



Figure 2. Fluoroscopy. We can see the Impella device (arrows), the extracorporeal membrane oxygenator venous cannula (asterisk), the Swan-Ganz catheter (arrowheads) and chest drain (hash sign).

6 days, respectively. The patient progressed satisfactorily, but still had moderate systolic dysfunction at discharge.

VA-ECMO is a safe and effective alternative treatment for coronary spasm, as it provides an adequate output, although it can be insufficient to unload the left ventricle. Among the measures to facilitate ventricular emptying and avoid distension of cardiac chambers are balloon counterpulsation (which was ineffective in our patient), percutaneous atrial septostomy, central cannulation for ECMO, and Impella implantation.^{4,5} Recently it has been observed that the combined use of ECMO and Impella can provide better outcomes than ECMO alone,⁶ although it must be remembered that both techniques are invasive and not free from thrombotic or hemorrhagic vascular complications. The case presented here describes for the first time the combined use of

ECMO and Impella in cardiogenic shock secondary to postoperative refractory coronary spasm.

Souhayla Souaf Khalafi,^a Belén Cid,^{b,c} Darío Durán,^{a,c}
José R. González-Juanatey,^{b,c} Carlos Peña,^{b,c}
and Ángel L. Fernández^{a,c,d,*}

^aServicio de Cirugía Cardíaca, Hospital Clínico Universitario de Santiago, Santiago de Compostela, A Coruña, Spain

^bServicio de Cardiología, Hospital Clínico Universitario de Santiago, Santiago de Compostela, A Coruña, Spain

^cCiberCV, Madrid, Spain

^dDepartamento de Cirugía y Especialidades Médico-Quirúrgicas, Universidad de Santiago de Compostela, A Coruña, Spain

* Corresponding author:

E-mail address: angelluis.fernandez@usc.es (Á.L. Fernández).

Available online 10 May 2018

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<https://doi.org/10.1016/j.rec.2018.04.012>
1885-5857/

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Mechanical Chest Compressions and Traumatic Complications in Out-of-hospital Cardiac Arrest. Is There a Price to Pay?



Lesiones traumáticas por el uso de compresiones torácicas mecánicas para la parada cardíaca extrahospitalaria: ¿hay un precio que pagar?

To the Editor,

Early, high-quality cardiopulmonary resuscitation (CPR) improves survival and neurological prognosis in out-of-hospital cardiac arrest. Mechanical compression systems have been developed with the aim of achieving uninterrupted CPR, without rescuer fatigue, or for use in places where manual resuscitation is impractical.

The most widely-used at the moment are the piston system (LUCAS, Jolife; Sweden) and the distributing band system (AutoPulse, Zoll; USA). The benefit of these systems is debated,¹ and there are few data on their safety. Our objective was to analyze the introduction of these mechanical systems to the medical emergency services network in our province, describing their use and associated complications.

We prospectively included all patients admitted to a cardiological intensive care unit with the diagnosis of recovered out-of-hospital cardiac arrest from January 2016, which was when mechanical compression devices were introduced.

We analyzed resuscitation times, neurological status at discharge according to the Glasgow-Pittsburgh Cerebral Performance Category (CPC) and the complications in patients who received mechanical compressions compared with those who received manual compressions.

Complications were defined as any new traumatic thoracic or abdominal lesion that could be explained as a consequence of resuscitation (bone fracture, pneumothorax, hemothorax, pneumomediastinum, pulmonary contusion, or organ laceration).

Between January 2016 and August 2017, 65 consecutive patients were identified with a diagnosis of out-of-hospital cardiac arrest; 11 (17%) received predominantly mechanical compressions when a device was available (1 with AutoPulse and 10 with LUCAS) and 54 (83%) received only manual compressions. The baseline patient characteristics and the cardiac arrest details are described in [Table 1](#).

The time to return of return of spontaneous circulation (ROSC) in the group with mechanical compressions was significantly longer (48.3 ± 26 min) than in the group with manual compressions

Table 1
Patient Characteristics and Cardiac Arrest Details

	Manual CPR group (n = 54)	Mechanical CPR group (n = 11)	P
Male	42 (78)	9 (81)	.6
Age, y	65 ± 13.6	61 ± 12	.27
1st rhythm VF	43 (79)	8 (72)	.77
ROSC, min	22.4 ± 17	48.5 ± 26	< .001
Witnessed arrest	51 (94)	8 (72)	.006
1st pH	7.19	7.09	.074
STEMI underlying cause	26 (48)	9 (81)	< .001
Therapeutic hypothermia	29 (53)	7 (63)	.47
Traumatic complications	15 (27.8)	10 (91)	< .0001
Enolase 72 h (ng/mL)	67.8 ± 83	58.7 ± 55	.83
CPC 1 or 2 at discharge	25 (46)	4 (37)	.74
Survival to discharge	36 (56)	5 (45)	.122

CPC, Glasgow-Pittsburgh Cerebral Performance Category; CPR, cardiopulmonary resuscitation; ROSC: return of spontaneous circulation; STEMI, ST-elevation myocardial infarction; VF, ventricular fibrillation.

Values are expressed as No. (%) or mean ± standard deviation.

22.4 ± 17 min; $P < .001$). The mechanical compression group also had a higher proportion of ST-elevation acute myocardial infarction as the cause of arrest.

The proportion of witnessed arrests was higher in the manual compression group than in the mechanical compression group.

All patients had a chest X-ray and/or computed tomography of the chest and abdomen within the first few hours of admission. Traumatic lesions were significantly more common in the mechanical compression group (91% vs 27.8%; $P < .001$) and their complications are listed in Table 2.

In the manual compression group, 13 X-rays were identified with isolated rib fractures and 2 computed tomography scans with traumatic lesions: 1 patient with bilateral rib fractures and flail chest and 1 patient with rib fractures and sternal fracture.

The main finding in our study was a significantly higher proportion of traumatic complications in the group of patients who

received mechanical compressions. Although most randomized trials¹ do not specifically include traumatic complications, the high percentage of complications in our study is in contrast to the CIRC study,² which contained a detailed table with the traumatic complications in which there were similar results in both groups (11% in the manual CPR group vs 12% in the mechanical CPR group).

Among the reasons that could explain the high prevalence of traumatic lesions in our study is the significantly longer time to ROSC in the group of patients who received mechanical compressions than in the manual compression group (48.3 ± 26 vs 22.4 ± 17 min; $P < .001$). However, in a randomized study³ in which information was available on time to ROSC—which was longer in the mechanical compression group—there were no differences between the 2 types of resuscitation, and the serious complication rate was 0.003%.

Table 2
Details of the Traumatic Complications in Patients Resuscitated With Mechanical Compressions

Patient	System	ROSC, min	CPC at discharge	Imaging	Traumatic complication
1*	AutoPulse	47	4	CT	Pneumomediastinum, pneumothorax, bilateral pleural effusion, sternal fracture, bilateral rib fractures with flail chest, splenic laceration, hemoperitoneum and abdominal wall hematoma
2	LUCAS	55	1	CT	Bilateral rib fractures with flail chest and right hemothorax with 1500 mL drained. Pulmonary contusion and cardiac contusion
3	LUCAS	20	Death	CT	Bilateral 3rd-7th anterior costal arch fractures
4	LUCAS	26	Death	CT	Bilateral pleural effusion, bilateral rib fractures, perihepatic and perisplenic fluid
5	LUCAS	26	1	CT	Rib fractures, pneumothorax and subcutaneous emphysema
6	LUCAS	20	2	XR	No evidence of rib fractures
7	LUCAS	88	5 (death)	XR	Rib fractures left side
8	LUCAS	100	5 (death)	CT	Fracture of 2nd right anterior costal arch and 2nd, 3rd, and 4th left anterior arches
9	LUCAS	55	1	CT	Fractures of 2nd to 6th ribs left side and 2nd to 4th ribs right side, sternal body fracture
10	LUCAS	47	Death	XR	Bilateral rib fractures
11	LUCAS	50	Death	XR	Bilateral rib fractures

CPC, Glasgow-Pittsburgh Cerebral Performance Category; CT, computed tomography; ROSC, return of spontaneous circulation; XR, X-ray.

* Patient transferred by helicopter during resuscitation.

A multicenter study based on the autopsies of patients who died during resuscitation⁴ found a traumatic complication rate of 75% in the manual compression group and 91% in the mechanical compression group. Both groups had a mean CPR time of 35 minutes, slightly lower than the mechanical compression group in our series, but still a high percentage of traumatic complications. It is worth mentioning here that in our series there were several patients treated with mechanical compressions and short ROSC times who had potentially serious complications (Table 2).

Despite the descriptive nature and small sample size of our study, there were no differences in terms of survival and good neurological status at discharge between the 2 groups. These results agree with the evidence published to date: in 4 of the randomized studies¹ there was no demonstrated superiority of mechanical compression systems; equivalence was demonstrated in the CIRC study.²

The advanced life support algorithm in the 2015 ERC resuscitation guidelines⁵ recommends the use of mechanical devices as a reasonable alternative when high-quality manual compressions are impractical or compromise the safety of the provider (transport, coronary angiography) or when prolonged CPR is necessary. In these cases, we believe that a low threshold of clinical suspicion for traumatic lesions and the systematic use of imaging to exclude them could help in the early detection of potentially serious complications.

Josep Iglesias,^{a,*} Pablo Loma-Osorio,^{a,c,*} Jaime Aboal,^a María Núñez,^a and Ramon Brugada^{a,b,c,d}

^aDepartamento de Cardiología, Hospital Dr. Josep Trueta, Girona, Spain

^bDepartamento de Genética, Centro de Genética Cardiovascular, Institut d'Investigacions Biomèdiques de Girona (IDIBGI), Girona, Spain

^cDepartamento de Ciencias Médicas, Facultad de Medicina, Universidad de Girona, Girona, Spain

^dCentro de Investigación Biomédica en Red de Enfermedades Cardiovasculares (CIBERCV), Madrid, Spain

*Corresponding author:

E-mail addresses: jiglesias@gmail.com (J. Iglesias), plomaosorio@gmail.com (P. Loma-Osorio).

Available online 11 April 2018

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<https://doi.org/10.1016/j.rec.2018.01.019>
1885-5857/

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An Early Post-discharge Intervention Planned to Reduce 30-day Readmissions in old and Frail Heart Failure Patients Remains Beneficial at 1 Year



Una intervención precoz para reducir reingresos a los 30 días en pacientes ancianos frágiles con insuficiencia cardíaca mantiene su beneficio al año

To the Editor,

The Structured multidisciplinary outpatient clinic for Old and frail Post-discharge patients hospitalized for heart failure (STOP-HF Clinic) study was designed to reduce 30-day readmission rates and to facilitate the transition to primary care of vulnerable patients recently admitted for acutely decompensated heart failure (HF).¹ The interventions performed in the STOP-HF Clinic study have recently been reported.¹ In summary, this was a prospective study including 518 patients (age 82 years; Barthel score, 70; Charlson index, 5.6) and starting 4.9 ± 2 days after discharge. The STOP-HF Clinic study is a 1-month intervention (up to 2-3 months in very specific cases) that included a number of actions ranging from health literacy, early reassessment, increased quality of medical management, with intravenous therapies if needed, and personalized transition of care. The efficacy of the STOP-HF Clinic was confirmed, examining its 30-day impact with the official readmission data registry of the Catalan Health Service (CatSalut), which provides medical care to 7.5 million people in Catalonia, Spain. We reported a ~ 50% reduction in the all-cause 30-day readmission rate after an index hospitalization for HF, mainly driven by the reduction in HF-related readmissions.

Whether an early postdischarge intervention, such as the STOP-HF Clinic, may have an impact on subsequent readmissions

in the following year remained to be determined. Accordingly, our aim was to assess the 1-year readmission rate of the STOP-HF Clinic cohort and to compare, as a natural experiment, the 1-year readmission rate of the STOP-HF referral area against that of a control group comprising the patients in the remainder of the CatSalut area. For this long-term analysis, the primary endpoint was HF-related rehospitalization at 1 year. We also addressed all-cause death and the composite endpoint of all-cause death or HF-related hospitalization in the on-site cohort. At 1-year, 151 (29.2%) patients were readmitted at least once for HF (with a total of 204 hospitalizations) and 128 (24.7%) died; the composite endpoint occurred in 216 patients (41.7%).

Readmission rates within the STOP-HF referral area (~ 250 000 people) were compared with those of the CatSalut registry (~ 7.5 million people) during 2 time periods: pre-STOP-HF (2012-2013) and post-STOP-HF (2014-2015). The 1-year HF-related readmission rates were significantly lower in the STOP-HF referral area than in the CatSalut registry in the 2014 to 2015 period ($P < .001$), whereas they were nonsignificantly different in the 2012 to 2013 period (Table). Indeed, in the 2014 to 2015, period a 36% reduction in 1-year HF-related hospitalizations in the STOP-HF referral area was observed, while rehospitalizations remained unchanged in the CatSalut registry. The Figure shows the probability actuarial curves of HF-related readmissions (Figure A) and all-cause readmissions (Figure B) after an index HF hospitalization within the CatSalut area and the STOP-HF referral area. Compared with the rest of the CatSalut area, the STOP-HF referral area showed a significant decline in HF readmissions during the 2014 to 2015 period, with the 2 curves following diverging paths starting before the first month and up to the 1-year follow-up ($P < .001$ using the Wilcoxon-Gehan test).