戦略会議

IABOをどのように使うか

2013年4月15日
Boston

IABO : intra-aortic balloon occlusion

機材自体は古い（朝鮮戦争の報告）

外傷症例報告も1980年代から少し出てきたが、それ以降は散見のみ

開胸下crossclampがfirst choiceだったところに選択肢としてあがった

REBOA : resuscitative endovascular balloon occlusion of the aorta

2011年以降蘇生処置法として名前が提唱された

最近、本邦ではIABO花盛り

ここ５年間で検索すると

医中誌 『IABO』 １１５件 『IABO 外傷』 ４７件

『REBOA』 １件 『REBOA 外傷』 １件

Medline [IABO] ９ [IABO trauma] 4

[REBOA] 24 [REBOA trauma] 19

どの文献でもreferenceとして出てくるのが、

1,The Journal of Trauma: Injury, Infection, and Critical Care: Volume 68(4), April 2010, pp 942

Intra-Aortic Balloon Occlusion to Salvage Patients With Life-Threatening Hemorrhagic Shocks From Pelvic Fractures

Martinelli, Thomas MD;Grenoble University Hospital, Grenoble, France.

2,Stannard A, Eliason JE, Rasmussen TE. Resuscitative endovascular balloon occlusion of the aorta (REBOA) as an adjunct for hemorrhagic shock. *J Trauma*. 2011; 71 (6): 1869–1872.

3, J **Trauma** Acute Care Surg. 2013 Sep;75(3):506-11.

A clinical series of resuscitative endovascular balloon occlusion of the aorta for hemorrhage control and resuscitation.

Brenner ML ,

The Journal of Trauma: Injury, Infection, and Critical Care
Issue: Volume 68(4), April 2010, pp 942-948

Intra-Aortic Balloon Occlusion to Salvage Patients With Life-Threatening Hemorrhagic Shocks From Pelvic Fractures

Martinelli, Thomas MD;Grenoble University Hospital, Grenoble, France.

From 1998 to 2007　骨盤骨折2064患者中CUHS13例でIABO使用
70mmHg以上BP上昇　12/13でアンギオへ行けた。
92%で動脈損傷あり　9症例で塞栓術の利益があった。
survival rate 46%　inflation時間とISSが影響

TABLE 4. Comparison Between Survivors and Nonsurvivors IABO

	Survivors (n = 6)	Nonsurvivors (n = 7)	Level of Significance, *p*
Age (yr)	46	38	0.321
ISS	38	58	0.011
Revised Trauma Score	4.362	4.779	0.761
Glasgow Coma Scale value	12	11	0.883
Probability of nonsurvival (%)	54.3	66.8	0.429
Time from injury to IABO (min)	238	164	0.344
Time from admission to IABO (min)	121	100	0.665
Time of inflation (min)	46	91	0.026
Physiological status before IABO			
SBP (mm Hg)	43	39	0.763
Heart rate (beats/min)	103	128	0.271
RBC (units)	17	20	0.626

Stannard A, Eliason JE, Rasmussen TE. Resuscitative endovascular balloon occlusion of the aorta (REBOA) as an adjunct for hemorrhagic shock. *J Trauma*. 2011; 71 (6): 1869–1872.

REBOAの名前を提唱

バルーンの留置位置や挿入手順を明記

Zone1(subclavian a.- celiac a.)

Zone3(infrarenal a.-bifurcation)

Zone2はその間（no-occlusion zone)

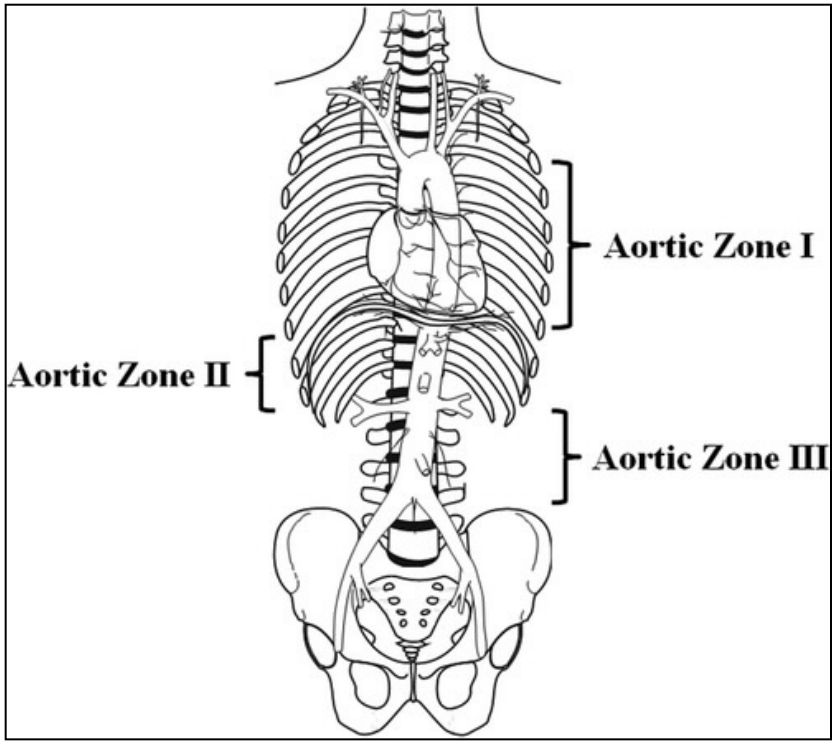
EAST開催の講習会の紹介

限界：

動脈内操作の危険性は全て含む

→ 他の手法がない場合に行われるべきもの

Figure 1.



Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) as an Adjunct for Hemorrhagic Shock.
Stannard, Adam; Eliason, Jonathan; Rasmussen, Todd

Journal of Trauma-Injury Infection & Critical Care.
71(6):1869-1872, December 2011.
DOI: 10.1097/TA.0b013e31823fe90c

Figure 1. Aortic zones related to REBOA. Zone I extends from the origin of the left subclavian artery to the celiac artery and is a potential zone of occlusion. Zone II extends from the celiac artery to the lowest renal artery and is a no-occlusion zone. Zone III exists from the lowest renal artery to the aortic bifurcation. REBOA in this zone may provide particular utility for instances of pelvic and junctional femoral (contralateral) hemorrhage.6

December 2012 to March 2013
J **Trauma** Acute Care Surg. 2013 Sep;75(3):506-11.
A clinical series of resuscitative endovascular balloon occlusion of the aorta for hemorrhage control and resuscitation.
Brenner ML ,
December 2012 to March 2013 the University of Maryland, R. Adams Cowley Shock**Trauma** Center, Baltimore, Maryland, and Herman Memorial Hospital, The Texas **Trauma** Institute, Houston, Texas.

blunt (n = 4) and penetrating (n = 2)
3例Zone1 3例Zone3
direct cutdown (n = 3) and percutaneous (n = 3)
the mean (SD) aortic occlusion time was 18 (34) minutes
There were no **REBOA**-related complications, and there was no hemorrhage-related mortality.

TABLE 1

Patient	1	2	3	4	5	6
Age, y	62	24	59	25	40	27
Sex	Male	Male	Male	Male	Male	Female
Mechanism of injury	MVC	GSW	GSW	MVC	MCC	ATV collision
Injury Severity Score (ISS)	28	50	9	25	48	43
SBP before REBOA, mm Hg	70	70	0	60	70	85
Cardiac arrest before REBOA	No	No	Yes	No	No	No
SBP after REBOA, mm Hg	135	122	100	110	130	125
Admission base deficit	12	4	NA	16	14	19
Time to occlusion, min	5	4	4	6	6	6
Time of occlusion, min	12	16	70	60	65	36
Surgery after REBOA	No	Yes	Yes	Yes	Yes	Yes
Pelvic embolization after REBOA	Yes	Yes	No	No	Yes	Yes
Complication of REBOA	No	No	No	No	No	No
Outcome	Alive	Alive	Alive	Alive	Brain death	Death (care withdrawn)

ATV, all-terrain vehicle; GSW, gunshot wound; MCC, motorcycle collision; MVC, motor vehicle collision; NA, not applicable.

A clinical series of resuscitative endovascular balloon occlusion of the aorta for hemorrhage control and resuscitation.
Brenner, Megan; Moore, Laura; DuBose, Joseph; Tyson, George; McNutt, Michelle; Albarado, Rondel; Holcomb, John; Scalea, Thomas; Rasmussen, Todd

Journal of Trauma and Acute Care Surgery. 75(3):506-511, September 2013.
DOI: 10.1097/TA.0b013e31829e5416

TABLE 1 Demographics and Summary of REBOA Use in Six Patients

C1 MVA 骨盤骨折
C2 gunshot 右腎損傷　腰椎損傷　腰動脈損傷
C3 gunshot 骨盤骨折　総腸骨静脈損傷
C4 MVA 骨盤骨折(open book)
C5 motorcycle　頭部外傷　脾損傷　骨盤骨折
C6 RV事故 骨盤骨折APcomp.

合併症なし　C5/6 2例のbrain death以外は生存

J Trauma Acute Care Surg
136 Volume 78, Number 1,2014
Evaluation and management of blunt traumatic aortic injury: a practice management guideline from the Eastern Association for the Surgery of Trauma.
Nicole Fox, MD,
1998から2013のsystematic review
EAST2000以降もguideline改定
造影胸部CTのBTAIの有用性
血管内修復の有用性
delayed repairの場合の血圧コントロールの有用性

January 15, 2015
Paper 11
8:00 am
CENTRAL AORTIC WIRE CONFIRMATION FOR REBOA DEPLOYMENT: AS FAST AS THE FAST
Sundeep Guliani, MD*, Michael Amendola, Mack Hendrix, Adam McLaurin, DO,
Gordon Morano, Brian Strife, Jeffrey Elbich, Francisco Albuquerque,
Daniel Komorowski, Malcolm Sydnor, Mark Levy
Virginia Commonwealth University

Irahara et al. World Journal of Emergency Surgery 2015, 10:1

Retrospective study of the effectiveness of
Intra-Aortic Balloon Occlusion (IABO) for
traumatic haemorrhagic shock

retrospective observation study January 2009 and March 2013
14症例
５例生存　９例死亡
生存例と死亡例の比較
RTS PsがP<0.04
輸血量とinflate時間が少ない
決定的治療までの素早い治療が結果を決める
合併症：１４例では生じていない
動物モデルでの合併症報告の記載

〈結論〉
初療からCUHS　→　可及的速やかに大腿動脈シース確保（4Fr.程度）
(near)CPAだとcrossclampも選択肢
　※CUHS　ショックをもたらす出血が目撃されていること（直視、FAST等)

・腹部外傷に対する止血としての手段
　当院での治療上現在のstrategyに問題がない

・骨盤腔内に対する止血としての手段
　腔内出血であればpacking – TAE等治療手段がある
　有効な手段がある場合はそちらを用いる
　骨盤開放骨折の場合有効な出血コントロール手段 (Zone3留置）

Crossclamp vs REBOA
Pubmed　文献なし
日血外会誌で1999に三重大の先生の報告
開胸５±４分　IABO３５±５分
特徴をとらえて行う

近年の変化は、
デバイスの変化：細径デバイス 7Fr.
トレーニングコース