

## Triton sponge and canister app for estimating surgical blood loss

Sir,

Conventionally gravimetric method and visual estimations are used to quantify intraoperative blood loss. In gravimetric method, soaked mops are weighed and difference in grams is estimated as blood loss in ml. In visual estimation, loss is estimated by the amount seen in drains and mops after which a rough quantification is done after enquiring about the saline wash used intraoperatively or the body fluids which is drained. Both methods are inconsistent in determining surgical blood loss. The loss is underestimated in major surgeries which involves excessive blood loss and overestimated in otherwise minimal blood loss.

The Triton system (Gauss Surgical, Inc., Palo Alto, CA) is a mobile monitoring system that uses mobile computing with Gauss "Feature Extraction Technology" (FET). The application can be downloaded on an iPad from the App Store on Macintosh platform by searching "Triton Sponge" [Figure 1a]. The application helps by directly assessing Hb mass (mHb) absorbed by surgical sponges from an image. The software works using algorithms, which can automatically filter out nonsanguineous components such as saline used for wash, body fluids like ascites, urine, pleural fluid that is absorbed by the mops. Triton system got US-FDA approval as an "Image Processing Device For Estimation Of External Blood Loss" with an 510(K) number: K163507.

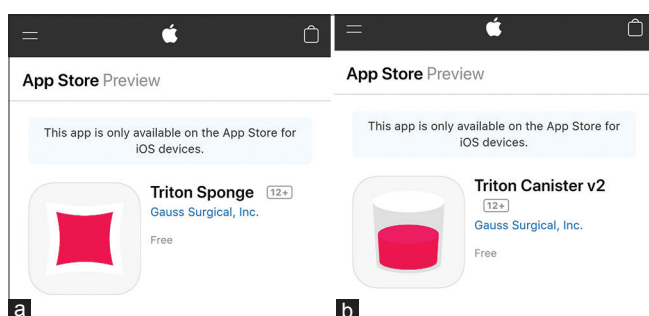


Figure 1: (a) Figure shows Triton Sponge App as available on App Store. (b) Figure shows Triton Canister App as available on App Store

Later, Gauss Surgical, Inc. launched 'Triton Canister' app, which used FET to estimate blood loss in canisters and other suction containers used to collect intraoperative losses [Figure 1b]. The app can be found on App store by typing "Triton Canister v2". In this app also the image of suction containers and canisters needs to be uploaded, which is then processed and an accurate estimate of blood loss is then provided by the app after excluding other fluids in the canisters. The canister app also received US-FDA approval in 2015 under device classification "Image Processing Device For Estimation Of External Blood Loss" with 510(K) Number: K142801.[8]

After the FDA approval, several studies have been conducted involving major laparotomies, orthopedic surgeries (spine, arthroplasties), cesarean deliveries<sup>[1-5]</sup> [Table 1]. Konig *et al.* conducted an *in vitro* study to assess the accuracy and performance of the app on surgical laparotomy sponges and later on suction canisters across various range of ambient light conditions, sponge saturation, saline contamination, and initial blood Hb and found it very accurate.<sup>[6]</sup> Although the sample size of the studies published till date is small, respective authors felt that this algorithm based app was much better and reliable in estimating intraoperative blood loss, thereby helping the clinicians to take decisions judiciously.

To conclude, the Triton system-based estimation of intraoperative blood loss in sponges and canisters is a simple and reasonably accurate way of estimating blood loss. It is easy to learn and understand. Presently, the app is available for free download on Macintosh platform only although the user's needs to purchase the license to use the app. The app can be used on an iPad once installed with a functional internet connection. Being a regulated medical product, the app is available for use in a country if the product is cleared by local regulating bodies.

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Nil.

Table 1: Table shows currently published papers which used the Triton Sponge and Canister App for estimation of intra-operative blood loss

Authors	App used	No. of patients	Conclusion
Holmes <i>et al.</i> (2014)	Sponge	46	App provided significantly more accurate estimation of Hb mass than the gravimetric method.
Sharareh <i>et al.</i> (2015)	Sponge	50	App could accurately determine Hb loss contained within surgical sponges.
Doctorvaladan <i>et al.</i> (2017)	Sponge and canister	50	App based algorithmic system provides more accurate results than visual and quantitative gravimetric methods of measuring blood loss during cesarean deliveries.
Konig <i>et al.</i> (2017)	Sponge	50	Use of the Triton App to measure Hb loss in real-time during surgery was feasible and accurate.
Nowicki <i>et al.</i> (2018)	Sponge	56	Authors concluded that intraoperative use of the Triton system was convenient and precise for monitoring intraoperative blood loss when compared to gravimetric method and visual estimation.

**Conflicts of interest**

There are no conflicts of interest.

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