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Access site complications and puncture site pain following transradial coronary procedures: A correlational study

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ABSTRACT

Background: Transradial coronary angiography (CA) and percutaneous coronary intervention (PCI) are gaining worldwide popularity due to the low incidence of major vascular complications and early mobilization of patients post procedures. Although post transradial access site complications are generally considered as minor in nature, they are not being routinely recorded in clinical settings.

Objectives: To evaluate the incidence of access site complications and level of puncture site pain experienced by patients undergoing transradial coronary procedures and to examine factors associated with access site complications occurrence and puncture site pain severity.

Methods: A cross-sectional correlational study of 85 Chinese speaking adult patients scheduled for elective transradial CA and or PCI. Ecchymosis, bleeding, hematoma and radial artery occlusion (RAO) were assessed through observation, palpation and plethysmographic signal of pulse oximetry after coronary procedures. Puncture site pain was assessed with a 100 mm Visual Analogue Scale. Factors that were related to access site complications and puncture site pain were obtained from medical records.

Results: Ecchymosis was the most commonly reported transradial access site complication in this study. Paired *t*-test showed that the level of puncture site pain at 24 h was significantly ($p < 0.001$) lower than that at 3 h after the procedure.

Stepwise multivariable regression showed that female gender and shorter sheath time were found to be significantly associated with bleeding during gradual deflation of compression device. Only longer sheath time was significantly associated with RAO. Female gender and larger volume of compression air were associated with the presence of ecchymosis and puncture site pain at 3 h after procedure, respectively.

Conclusions: The study findings suggest that common access site complications post transradial coronary procedures among Chinese population are relatively minor in nature. Individual puncture site pain assessment during the period of hemostasis is important.

Nurses should pay more attention to factors such as female gender, sheath time and volume of compression that are more likely to be associated with transradial access site complications and puncture site pain.

What is already known about the topic?

- Transradial coronary angiography and percutaneous coronary intervention has gained popularity due to the low incidence of major vascular complications.
- Puncture and compression of radial artery can lead to access site complications but they are not being routinely recorded.

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- Manipulation of arterial sheath often causes puncture site pain.

What this paper adds

- Common transradial access site complications are generally minor in nature among Hong Kong Chinese population.
- Individual puncture site pain assessment is important after transradial coronary procedure especially during hemostasis.
- Nurses should pay more attention to the factors that are more likely to be associated with transradial access site complications such as higher risk for bleeding and ecchymosis among female patients and higher likelihood for radial artery occlusion with longer sheath time.

1. Introduction

Transradial coronary angiography (CA) and percutaneous coronary intervention (PCI) are gaining more popularity over the traditional femoral approach due to the low incidence of major vascular complications (Jolly et al., 2011) and immediate mobilization of patients after the procedure (Amoroso et al., 2007). Due to the immediate sheath removal after transradial procedures and the concomitant use of antiplatelet and anticoagulant therapies, mechanical compression at the puncture site is necessary (Papadimos and Hofmann, 2002). Both the puncture and compression of the radial artery can lead to access site complications although they are not being routinely recorded (Steffenino et al., 2006). And some of the commonly reported complications include ecchymosis (Gwon et al., 2006; Wu et al., 1997), bleeding (Gwon et al., 2006), radial artery occlusion (RAO) (Korn et al., 2008; Pancholy et al., 2008) and hematoma (Tse et al., 2006; Pillay et al., 2001). Also, since radial artery is much narrower than femoral artery, manipulation of the arterial sheath often causes puncture site pain (Pillay et al., 2001; Hildick-Smith et al., 2003; Gwon et al., 2006). Since the first transradial coronary angiography by Campeau (1989), reported experience in Chinese patients has been limited (Tse et al., 2006) with minimal local data available among the Hong Kong Chinese population. Since populations in the reviewed studies were mostly Caucasians, when generalizing study results, biological variations of Chinese should be taken into consideration. In terms of body size and structure, Chinese are normally shorter and tend to have smaller-sized radial arteries which may limit transradial access (Tse et al., 2006). Besides, Chinese patients tend to interpret and react to pain and physical discomforts in ways that fit their cultural norms. According to Giger and Davidhizar (1995), Chinese culture is dominated by Confucius' teachings, and Chinese tend to suppress feelings such as anxiety, fear, depression, or pain. Further study is needed to provide a better picture from the transradial approach in terms of access site complications and puncture site pain.

Several factors such as gender, catheter size, body weight, body mass index, age, heparin dosage, clopidogrel prescription, sheath/cannulation time, repeated procedure (i.e. previous transradial coronary procedure had been done) and compression duration for hemostasis had been studied to have a relationship with transradial access site complications and puncture site pain. For example, female gender and catheter size had been reported to be associated with higher incidence of minor bleeding than men post transradial catheterization (Pristipino et al., 2007). Lower body weight (BW), body mass index (BMI), higher dosage of heparin, higher clopidogrel prescription rate and longer sheath time were found to be related to the occurrence of hematoma post transradial catheterization (Li et al., 2007). Moreover, lower BW, female gender, older age (Pancholy et al., 2008), repeated procedure (Yoo et al., 2003), longer duration of arterial cannulation time (Tuncali et al., 2005) had been reported to be associated with higher incidence of RAO while prolonged compression is considered as a strong predictor of early RAO (Sanmartin et al., 2007).

Since heparin and clopidogrel are known to have a tendency to cause bleeding (Deglin and Vallerand, 2001) while International Ratio was an indication for bleeding tendency (Kee, 2005), the relationship between these factors and bleeding required further exploration. It has been suggested that as long as there was no increase in bleeding complications, there appeared to be no drawback of using a lower pressure hemostatic method and compression devices that allowed progressive reduction of pressure so as to ensure radial artery patency (Pancholy et al., 2008). However, no study can be found to look at the relationship between the amount of compression pressure exerted onto the puncture site and the incidence of transradial access site complications.

In terms of transradial puncture site pain, smaller catheter size had been reported to be associated with significantly lower wound pain at sheath insertion, during procedure and at sheath removal but not at 24 h post procedure (Gwon et al., 2006). Prolonged compression can cause patient discomfort at the puncture site and in severe cases, lead to regional chronic pain syndrome (Papadimos and Hofmann, 2002). And yet, no study can be found to examine the relationship between duration of compression and level of puncture site pain.

Based on the studies reviewed, definitions of access site complications and methods for assessing the access site complications were not clear for most of the studies. Also, studies that explored factors related to the presence of transradial access site complications tended to focus on one particular type of access site complication only. Therefore, the first purpose of this study was to explore the incidence of transradial access site complications provided that definitions were set to be relevant for the transradial approach. And the second purpose of this study was to examine the relationships between each of the reported transradial access site complications and its related factors with a more comprehensive approach. Specific objectives of this study include:

1. To describe the occurrence rate of access site complications namely bleeding, ecchymosis, hematoma and RAO resulted from transradial coronary procedures.