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# A Nurse's Guide to Caring for Cardiac Intervention Patients

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*By*

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*Interventional Cardiology Unit, Leeds General Infirmary*



John Wiley & Sons, Ltd



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West Sussex PO19 8SQ, England

Telephone (+44) 1243 779777

Email (for orders and customer service enquiries): [cs-books@wiley.co.uk](mailto:cs-books@wiley.co.uk)  
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John Wiley & Sons Canada Ltd, 6045 Freemont Blvd, Mississauga, Ontario, L5R 4J3, Canada

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Anniversary Logo Design: Richard J. Pacifico

#### ***Library of Congress Cataloging-in-Publication Data:***

O'Grady, Eileen.

A Nurse's Guide to Caring for Cardiac Intervention Patients / Eileen O'Grady.

p. ; cm.

Includes bibliographical references.

ISBN-13: 978-0-470-01995-5 (alk. paper)

ISBN-10: 0-470-01995-6 (alk. paper)

1. Heart – Diseases – Nursing. 2. Heart – Diseases – Patients – Rehabilitation. 3. Coronary heart disease. I. Title.

[DNLN: 1. Heart Diseases – nursing. WY 152.5 O35c 2007]

RC674.O327 2007

616.1'20231 – dc22

2006022726

#### ***British Library Cataloguing in Publication Data***

A catalogue record for this book is available from the British Library

ISBN-13: 978-0-470-01995-5

Typeset in 10/12pt Times by Laserwords Private Limited, Chennai, India

Printed and bound in Great Britain by TJ International, Padstow, Cornwall

This book is printed on acid-free paper responsibly manufactured from sustainable forestry in which at least two trees are planted for each one used for paper production.

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# Preface

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Since the publication of the *National Service Framework for Coronary Heart Disease* (NSFCHD), in March 2000, the number of interventional cardiac procedures being performed in England has grown and continues to grow. In order to achieve the NSFCHD targets, more district general hospitals (DGHs) are now performing procedures previously only carried out in tertiary centres, such as electrophysiology and ablation, as well as routine, low-risk percutaneous coronary intervention (PCI) and implantable cardioverter defibrillator (ICD) implantation.

The role of the cardiac nurse in the DGH will evolve to provide efficient and effective care for these patients. As a staff nurse working in Leeds General Infirmary – one of the busiest cardiology interventional centres in England – I found it difficult to find a book explaining various procedures from a nursing perspective. Therefore, using experience gained on the ward, latest research studies and evidence-based practice, this book aims to:

- outline how to care for such patients pre and post procedure;
- provide guidance for when speaking to patients and their families;
- help to recognise and deal with potential complications.

Cardiology is research-driven; therefore protocols vary from hospital to hospital and change in accordance with the latest research findings and cardiologist preference. This book aims to guide nurses through interventional cardiology even though local protocols may differ from what is suggested in the book.

The glossary can be found at the back of the book. This serves not only to explain terms used throughout the book, but can also be used as a quick reference guide and is eminently readable and informative as a stand-alone chapter.

## ACKNOWLEDGEMENTS

I would like to thank all of my colleagues at Leeds General Infirmary for their patience and support, especially those who took the time to read a chapter and provided valuable feedback, suggestions and alterations.

All illustrations have been created by Steve Granshaw. I would like to thank Steve for his superb artwork and knowledge on how to use a computer.

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# 1 Access Sites of Percutaneous Procedures

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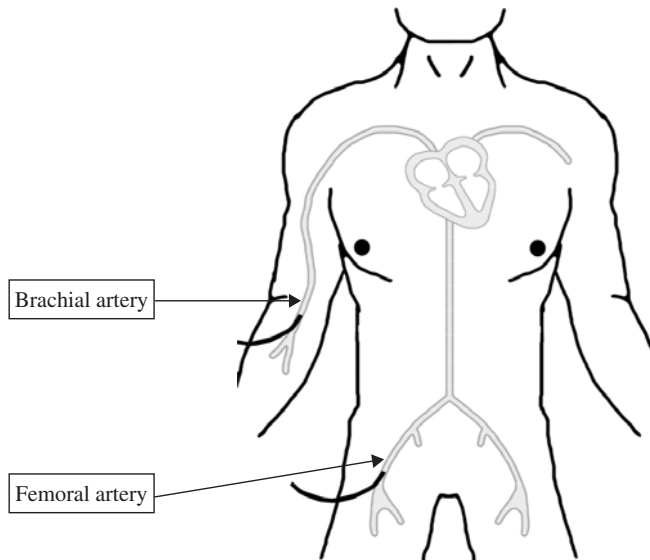
In 1929, Werner Forssman performed the first human cardiac catheterisation by passing a urethral catheter from his left antecubital vein into the right side of his heart (10). Cardiac catheterisation has evolved since then and nowadays is used in a variety of procedures that vary from investigative tests such as angiograms to interventions such as coronary angioplasty and atrial septal defect repairs, thus reducing the need for cardiac surgery (11).

These can be referred to as percutaneous coronary procedures, as the heart is accessed by inserting a catheter through the skin into an artery and/or vein, and threading it up to the heart. Access to the arterial system may be via the femoral, brachial or radial artery (5).

## **ADVANTAGES OF PERCUTANEOUS ACCESS**

The majority of percutaneous coronary investigations and interventions are performed under local anaesthetic, as patients may be asked to cough, hold their breath or move their position during the procedure. Using a local anaesthetic also has the advantage of avoiding the risks associated with general anaesthesia (11). The other advantages that percutaneous coronary procedures offer over cardiac surgery include:

- Patients are less anxious waiting for a percutaneous procedure than for a surgical procedure (8).
- A cardiopulmonary bypass machine, if required, and its inherent risks are avoided (8).
- The hospital stay is shorter. For example, patients undergoing percutaneous coronary intervention (PCI) normally stay in hospital for 12–24 hours, whereas patients undergoing a coronary artery bypass graft (CABG) require a stay of 3–7 days (8).
- Barring complications, the average cost of percutaneous coronary procedures is substantially lower than that of surgery (8).
- Patients are able to resume their normal life sooner after percutaneous procedures. For example, patients can usually return to work within 7–10 days after a PCI, whereas patients undergoing a CABG return to work within 6 weeks (8).



**Figure 1.1.** Introducing a catheter into the brachial or femoral artery.

- If a patient has a clotting disorder or has recently had thrombolysis, they can be treated in an emergency with PCI (1).

## SELECTING THE ARTERIAL PUNCTURE

The access site is selected by the cardiologist prior to the procedure; however, the femoral artery is the preferred access site to the arterial system for the majority of percutaneous procedures (see Figure 1.1). Although the brachial and radial arteries may be preferred by some cardiologists, they are mainly used if the femoral artery is unavailable, due to peripheral vascular disease, for example, or if the patient is unable to lie flat on their back during the procedure, such as patients with severe heart failure, who would normally sleep with three or four pillows (9).

The brachial and radial arteries are smaller than the femoral artery and carry a higher risk of dissection and occlusion. Percutaneous puncture of the brachial artery is more likely to require surgical repair than percutaneous femoral puncture. In addition to this, brachial arteriotomy under direct vision can be technically challenging for the inexperienced operator and is time-consuming (9).

Percutaneous radial artery puncture appears safe, but it results in occlusion of the radial artery in around 5% of cases. Although, in such cases, the blood to the hand would be supplied by the ulnar artery, the occluded radial artery would not be available for a CABG surgery if the patient required one in the future (9).

## FEMORAL ACCESS

The most common vascular access site is the femoral artery. It can also be referred to as the Judkin's approach (7). The selected femoral artery is shaved of groin hair in order to reduce infection risk and then the area is liberally cleaned with antiseptic solution (8). Then, a local anaesthetic such as lignocaine is slowly injected into the inguinal area of the groin, as a slow injection of the local anaesthetic is less painful for the patient and produces better tissue infiltration (2).

Once the femoral area is anaesthetised, the cardiologist punctures the femoral artery percutaneously by inserting a large cannula containing a removable obturator. The presence of blood flow once the obturator is removed confirms that this cannula is within the lumen of the artery. Once proper placement is established, a guidewire is introduced through the cannula into the artery to the level of the diaphragm. The cannula is then removed and replaced by a valved introducer sheath (known as a femoral sheath) (8). The patient may feel some pushing and tugging at this time. This introducer sheath provides haemostasis and support at the puncture site and reduces potential arterial trauma if multiple catheter exchanges are necessary (8).

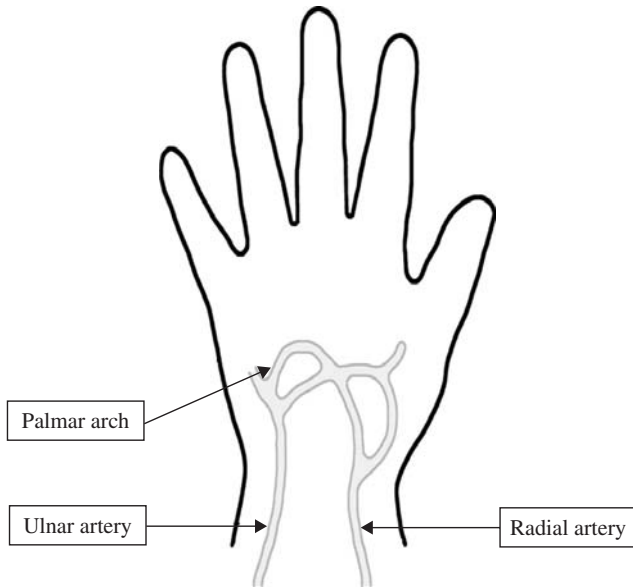
The femoral vein is accessed in a similar manner if it is required. Venous access is mainly used during electrophysiological studies (EPS) and radio-frequency ablation (RFA). Venous access for temporary pacing is no longer routine during PCI; however, it should be considered for high-risk patients, such as those with acute myocardial infarction (MI) or left bundle branch block needing right coronary artery PCI, or if a rotoblator or thrombus aspiration device is required (6).

## REMOVING A FEMORAL SHEATH

There are several methods of obtaining haemostasis in the femoral puncture site post sheath removal. Closure devices, such as AngioSeal, VasoSeal, Duett and Perclose, allow the removal of the femoral sheath at the end of the procedure, no matter what the anticoagulation status is (9). However, the majority of centres still rely on the compression of the femoral artery using either manual or mechanical compression, or a combination (4). This means that the femoral sheath is usually removed 3–4 hours after the procedure if heparin has been used, such as during PCI (8). As femoral sheaths are usually removed on the ward by nursing staff, it is discussed in more detail in Chapter 2.

## RADIAL ACCESS

The radial artery approach was developed as an alternative to the percutaneous transbrachial approach in an attempt to limit vascular complications. The inherent advantages of the transradial approach are that the hand has a dual arterial supply



**Figure 1.2.** Radial artery anatomy and collateral circulation.

connected via the palmar arches and that there are no nerves or veins at the site of puncture (3). The location of the radial artery enables easy access in most people, and it is easier to control bleeding (see Figure 1.2). In addition, prolonged bed rest is unnecessary after the procedure (6).

Although using the radial approach is associated with fewer severe access site-related bleeding complications than the femoral approach, the sheath sizes are smaller. They are usually limited to size 6 or 7 French, and therefore would not be suitable for cases in which larger catheters are required, such as valvuloplasty or rotablation (7). Unfortunately, the radial artery has a propensity to develop spasm, which may make catheter movement difficult or impossible. This can be overcome by the use of vasodilators and long introducer sheaths when appropriate (6). In addition, radial access is only suitable for left-sided heart catheterisation; another approach would be required if the right side of the heart required catheterisation as well (3).

Prior to a radial procedure, the clinician must complete an Allen's test to assess the ulnar artery in the arm to be proceeded on. First, the radial and ulnar arteries are occluded simultaneously while the patient makes a fist. Then, when the hand is opened, it appears blanched. The ulnar artery is released and the hand colour should return within 8–10 seconds. Satisfactory ulnar flow can also be documented by pulse oximetry (6).

In order to insert the catheter into the radial artery, the selected arm is abducted at a 70° angle on an arm board, and the wrist hyperextended over a gauze roll. It is cleaned liberally with antiseptic. A topical anaesthetic is applied first, as

it reduces the amount of lignocaine needed for local infiltration over the radial pulse. Large amounts of lignocaine may obscure the pulse and make cannulation more difficult (6). A small incision is made and an 18-gauge needle is introduced at a 45° angle into the radial artery. A guidewire is inserted first and then a valved introducer sheath. Haemostasis is obtained at the end of the procedure after sheath removal using direct pressure. It is recommended that the arterial puncture site be allowed to bleed for several beats before maintaining direct pressure. The radial pulse should be monitored regularly for several hours after the procedure (3).

### **SHEATH REMOVAL AND POST-PROCEDURE CARE**

Before the sheath is removed, 1 mg of verapamil is given through the sheath to minimise spasm of the radial artery (6).

Although haemostasis can be achieved by applying direct manual pressure over the puncture site, there are several radial haemostat devices available on the market, and their guidelines should be followed. The following is a description of one such device. A plastic bracelet with a pressure pad is placed around the wrist. Gauze is wrapped around the plastic strip to prevent skin injury when the bracelet is tightened. Another folded piece of gauze is placed under the pressure pad over the sheath insertion site. While the operator presses the pad over the puncture site, the sheath is withdrawn gently and the bracelet is tightened. The pad is pressed down and locked over the puncture by tightening of the bracelet bracket. The bracelet should be tight enough to ensure haemostasis but not occlude flow to the hand. The patient is checked 1–2 hours later, and the bracelet is loosened. The patient can be discharged 2 hours later and the bracelet removed at home. The patient should be given instructions about puncture site compression with the fingers if later bleeding occurs (6).

### **BRACHIAL ACCESS**

There are two methods of obtaining brachial access, but they should be reserved for patients in whom the radial artery cannot be used (6).

### **PERCUTANEOUS BRACHIAL ARTERY PUNCTURE**

Percutaneous arterial puncture is a safe and effective alternative to brachial artery cut-down, and is normally favoured over the brachial artery cut-down. Although it is similar to femoral arterial puncture, there are several important differences:

1. The brachial artery is smaller (3–5 mm in diameter) than the femoral artery.
2. Because of relatively loose subcutaneous tissues, the course of the brachial artery may change considerably.
3. Spasm can occur easily, with considerable decrease in pulse amplitude, making the puncture more difficult.