principles.

Orthopaedic surgery on limbs is usually done with a tourniquet, and hip, shoulder, and spine procedures are done under advantageous positions for blood drainage away from the operative site. Plastic surgery and E.N.T. procedures, such as fenestration, can be done just as easily, and are probably safer with judicious use of dilute adrenaline infiltration.

This paper may sound overly conservative to some, but, nevertheless, induced hypotension requires considerable respect in its use. We must be always aware of the hazards and recognize the limited indications, and, in the final analysis, we must remember that operative results and the well-being of patients were just as good, with few exceptions, before the use of induced hypotension as with it.

RÉSUMÉ

L'emploi de l'hypotension contrôlée a soulevé un enthousiasme un peu surprenant mais, en dépit des statistiques de morbidité (1 sur 31) et de mortalité (1 sur 291) (1), je ne crois pas qu'on doive condamner d'emblée cette technique. Le Docteur John Gillies (2) d'Edimbourg émet l'opinion que le manque d'expérience et le manque de connaissance en physiologie sont les principales contrindications à l'emploi de cette technique. Dans la plupart des cas, l'hypotension contrôlée augmente les risques de la chirurgie et il faut des raisons bien précises pour faire encourir au malade ce risque additionnel. Le groupe de cas du tableau no 1 permet à l'auteur de nous exposer les avantages de cette méthode et de nous faire part de son expérience personnelle.

L'hypotension contrôlée a augmenté les chances de succès dans les cas d'anévrismes cérébraux. Elle a également une place bien choisie dans les opérations de certaines anomalies artério-veineuses et de certaines tumeurs cérébrales très vascularisées.

L'hypotension peut également devenir très utile pour faire une dissection fine et aider à différencier des structures importantes. Un champ opératoire exsangue facilite le travail du chirurgien et l'identification des tissus. Il n'est pas admissible de pratiquer l'hypotension dans le seul but de diminuer les pertes sanguines, car les risques qu'elle entraîne ne justifient pas son emploi pour cette seule raison.

Il faut être au courant des risques de l'hypotension contrôlée et savoir reconnaître ses indications précises. Il faut bien nous rappeler, en dernière analyse, que les résultats opératoires, à quelques exceptions près, aussi bien que l'évolution des malades étaient aussi satisfaisants avant l'arrivée de l'hypotension que depuis sa venue.

REFERENCES

1. LITTLE, D. M. Induced Hypotension during Anaesthesia and Surgery *Anaesthesiology*, 16: 320 (1955).
2. GILLIES, JOHN. Personal communication
3. NORLEN, G & OLIVECRONA, H Treatment of Aneurysma of the Circle of Willis *J Neurosurg*, 4: 404 (1953).