BLOOD LOSS DURING SURGERY

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The introduction of blood transfusion marked a milestone in the progress of surgery comparable to the discoveries of anaesthesia and of measures to combat surgical infections. Blood transfusion, however, introduces certain hazards of its own, and there is by no means uniformity of opinion among surgeons on the indications for blood transfusion in surgical operations.

There can be little doubt that blood loss requiring transfusion should be anticipated before the body's ability to compensate for it fails and hypotension develops. Less blood is required to prevent such hypotension than to correct it (Reeve, 1961, unpublished data), and it is widely known that even short periods of hypotension can produce irreversible sequelae in patients with vascular disease (Shackman *et al.*, 1960). Maintenance of normal blood-pressure and blood-volume is the keynote of successful surgery, particularly in the elderly and neonatal patient.

When severe blood loss leaves no doubt about the need for transfusion, a further hazard seen with increasing frequency is that of excessive transfusion, which is also poorly tolerated in the elderly patient or in the presence of cardiac disease.

In assessing the need for transfusion three courses are open to the surgeon. He can wait until signs of shock appear before giving blood. This policy undoubtedly avoids some unnecessary blood transfusions but courts disaster in the vulnerable patient, especially in the post-operative period, when the onset of shock may be recognized too late. It is also disadvantageous because a depleted blood-volume, although insufficient to produce shock, may still increase morbidity, delay wound-healing, and prolong convalescence.

A second policy is to give blood routinely for major operations usually requiring transfusion. This policy still results in some unnecessary transfusions. Also when massive bleeding occurs the surgeon has to depend upon clinical judgment alone to determine the volume of blood required, with the resulting risks of inadequate or excessive replacement.

The third and obviously ideal course is to use a reliable method of measuring blood loss as it occurs, so that accurate blood replacement can be effected. This paper describes our experience with a simple sponge-weighing technique to measure operative blood loss and some of the lessons learned from adopting this policy.

Material.—Data are presented from a total of 412 cases in which blood loss was measured gravimetrically. The operations involved were 255 cases of thyroid-

ectomy and neck surgery, and 52 vascular, 48 abdominal, 28 urological, and 29 breast operations (Fig. 1).

Method of Estimation of Blood Loss

Simple scales accurate to 5 g. and containing an adequate-sized pan were used (Fig. 2). The difference in weight between each blood-stained sponge and the average weight of a dry one of similar size is recorded in grammes and is taken to represent millilitres of blood lost. Some additional allowance is made for blood on gowns and large drapes and other sites if these cannot be weighed. This additional blood should be minimal if care is taken with swabbing and if oiled-silk under-sheets are used. Dry swabs and sponges were used throughout all cases.

Only known volumes of water are run through the suction line, and the sucker bottle is accurately calibrated and the contents are measured. In many cases blood volume was measured immediately after operation, using red cells tagged with ^{51}Cr (Reeve *et al.*, 1959). Thus the accuracy of measured blood losses (and replacement) was checked.

Results

The results of the 412 measurements are shown in Fig. 1. The range of bleeding is noteworthy. The magnitude of the blood loss in several standard procedures is impressive. In radical mastectomy the variation in blood loss was considerable, extending from 380 to 3,200 ml. During subtotal gastrectomy the range was from 200 to 1,800 ml. and during prostatectomy 150 to 2,750 ml.

The extent of haemorrhage beyond a limited range cannot be estimated reliably by "experience." In long operations especially, or when the blood loss is severe, estimations of blood loss may be wildly misleading.

It is interesting that an awareness of bleeding and a systematic measurement of it seems to have resulted in a progressive reduction in blood loss during these operations. In three types of operations—total thyroid lobectomy, thyroidectomy for intrathoracic goitre, and bilateral subtotal thyroidectomy—there has been a reduction in the average blood loss each year. Greater care is exercised by the surgeon, who is kept continually conscious of blood loss.

As stated, the accuracy of replacement during excessive haemorrhage can be checked post-operatively by determining the patient's blood volume.

A man aged 68 was admitted suffering from a ruptured abdominal aneurysm. During an operation for resection of the aneurysm and its replacement by a prosthetic graft the measured blood loss was 15 litres, and this volume of fresh blood was given by two simultaneous transfusions through large-bore cannulae. On checking his post-operative blood-volume it was found to be 4,393 ml. with a red-cell mass of 1,882 ml., which are well within the normal range; at the end of the operation his condition was satisfactory and his blood-pressure was well maintained.

Discussion

We would deprecate an attempt to establish figures for average blood loss during particular operations, for such average figures may well give surgeons and anaesthetists a false sense of security. For example, in an operation such as thyroidectomy our average blood loss is only 250 ml., but in a number of instances the

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loss was well over 1 litre. In operations such as radical mastectomy, prostatectomy, or abdomino-perineal resection, the surgeon and anaesthetist should employ some technique for measuring blood loss, otherwise accurate replacement cannot be achieved.

On many occasions we have measured the patient's blood-volume before and after operation, using red cells tagged with ^{51}Cr , and have found that the blood replacement was accurate even after a large operative blood loss, thus confirming the validity of the simple method of measurement here described. In cases of massive haemorrhage we submit that it is impossible safely to give large volumes of blood without accurate knowledge of the amount of blood lost.

In our own experience, where we have attempted to guess the blood loss we have made errors of up to 100%. The difficulty of estimating losses accurately is accentuated when the losses are great or when the operating-time is prolonged. The simple gravimetric

technique described here gives no extra work to the theatre staff and has been shown to compare favourably with other methods, such as weighing the patient or

FIG. 2.—Scales used for measuring blood loss.

FIG. 1.—Blood loss recorded at 412 operations, plotted for convenience on a logarithmic scale.

colorimetric determination of operative bleeding (Baronofsky *et al.*, 1946). Moreover, sponge-weighing and constant reference to the volume of blood in the suction bottles enables progress assessments of blood loss to be made and blood replacement to be geared accurately to the loss.

Routine use of this method improves the surgeon's judgment of the volume of blood being lost. A better surgical technique is likely to be developed as a result of increased attention to measurement of the blood loss.

Blood is a valuable commodity. Accurate measurement of blood loss leads to saving of blood for our community's blood banks. In some patients undergoing major operations the measured blood loss is small and transfusion is clearly unnecessary.

With this simple method geriatric patients can usually be maintained at a normotensive level even during such radical surgery as aortic replacement. Survival rates show gratifying improvement. In view of its many

advantages, this simple method should be a routine part of modern theatre practice.

Summary

A simple gravimetric method for measuring loss of blood during surgery has been discussed.

This method allows of the rational replacement of blood lost and minimizes the risk of over- or under-transfusion.

The use of this procedure is recommended during all major surgical operations.

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BROW PRESENTATION

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Brow presentation is associated with high mortality and morbidity of both mother and foetus. That it is the rarest of all malpresentations only increases its importance in obstetric practice, for few obstetricians are able to gain sufficient experience of the condition. Many of the papers published show combined statistics of face and brow presentations and deal with series of cases encountered over many years. In this paper 35 consecutive cases of brow presentation that occurred in Chittaranjan Seva Sadan College between April, 1953, and January, 1961, have been analysed in an attempt to show the recent trends in the management of this serious condition.

Incidence.—During the period of review there were 60,130 deliveries, giving an incidence of brow presentation of 1:1,718. The figures reported by different authors varied from 1:667 (Moore and Dennen, 1955) to 1:3,453 (Posner and Buch, 1943). The average incidence was found to be 1:1,804 (Table I).

TABLE I.—Incidence and Foetal Mortality

Authors	Years of Survey	No. of Deliveries	No. of Brow Cases	Incidence	Foetal Mortality
Hellman <i>et al.</i> (1950)	1896–1948	65,930	44	1:1,498	25%
Kenwick (1953)	1930–1952	76,062	26	1:2,941	8.7%
Madden (1956)	1945–1955	13,774	13	1:1,059	—
Magid and Gillespie (1957)	1945–1955	39,371	16	1:2,473	6.25%
Moore and Dennen (1955)	1931–1953	24,030	36	1: 667	8.3%
Morris (1953)	1934–1950	64,817	53	1:1,224	28.3%*
Posner and Buch (1943)	1914–1942	46,058	13	1:3,453	20%
Posner <i>et al.</i> (1957)	1943–1956	50,345	23	1:2,189	6.3%†
Simpson (1950)	1935–1949	31,534	38	1: 829	13.1%
Skalley and Kramer (1960)	1953–1958	63,104	27	1:2,337	7.7%
Tancer and Rosanelli (1957)	1935–1957	27,937	22	1:1,269	—
Present series	April, 1953, to January, 1961	60,130	35	1:1,718	8.5% 25.7%*
Combined Series		563,092	346	1:1,804	

* Uncorrected. † Face and brow.

Aetiological Factors

Many maternal and foetal factors have been said to be the cause of brow presentation. Tancer and Rosanelli (1957), however, failed to discover any important maternal predisposing factor. White (1954) found no cause in 33 out of 100 collected cases. He concluded that most of the brow and face presentations, if not all, were primary in nature and were due to the increased tone of the extensor muscles of the neck of the foetus. Excluding multiparity, no cause was detected in 14 cases (40%) of the present series.

Contracted Pelvis.—According to MacLennan *et al.* (1955) brow presentation is nearly always associated with contracted pelvis. Greenhill (1955) mentioned that it occurred in 53.8% of the cases reported by Hellman *et al.* (1950). Simpson (1950) found the incidence to be 23.7%, whereas Madden (1956) had only one contracted pelvis in 33 cases. In the present series contracted pelvis was noted in 17.1% of cases—a figure in close agreement with those of Kenwick (1953) and Morris (1953) (see Table II).

TABLE II.—Aetiological Factors (Percentages)

Authors	Primiparae	Multiparae	Contracted Pelvis	Big Baby (>8 lb.)	Pre-maturity
Hellman <i>et al.</i> (1950)	37.2	62.8	53.8	—	Nil
Kenwick (1953)*	33.3	66.7	15.1	10.9†	12.4
Madden (1956)	55.5	44.5	7.7	30.7	Nil
Morris (1953)	62.2	37.8	15.1	31.3	15.1
Simpson (1950)	—	—	23.7	13.1	8
Skalley and Kramer (1960)	22	78	11	15	18.5
Present series ..	40	60	17.1	11.4	28.5

* Combined figure of face and brow.

† Birth weight 8 lb. 8 oz. (3,858 g.) or above.

Parity.—Hellman *et al.* (1950) observed that 62.8% of their brow presentations occurred in multiparae, in contrast to the average clinic figures of 52.9%. But Morris (1953) and Madden (1956) found 62.2% and 55.5% of their cases respectively to be in primiparae. Out of 35 cases in the present series, 14 (40%) were in