Anesthetic Management of A Giant Abdominal Aneurysm Monitored with The Flo-Trac™/Vigileo System

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ABSTRACT

Background: The Flo-Trac™/Vigileo system (Edwards Lifesciences, Irvine, CA, USA) can be used to estimate cardiac output and stroke volume variation for giant abdominal aortic aneurysm (AAA).

Case Presentation: A 60-year-old male patient presented with a thrombosed abdominal aortic aneurysm approximately 8.8 x 8.4 cm in size. The patient was scheduled to undergo open repair. The left radial artery was punctured to monitor direct arterial pressure, stroke volume, cardiac output, and SVV. A Flo-Trac™ sensor (Edwards Lifesciences, Irvine, CA, USA) was connected to the arterial monitor system. The aneurysm was opened and longitudinally incised. A total of 600 ml of blood in the aneurysm was drained, and mural thrombi were removed. The graft was proximally anastomosed to the pararenal abdominal aorta. The distal portion of the graft was anastomosed to the iliac bifurcation. The clamping time was 62 min. The CO and SVV measured by the Flo-Trac™ sensor were 4.2 L/min and 8%, respectively.

Conclusions: We report a case of giant AAA where intravascular volume control was obtained by CO and SVV, which were monitored by a Flo-Trac™/Vigileo system.

Keywords
Abdominal aortic aneurysm, Cardiac output, Stroke volume variation.

Introduction
Giant abdominal aortic aneurysm (AAA) is defined as aneurysm with a transverse diameter of 13.0 cm or more and occurs rarely [1]. The complex shape of giant AAA includes a short aneurysm neck, significant angulation, and a heavy intraluminal thrombus burden, which can be challenging for the managing vascular surgeon and anesthesiologist [1]. The stroke volume variation (SVV) response can be monitored by a Flo-Trac™ sensor (Edwards Lifesciences, Irvine, CA, USA) and used to gauge changes in intravascular volume in elective surgical patients [2]. We report a case of giant AAA in which intravascular volume control was used to assess CO and SVV.

Case presentation
A 60-year-old male patient was referred to our hospital with an incidental ultrasonic finding of abdominal aortic aneurysm at a local clinic. His medical history was positive for hepatitis B virus carrier. The findings indicated a juxta-renal abdominal aortic aneurysm about 8.8 x 8.4 cm in size, which was confirmed to be a thrombosed abdominal aortic aneurysm (AAA) (Figure 1). The proximal neck length of the AAA was 0.4 cm, the right limb length was 1.5 cm, and the left limb length was 1.7 cm.

No definite evidence of significant steno-occlusive lesion at either lower extremity arterial system was noted. Endovascular aortic aneurysm repair could not be attempted due to the location and size of the AAA. Therefore, the patient was scheduled for open repair. Anesthesia was induced through a mask at 100%
oxygen with intravenous administration of propofol 90 mg and
recuronium 50 mg. Endotracheal intubation was performed with
an 7.5 endotracheal tube after a 90-second manual ventilation.
The left radial artery was punctured to monitor direct arterial
pressure, stroke volume, cardiac output, and SVV. A Flo-Trac™
sensor (Edwards Lifesciences, Irvine, CA, USA) was connected
to monitoring the arterial system. Midline laparotomy was
performed, in which the omentum and transverse colon were
retracted cephalad, and the small bowel was packed in the right
hemiabdomen. Bilateral renal arteries were dissected, exposed,
and wrapped with U-tape, as were bilateral common iliac arteries
(Figure 2). A total of 5000 IU of heparin was infused. Bilateral renal
and common iliac arteries were clamped, with a suprarenal clamp
placed just above the origins of the bilateral renal arteries. The CO
and SVV were measured by a Flo-Trac™ sensor and determined
to be 4.8 L/min and 10%, respectively (Figure 3A). The aneurysm
was opened and longitudinally incised. A total of 600 ml of blood
was drained from the aneurysm, and mural thrombi were removed.
The graft was anastomosed proximal to the pararenal abdominal
aorta. The distal portion of the graft was anastomosed to the iliac
bifurcation, and the clamps at the common iliac arteries were released.
The clamping time was 62 minutes, and the CO and SVV measured
by the Flo-Trac™ sensor were 4.2 L/min and 8%, respectively (Figure
3B). After closure of the abdominal operation wound, 200 mg of
bridion was administered. Exubation of the endotracheal tube was
performed when neuromuscular blockade recovery was confirmed by
the neuromuscular stimulator. Finally, the patient was transferred to
the intensive care unit after recovery of consciousness.

Figure 1: A 60-year-old male patient with computed tomography findings showing a juxta-renal abdominal aortic aneurysm about 8.8 x 8.4 cm in size and a thrombosed abdominal aortic aneurysm in axial (A) and sagittal (B) views.

Discussion
The risk of open AAA operation is high, with associated morbidity
and mortality reported at rates from 12% to 26% and 4% to 6%,
respectively [3,4]. Therefore, measurement and assessment of
cardiac output (CO) can be useful when administering anesthesia
for giant AAA, as well as for critical patients undergoing major
surgery [5]. For patients undergoing major surgery, goal-directed
fluid administration with CO monitoring measured by esophageal
Doppler is associated with improved patient outcomes and a slight
reduction in the length of hospital stay [5]. The CO measured by
the Flo-Trac™ sensor is based on analysis of the systemic arterial
pressure wave, which has been confirmed to be both accurate and
reliable [6,7]. In patients undergoing elective cardiac surgery, CO
measured by the FLOTrav/Vigileo™ system was comparable to the
results of intermittent thermodilution [6]. Senn et al. demonstrated
that the Flo-Trac™/Vigileo system improved cardiac output
measurement as well as tracking alterations during hemodynamic
changes induced by body positioning in patients after electrive
off-pump coronary bypass surgery [7]. In addition, SVV, which
is the percentage variation of stroke volume over a floating period
of 20 seconds, can be used to predict fluid responsiveness in
patients undergoing cardiac surgery or neurosurgical procedures,
particularly within the context of the intensive care unit [8-10].
The SVV displayed on the monitor in the Flo-Trac™ sensor better
predicts the response to fluid administration than does any other
invasive monitors, such as central venous pressure (CVP) or
pulmonary artery occlusion pressure [10]. Li et al. [11] proposed that
the changes in SVV and CVP were significantly correlated with the
changes in stroke volume index, while the changes in heart rate, mean
arterial pressure and systemic vascular resistance were not. Both CVP
and SVV can be used to evaluate volume status, but fluid responsivity
can only be predicted by SVV. Reports have indicated that the normal
range of SVV under controlled ventilation is less than 10-13%. In this
case, CO and SVV were 2.4-7.2 L/min and 5-25%, respectively. Fluid
was administered instantaneously (6% hydroxyethyl starch; 4-5 mL/
kg + saline ) whenever SVV was more than 13%.

Conclusions
We report a successful case of open repair for an abdominal aortic
aneurysm with fluid administration monitored by the Flo-Trac™/
Vigileo system. Based on our results, this approach should be considered for similar cases to optimize patient outcomes.

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Declarations
Author Contributions: all authors including SIP, JHS, WJJ, CWP and SYC participated in the care of the patient and revise this manuscript, have read and approved final manuscript.

All authors participated in care of the patient, contributed to the drafts and revisions of this manuscript, and have read and approved the final manuscript.

References

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