Effective Hemorrhage Control in IVC Injury; Dual Approach with REBOA and REBOVC

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Background

Inferior vena cava (IVC) injuries are often difficult to isolate anatomically and are associated with high mortality rates of 56%.(1) Recently, a technique called **resuscitative balloon occlusion of the IVC (REBOVC)** has been reported to isolate the injury site in IVC injuries. Some studies suggest that combining REBOA with REBOVC might prevent venous congestion in the lower body and stabilize hemodynamics.(2) We report a case in which we successfully controlled bleeding from an IVC injury using REBOVC in combination with REBOA, leading to the patient's survival.

Case

【Patient Information】
28 years old / Male
He attempted suicide by **stabbing himself in the chest and abdomen**. Three chest stab wounds, one abdominal wound, and evisceration.
【Past Medical History】 None
【Allergy】 None 【Meds】 None
【Vital signs】 GCS E3V4M5, BT 36.5℃, HR 150/min, BP 103/64 mmHg, SpO2 100% (10 LRM),tachypnea.

【CT】

Evisceration

Intraperitoneal fluid

Prolonged shock vitals
Laparotomy required

Procedure

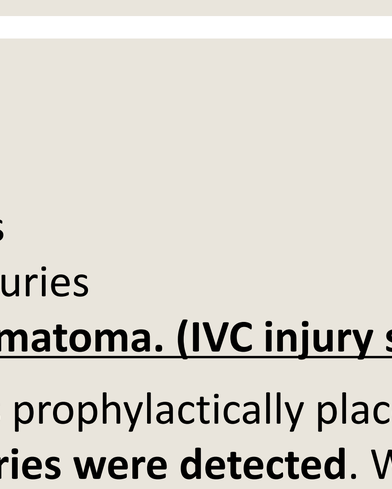
Laparotomy showed;
- Small bowel injuries
- Transverse colon injuries
- **Retroperitoneal hematoma. (IVC injury suspected)**

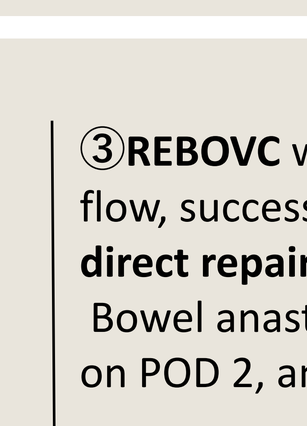
①**REBOA** catheter was prophylactically placed in Zone I.
②**Severe IVC wall injuries were detected**. While the right common iliac vein (CIV) was clamped, and the left CIV was manually compressed, **bleeding from the central side remained uncontrolled.**

③**REBOVC** was placed infrarenal IVC to occlude the central flow, successfully **isolating the injury site and allowing IVC direct repair.**
Bowel anastomosis and abdominal closure were performed on POD 2, and the patient was discharged on POD 18.

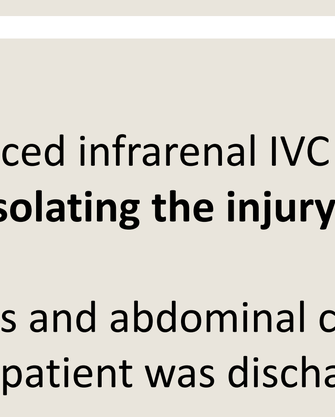
Operation time：3h 41min
Blood loss: 7233ml
Transfusion : RBC(5880ml)
FFP(5040ml) PC(200ml)

RTS＝6.6132 ISS 25
TRISS Ps＝91.7％

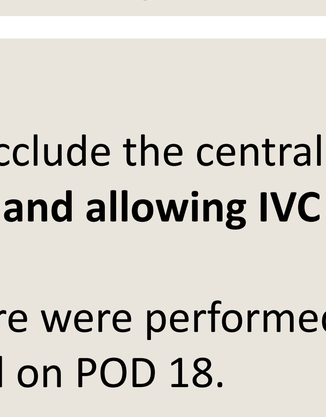




【REBOVC inflation in IVC】



【IVC injury site】



【Repaired IVC injury】

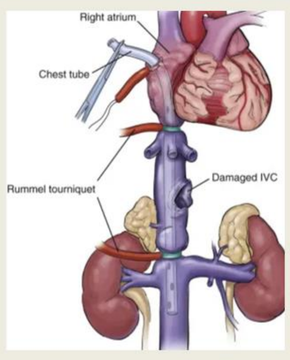
Discussion

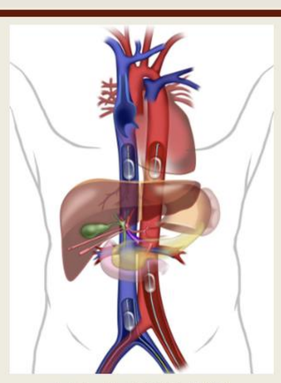
There is no definitive treatment for IVC injuries. Options include direct repair, IVC ligation, and gauze packing (damage control surgery). IVC ligation was independently associated with AKI, DVT, and fasciotomy(3). **Direct repair is preferred for unstable penetrating injuries, but controlling hemorrhage can be difficult due to anatomical challenges** (4). Devices known for controlling hemorrhage aside from direct compression of the IVC include the **Atriocaval Shunt** and **REBOVC**.

【Primary direct repair】
Difficult bleeding control
↓
Consider using hemorrhage control devices

Complete hemorrhage control is difficult due to persistent venous return from sources such as the lumbar veins. In this case, hemorrhage was partially controlled using REBOVC, and the IVC injury was repaired.

【Hemorrhage Control Devices】





	Atriocaval Shunt	REBOVC
Pros	Useful for retrohepatic injuries. Less venous congestion.	Rapid deployment. Less invasive.
Cons	Requires thoracotomy and time to establish	No clear inflation guidelines. Risk of venous congestion.

Conclusion

While REBOVC, which involves placing REBOA in the IVC, is still a relatively unknown technique, it may be more effective with REBOA.

References

1. Sergio Huerta. injuries. *Am Surg.* 2006; **72**: 290–6.
2. Wikström, Maria. Journal of Trauma and Acute Care Surgery January 2020.
3. P.L. van Rooyen. Clinical research study | Venous injuries 7, 2019
4. Saskya Byerly. Injury, 2015-01-01, Volume 46, Issue 1,