Ultrasound-Guided Versus Landmark-Guided Femoral Vein Access in Pediatric Cardiac Catheterization

Thesis

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استخدام الموجات فوق الصوتية في تحديد مكان الوريد الفخذي مقارنة باستخدام التحديد التشريحي له في عمليات قسطرة القلب للأطفال

رسالـــة

توطئة للحصول على درجة الماجستير في أمراض القلب والأوعية الدموية

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SUMMARY

Vascular access in infants and children with multiple prior catheterizations can pose a significant challenge to the pediatric interventional cardiologist and may consume up to 25% of the entire procedure time. Guidance for vascular access is traditionally based on external anatomical landmarks, the technique of locating surface landmarks and palpation was used to assist in vascular access. Success in these procedures has relied upon a good working knowledge of vascular anatomy and identification of surface landmarks by visual inspection and palpation.

In the last 30 years, the US guided-technique starts to play important roles in vascular access. At first physicians stared to use audio Doppler which provided for more accurate guidance of the puncture procedure. Now the ultrasound procedure of choice is the two-dimensional ultrasound scan, or so-called B-scan. With color-Doppler imaging, irregular blood flow or differences in flow velocity can be measured. This can be helpful in determining the access site and in optimizing the exact localization of catheter placement.

The needle can be guided through the tissue directly or indirectly. In indirect ultrasound guidance, ultrasound scans are performed before puncture and needle insertion is without

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قَالُوا سُبْحَانَكَ لاَ عِلْمَ لَنَا إِلاَّ مَا عَلَّمْتَنَا إِنَّكَ أَنتَ الْعَلِيمُ الْحَكِيمُ

صدق الله العظيم

سورة البقرة الآية (٣٢)

سورة البقرة الآية (٣٢)

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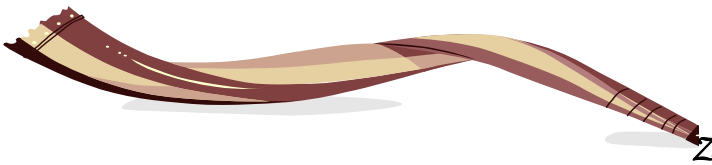

Zeinab Hassan hammam

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List of Abbreviations

2D US	***two-dimensional ultrasound***
3D US	***Three-dimensional ultrasound***
4D US	***four-dimensional ultrasound***
ACEP	***American College of Emergency Physicians***
ARVA	***Alternate routes of vascular access***
CBC	***Complete blood picture***
CHD	***congenital heart disease***
CVC	***Central venous catheterization***
DVT	***Deep venous thrombosis***
ECMO	***Extracorporal membrane oxygenation***
FA	***Femoral artery***
FV	***Femoral vein***
IJV	***Internal jugular vein***
IV	***Intravenous***
LM	***Landmark***
NICE	***National Institute for Clinical Excellence***
pp	***Peripheral pulsation***
SCV	***Subclavian vein***
SVC	***Superior vena cava***
US	***Ultrasound***

INTRODUCTION

Over the past decade, the pediatric catheterization laboratory, while continuing to play a significant role in anatomic and hemodynamic diagnosis, has evolved a therapeutic function **(Mullins CE et al., 1990).** With this augmented use of catheterization procedures, it becomes important to make sure that vascular complications are reduced to a minimum.

Previous studies addressing the incidence and risk factors of these vascular complications have been based on retrospective analyses of cohorts who underwent vascular access procedures **(Toursarkissian B et al., 1997).** All such procedures, both diagnostic and interventional, are associated with some risk. The ability to obtain reliable and safe venous access is important in the management of pediatric patients. Although the procedure for landmark-based placement of catheters is well known, the technique is not without significant complications.

In recent decades, external landmark techniques have been used in pediatric catheterization, but there are sometimes technical difficulties, such as anomalies in anatomy of vascular structures, dependency on the patient's movements, and an increased variability of vessel position related to adhesive structures of the perivascular area.

The landmark method fails, irrespective of anatomy, if the vein has thrombosed and may lead the operator to pass the needle in an inappropriate direction. All can result in a difficult puncture with or without complications. Thus, as early as in 1984, authors have recommended utilizing ultrasound guidance to optimize the success rate of cannulations and to minimize complications **(Legler D et al., 1984).**

Dynamic ultrasound (real time ultrasound) and static ultrasound are the two basic techniques utilized in ultrasound assisted procedures. When using dynamic ultrasound the anatomy and needle are visualized with the ultrasound machine throughout the entire procedure. The needle or the ultrasound artifact it produces is visualized thus assuring correct vessel cannulation. When using static ultrasound, the anatomy is surveyed with ultrasound prior to performing the procedure. A point of entry in the skin is identified and the procedure is then performed without continuous ultrasound visualization. Although both techniques can be utilized, dynamic imaging is superior and is used in most studies ***(*Slama M et al., 1997)**.

Few reports have discussed the issue of safer and more reliable femoral vein access in pediatric catheterization. This study will evaluate whether an ultrasound-guided technique can improve on the traditional landmark-guided technique in facilitating access to the femoral vein in the pediatric cardiac catheterization laboratory.

AIM OF THE STUDY

This study aims to evaluate whether an ultrasound-guided technique can improve on the traditional landmark-guided technique in facilitating access to the femoral vein and in decreasing the complications in the pediatric cardiac catheterization laboratory.