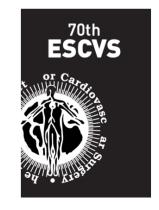
# Enhanced recovery after minimally invasive cardiac surgery: is there a place for on-table extubation?

Dr Océane Jaquet 22nd June 2022





Preamble

No conflict of interest

# Introduction

- Modernization of cardiac surgery
- Development of postoperative rehabilitation protocols
- Topic of intubation

90's

# Early vs Conventional Extubation After Cardiac Surgery With Cardiopulmonary Bypass\*

Antonio Reyes, MD; Gema Vega, MD; Rafael Blancas, MD; Begoña Morató, MD; José-Luis Moreno, MD; Carmen Torrecilla, MD; and Enrique Cereijo, MD

Objectives: Sedation and ventilation overnight after cardiac surgery is common practice. However, early extubation may be feasible with no increase in postoperative complications. This study examines (1) if early extubation is possible in a significant number of patients, (2) if it reduces ICU stay, and (3) if this practice increases postoperative complications.

Design Prospective controlled randomized clinical trial

Patients and methods: We randomized 404 consecutive patients to early extubation (7 to 11 h postoperatively) (group A, 201 patients) or conventional extubation (between 8 and 12 AM the following day) (group B, 203 patients). Variables included type and severity of the disease, surgical risk, type of operation, operative incidences, postoperative complications, duration of mechanical ventilation, intubation and ICU stay, bleeding, reoperation, vasoactive drugs, and mortality.

Results: Groups were comparable. Extubation within the preestablished time was successful in 60.2% of patients in group A and 74.4% in group B. Median ICU stay was  $27\,h$  in group A and  $44\,h$  in group B (p=0.008). Discharge from ICU within the first  $24\,h$  postoperatively was 44.3% in group A and 30.5% in group B (p=0.006). There was no significant difference in complications between groups. Successfully extubated patients in group A had more reintubation and prolonged ventilation than in group B.

Conclusions: (1) Sixty percent of our patients were extubated within 11 h of operation. (2) As a result, the length of stay in ICU was reduced and the percentage of patients discharged within 24 h was increased. (3) There was no increase in clinically important postoperative complications.

(CHEST 1997; 112:193-201)

### Guidelines for Perioperative Care in Cardiac Surgery Enhanced Recovery After Surgery Society Recommendations

2019

Daniel T. Engelman, MD; Walid Ben Ali, MD; Judson B. Williams, MD, MHS; Louis P. Perrault, MD, PhD; V. Seenu Reddy, MD; Rakesh C. Arora, MD, PhD; Eric E. Roselli, MD; Ali Khoynezhad, MD, PhD; Marc Gerdisch, MD; Jerrold H. Levy, MD; Kevin Lobdell, MD; Nick Fletcher, MD, MBBS; Matthias Kirsch, MD; Gregg Nelson, MD; Richard M. Engelman, MD; Alexander J. Gregory, MD; Edward M. Boyle, MD

#### **Extubation Strategies**

Prolonged mechanical ventilation after CS is associated with longer hospitalization, higher morbidity, mortality, and increased costs. <sup>163</sup> Prolonged intubation is associated with both ventilator-associated pneumonia and significant dysphagia. <sup>164</sup> Early extubation, within 6 hours of ICU arrival, can be achieved with time-directed extubation protocols and low-dose opioid anesthesia. This is safe (even in patients at high risk) and associated with decreased ICU time, length of stay, and costs. <sup>165-172</sup> A meta-analysis demonstrated that ICU times and length of stay were reduced; however, no difference in morbidity and mortality occurred, likely because of disparate study design and statistical underpowering. <sup>173</sup> Thus, studies have shown early extubation to be safe, but efficacy in reducing complications has not been conclusively demonstrated. Based on

this evidence, we recommend strategies to ensure extubation within 6 hours of surgery (class IIa, level B-NR).

On-table extubation

Avoid postoperative ventilation and sedation

- Additional potential benefits:
- Decreased need for vasopressors and inotropes?
  - Improvement of the fluid balance?
  - Reduced incidence of atrial fibrillation?
- Decrease in length of stay in the ICU? In the hospital?

# Safety of on-table extubation

## The Impact of Immediate Extubation in the Operating Room After Cardiac Surgery on Intensive Care and Hospital Lengths of Stay

Dmitri Chamchad, MD,\*‡ Jay C. Horrow, MD, MS,‡ Lev Nakhamchik, MSc,\* Francis P. Sutter, DO,†
Louis E. Samuels, MD,†‡ Candace L. Trace, RN, BA,† Francis Ferdinand, MD,† and Scott M. Goldman, MD†

Conclusions: Selection of patients for immediate extubation in the operating room by experienced clinicians was associated with shorter ICU and hospital stays. Immediate extubation rarely resulted in tracheal re-intubation.

Journal of Cardiothoracic and Vascular Anesthesia, Vol 24, No 5 (October), 2010: pp 780-784

#### Routine Immediate Extubation After Off-Pump Coronary Artery Bypass Surgery: 514 Consecutive Patients

Jeffrey L. Horswell, MD,\* Morley A. Herbert, PhD,† Syma L. Prince, RN,\* and Michael J. Mack, MD\*

#### CONCLUSION

Routine immediate extubation of OPCAB patients is feasible and probably safe. Because of the high rate of success of immediate extubation, the question now is not which patients can be immediately extubated, but which patients still need ventilatory support? The strict adherence to a patient care pathway with principles as outlined in this article will allow the

Early extubation does not increase complication rates after coronary artery bypass graft surgery with cardiopulmonary bypass

J. Reis<sup>a,\*</sup>, J.C. Mota<sup>b</sup>, P. Ponce<sup>b</sup>, A. Costa-Pereira<sup>c</sup>, M. Guerreiro<sup>b</sup>

In conclusion, we have found that a very early extubation protocol (on average less than 1 h) can be both effective and safe as it reduces intubation and ventilation times without increasing postoperative complications. As early extubation was also shown to be cost effective (as discussed in Section

J. Reis et al. / European Journal of Cardio-thoracic Surgery 21 (2002) 1026-1030

#### Routine Immediate Extubation for Off-Pump Coronary Artery Bypass Grafting Without Thoracic Epidural Analgesia

Zbynek Straka, MD, PhD, Petr Brucek, MD, Tomas Vanek, MD, PhD, Jan Votava, MD, and Petr Widimsky, MD, PhD

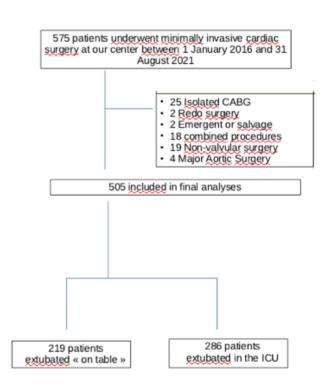
Judging from our results, the technique is safe, without specific complications, and allows early recovery. Immediate extubation and early mobilization of patients substantially reduce the need for intensive postoperative care. Local reimbursement regulation require a minimum ICU and hospital stay to register for a fee for hypass

(Ann Thorac Surg 2002;74:1544-7) © 2002 by The Society of Thoracic Surgeons

# On-table extubation – Our experience in Liege

- On-table Extubation After Cardiac Surgery: a Retrospective Single-center Non-inferiority Trial
- Océane Jaquet, Laura Gos, Philippe Amabili, Anne-Françoise Donneau, Manuel Azevedo Mendes, Vincent Bonhomme, Vincent Tchana-Sato, and Grégory A. Hans

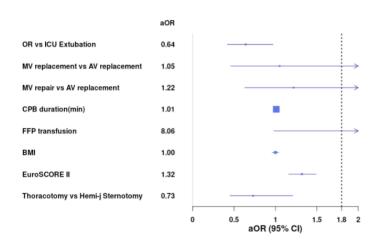
 Objective: To investigate the safety of ontable extubation after minimally invasive cardiac surgery



# On-table extubation – Our experience in Liege

Primary outcome:
Proportion of patients having a
ICU length of stay longer than 2
days

Secondary outcomes
24h cumulative fluide balance, Noradrenaline and inotropics use, respiratory complications, de novo atrial fibrillation, 30-day mortality



	Univariable Analysis			Multivariable analysis			
	OR	95%CI	P Value	aOR	95%CI	P Value	
24-hour cumulative fluid balance > P50	0.54	0.38-0.78	0.001	0.78	0.51-1.18	0.239	
Noradrenaline use	0.35	0.24-0.52	<0.001	0.27	0.17-0.43	<0.001	
Inotropic support > 24 hours	0.37	0.20-0.68	0.01	0.37	0.18-0.77	0.008	
Respiratory complications	0.91	0.55-1.50	0.71	0.97	0.55-1.73	0.931	
De novo atrial fibrillation	0.8	0.53-1.20	0.28	0.96	0.60-1.53	0.849	
30-day mortality	0.35	0.10-1.26	0.11	-*	-	-	

# Disadvantages of on-table extubation

- Persistant effects of medications
- Risk of hypoventilation, hypercarbia, hypoxemia, atelectasis
- Impossibility of performing TEE
- Risk of reintubation in case of tamponade

# Predictive factors for on-table extubation

# Predictors of operating room extubation in adult cardiac surgery

Kathirvel Subramaniam, MD, MPH, <sup>a</sup> Diana S. DeAndrade, MD, <sup>a</sup> Daniel R. Mandell, MD, <sup>a</sup> Andrew D. Althouse, PhD, <sup>b</sup> Rajan Manmohan, BS, <sup>c</sup> Stephen A. Esper, MD, MBA, <sup>a</sup> Jeffrey M. Varga, MD, <sup>a</sup> and Vinay Badhwar, MD<sup>d</sup>

TABLE 4. Multivariate logistic regression model predicting successful operating room extubation (including operative characteristics)

			. 51			
Extubation predictors	Beta	95% CI	OR	95% CI	P value	Score points
Preoperative characteristics						
Age, y						
40-49	1.22	(0.41-2.02)	3.39	(1.51-7.56)	.003	+3
50-59	0.97	(0.26-1.67)	2.63	(1.30-5.30)	.007	+2
60-69	0.58	(-0.01 to 1.23)	1.79	(0.93-3.42)	.080	+1
>70 (reference)	NA	(ref)	NA	(ref)	(ref)	
BMI (kg/m <sup>2</sup> )						
<25	1.22	(0.35-2.08)	3.37	(1.42-7.99)	.006	+3
25-30	0.81	(0.01-1.62)	2.26	(1.01-5.04)	.047	+2
30-35	0.68	(-0.17 to 1.53)	1.97	(0.84-4.60)	.119	+1
>35 (reference)	NA	(ref)	NA	(ref)	(ref)	
Diabetes	-1.18	(-1.79  to  -0.57)	0.31	(0.16-0.57)	<.001	-2
Non-full sternotomy (vs full sternotomy)*	1.84	(1.13-2.55)	6.31	(3.12-12.77)	<.001	+4
Procedure						
Isolated CABG (reference)	NA	(ref)	NA	(ref)	(ref)	
Isolated AVR	-1.96	(-2.91  to  -1.00)	0.14	(0.05-0.37)	<.001	-4
Isolated MVR	-0.73	(-2.70 to 1.25)	0.48	(0.06-3.48)	.471	-1
Multiple operations	-1.57	(-2.62  to  -0.52)	0.21	(0.07-0.60)	.004	-3
Other	-1.25	(-1.94  to  -0.56)	0.29	(0.14-0.57)	<.001	-3
Elective status (vs urgent)	0.56	(-0.07 to 1.19)	1.75	(0.93-3.28)	.082	+2
Intraoperative characteristics						
Fentanyl dose (per 500 µg)	-1.20	(-1.61 to -0.78)	0.30	(0.19-0.46)	<.001	-2
Multiple inhalational agents	1.33	(0.64-2.02)	3.79	(1.91-7.51)	<.001	+2

CI, Confidence interval; OR, operating room; NA, not available; BMI, body mass index; CABG, coronary artery bypass grafting; AVR, aortic valve replacement; MVR, mitral valve replacement. \*Includes partial sternotomy, left thoracotomy, right thoracotomy, and minimally invasive surgery.

Normothermia
Hemodynamical stability
Pain control
Absence of excessive bleeding
+
Logistic factors

# Conclusion

6h Gold standard

On-table Safe and Feasible

BUT



One size does not fits all



Thank you for your attention!