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Acute Complications during CICC placements

Big vessels dammmages

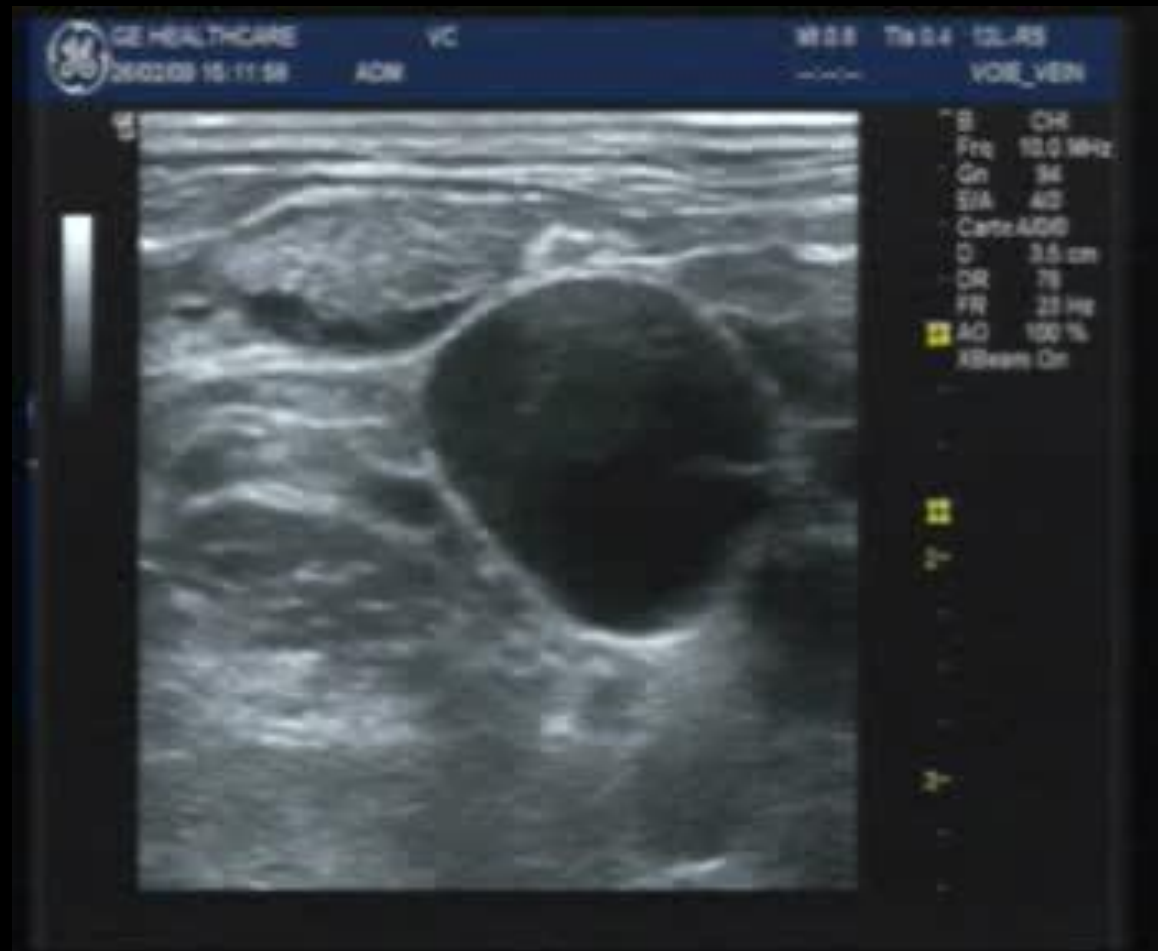


It does not happen only to the
others!...

Mary

- Self examination, small mass, mammography
- Breast tumor,
- Partial mastectomy, axillary node -, → adjuvant chemotherapy
- Port a cath in jugular vein
- Michele. Junior Resident. Few months before the end of her education of gynecologic surgeon.

Ponction with US



- Introducer advanced with only a small resistance,
- Discovery of pulsatile red flow
- Ask to the nurse in operating room to call senior surgeon
- Unfrequent problem but not really important
- Remove devices and compress
- Mary does not answer any more to Michele's questions
- Mary breath with difficulties
- Anesthesiologist called, diagnoses coma (glasgow 7), put a tracheal tube
- Angio CT scan, massive stroke attack, fibrinolysis,
- Mary's Death
- Michele, Senior Surgeon Nurse -> 2 nights in jail

Anesthesia Closed Claims USA

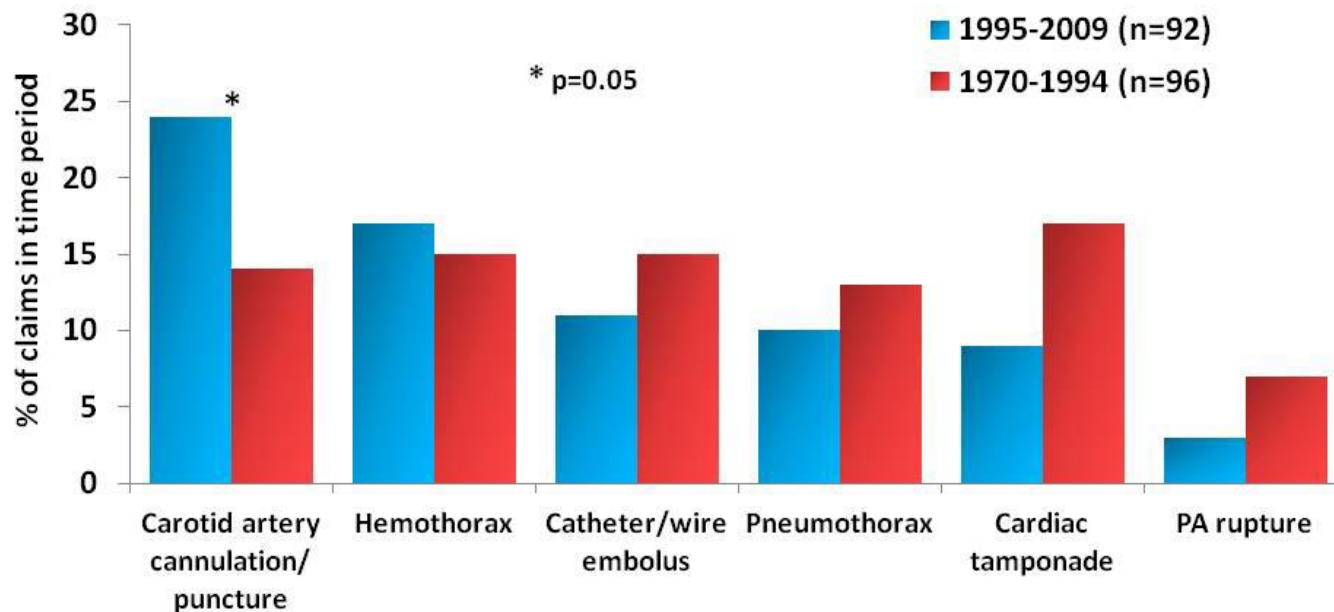
1970-1994

Table 2. Severity of Injury, Standard of Care, and Payment by Type of Central Catheter Complication (n = 110)

Type of Complication	No.	Death		Substandard Care		Payment Made		Median Payment, \$	Range of Payment, \$
		No.	%	No.	%*	No.	%*		
Wire/catheter embolus	20	1	5†	14	82†	7	85	39,725†	654-132,500
Cardiac tamponade	16	13	81†	5	42	11	69	160,245	34,499-6,912,000
Carotid artery puncture/cannulation	16	5	31	4	31	7	54	40,870	12,975-527,000
Hemothorax	15	14	93†	4	27	8	62	297,000	17,850-1,435,293
Pneumothorax	14	3	21	4	31	4	33	143,250	1,280-208,750
Miscellaneous other vessel injury	8	3	38	2	40	6	75	184,625	1,000-1,717,775
Pulmonary artery rupture	7	7	100†	1	14	3	50	89,600	48,000-152,000
Hydrothorax/pleural effusion	5	2	40	3	100	5	100	110,250	1,604-726,600
Air embolism	4	3	75	2	100	4	100	517,125	304,000-1,076,653
Fluid extravasation in neck	3	1	33	2	67	1	100	444,500	444,500
Other nonvessel injury	2	0	0	0	0	0	0	—	—
All central catheter claims	110	52	47	41	45	66	66	105,500	654-6,912,000

Closed Claims USA

Most Common Central Line Complications



1. Domino et al. Anesthesiology 2004; 100:1411-8.
2. Anesthesiology 2012; 116:539-73.

Claims against NHS 1995-2009

26 claims
20 severe; 10 deaths

14 arterial punctures,
8 carotid punctures; 3 canulations
5 deaths, 3 brain damages

Arterial punctures: 14
Hemopericardium: 4
Pneumothorax: 2
Hemothorax: 1
Nerve injury: 1
Non arterial injury: 1
Non trauma: 5

Litigation related to central venous access by anaesthetists: an analysis of claims against the NHS in England 1995-2009

T. M. Cook

Anaesthesia, 2011, **66**, pages 56-66


Reducing major procedural complications from central venous catheterisation

A. Bodenham

Anaesthesia, 2011, **66**, pages 1-9

Anaesthesia © 2010 The Association of Anaesthetists of Great Britain and Ireland

Analysis of central venous access injuries from claims to the Swedish Patient Insurance Company 2009-2017

Sophie Lindgren¹  | Pelle Gustafson² | Fredrik Hammarskjöld³

Acta Anaesthesiol Scand. 2019;00:1–6.

Type of complication	Avoidable	Unavoidable
Infection	2	13
Catheter-related blood-stream infection	2	6
Local		7
Accidental arterial insertion	3	1
Stroke	2	1
Emboli in the foot	1	
Retained material	4	1
Parts of a SVP	3	
Parts of a t-CVC	1	
Guidewire		1
Bleeding	7	9
With secondary nerv injury	1	
Local bleeding	4	5
Bronchial bleeding		1
Hemothorax	2	3
Pneumothorax	3	12
Trombosis	7	6

87 claims
 Non tunelled CVC , int jug
 Bleeding
 US in 20% of cases

Catheter placed outside the vessel	2	
Mediastinitis	1	
Pleural infusion	1	
Nerve injury	2	4
Accidental intravascular total catheter or guidewire	1	1
Postoperative scar/pain		2
Incorrect positioning of the SVP chamber	2	
Catheter fracture. Extravasation of chemotherapy	1	
Air embolism		1
Perforation of the right atrium		1
Incorrect CVC inserted	1	
No indication inserted for t-CDC	1	

Abbreviations: CVC, Central venous catheter; SVP, Subcutaneous venous port; t-CDC, tunnelled-central dialysis catheter.

TABLE 3 Long-term effect for the patients with avoidable central venous access device complications

Type of long-term effect	Number
Sick leave	
Less than 3 months	10
More than 3 months	8
Degree of invalidity	
1%-15%	15
16%-30%	1
More than 30%	2
Mortality	0

0.2% serious mechanical complications
 20 acc/year

19. Bjorkander M, Bentzer P, Schott U, Broman ME, Kander T. Mechanical complications of central venous catheter insertions: a retrospective multicenter study of incidence and risks. *Acta Anaesthesiol Scand.* 2019;63(1):61-68.

A review of patient safety incidents reported as 'severe' or 'death' from critical care units in England and Wales between 2004 and 2014

A. N. Thomas¹ and J. J. MacDonald²

Anaesthesia 2016, 71, 1013-1023

- 1743 vital accidents
- 50 with vascular access;
 - 27 between 2005 and 2009; 23 between 2010 and 2014
- 14 DL; 6 SC, 17 int Jug
- **13 arterial placements; 2 recognised during the placement;
4 X-Ray nl**
- 6 guide embolies
- 8 secondary dislodgements (hypotension, 2 arrêts cardiaques)
- **14 majors bleedings**
- 4 pneumothorax

A multicentre snapshot study of the incidence of serious procedural complications secondary to central venous catheterisation

R. K. Lathey,¹ R. E. Jackson,² A. Bodenham,³ D. Harper⁴ and V. Patle⁵ on behalf of the Anaesthetic Audit and Research Matrix of Yorkshire (AARMY)

Anaesthesia 2017, 72, 328-334

15 centers, CVC with US,

Table 1 Serious complications relating to central venous catheter insertion as specified in the study design.

Complications requiring intervention	Complications leading to permanent damage
Failure to site an appropriate device at the chosen time	Nerve injury
Pneumothorax	Limb damage secondary to vascular injury
Bleeding requiring surgical referral	Cerebrovascular accident
Bleeding requiring interventional radiology referral	Airway obstruction with hypoxic brain injury
Thrombus requiring anticoagulation	Death
Thrombus requiring thrombolysis	
Cardiac arrhythmia requiring pharmacological management	
Cardiac arrhythmia requiring electrical cardioversion	
Cardiorespiratory arrest with successful resuscitation	
Cardiac tamponade	
Haemothorax	
Haemoperitoneum	
Arterial cannulation	

- 487 CVC , 430 acute CVC
- Placed by anesthesiologist with US
- 3.1% complications:
 - 1.4% failures
 - 0.2%pneumothorax
 - **0.2% hemothorax**
 - **0.2% artérial cannulation**
 - 1,1% others: **carotid punctures without cannulation**, bad placement needed replacement

Arterial trauma during central venous catheter insertion

Guilbert MC, Elkouri S, Bracco D, et al
J Vasc Surg 48:918-925, 2008

13 cases in
Universary Hospital
of Montreal

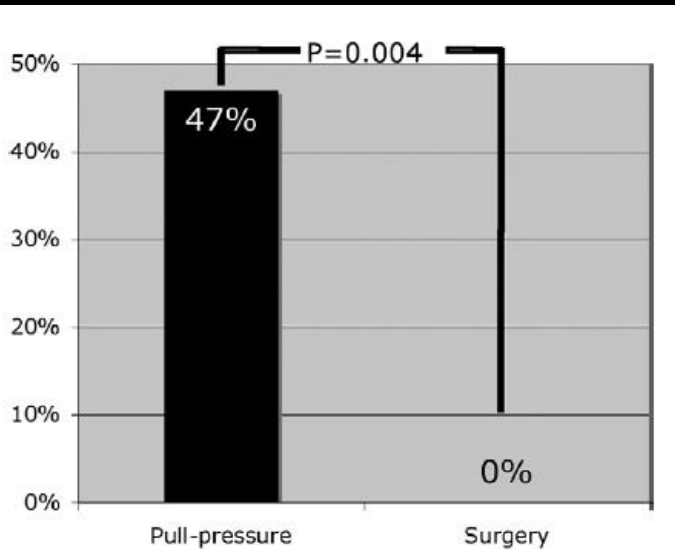
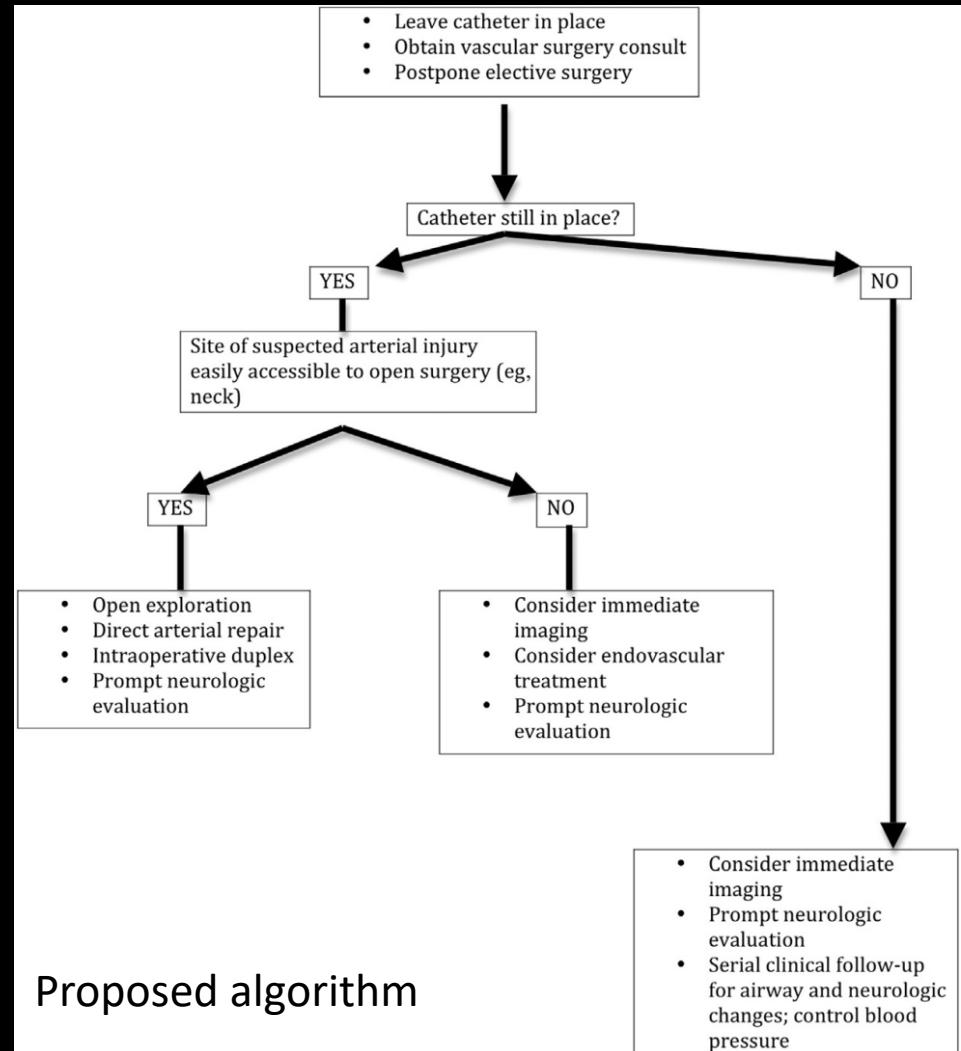


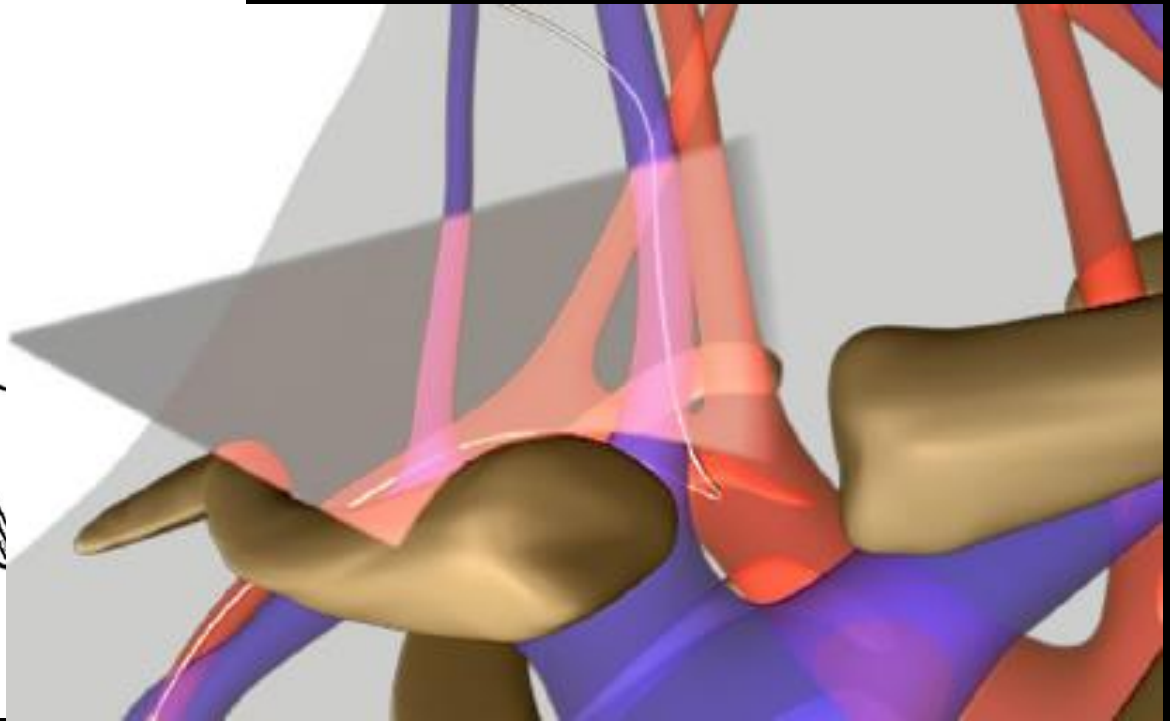
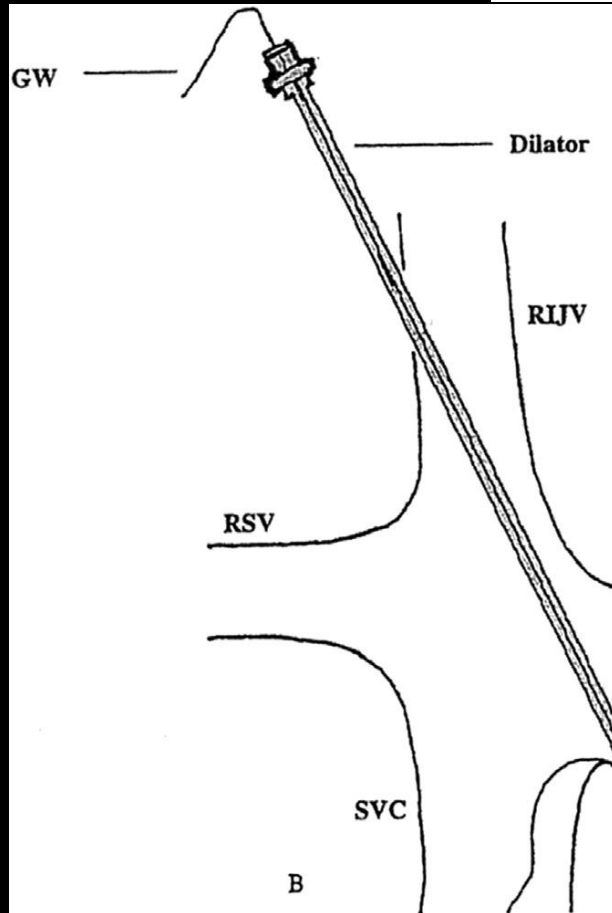
Fig 3. Complications related to differential management of catheter-related cervicothoracic artery injury.

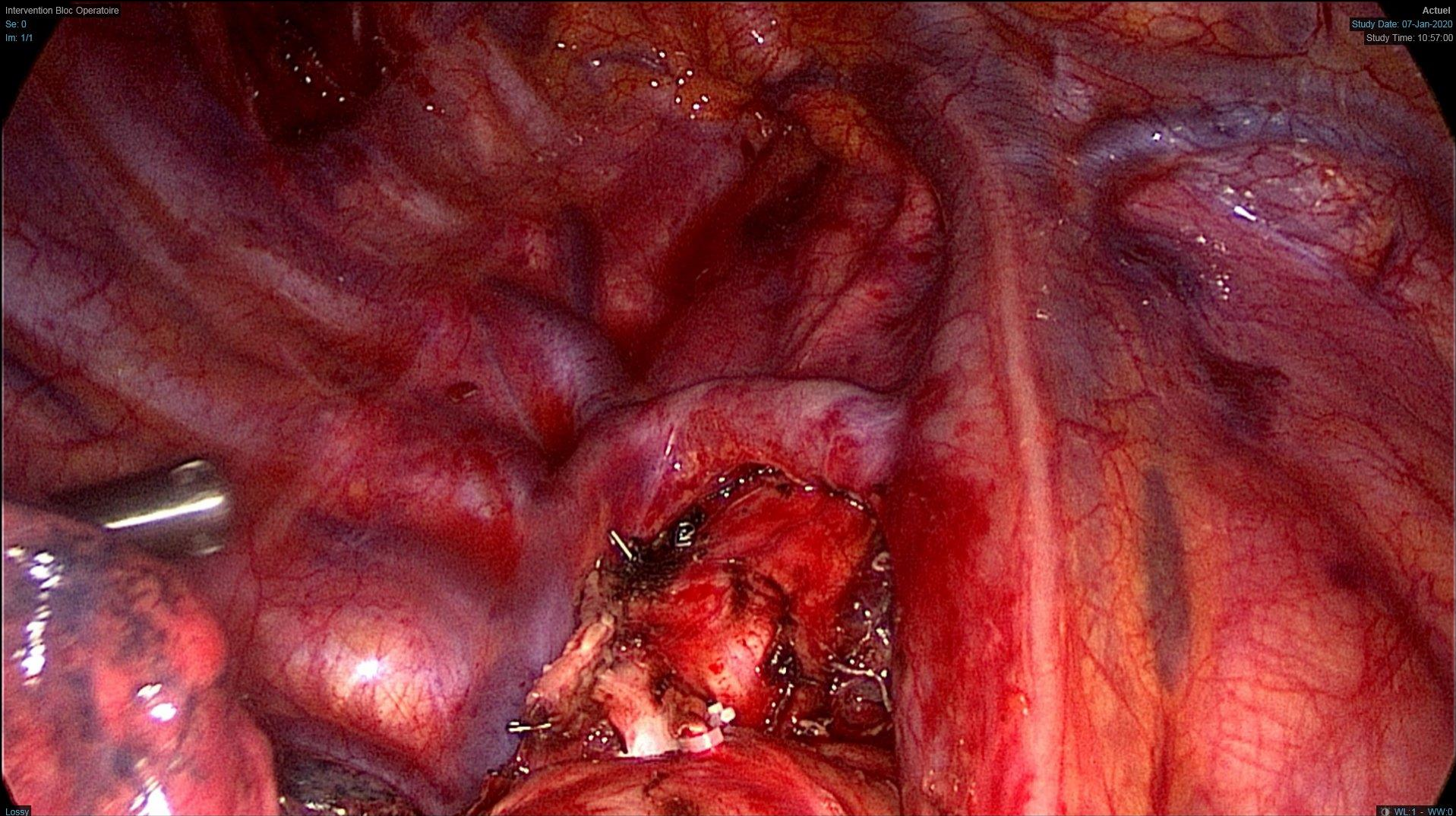


Vascular Complications of Central Venous Catheter Placement: Evidence-Based Methods for Prevention and Treatment

Andrew Bowdle, MD, PhD

Journal of Cardiothoracic and Vascular Anesthesia, Vol 28, No 2 (April), 2014: pp 358–368





Brachiocephalic Vein Perforation During Cannulation of Internal Jugular Vein: A Case Report

Atsushi Kainuma, MD,* Keiichi Oshima, MD,* Chiho Ota, MD,§ Yu Okubo, MD,† Naoto Fukunaga, MD,‡ and Soon Hak Suh, MD*

cases-anesthesia-analgesia

November 1, 2017 • Volume 9 • Number 9

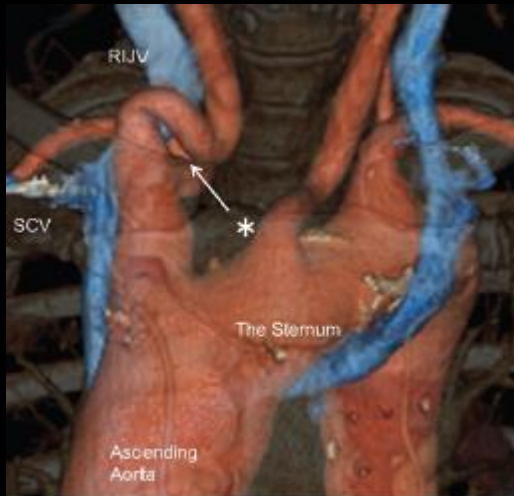


Figure 3. Computed tomographic angiography (front view) showing the tortuous right common carotid artery. *Tortuous common carotid artery. RIJV indicates right internal jugular vein; SCV, subclavian vein.

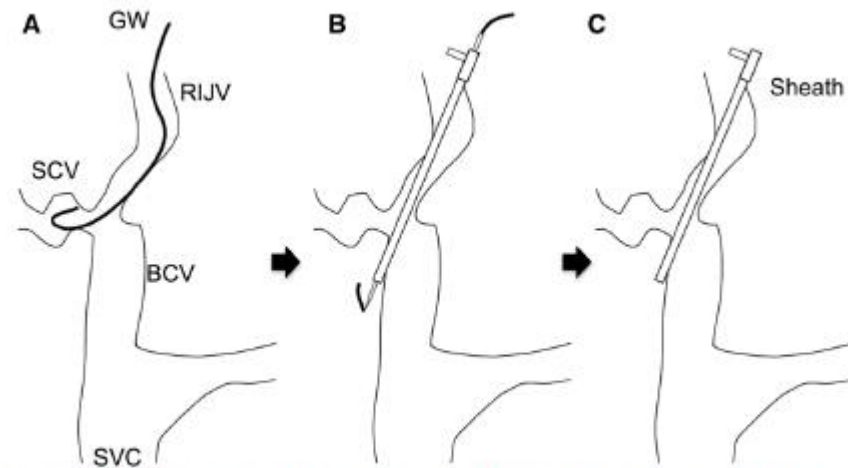
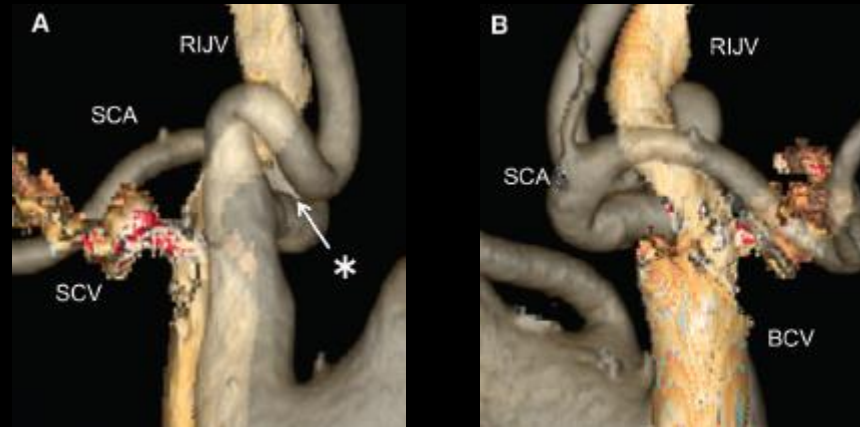
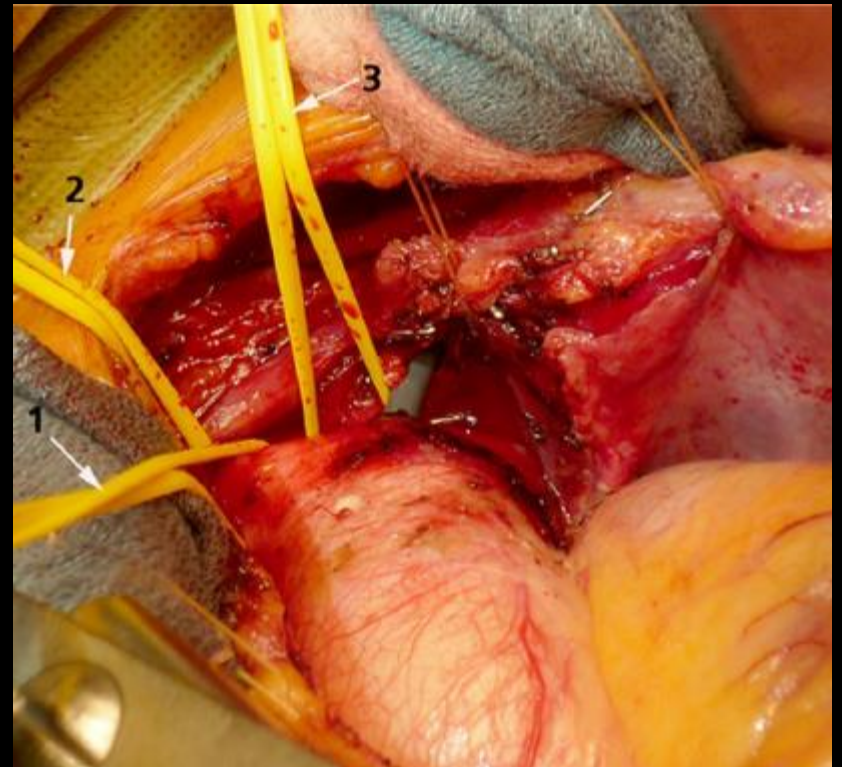
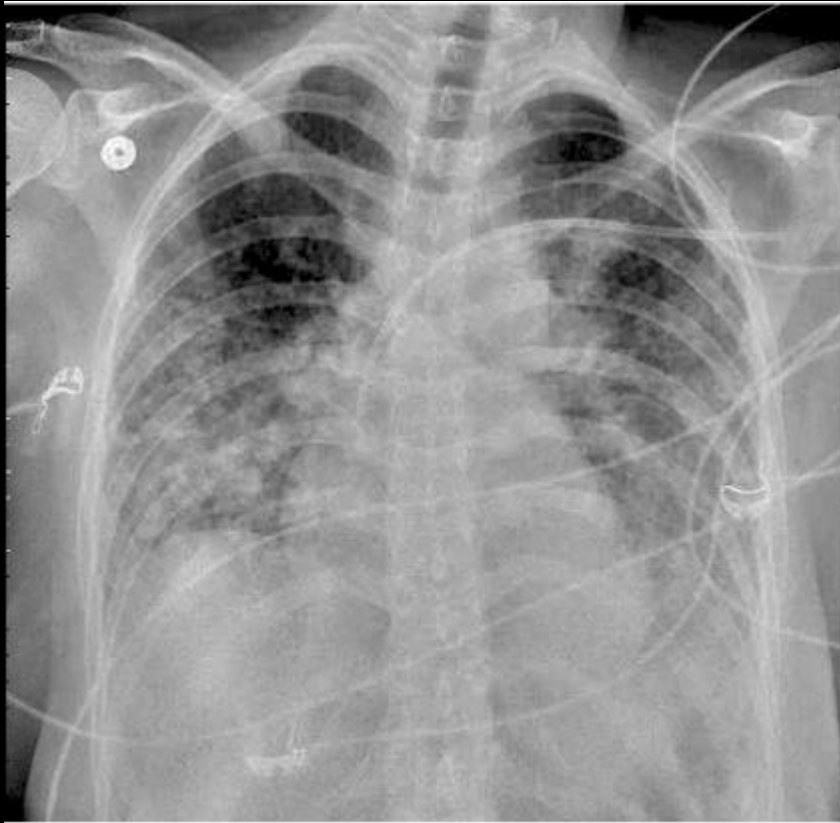
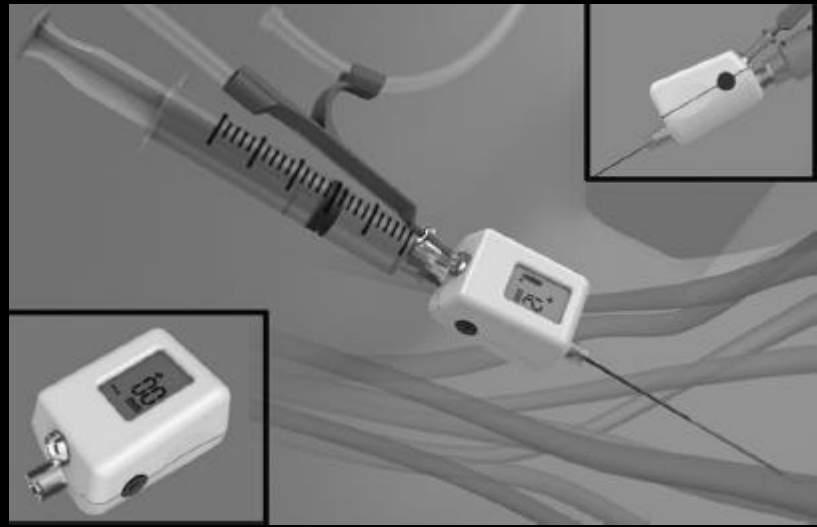
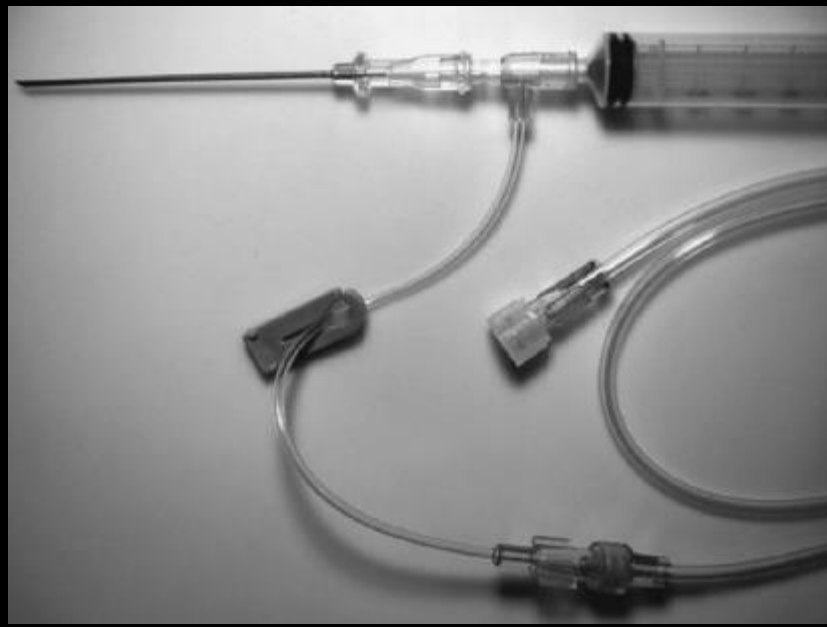


Figure 5. Suspected mechanism of perforation. A, The guidewire went into the subclavian vein. B, The stiff dilator sheath penetrated the brachiocephalic vein wall. C, The tip of the sheath remains outside the vessel. BCV indicates brachiocephalic vein; GW, guidewire; RIJV, right internal jugular vein; SCV, subclavian vein; SVC, superior vena cava.





Management of Arterial Trauma or Injury Arising from Central Venous Catheterization

A systematic review of management of inadvertent arterial injury during central venous catheterisation

Oliver G.B. Dixon, George E. Smith, Daniel Carradice, Ian C. Chetter

J Vasc Access 2017; 18 (2): 97-102

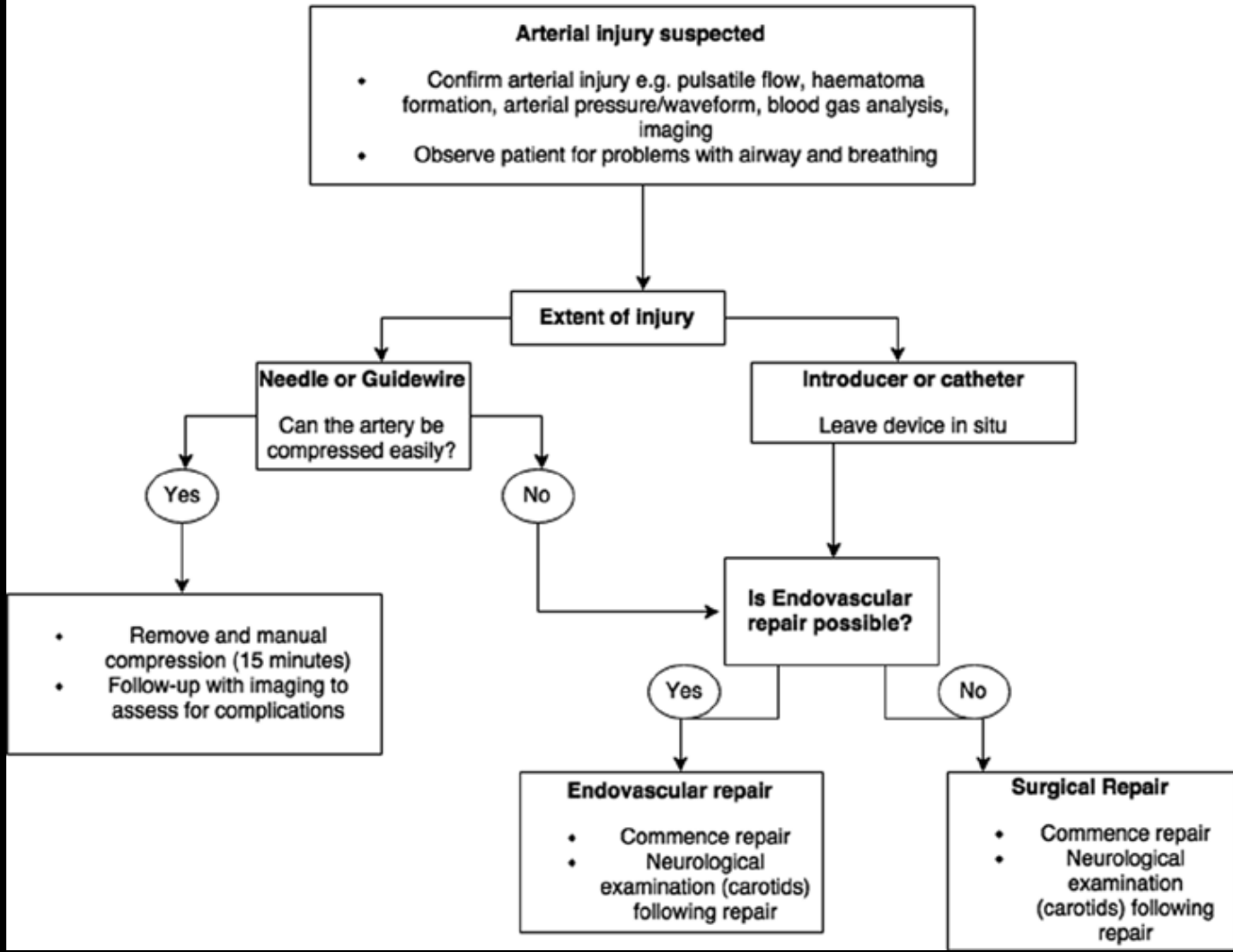
78 cases

Results

TABLE II - Management methods employed and success rate

	Removal and compression	Endovascular	Surgery
No complications (n)	1	35	37
Complications (n)	17	2	0
Complication types	5 failure to control haemorrhage 1 haemothorax 1 left lung collapse 1 pseudoaneurysm 4 embolic stroke 2 arteriovenous fistula 3 deaths	1 failure to control haemorrhage 1 cerebral embolus	None
Success rate (%)	5.6	94.6	100.0

Suggested management of inadvertent arterial cannulation during central venous catheterisation



Prevention and treatment of dilator injuries during central venous catheter placement

<https://doi.org/10.1016/j.jvsv.2019.06.020>

Paul E. Collier, MD, FACS, *Sewickley, Pa*

Journal of Vascular Surgery: Venous and Lymphatic Disorders

- 2008-2014
- 20 catheterisations 21 venous damages
- 5 vena cava, 6 right innominate vein, 10 left innominate vein.
- 17 operators remembers to push completely the dilatator or radiologic documentation.
- Venous damages. No arterial damage in this serie.
- 17 death, 19 claims

Take home message

- Prevention of these injuries is paramount.

Use ultrasound in real time to puncture veins.

Take home message

Prevention of these injuries is paramount.

Wires and dilators must never be advanced against any resistance.

Guidewire should be repeatedly checked to ensure it moves freely through the dilator, to ensure no distortion

Dilators should only be advanced far enough to enter the vein that is accessed and no further.

If a catheter is misplaced, it must not be removed until the operator is ready to take care of the hole in the vein

Take home message

- **Shorter dilators should be provided in the insertion kits so that they only are used to dilate the skin, subcutaneous tissue, muscle, and entry in to the vein.**
- **A decisional tree must be immediately available in your hospital, in your operating room**

Lésion artérielle suspectée: à confirmer:
Flux pulsatile de sang rouge, Formation
rapide d'un hematome, valeurs et forme
de la courbe de pression artérielle, Gaz du
sang, imagerie

Y a-t-il des problèmes d'airway ou neurologique?

Extension de la plaie

Aiguille ou guide
l'artère est elle facilement
compressible?

oui

Retirer et comprimer
manuellement (15 mn)
Suivi avec imagerie afin
d'évaluer une complication

Non

Introduceur ou catheter
Laisser le dispositif in situ

La réparation (endo)vasculaire
est elle possible?

Oui

Veine sousclavière

Réparation Endovasculaire
radiologique
Suivi Neurologique

Non

Veine Jugulaire interne

Réparation chirurgicale
Suivi neurologique

