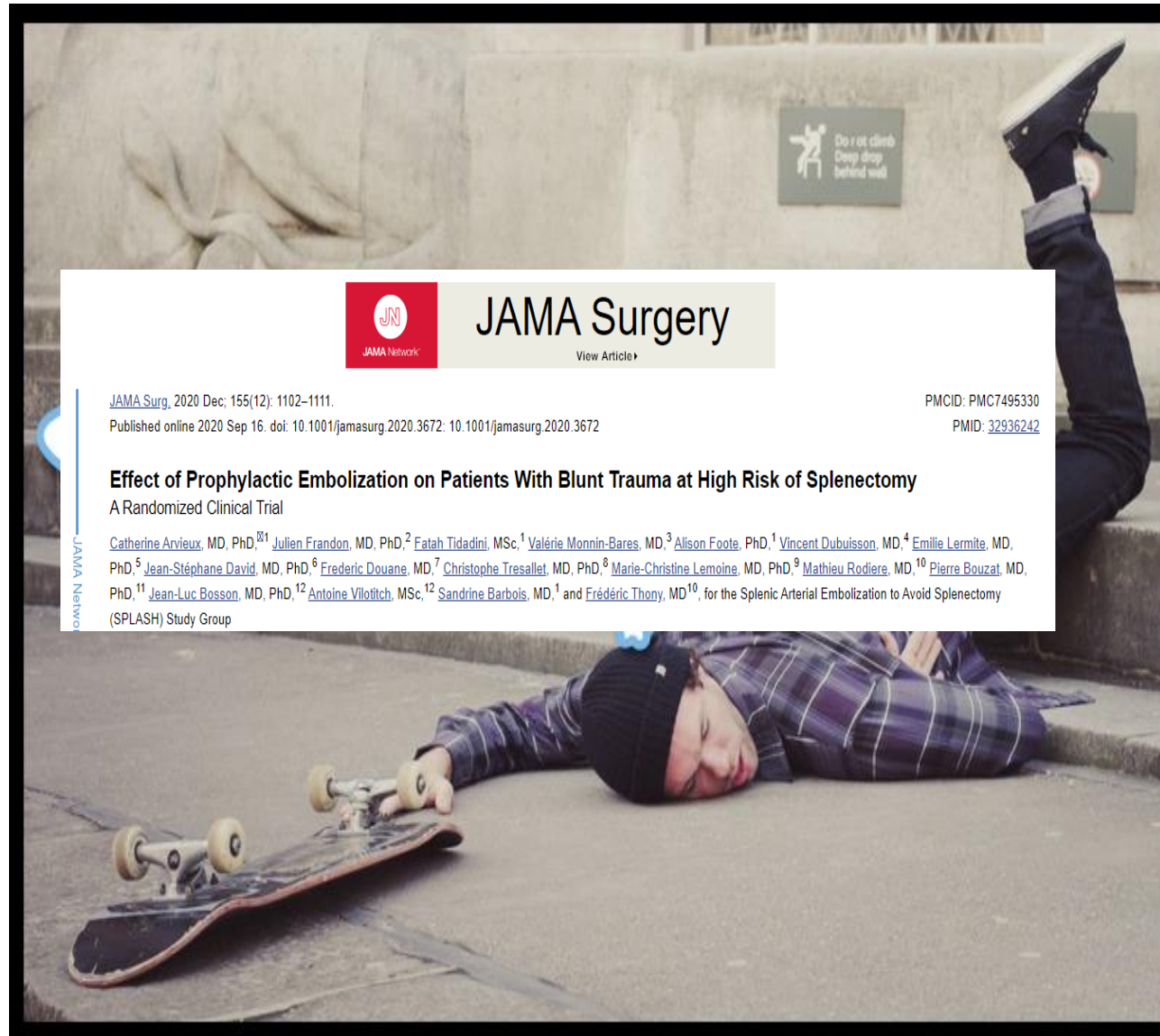


Interventional Radiology in Trauma – updates and trends

DFIRs årsmøde 2022

Mikkel Taudorf, MD, PhD, Ass. Prof, Rigshospitalet, København



Spleen injuries - introduction

- The most commonly injured organ in blunt abdominal trauma
- With increase in CT, more low grade injuries are being diagnosed

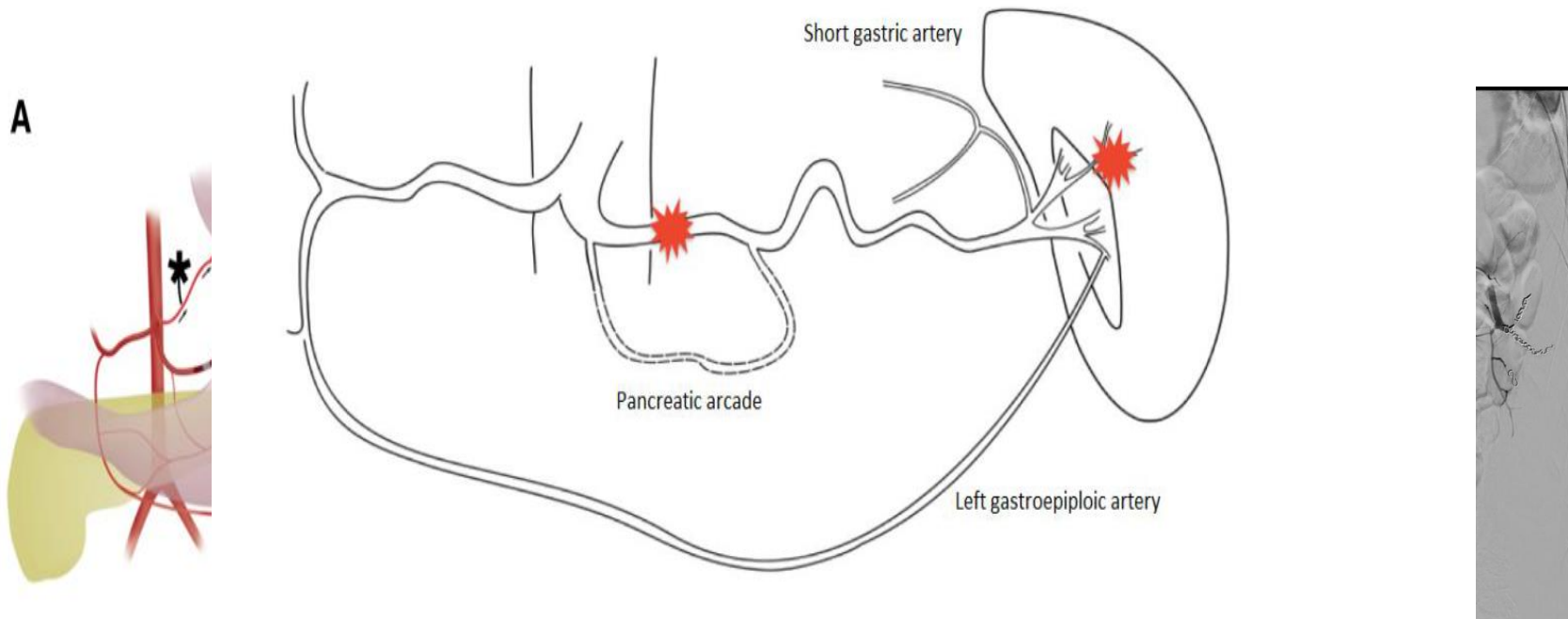
Spleen injuries - NOM

- “The advantages of NOM over OM were described as lower hospital costs, avoidance of non-therapeutic laparotomies, lower rates of intra-abdominal complications and of blood transfusions, lower mortality and the maintenance of the immunological function, and the prevention of OPSI.”
- Angioembolization - To decrease the failure rate of NOM

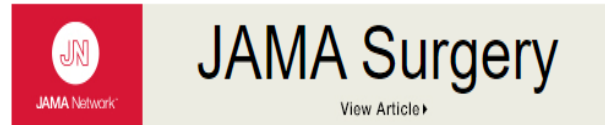
“WSES guidelines”

Spleen injuries – Angioembolization - techniques

Combined Embolization:



Spleen injuries – Angioembolization - RCT



[JAMA Surg.](#) 2020 Dec; 155(12): 1102–1111.

PMCID: [PMC7495330](#)

Published online 2020 Sep 16. doi: [10.1001/jamasurg.2020.3672](#); [10.1001/jamasurg.2020.3672](#)

PMID: [32936242](#)

Effect of Prophylactic Embolization on Patients With Blunt Trauma at High Risk of Splenectomy

A Randomized Clinical Trial

[Catherine Arvieux](#), MD, PhD,¹ [Julien Frandon](#), MD, PhD,² [Fatah Tidadini](#), MSc,¹ [Valérie Monnin-Bares](#), MD,³ [Alison Foote](#), PhD,¹ [Vincent Dubuisson](#), MD,⁴ [Emilie Lermite](#), MD, PhD,⁵ [Jean-Stéphane David](#), MD, PhD,⁶ [Frederic Douane](#), MD,⁷ [Christophe Tresallet](#), MD, PhD,⁸ [Marie-Christine Lemoine](#), MD, PhD,⁹ [Mathieu Rodiere](#), MD,¹⁰ [Pierre Bouzat](#), MD, PhD,¹¹ [Jean-Luc Bosson](#), MD, PhD,¹² [Antoine Vilotitch](#), MSc,¹² [Sandrine Barbois](#), MD,¹ and [Frédéric Thony](#), MD¹⁰, for the Splenic Arterial Embolization to Avoid Splenectomy (SPLASH) Study Group

JAMA Network

Spleen injuries – Angioembolization - RCT

- **Importance** Splenic arterial embolization (SAE) improves the rate of spleen rescue, yet the advantage of prophylactic SAE (pSAE) compared with surveillance and then embolization only if necessary (SURV) for patients at high risk of spleen rupture remains controversial.
- **Objective** To determine whether the 1-month spleen salvage rate is better after pSAE or SURV.

Spleen injuries – Angioembolization - RCT

Inclusion criteria:

- Patients over 18 and under 75 years
- Hemodynamically stable patients (systolic BP ≥ 90 mmHg and absence of hemorrhagic shock)
- Closed splenic trauma within less than 48 hours
- High risk of splenectomy:
 - Moore grade 4 or 5 spleen damage on injected abdominal computed tomography or
 - Moore grade 3 spleen damage and at least one of the following characteristics:
 - large hemoperitoneum (when visible at the pelvic level)
 - associated serious damage NISS - New Injury Severity Score greater than or equal to 15
- Patient volunteering to participate in the study, having signed the consent form or with the agreement of the family if the patient is not able to give consent, after adequate information and delivery of the patient information document.
- Person affiliated with a social security scheme and/or beneficiary of such a scheme

Spleen injuries – Angioembolization - RCT

III-3 Non-inclusion criteria

- Patients who are resident outside of the EU
- Patient with hemodynamic instability (Systolic blood pressure <9 despite resuscitation)
- Patient with open splenic trauma
- Patient with an indication for surgery preventing the possibility of monitoring splenic trauma
- Patient with indication for embolization of another organ other than the spleen
- Patient with indication for splenic embolization due to post-traumatic vascular abnormality (active contrast agent leakage, pseudoaneurysm or early splenic arteriovenous fistula).
- Patients under 18 and ≥ 75 years of age
- Patient with a previously pathological spleen (tumor, infection, intrasplenic vascular abnormality)
- Patient with Grade 1-2 trauma
- Patient with grade 5 trauma with total ischemia of the spleen
- Patient who had partial or complete splenectomy before inclusion
- Patient with acquired or innate immune deficiency
- All contra-indications to the realization of an embolisation
- Pregnant woman
- Person deprived of liberty by judicial or administrative decision, person subject to a legal protection measure
- Patient currently in a clinical trial or who participated in a clinical trial in the month prior to inclusion
- Patient with a mental or psychiatric disorder, or a history of such, or any other factor limiting their ability to participate in an informed manner and to adhere to the protocol
- Patient with acquired or innate hemostasis abnormality (anticoagulant therapy)

Spleen injuries – Angioembolization - RCT

- Primary End Points:
 - >50% vascularized parenchyma detected on arterial CT and no splenectomy at 1 mth
- Secondary End Points:
 - Death; splenectomy; vascular spleen abnormalities; need for urgent embolization or reembolization; hemorrhagic, infectious, and thromboembolic complications; length of hospital stay; spleen rescue rate at 6 months; total time off work or studies; and physical activity.

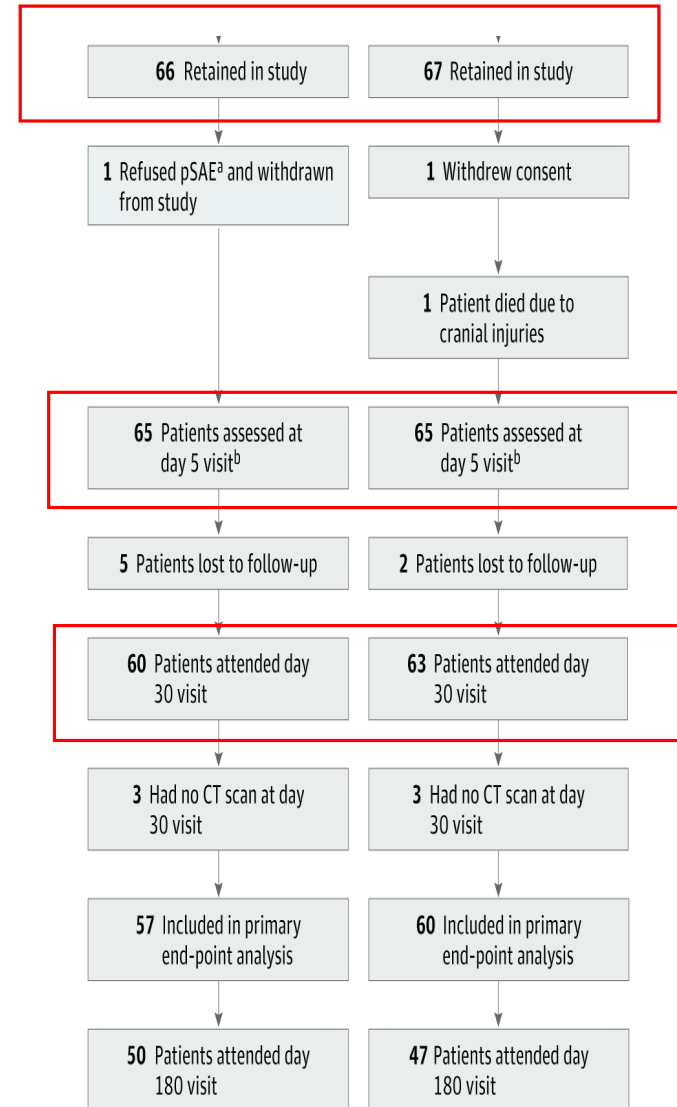
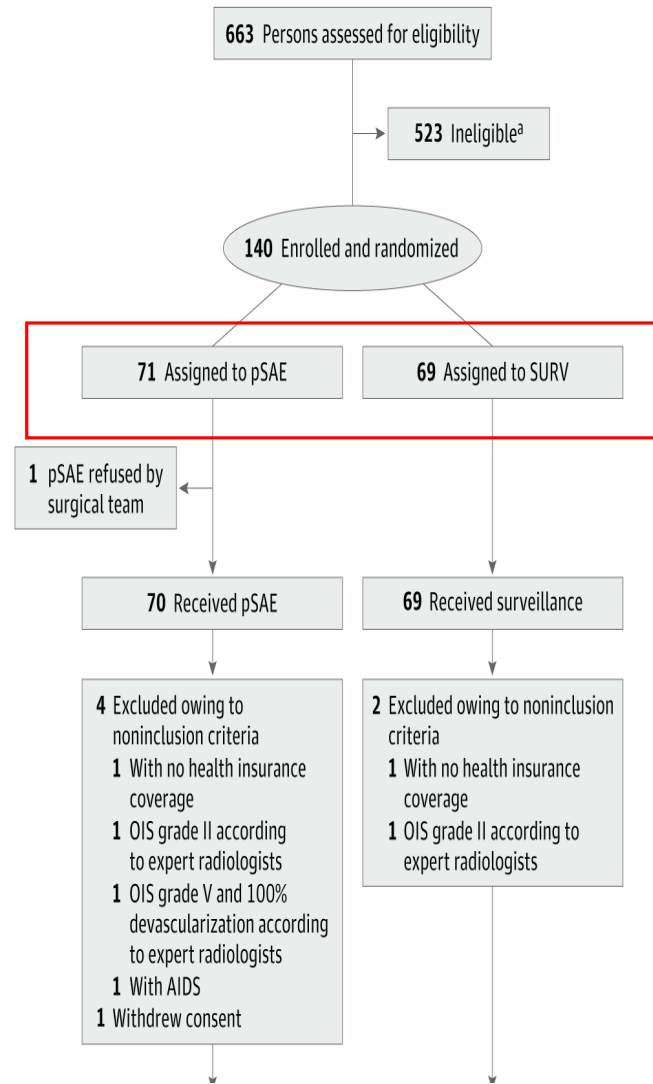
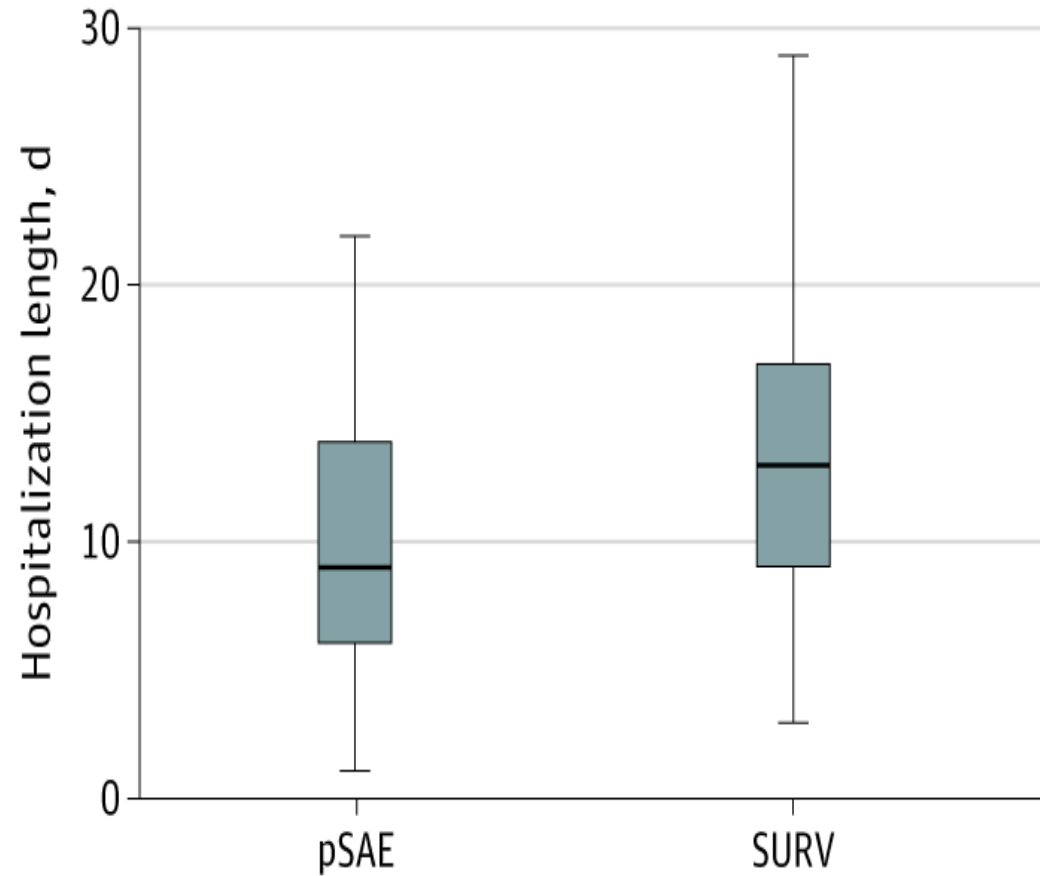


Table 3. Complications Reported at Day 5 Visit and at Month 1 Visit

Type of complication	Patients at day 5 visit, No. (%) ^a				Patients at month 1 visit, No. (%) ^b			
	Total (N = 130)	pSAE (n = 65)	SURV (n = 65)	P value	Total (N = 122)	pSAE (n = 59)	SURV (n = 63)	P value
Need for splenic embolization	20 (15.4)	1 (1.5)	19 (29.2)	<.001	4 (3.3)	1 (1.7)	3 (4.8)	.62
Due to SAE procedure								
Hematoma on femoral access	1 (0.8)	1 (1.5)	0	>.99	1 (1.3) ^c	1 (1.7)	0 ^d	>.99
Thrombosis on femoral access	1 (0.8)	1 (1.5)	0	>.99	0 ^c	0	0 ^d	NA
Aneurysm on femoral access	1 (0.8)	1 (1.5)	0	>.99	1 (1.3) ^c	1 (1.7)	0 ^d	>.99
Allergy to contrast agent	0	0	0	NA	0	0	0	NA
Kidney insufficiency	0	0	0	NA	0	0	0	NA
Splenic								
Abscess	0	0	0	NA	0	0	0	NA
Splenectomy	3 (2.3)	0	3 (4.6)	.12	1 (0.8)	0	1 (1.6)	.52
Arteriovenous fistula	2 (1.5)	0	2 (3.1)	.50	2 (1.6)	1 (1.7)	1 (1.6)	>.99
Pseudoaneurysm	9 (6.9)	1 (1.5)	8 (12.3)	.03	3 (2.5)	0	3 (4.8)	.25
Pseudocyst	1 (0.8)	1 (1.5)	0	>.99	1 (0.8)	0	1 (1.6)	>.99
Hemorrhagic								
Decrease in hemoglobin >3 g/dL with an identified bleeding site or a decrease in hemoglobin >4 g/dL without an identified bleeding site	18 (13.8)	7 (10.8)	11 (16.9)	.31	3 (2.5)	0	3 (4.8)	.25
Transfusion	15 (11.5)	7 (10.8)	8 (12.3)	>.99	2 (1.6)	0	2 (3.2)	.50
No. of packed RBC units transfused, median (IQR)	2 (2-4)	2 (1-3)	2 (2-5)	.13	5 (4-6)	0	5 (4-6)	NA
Infectious								
≥1 Infectious complications	4 (3.1)	3 (4.6)	1 (1.5)	.62	4 (3.3)	1 (1.7)	3 (4.8)	.62
Septicemia	1 (0.8)	1 (1.5)	0	>.99	2 (1.6)	0	2 (3.2)	.50
Pancreatic								
Pancreatitis	0	0	0	NA	2 (1.6)	0	2 (3.2)	.50
Thrombotic								
Thrombosis of splenoportal trunk	1 (0.8)	0	1 (1.5)	>.99	0	0	0	NA
Phlebitis	0	0	0	NA	1 (0.8)	0	1 (1.6)	NA
Pulmonary embolism	2 (1.5)	1 (1.5)	1 (1.5)	>.99	1 (0.8)	0	1 (1.6)	NA
Pulmonary								
Pleural effusion	11 (8.5)	5 (7.7)	6 (9.2)	.75	4 (3.3)	2 (3.4)	2 (3.2)	>.99
Thoracic drain if pleural effusion	5 (3.8)	2 (3.1)	3 (4.6)	>.99	1 (0.8)	0	1 (1.6)	>.99
Pulmonary infection	5 (3.8)	4 (6.2)	1 (1.5)	.37	2 (1.6)	1 (1.7)	1 (1.6)	>.99
≥1 Complications (all)	46 (35.4)	19 (29.2)	27 (41.5)	.14	23 (18.9)	11 (18.6)	12 (19.0)	.96

Spleen injuries – Angioembolization - RCT



Spleen injuries – Angioembolization - RCT

Conclusions

For hemodynamically stable patients with splenic trauma at high risk of rupture, there was no significant difference in the rates of splenic rescue and complications or in their effects on activities between immediate pSAE and SURV with SAE performed only if necessary. A significant proportion of patients in the SURV group needed SAE (in particular, those with higher OIS grade splenic injuries). Performing control CT scans on about day 5 and day 30, with SAE if necessary seems to provide a good rate of spleen salvage for trauma patients at high risk of splenic rupture, but the practice needs to be validated in further studies.

Trauma resuscitation room + CT?



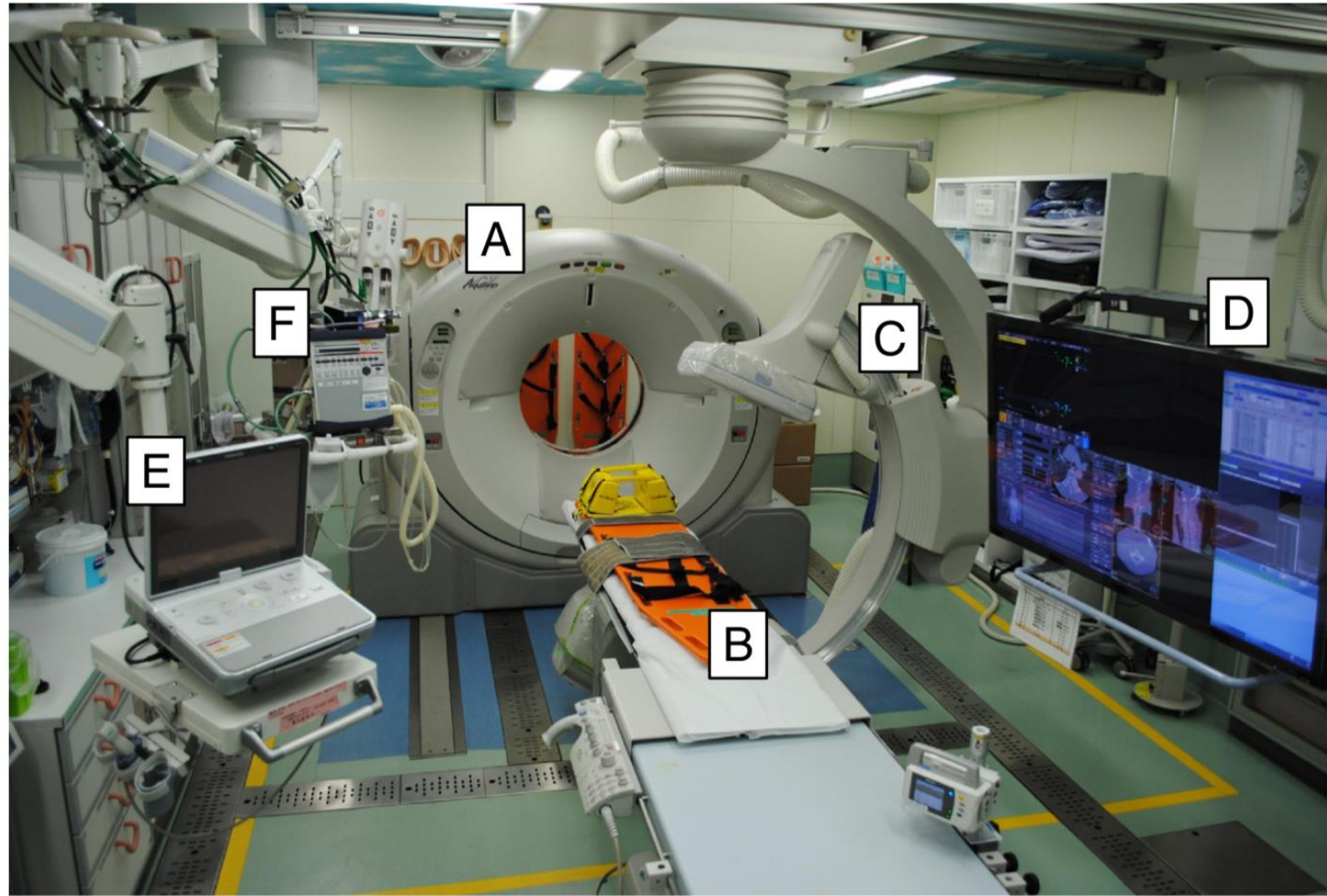


Figure 1 Photograph showing the IVR-CT system in our emergency room. All life-saving procedures including airway management, emergency surgery, and TAE can be performed on the table without relocating the patient. (A) sliding CT scanner, (B) CT examination and intervention table, (C) moveable C-arm, (D) 56-inch monitoring screen, (E) ultrasonography equipment, and (F) mechanical ventilator.

ORIGINAL ARTICLE

OPEN

The Survival Benefit of a Novel Trauma Workflow that Includes Immediate Whole-body Computed Tomography, Surgery, and Interventional Radiology, All in One Trauma Resuscitation Room

A Retrospective Historical Control Study

Takahiro Kinoshita, MD, Kazuma Yamakawa, MD, PhD,* Hiroki Matsuda, MD,* Yoshiaki Yoshikawa, MD,*
Daiki Wada, MD, PhD,† Toshimitsu Hamasaki, PhD,‡ Kota Ono, MPH,§ Yasushi Nakamori, MD, PhD,†
and Satoshi Fujimi, MD, PhD**

TABLE 2. Overall Mortality and Adjudicated Cause of Death by the Period From Admission

	Conventional (n = 360)	Hybrid ER (n = 336)	<i>P</i>
24-h mortality	49 (14%)	31 (9%)	0.070
Exsanguination	29 (8%)	11 (3%)	0.007
TBI	20 (6%)	18 (5%)	0.91
MODS	0 (0%)	0 (0%)	
Sepsis	0 (0%)	0 (0%)	
Respiratory	0 (0%)	2 (1%)	0.23
Others	0 (0%)	0 (0%)	
28-day mortality	78 (22%)	51 (15%)	0.028
Exsanguination	29 (8%)	11 (3%)	0.007
TBI	45 (13%)	32 (10%)	0.21
MODS	4 (1%)	1 (0%)	0.37
Sepsis	0 (0%)	2 (1%)	0.23
Respiratory	0 (0%)	2 (1%)	0.23
Others	0 (0%)	3 (1%)	0.11

Data are expressed as numbers (%).

ER indicates emergency room; MODS, multiple organ dysfunction syndrome; TBI, traumatic brain injury.

