**Table IXs - Characteristics of included abstracts and conference proceedings**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **N°** | **FIRST AUTHOR** | **YEAR** | **COUNTRY OF IMPLEMENTATION** | **JOURNAL** | **STUDY DESIGN** | **STUDY POPULATION** | **SAMPLE SIZE****(n° pts)** | **INTERVENTION****(n° pts)** | **CONTROL** | **OUTCOMES** |
| **1** | **VESS 42nd Annual Meeting [77]** | 2018  | USA  | Annals of Vascular Surgery  | Observational retrospective study (single center)  | CS | 19  | **Impella 5.0**: 19 | no control | * General situation postoperative
* % next step
 |
| **2** | **Abstracts from the 3rd Annual A-CURE Symposium [78]** | 2019  | USA  | BMC Cardiovascular Disorders 2019  | Observational retrospective study (single center)  | Severely decompensated end stage heart failure (HF) and CS.  | 23  | **Impella 5.0**:23  | no control | * General condition for prolunged Impella 5.0 supports
 |
| **3** | **Afana [79]** | 2019  | USA  | BMC Cardiovascular Disorders  | Observational retrospective  study (single center)  | CS | 10  | **Impella 5.0**: 10  | no control | * Survival
 |
| **4** | **Annamalai [80]** | 2018  | USA  | Journal of Cardiovascular Translational Research  | Observational retrospective  study  (single center)  | CS | 19   | **Impella 5.0**: 19  | no control | * Mortality
* Johns Hopkins Highest Level of Mobility (JH-HLM)
* Activity Measure for Post Acute Care (AM-PAC) Score
 |
| **5** | **Ansari [81]** | 2014  | USA  | Journal of Cardiac Failure  | Observational retrospective Study (single center)  | CS [Acute myocardial infarction, chronic ischemic cardiomyopathy and cardiac transplant rejection  | 13   | **Impella 5.0**: 13  | no control | * 30-day mortality
* 90-day mortality
 |
| **6** | **Araujo-Gutierrez [82]** | 2018  | USA  | The Journal of Heart and Lung Transplantation  | Observational retrospective study (single center)   | Heart failure and advanced renal failure  | 24   | **Short-term MCS** (Impella 5.0 IABP)   | **Long-term MCS** (TAH, VAD ) **No MCS**  | * Survival
* dialysis >3 month,
* cardiac allograft failure requiring redo-heart transplant and/or death
 |
| **7** | **Bansal [83]** | 2013  | USA  | Journal of Heart and Lung Transplantation  | Observational retrospective Study  (single center)  | Acute decompensated heart failure  | 15   | **Impella 5.0**: 6 **Impella 5.0 + IABP**: 9   | no control | * Model for End-Stage Liver Disease (MELD) to assess end organ function
* end point of bridge to decision (BTD)
* death
 |
| **8** | **Bhimaraj [84]** | 2018  | USA  | Journal of Cardiovascular Translational Research  | Observational retrospective Study (single center)  | CS and multiorgan failure  | 36   | **Impella 5.0**: 36**Impella 5.0 🡪o IABP**: 6**Impella 5.0 🡪 VA ECMO**: 1 | no control | * length of hospital stay
* median length of Impella support
* pump dysfunction or replacement
* survival
 |
| **9** | **Boll [85]** | 2018  | USA  | Annals of Vascular Surgery  | Observational retrospective Study (single center)  | CS | 24   | **Impella 5.0**: 24  | no control | * Evaluate right axillary artery technique and clinical benefits in comparison with femoral artery access
* %survival
 |
| **10** | **Bonnefoy [86]-Cudraz** | 2014  | France  | European Heart Journal   | Multicentric prospective, randomized study  | AMI | 3   | **Impella 5.0+IABP:** 7  | **IABP**: 6  | * The change in cardiac power index (CPI) from baseline to 12 hours after implantation.
* Lactic acidosis change from baseline to 96 hours.
* Mortality after 30 days.
 |
| **11** | **Castro [87]** | 2019  | Germany  | The Thoracic and Cardiovascular Surgeon  | Observational retrospective study  (single center)  | CS due to ischemic or dilative cardiomyopathy  | 26 but only 15 from ECMO to Impella 5.0  | **Impella 5.0 + ECMO**: 15   | No control | * Compare the number of transfused packed red blood cells (PRBC) during the time of ECMO and Impella 5.0 support
 |
| **12** | **Cecere [88]** | 2010  | Canada  | Interactive Cardiovascular and Thoracic Surgery.  | Observational retrospective study  (single center)  | acute hemodynamic collapse  | 11  | **Impella 5.0**: 8 **Impella 2.5**: 3  | Not specified  | * Survival
* cost analisys
* reduction of risk
 |
| **13** | **Chagarlamudi [89]** | 2013  | USA  | Catheterization and Cardiovascular Interventions   | Observational retrospective study   (single center)  | AMI-CS   | 21  | **Impella 2.5 🡪 Impella 5.0**: nd**Impella 5.0**: 2  | **Impella 2.5**: not defined  | * survival
 |
| **14** | **Cheng [90]** | 2017  | USA  | Journal of Heart and Lung Transplantation  | Observational retrospective Study  | CS | 32 Impella devices (26 bridge to durable mechanical circulatory support, 6 direct bridge to transplant) implanted in 27 patients   | **Impella 5.0**: 11 | **Impella 2.5**:2 **Impella CP**: 19 | * 30 - days survival
* 60- days survival
 |
| **15** | **Cheung [91]** | 2012  | Canada  | Journal of the American College of Cardiology  | Observational retrospective Study  | Acute decompensated heart failure and post-cardiotomy shock  | 60 | **Impella 5.0**: 29   | **ECMO:** 31 | * blood product costs,
* perfusion costs,
* ICU costs,
* length of stay (LOS)
 |
| **16** | **Doersch [92]** | 2014  | USA  | Journal of Heart and Lung Transplantation  | Observational retrospective Study  | CS | 13 | **Impella5.0: 8** **Impella 5.0 + LVAD:** 5  | no control | * major bleedings, infectious
* complications,
* recovery,
* mobilization,
* separation from mechanical ventilation,
* survival
 |
| **17** | **Emmanuel [93]** | 2019  | Australia  | Heart Lung and Circulation  | Observational retrospective Study  | CS | 33  | **Impella** **(CP or 5.0)** 3  | **VA,ECMO:** 30  | * median lenght of support
* patients wean to recovery,
* patients bridge to LVAD,
* patients died
 |
| **18** | **Engstrom [94]** | 2010  | Netherlands  | Journal of the American College of Cardiology  | Observational retrospective study  | CS | 41    | **Impella 5.0**: 18**Impella 2.5 🡪 Impella 5.0**: 7  | **Impella 2.5**: 15  | * 30-day survival
 |
| **19** | **Esposito [95]** | 2016  | USA  | Journal of Heart and Lung Transplantation  | Observational retrospective study  | not specified  | 49    | **Impella 5.0:**22   | **Impella CP**: 19**Impella RP**: 4 **biventricular Impellas (BiPella)**: 4  | * hemolysis
 |
| **20** | **Esposito [96]** | 2016  |  USA |  Journal of Cardiac Failure |  Observational retrospective study  | CS |  53 | Impella CP, Impella 2.5, Impella 5.0, Impella RP, TandemHearth RVAD |  no control | * CS categorization
* In-hospital mortality
 |
| **21** | **Farahmand [97]** | 2015  | France  | Journal of Heart and Lung Transplantation  | Observational retrospective study  | CS | 60  | **Impella 5.0**: 55  | **Impella 2.5**: 5 **Impella CP**: 1 | * duration of support left ventricular
* functional recovery
* bridge to long term LVAD
* bridge to transplantation
* switch to ECMO
* death
* 6-month survival
* 1-year survival
* device related complicons
* acute pulmonary oedema
 |
| **22** | **Gaudard [98]** | 2015  | France  | Critical Care  | Observational retrospective study (single center)  | CS | 40 | **Impella 5.0**: 25 **PVA-ECMO🡪Impella 5.0**: 15  | no control | * death before Impella removal,
* cardiac recovery
* bridge to LVAD
* bridge to heart transplantation,
* day-28 mortality,
* ICU mortality,
* month-6 mortality
* MV duration,
* need for renal replacement therapy (RRT),
* the length of ICU stay.
 |
| **23** | **Goulet [99]** | 2019  | USA  | Journal of Heart and Lung Transplantation.   | Observational retrospective study (multicenter)  | CS | 111  | **Impella 5.0**: 26  | **IABP**: 31**ECMO**: 37  | * 30-day mortality (through dialysis, heart rate)
 |
| **24** | **Hall [100]** | 2012  | USA  | Journal of Cardiac Failure  | Observational retrospective study  | CS | 15  | **Impella 5.0**: 15  | no control | * 30-day survival
 |
| **25** | **Hall [101]** | 2016  | USA  | Journal of the American College of Cardiology  | Observational retrospective study  | CS | 58  | **Impella 5.0**:58  | no control | * Demographics,
* procedural characteristics,
* inhospital and intermediate term outcomes,
* in-hospital complications
 |
| **26** | **Hall [102]** | 2016  | USA  | Journal of Heart and Lung Transplantation  | Observational retrospective study (multicenter)  | Patients with end-stage heart failure refractory to medical therapy  | 51  | **Impella 5.0**: 51 | no control | * Mortality
* complications
 |
| **27** | **Hall [103]** | 2015  | USA  | Journal of Heart and Lung Transplantation  | Observational retrospective study (single center)  | CS | 35 | **Impella 5.0**: 35 | no control  | * Hemodynamic stabilisation
* Survival
* complications
 |
| **28** | **Ibarra [104]-Cortez** | 2017  | USA  | Journal of Heart and Lung Transplantation  | Observational retrospective study (single center)  | CS | 36  | **Impella 5.0**: 26 | no control | * Survival
 |
| **29** | **Itoh [105]** | 2017  | USA  | Journal of Heart and Lung Transplantation  | Observational retrospective study  | CS | 76 | **Impella 2.5**:19 **Impella CP**: 6 **Impella 5.0**: 3  | **ECLS + surgical LV vent**: 48  | * survival to discharge
* ECLS decannulation
* vascular complications
 |
| **30** | **Jablonski  [106]** | 2018  | USA  | Cardiopulmonary Physical Therapy Journal  | Observational retrospective study  (single center)  | CS | 15 | **Impella 5.0**: 15  | no control | * Survival, related to mobility level (JH-HLM scale)
 |
| **31** | **Kawabori [107]** | 2019  | USA  | Annals of Thoracic Surgery  | Sperimental (single center)  | CS | 6  | **Impella 5.0:** 5  | no control | * Complication related to Impella 5.0 removal procedure
 |
| **32** | **Lebreton [108]** | 2015  | France  | Journal of Heart and Lung Transplantation.  | Observational retrospective study (single center)  | CS | 14  | **Impella 5.0**: 14  | no control | * Weaning rate
* survival or bridge to other therapy
 |
| **33** | **Lee [109]** | 2019  | USA  | Journal of Heart and Lung Transplantation.  | Observational retrospective study (single center)  | CS | 43  | **Impella 5.0**: 28  | **IAPB**: 15 | * Mortality,
* successful bridge to cardiac transplantation or durable ventricular assist device (Tx/VAD),
* hemodynamic parameters,
* renal function
* device related complications
 |
| **34** | **Lemaire [110]** | 2013  | USA  | Journal of Heart and Lung Transplantation.  | Observational retrospective study (single center)  | Postcardiotomy CS | 25  | **Impella 5.0**: 20   | **Impella 2.5**: 5  | * operative mortality
* device complications
 |
| **35** | **Lemaire [111]** | 2012  | USA  | Innovations: Technology and Techniques in Cardiothoracic and Vascular Surgery   | Observational retrospective study (single center)  | CS (52%), acute myocardial infarction (11%), ischemic cardiomyopathy (8%), and other indications (28%).  | 36 | **Impella 5.0**: 25  | **Impella 2.5**: 11 | * Mortality
* complications
 |
| **36** | **Lemaire [112]** | 2014  | USA  | Journal of Heart and Lung Transplantation.  | Observational retrospective study (single center)  | CS (42%) and postcardiotomy CS (58%)  | 66 | **Impella 5.0**: 54  | **Impella 2.5**: 11 **Impella CP**: 1   | * Mortality
* complications
 |
| **37** | **Maini [113]** | 2016  |  USA |  Journal of the American College of Cardiology  |  Observational retrospective study (multicenter)  |  Not specified | 2903  | **Impella 2.5, Impella CP, Impella 5.0, Impella RP** | no control  | * Procedural characteristic
* Hemodynamic parameters
* Echocardiographic imaging data
 |
| **38** | **McCabe [114]** | 2017  | USA  | Journal of the American College of Cardiology  | Observational retrospective study (multicenter)  | The Axillary access Registry to Monitor Safety [ARMS] is a prospective multicenter registry of percutaneous upper extremity access for mechanical circulatory support devices to evaluate the procedural and short term safety of such an approach.  | 51  | **Impella 5.0**: 3  | **Impella CP**: 42 **Impella 2.5**: 6    | * Complications
 |
| **39** | **Napp [115]** | 2018  | Germany  | European Heart Journal  | Observational retrospective study (multicenter)  | Takotsubo Syndrome with CS  | 15  | **Impella 2.5**: 4 **Impella CP:** 10 **Impella 5.0**: 1  | no control  | * Mortality
* complications
*
 |
| **40** | **Nelson [116]** | 2019  | USA  | BMC Cardiovascular Disorders  | Observational retrospective study (single center)  | Severely decompensated end stage heart failure (HF) and cardiogenic shock  | 23  | **Impella 5.0**: 23  | no control | * Mortality
* complications
 |
| **41** | **Nelson [117]** | 2019  | USA  | Journal of the American College of Cardiology  | Observational retrospective study  (single center)  | Severely decompensated end stage heart failure (HF) and cardiogenic shock  | 32  | **Impella 5.0**: 32 | no control | * Mortality
* complications
 |
| **42** | **Nguyen [118]** | 2019  | USA  | Journal of Cardiac Failure   | Observational retrospective study (single center)  | CS | 68  | **Impella 5.0**: 68   | no control | * Mortality (by duration of support)
 |
| **43** | **Nicholson [119]** | 2017  | USA  | Cardiopulmonary Physical Therapy Journal  | Case series  | CS pts with axillary Impella   | 5  | **Impella 5.0**: 5 | no control | * Adverse events
* Ability to improve 6 Clicks scores scale
 |
| **44** | **Okoh [120]** | 2019  | USA  | Journal of the American College of Cardiology  | Observational retrospective study  | CS | 349 | **Impella 5.0**: 262 | **Impella 2.5**: 81 **Impella CP**: 6 | * Survival to next therapy and to 1-year post-transplant
 |
| **45** | **Oses [121]** | 2012  | France  | Journal of Cardiac Surgery  | Observational retrospective study  | AMI- CS  | 14  | **Impella 5.0**: 14 | no control  | * Complications
* outcomes
 |
| **46** | **Ouweneel [122]** | 2017  | Netherlands  | European Heart Journal  | Observational retrospective study  | AMI-CS  | 112  | Not specified | Not specified | * 30-day
* 6-month mortality
* device and non-device related vascular complications,
* predictors of 6-month mortality
 |
| **47** | **Pappalardo [123]** | 2019  | Germany, Italy  | Thoracic and Cardiovascular Surgeon  | Observational retrospective study  | CS | 9  | **Impella 5.0**: 9 | no control | * left ventricular unloading
* end-organ recovery
* right ventricular function
 |
| **48** | **Richet [124]** | 2016  | France  | Archives of Cardiovascular Diseases Supplements  | Observational retrospective study  | CS | 12 | **Impella 5.0**:12  | no control  | * Outcomes
 |
| **49** | **Sudhakar [125]** | 2019  | USA  | Catheterization and Cardiovascular Interventions  | Observational retrospective study  | CS | 41  | **Impella 5.0**: 41 | no control | * Brige to longer term therapy
 |
| **50** | **Taimeh [126]** | 2019  | USA  | Journal of Cardiac Failure  | Observational retrospective study (single center)  | CS | 68 | **Impella 5.0**: 68 | no control | * recovery of heart function
 |
| **51** | **Tank [127]** | 2017  | USA  | Journal of the American College of Cardiology  | Observational retrospective study  | CS | 56 | **Impella 5.0**: 20 | **Impella CP**: 36 | * survival
 |
| **52** | **Tepper [128]** | 2016  | USA  | Circulation  | Observational retrospective study  | CS | 42  | **ECLS + Impella 5.0**: 9**ECLS + other Impella device**: 14  | **ECLS** : 19   | * 48-hours survival
* 30-day survival
* ICU discharge
* ECLS decannulation
* transition to LVAD
* vascular complications
 |
| **53** | **Wolfson [129]** | 2019  | USA  | The Journal of Heart and Lung Transplantation  | Observational retrospective study (single center)  | CS | 103  | **Impella 5.0**: 103 | no control | * Right ventricular function
 |
| **54** | **Yanagida [130]** | 2014  | USA  | American Society of Transplant Surgeons  | Observational retrospective study  | CS | 21  | **Impella 5.0**: 1 | **IABP**: 8**ECMO with femoral cannulation**: 4**central ECMO**:6 **HeartMateII**: 2   | * Outcomes
 |
| **55** | **Zern [131]** | 2018  | USA  | The Journal of Heart and Lung Transplantation  | Observational retrospective study  | CS | 7 | **Impella 5.0**: 7 | no control | * Safety of ramp study
* hemodinamic data
* ecocardiographic data
 |
| **56** | **Zipfel [132]** | 2018  | Germany  | The Journal of Heart and Lung Transplantation  | Observational retrospective study  | CS | 15 | **Impella 5.0**: 15 | no control | * Study safety
* feasibility of switching ECMO to Impella 5.0
 |
| **57** | **Zipfel [133]** | 2018  | Germany  | The Thoracic and Cardiovascular Surgeon  | Observational retrospective study  | CS | 47 | **ECLS + Impella 2.5 🡪 Impella 5.0**: 4  | no control | * survival
* weaning depending on LV unloading
 |

*Legend:*

LV (left ventricle), ECMO (extracorporeal membrane oxygenation), VA ECMO (Venoarterial extracorporeal membrane oxygenation), VP ECMO (veno- pulmonary extra corporeal membrane oxygenation), PVA ECMO (Percutaneous Venoarterial extracorporeal membrane oxygenation), CPI (cardiac power index), RV (right ventricle), VAD (ventricular assist device ), LVAD (left ventricular assist device), BT LVAD (bridge to transplantation left ventricular assist device), P VAD (percutaneous ventricular assist device), MCS (mechanical circulatory support), VESS (Vascular & Endovascular Surgery Society), HF (heart failure), CGS or CS (cardiogenic shock), JH-HLM (Johns Hopkins Highest Level of Mobility), AM-PAC (Activity Measure for Post-Acute Care), TAH (total artificial heart), IABP (Intra-aortic balloon pump), RSA (right subclavian artery), MELD (model for end-stage liver disease), ECLS (extracorporeal life support), PRBC (packed red blood cells), HR-PCI (high-risk percutaneous coronary intervention), ARMS (axillary access registry to monitor safety), Tx (transplantation), BTHT (bridge to heart transplantation), BTD (bridge to decision), BTR (bridge to recovery), BTDD (bridge to durable device), BTT (bridge to transplantation), ESHF (end-stage heart failure), FDA (Food and Drug Administration), LDH (lactate dehydrogenase), ICU (intensive care unit). AMI-CS (cardiogenic shock due to acute myocardial infarction) pts (patients)