

Role of Ultrasound in Pediatric Anesthesia

Essay

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قَالَ

سَبَّحَانَكَ لَا يَلْمُ لَنَا
إِلَّا مَا عَلِمْنَا إِنَّكَ أَنْتَ
الْعَلِيمُ الْعَظِيمُ

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List of Abbreviations

<i>Abbr.</i>	<i>Full-term</i>
ASD	: Atrial septal defect
AV	: Aortic valve
AV	: Atrio-ventricular
CABG	: Coronary artery bypass graft
CFD	: Colour flow Doppler
CNS	: Central nervous system
CPB	: Cardiopulmonary bypass
CSF	: Cerebrospinal fluid
CT	: Computerized tomography
CVC	: Central venous catheter
CVP	: Central venous pressure
D	: Dimensional
ECG	: Electrocardiogram
IJV	: Internal jugular vein
IVC	: Inferior vena cava
IVS	: Interventricular septum

LA	: Left atrium
LA	: Local anesthetics
LV	: Left ventricle
LVIDD	: Left ventricular internal diastolic dimension
LVISD	: Left ventricular systolic dimension
MAC	: Minimal alveolar concentration
MIDCAB	: Minimally invasive direct coronary artery bypass
MR	: Mitral regurgitation
MRI	: Magnetic resonance imaging
MV	: Mitral valve
OPCAB	: Off pump coronary artery bypass
PA	: Pulmonary artery
PAC	: Pulmonary artery catheter
PICCs	: Peripherally inserted central catheters
PNBs	: Peripheral nerve blocks
PRF	: Pulse repetition frequency
PTCA	: Percutaneous transluminal coronary angioplasty
RA	: Right atrium
RV	: Right ventricle
SAS	: Subaortic stenosis

SV	: Stroke volume
SVC	: Superior vena cava
SWMA	: Segmental wall motion abnormalities
TEE	: Transesophageal echocardiography
TGC	: Time gain compensation
US	: Ultrasound
VSD	: Ventricular septal defect

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Abstract

Background: Ultrasound is a rapidly rising and flourishing technology invading the local anaesthesia field, as direct visualization of the nerves and surrounding structures improves the outcome of most techniques especially in pediatric patients due to small field, difficult surface anatomical markings and very small structures. **Aim of the Work:** To discuss role of ultrasound in pediatric anesthesia.

Key words: Ultrasound, pediatric anesthesia

INTRODUCTION

Pediatric anesthesia is a challenge for an anesthesiologist not only due to physiological differences that require wide medical knowledge but also due to anatomical differences that require fine skills to handle techniques needed for anesthesia as peripheral and central venous cannulation, arterial circulation and peripheral and central neuro-axial blocks. Being blind and depend on surface anatomy and individual skills, these techniques are difficult and may carry risk of failure or complications. The use of ultrasound and an aid for accurate administration of local anesthetics is gaining in popularity for regional anesthesia over conventional landmark-based techniques and neurostimulation (*Marhofer et al., 2014*).

Ultrasound imaging is rapidly emerging as one of the most promising tools as the size, depth and precise location of nerves in their surrounding environment can be determined, depending on correct interpretation. Viewing the moving needle once inserted at an appropriate angle and within the plane of the ultrasound, probe, as well as the spread of local anesthetic provides valuable assistance to the anesthesiologist when performing regional anesthesia (*Pietrini et al., 2011*).

Regional anesthesia plays an important role in the perioperative management of children and particularly of babies and neonates, where one should avoid or minimize airway manipulation whenever possible. Perfect block techniques are required for an improved perioperative outcome. Interestingly, many peripheral regional techniques are not adequately described, resulting in complications and low success rates whereas central techniques are well-described with ensuing high success rates (*Rapp et al., 2013*).

Although it has not yet been sufficiently described in an “evidence-based” manner, ultrasonographic guidance for a broad spectrum of regional anesthetic techniques results in safe and effective blocks. Recent publications have illustrated the use of ultrasonography for central and peripheral blocks for children also. The initial results of encouraged scientific study groups to increase their efforts to develop new ultrasound-guided regional techniques targeted towards children, in an effort to introduce these techniques into clinical practice in the future (*Schafhalter-Zoppoth et al., 2014*).