

—Report on Experiments and Clinical Cases—

Blood Loss Estimation during Laparoscopic Myomectomy Using HemoCue[®]

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Abstract

During laparoscopic myomectomy, it is difficult to determine the actual blood loss volume because physiological saline is used for lavaging to detect the bleeding point or to ensure no active bleeding site. We attempted to estimate blood loss by measuring the waste irrigation fluid's hemoglobin (Hb) concentration using HemoCue[®] (HemoCue, Angelholm, Sweden). Twenty-three women enrolled in our study. After the end of laparoscopic myomectomy, the waste irrigation fluid's Hb content was measured using HemoCue[®]. We estimated blood loss using the following formula. Estimated blood loss (ml) = [waste irrigation fluid volume (ml)] × [Hb concentration in waste irrigation fluid (g/l)] ÷ [patient's preoperative Hb level (g/l)]. The demographic data of the patients showed 35.4 years in age, 159.6 cm in height, and 50.7 kg in weight (mean). The total lavage fluid's Hb level ranged between 0.2~4.7 (g/l). The total blood loss estimation was calculated and ranged between 17.6~725.2 ml. There was no significant correlation between the calculated blood loss and the difference in Hb level (Hb level on the first postoperative day minus preoperative Hb level). The HemoCue[®] needs only 10 mcl of blood and it takes only about 45 seconds to produce the result. Furthermore, the HemoCue[®] is a reliable device for measurement of blood hemoglobin concentration. Our method is easy and quick to perform, and blood loss estimation and surgeon's experience (subjective method) show accordance.

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Key words: laparoscopic myomectomy, blood loss, HemoCue[®]

Introduction

Many techniques (subjective, gravimetric, volumetric, radiometric, dilutional, and colorimetric) have been employed to estimate blood loss, but the gravimetric methods is neither precise nor accurate¹.

Furthermore, additional techniques have been devised to estimate surgical blood loss more

accurately, including a mathematical model, a photometric method, and cell counts in blood loss²⁻⁵. However, these methods are impractical, and expensive.

During laparoscopic myomectomy, it is difficult to determine the actual blood loss volume because physiological saline is used for lavaging to detect the bleeding point or to ensure no active bleeding site. Previously we have calculated blood loss by

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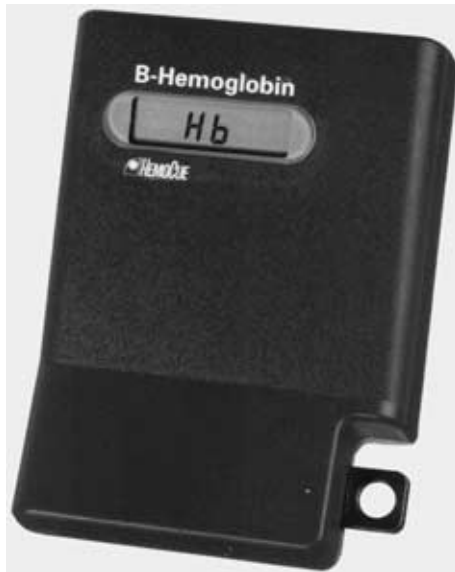


Fig. 1 HemoCue® is a portable photometer for measurement of hemoglobin. The HemoCue® needs only 10 μ l of blood and it takes only about 45 seconds to produce the result.

deducting physiological saline amount for lavaging from waste irrigation fluid volume (volumetric method), but a dissociation existed between the calculation of blood loss and the surgeon's experience (subjective method); furthermore, calculation of blood loss was sometimes minus volume. Here, we attempted to estimate blood loss by measuring the waste irrigation fluid's hemoglobin (Hb) concentration using HemoCue® (HemoCue, Angelholm, Sweden).

Methods

A study was carried out to estimate blood loss during laparoscopic myomectomy. Twenty-three women enrolled in our study. Oral informed consent was obtained. Laparoscopic myomectomy was performed under general anesthesia. General anesthesia was induced by propofol 2 mg/kg and vecuronium 0.1 mg/kg and maintained with N₂O-O₂-Sevoflurane. Intravenous infusion (acetated Ringer's solution) was administered at a rate of 10 ml/kg/h for one hour, and then 5~10 ml/kg/h until the operation was finished. After the end of laparoscopic myomectomy, the waste irrigation fluid's Hb content was measured using HemoCue®.

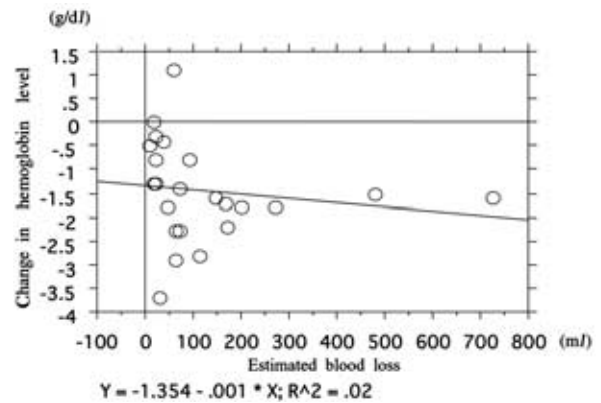


Fig. 2 No significant correlation between estimated blood loss and change in hemoglobin level in 23 women

We estimated blood loss using the following formula. Estimated blood loss (ml) = [waste irrigation fluid volume (ml)] \times [Hb concentration in waste irrigation fluid (g/l)] \div [patient's preoperative Hb level (g/l)].

HemoCue® is a portable hemoglobin photometer, and measurement of Hb is easy, quick and accurate (Fig. 1).

Correlations between estimated blood loss volume and change in Hb level (preoperative hemoglobin level minus hemoglobin level on the first postoperative day) were studied with a simple linear regression analysis. Statistical analysis was performed using StatView®. A *P* value less than 0.05 was considered significant.

Results

The demographic data of the patients show 35.4 ± 5.9 years in age, 159.6 ± 5.9 cm in height, and 50.7 ± 6.3 kg in weight (mean \pm SD). The total infused intravenous fluid volume was $1,052 \pm 95$ ml (mean \pm SD) during anesthesia. The total lavage fluid's Hb level could be measured, and ranged between 0.2~4.7 (g/l). The total blood loss estimation was calculated and ranged between 17.6~725.2 ml.

There was no significant correlation between the calculated blood loss and the difference in Hb level (Fig. 2). Fifteen of the 23 patients had drainage tubes inserted. In the eight patients without drainage tubes, there was also no significant correlation between the calculated blood loss and

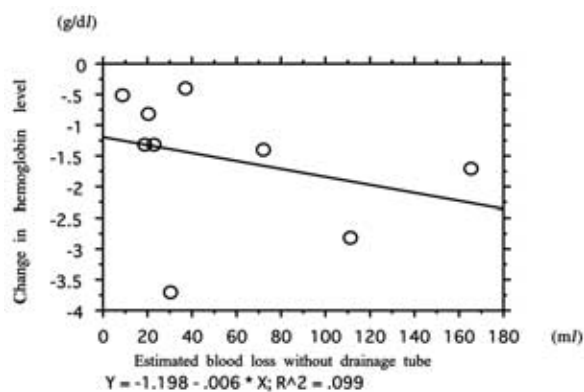


Fig. 3 No significant correlation between estimated blood loss and change in hemoglobin level in 8 women without drainage tubes

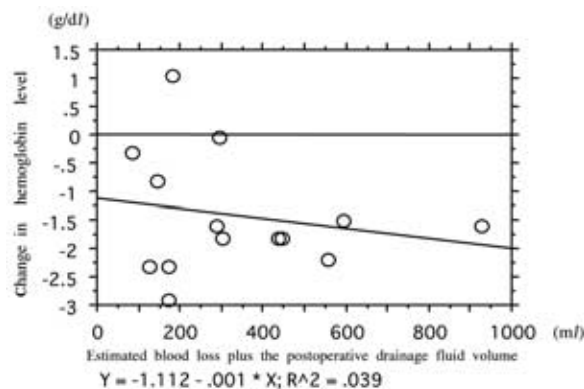


Fig. 4 No significant correlation between estimated blood loss plus the postoperative drainage fluid volume and change in hemoglobin level in 15 women with drainage tubes

the difference in Hb level (Fig. 3). Also, in the 15 patients with drainage tubes, there was no significant correlation between the calculated blood loss plus the postoperative drainage fluid volume and the difference in Hb level (Fig. 4).

Discussion

During laparoscopic myomectomy, it is difficult to determine the actual blood loss volume. The amount of absorbed physiological saline in the peritoneum was difficult to estimate. We measured the waste irrigation fluid's Hb concentration using HemoCue® easily and quickly. The estimation of blood loss and the surgeon's experience show accordance.

In this study, there was no significant correlation between the calculated blood loss and difference in Hb level. This might be due to the fact that the blood loss volume was relatively small for the whole blood volume. The limitations of this study were as follows. First, we measured postoperative Hb level on the first postoperative day, because routine examination of Hb was performed on the first postoperative day. Fifteen of 23 patients had drainage tubes inserted postoperatively, so the postoperative Hb level differed from the Hb level at the end of the surgery. Second, we measured preoperative Hb level instead of intraoperative Hb level. During preoperative and intraoperative Hb measurements, menstruation may occur, therefore the estimation of blood loss may be incorrect.

Furthermore, in 15 patients with drainage tubes

inserted, there was no significant correlation between the calculated blood loss plus postoperative drained fluid volume and the difference in Hb level. Santoso JT, et al. reported that blood volume in the suction container during hysterectomy was used to estimate blood loss. However the hematocrit level in the suction container decreased as the duration of surgery increased, therefore estimation of red cell level in surgical blood loss becomes less accurate as the length and radical nature of the surgery increases⁶. We also speculate that the lymph fluid contributed to the increased volume of lost blood in the suction container.

The HemoCue® needs only 10 mcl of blood and its takes only about 45 seconds to produce the result. Furthermore, the HemoCue® is a reliable device for measurement of blood hemoglobin concentration⁷.

Yokoyama, et al. reported that evaluation of blood loss in trans-urethral resection of the prostate with HemoCue Plasma Low Hemoglobin®. They used mean of preoperative and postoperative Hb concentration instead of our preoperative Hb concentration. It may be more accurate if we used mean of preoperative and postoperative Hb concentration.

Apart from these limitations, our method is easy and quick to perform, and blood loss estimation and surgeon's experience (subjective method) show accordance.

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