TITLE:  Intra-Aortic Balloon Pumps for Cardiac Conditions: Guidelines

DATE:  9 May 2014

RESEARCH QUESTION

What are the evidence-based guidelines regarding the use of intra-aortic balloon pumps for the treatment of cardiac conditions?

KEY MESSAGE

Twelve systematic reviews and meta-analyses and four evidence-based guidelines were identified regarding the use of intra-aortic balloon pumps for cardiac conditions.

METHODS

A limited literature search was conducted on key resources including PubMed, The Cochrane Library (2014, Issue 4), University of York Centre for Reviews and Dissemination (CRD) databases, Canadian and major international health technology agencies, as well as a focused Internet search. Methodological filters were applied to limit retrieval to health technology assessments, systematic reviews, meta-analyses, randomized controlled trials, and guidelines. Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between January 1, 2009 and April 29, 2014. Internet links were provided, where available.

The summary of findings was prepared from the abstracts of the relevant information. Please note that data contained in abstracts may not always be an accurate reflection of the data contained within the full article.

RESULTS

Rapid Response reports are organized so that the higher quality evidence is presented first. Therefore, health technology assessment reports, systematic reviews, and meta-analyses are presented first. These are followed by evidence-based guidelines.
Twelve systematic reviews and meta-analyses and four evidence-based guidelines were identified regarding the use of intra-aortic balloon pumps for cardiac conditions.

Additional references of potential interest are provided in the appendix.

OVERALL SUMMARY OF FINDINGS

Four evidence-based guidelines\textsuperscript{13-16} were identified regarding the use of intra-aortic balloon pumps (IABP) for cardiac conditions. The IABP-specific recommendations and the grades of evidence to support these recommendations are presented in Table 1. More detail regarding the evidence used to support the recommendations is available in the full-text guideline documents.

<table>
<thead>
<tr>
<th>Authors or Association</th>
<th>Recommendations</th>
<th>Grade of Supporting Evidence</th>
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<tbody>
<tr>
<td>Scottish Intercollegiate Guidelines Network (SIGN) (2013)\textsuperscript{13}</td>
<td>&quot;Patients with an acute coronary syndrome complicated by cardiogenic shock, myocardial rupture (ventricular septal defect and papillary muscle rupture) or refractory ischaemia should be considered for IABP especially when contemplating emergency coronary revascularisation or corrective surgery.” p. 27</td>
<td>Level D - Evidence level 3 (non-analytic studies, e.g., case reports, case series) or 4 (expert opinion); or extrapolated evidence from studies rated as 2+ (well conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal)</td>
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| American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines (2013)\textsuperscript{14} | "The use of IABP can be useful for patients with cardiogenic shock after STEMI who do not quickly stabilize with pharmacological therapy." | Size of treatment effect Class Iia - Benefit >> Risk  
- Additional studies with focused objectives needed  
- It is reasonable to perform procedure/administer treatment  

Estimate of certainty (precision) of treatment effect  
Level B  
- Limited populations evaluated  
- Data derived from a single randomized clinical trials or nonrandomized studies  
- Recommendation in favor of treatment or procedure being useful/effective  
- Some conflicting evidence from single randomized trial or nonrandomized studies  

↑ - Recommended: "should"  
- usually based on studies with evidence level 2++ (high-quality systematic reviews of case-control or cohort studies with very low risk of confounders or bias and a high probability of causal |
| Werdan et al. (2012)\textsuperscript{15} | For IABP in patients with systolic pump failure:  
"(E 44 ↑) In patients undergoing fibrinolysis treatment, IABP should be carried out adjunctively.”  
"(E 45 ↔ ) In patients undergoing |  
| | |  |
Table 1: Summary of Recommendations

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<th>Authors or Association</th>
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<th>Grade of Supporting Evidence</th>
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<tr>
<td>PCI, IABP may be considered, but the available evidence is unclear.”</td>
<td>relationships) or 2+ (well performed systematic reviews of case-control or cohort studies with a low risk of confounders or bias and a moderate risk of noncausal relationships)</td>
<td>↔ - No recommendation: &quot;may&quot; • no confirmed study results exist that demonstrate either a beneficial or a harmful effect</td>
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Carl et al. (2010)“IABP should only be used after cardiac surgery when hemodynamic stabilization is not possible despite the use of high dose positive inotropic agents and catecholamines. There is no good quality evidence upon which recommendations regarding the indications for and timing of IABP in postoperative cardiac surgical patients. However, timely application is essential if multi-organ failure and related complications are to be avoided.” Information regarding the grading of evidence was not provided.

IABP = intra-aortic balloon pump; PCI = percutaneous coronary intervention

Twelve systematic reviews and meta-analyses1-12 were identified, examining the use of IABP for cardiac conditions. The condition of interest and main review findings are summarized in Table 2.

Table 2: Summary of Included Systematic Reviews and Meta-Analyses

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Condition/Comparison</th>
<th>Findings/Conclusions</th>
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<tbody>
<tr>
<td>Chen et al. (2014)1</td>
<td>High risk reperfusion therapies IABP vs no IABP</td>
<td>• early mortality rate did not differ between IABP and non-IABP groups • long-term mortality was significantly reduced in IABP group • effect was more pronounced in patients undergoing PCI</td>
</tr>
<tr>
<td>Romeo et al. (2013)2</td>
<td>High-risk patients undergoing PCI without cardiogenic shock IABP vs no IABP</td>
<td>No significant differences between groups in terms of: • in-hospital mortality • major adverse cardiovascular events • access-site complications • stroke</td>
</tr>
<tr>
<td>Romeo et al. (2013)2</td>
<td>IABP support in acute MI complicated by cardiogenic shock Comparison between acute</td>
<td>• risk of death was not significantly different between IABP and control groups • IABP support was significantly effective in thrombolytic therapy reperfusion</td>
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<tr>
<td>Author, Year</td>
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<td>MI treatment groups</td>
<td>• IABP was associated with a significant increase in in-hospital mortality with primary PCI</td>
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| Bahekar et al. (2012)⁴ | IABP in high-risk acute MI with or without cardiogenic shock vs no IABP | • in-hospital mortality was similar between IABP group and no IABP group with or without cardiogenic shock  
• significant improvement in mortality for patients with acute MI with cardiogenic shock  
• use of IABP did not significantly reduce the rate of reinfarction or recurrent ischemia  
• IABP use significantly increased the risk of moderate bleeding  
• Authors suggested patients with high-risk acute MI without cardiogenic shock may not benefit from the use of IABP |
| Cassese et al. (2012)⁵ | IABP in patients with acute MI without cardiogenic shock vs no IABP | • IABP did not reduce all-cause death, congestive heart failure, or reinfarction  
• IABP significantly reduced recurrent myocardial ischemia but increased the risk of cerebrovascular accidents and bleeding |
| Sa et al. (2012)⁶ | IABP in high-risk patients undergoing CABG vs no IABP | • Mean length of ICU stay and hospital stay were significantly lower in the IABP group  
• overall RR of hospital mortality was 0.206 for the IABP group  
• The authors suggested prophylactic IABP may be useful to reduce in-hospital mortality |
| Wakai (2011)⁷ | IABP in patients with acute MI | authors identified no clinically important results from RCTs for IABP vs no IABP in people after an acute MI and indicated there was no evidence to support the expert consensus that IABP was beneficial in people with cardiogenic shock after acute MI |
| Theologou et al. (2011)⁶ | Preoperative IABP in patients undergoing CABG vs no IABP | • there were significantly fewer hospital deaths in the IABP group  
• one study suggested a favorable effect of preoperative IABP for off-pump patients |
| Unverzaght et al. (2011)⁹ | IABP in patients with acute MI with cardiogenic shock vs no IABP | • there was no evidence of survival benefit associated with IABP  
• the authors suggested IABP may have a beneficial effect on hemodynamics but there was no convincing evidence to support the use of IABP |
| Cheng et al. (2009)¹⁰ | LVAD vs IABP for cardiogenic shock | • cardiac index and mean arterial pressure were significantly higher and in patients who received LVAD treatment vs patients with IABP  
• 30-day mortality was similar between groups  
• significantly more bleeding was observed in the LVAD group |
| O’Connor et al. (2009)¹¹ | Therapies for prevention and treatment of cardiogenic shock | • evidence supporting the in-hospital use of IABP in patients less than 75 years of age was |

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| Sjauw et al. (2009)  | IABP in STEMI with or without cardiogenic shock vs no IABP | • 30-day survival and left ventricular ejection fraction were not improved in the IABP group  
• IABP was associated with significantly higher rates of bleeding and stroke  
• the authors suggested IABP the data did not support use of IABP in patients with high-risk STEMI |

CABG = coronary artery bypass grafting; IABP = intra-aortic balloon pump; LVAD = left ventricular assist devices; MI = myocardial infarction; PCI = percutaneous coronary intervention; RR = relative risk; STEMI = ST-segment elevation myocardial infarction; vs = versus
REFERENCES SUMMARIZED

Health Technology Assessments
No literature identified.

Systematic Reviews and Meta-analyses


Guidelines and Recommendations


APPENDIX – FURTHER INFORMATION:

Consensus Guidelines and Recommendations


PubMed: PM23439848

Review Articles

PubMed: PM24686399

PubMed: PM24514033

PubMed: PM24232009

PubMed: PM23995129

PubMed: PM23908332

PubMed: PM24077607

PubMed: PM22607158

PubMed: PM22569335


PubMed: PM22231716

PubMed: PM20497611

Additional References

PubMed: PM23312777

PubMed: PM19324285