severe PPCM who need prompt intervention due to their refractory response to inotropic and ventilatory support.

References


Transbrachial Intraaortic Balloon Pumping in Severe Peripheral Atherosclerosis

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Preoperative intraaortic balloon pumping improves the results of complex coronary surgery; however, insertion may be harmful or contraindicated in severe and diffuse atherosclerosis of the descending aorta and peripheral arteries. We report our experience with 10 consecutive patients with severe peripheral atherosclerosis or distal abdominal aortic aneurysms, in whom a 7.5F intraaortic balloon catheter was inserted through the brachial artery. Intraaortic balloon pumping was maintained until hemodynamic stability was established; no complications or ischemia of the hand related to the intraaortic balloon pump occurred. Transbrachial intraaortic balloon pumping with a 7.5F catheter is as safe and effective as the transfemoral method in patients with unavailable femoral arteries.


Since Christensen and colleagues [1] demonstrated that preoperative intraaortic balloon pumping (IABP) improves in-hospital and follow-up outcomes of high-risk coronary surgery, and with the recent availability of new IABP guidewires and smaller catheters, the indications for preoperative IABP have widened. Furthermore, the growing number of elderly patients referred for coronary artery bypass grafting (CABG) in daily practice has opened the debate on the best perioperative left-ventricular assistance methods in this subset of patients. Elderly patients tend to have an increasing burden of comorbid conditions that may hamper or mostly contraindicate the traditional transfemoral insertion of IABP devices, including critical coronary disease, poor ventricular function, ongoing angina, and diffuse and severe peripheral atherosclerosis ranging from peripheral arteriopathy to abdominal aortic aneurysms.

The downsizing of IAB catheters to 7.5F has significantly reduced the incidence of ischemic peripheral vascular complications, opening the way to alternative methods of insertion [2], such as vascular grafts to the ascending aorta [3] or the axillary artery [4]. However, these invasive techniques seem to be indicated in patients with long-term need for IABP because of the necessity of surgical procedures and general anesthesia.

We recently reported a case of successful perioperative left-ventricular assistance using the transbrachial insertion of a 7.5F IAB catheter in a patient with critical narrowing of the iliac-femoral tree—a traditional major risk factor for perioperative peripheral thrombosis or thromboembolism, or both, after transfemoral IAB insertion with acute onset of limb ischemia [5]. Since then, we have routinely used this approach in patients with contraindications to the transfemoral method of insertion. We report here the complete series of 10 consecutive patients undergoing successful transbrachial perioperative IABP assistance.

From July 2005 to June 2006, 10 patients referred to our institution because of severe coronary disease needing preoperative IABP assistance were considered unsuitable for traditional transfemoral IAB insertion. After Institutional Review Board approval and informed consent was obtained, all patients were scheduled for the transbrachial method of insertion. Indications for transbrachial insertion are summarized in Table 1.

IABP insertion was performed under local anesthesia (7 mL of Xylocaine 20 mg/mL [AstraZeneca, Basiglio-Milan, Italy]), always percutaneously with the “sheetless” technique through the right brachial artery (previously confirmed by angiography to be free from atherosclerosis) 3 cm above the elbow. Either 34 cm3 or 40 cm3 7.5F IAB (Datascope, Fairfield, NJ) catheters were chosen as appropriate, based on the patient’s body surface area.

Under fluoroscopic guidance, the IAB was forwarded in the descending thoracic aorta (Fig 1A), paying attention that the proximal tip of the balloon was positioned a few centimeters beneath the inferior margin of the collarbone or at the level of the aortic arch (Fig 1B). Chest roentgenograms were used postoperatively, and then daily thereafter, to confirm the exact position of the IAB.

In all patients, the IABP was set on electrogadiogram-trace only using the semi-automatic setting. In fact, the
“upside-down” position of the balloon did not allow for the direct derivation of the invasive intraaortic arterial pressure from the tip of the balloon; therefore, we did not consider the automatic setting to be safe for the assistance using either electrocardiogram-trace or intraaortic arterial pressure.

Intravenous heparin was started immediately after IABP positioning to achieve an activated partial thromboplastin time of more than 55 seconds, until full heparinization (300 IU/kg to maintain an activated clotting time of 480 seconds or more) was accomplished intraoperatorively, just before initiation of cardiopulmonary bypass. Postoperative anticoagulation consisted of nadroparin (4000 IU/d) until the second postoperative day, followed by 150 mg of aspirin daily thereafter in all patients.

A pulse oximeter was applied to the middle finger of the right hand immediately after IAB positioning to rule out any hypoperfusion syndrome and continued for 12 hours after IAB withdrawal during the postoperative period. Homolateral peripheral pulse oximetry, radial-pulse digital palpation, and hand temperature were strictly monitored. Compared with the preoperative period, pulse oximetry values in all patients remained at 96% to 100% oxygen saturation, with constant waveform, the radial artery pulse was always present, and the hand remained warm during the entire period of IABP assistance. Furthermore, the superficial location of the brachial artery allowed a simple manual compression to stop the bleeding when IABP assistance was discontinued and the IAB was withdrawn.

The duration of IABP was 18 to 39 hours (Table 1). In all patients, perioperative assistance with IABP through the brachial artery was successful and uneventful. No cases of vascular complications, hand ischemia, dissections, or infections were recorded. There were no in-hospital deaths, no instances of perioperative low output syndrome, and no acute myocardial infarctions. Hospital morbidity is summarized in Table 1. All patients were discharged home in a healthy condition.

Comment

With the increased number of patients referred for CABG at the end stage of their disease, the need for short-term circulatory support with IABP during the perioperative period has become advisable to prevent critical myocardial ischemia during the induction phase of anesthesia and graft harvesting, as well as to facilitate weaning from cardiopulmonary bypass [1]. Sometimes, however, IABP insertion may be cumbersome, risky, or contraindicated because of severe and diffuse atherosclerosis of the descending aorta and peripheral arteries, or because of abdominal aortic aneurysms [3, 4].

**Table 1. Characteristics of 10 Patients With Severe Peripheral Atherosclerosis Who Received Transbrachial Intraaortic Balloon Pumping**

<table>
<thead>
<tr>
<th>Patient</th>
<th>Indications</th>
<th>IABP Duration (hours)</th>
<th>Hospital Morbiditya</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Occlusion right CFA, 50% stenosis left CFA, eggshell distal aorta</td>
<td>20</td>
<td>Pneumothorax</td>
</tr>
<tr>
<td>2</td>
<td>Burger disease</td>
<td>29</td>
<td>None</td>
</tr>
<tr>
<td>3</td>
<td>80% stenosis right CIA, occlusion left CFA</td>
<td>18</td>
<td>None</td>
</tr>
<tr>
<td>4</td>
<td>75% stenosis right CIA, 60% stenosis right CFA, 55% stenosis left CFA</td>
<td>35</td>
<td>None</td>
</tr>
<tr>
<td>5</td>
<td>Previous aortobiiliac bypass graft</td>
<td>27</td>
<td>Mild renal impairment</td>
</tr>
<tr>
<td>6</td>
<td>Distal AAA</td>
<td>24</td>
<td>None</td>
</tr>
<tr>
<td>7</td>
<td>Occlusion right CFA, 50% stenosis left EIA</td>
<td>39</td>
<td>None</td>
</tr>
<tr>
<td>8</td>
<td>Previous aortobifemoral bypass graft (40% narrowing of distal anastomoses)</td>
<td>33</td>
<td>Superficial sternal wound infection</td>
</tr>
<tr>
<td>9</td>
<td>70% stenosis right CFA, 60% stenosis left CFA</td>
<td>21</td>
<td>None</td>
</tr>
<tr>
<td>10</td>
<td>80% stenosis right CFA, 55% stenosis left CIA, 45% stenosis left CFA</td>
<td>24</td>
<td>None</td>
</tr>
</tbody>
</table>

a There were no complications related to the IABP.

AAA = abdominal aortic aneurysm; CFA = common femoral artery; CIA = common iliac artery; EIA = external iliac artery; IABP = intraaortic balloon pump.

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**Fig 1.** (A) Fluoroscopic positioning of the intraaortic balloon in the descending thoracic aorta, (B) with the demonstration of the proximal end of the balloon a few centimeters beneath the inferior margin of the collarbone (arrow) distal to the origin of the left subclavian artery, and of the inflated balloon (asterisk) in the descending aorta.
In such cases, previous reports have proposed percutaneous femoral or iliac revascularization before IABP [6], or transaxillary [4] or transaortic insertion of the IAB [3]. All these approaches are costly and risky because they require general anesthesia, and surgical procedures may be deemed unsuitable in patients with unstable hemodynamics who are increasingly being indicated for CABG.

Noel and colleagues [7] first reported the transbrachial approach for IABP assistance during percutaneous coronary intervention, but the 8F IAB catheter used required early withdrawal owing to the onset of hand hypoperfusion. After their report, we initially reported a successful long-lasting and uncomplicated perioperative management with a 7.5F transbrachial IABP [5]. Since then, we have routinely used such an approach in all patients referred to our institution in whom the transfemoral approach was considered unsuitable.

The series reported here not only confirms the efficacy of IABP perioperative assistance in high-risk coronary surgery but also demonstrates the safety of the transbrachial approach in a consecutive series of 10 patients in whom the transfemoral method was inaccessible. Technically, arterial access was the same as described for routine transbrachial coronary angiography.

To date, the main limitation of the transbrachial method has been the relatively small diameter of the brachial artery itself, a limitation that has been overcome by the recent availability of 7.5F IABP catheters. It can be argued that future availability of 7F IABP catheters will broaden the indication for this method of insertion in a growing number of patients encountered in daily practice.

Constant monitoring of the pulsatile flow in the corresponding limb is crucial, and pulse oximetry seems to work well, as validated in the literature [8]. We also used pulse oximetry to constantly monitor the hand perfusion. We never observed values suggestive of hypoperfusion or any signs or symptoms of hand ischemia, such as pain, cyanosis, or edema, thus confirming the safety of the transbrachial approach with small IABP catheters. Moreover, the superficial location of the brachial artery allows a simple external manual compression at IABP removal, minimizing the risk of hemorrhagic complications.

In conclusion, we demonstrate that patients with severe peripheral atherosclerosis or distal abdominal aortic aneurysms, previously considered at high-risk for complications or even absolutely contraindicated for IABP, can safely and effectively receive long-lasting IABP assistance using the transbrachial method of insertion and the sheetless technique. Studies on larger numbers of patients are needed to validate this alternative approach.

References

Delayed Left Ventricular Pseudoaneurysms After Left Ventricular Aneurysm Repairs With the CorRestore Patch

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We present two cases of left ventricular pseudoaneurysm that developed after left ventricular aneurysm repair with the CorRestore patch (Somanetics Corp, Troy, MI). Both patients underwent subsequent pseudoaneurysm repair with Dacron patches (Boston Scientific Corp, Natick, MA). We discuss the physiologic limitations of the CorRestore patch and the causes of pseudoaneurysms that arise after left ventricular aneurysm repair.


The first successful repair of a left ventricular aneurysm was described in 1958 by Cooley and colleagues [1], who also reported the first such repair with a Dacron patch (Boston Scientific Corp, Natick, MA) in 1989 [2]. Soon thereafter, woven Dacron became the material of choice for these patch repairs because of its durability, flexibility, and availability. Nonetheless, in recent years, other materials have become available that are potentially even better suited for aneurysm patching. Recently we have had experience using a relatively new bovine pericardial system—the CorRestore patch (Somanetics Corp, Troy, MI)—in place of the Dacron patch (Boston Scientific Corp). We report two cases of pseudo-