Technique of intraosseous access in neonates

Bernhard Schwaberger
MD PhD

Medical University of Graz

Neonatal European Vascular Access Team

Nothing to disclose

NEVAT

https://neonat.org

Case Report

Full-term Infant (3580 g) with **multiple congenital malfomations**:

- Severe CDH
- Megaomphalocele
- Scoliosis

Initial stabilization:

- Intact cord resuscitation during C-section
- Endotracheal intubation after intranasal fentanyl
- Cord clamping after approx. 5 minutes

SpO2 78% at minute 10, FiO2 100%, HR 160/min, MABP 32 mmHg

Emergent requirement for vascular access

- Umbilical Catheterization not feasible
- Attempts at establishing peripheral venous access not successful
- Dislocation of the first intraosseous catheter at the left tibia

RESUSCITATION 156 (2020) A156 –A187

Available online at www.sciencedirect.com

Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation

ELSEVIER

EUROPEAN RESUSCITATION COUNCIL

Neonatal Life Support
2020 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations☆

Treatment Recommendations

We suggest umbilical venous catheterization as the primary method of vascular access during newborn infant resuscitation in the delivery room. If umbilical venous access is not feasible, the intraosseous route is a reasonable alternative for vascular access during newborn resuscitation (weak recommendation, very low-certainty evidence).

Treatment Recommendations (Intraosseous Versus Umbilical Vein for Emergency Access [NLS 616: SysRev])

Which evidence?

Which evidence supports the use of intraosseous access?

Which device?

Which devices are available?

Which device may be the best?

Which location?

Which location is the best?

Which alternative locations might be considered?

Which evidence is available?

01

Clinical Case Series and Case Reports

Animal studies

Cadaver studies

(Simulation studies)

Five-Year Experience in Prehospital Intraosseous Infusions in Children and Adults

From the Medical College of Wisconsin;* the Children's Hospital of Wisconsin;† and Milwaukee County Paramedic Training Institute,‡ Milwaukee, Wisconsin.

Received for publication March 24, 1992. Revision received December 22, 1992. Accepted for publication January 19, 1993.

Peter W Glaeser, MD*†
Thomas R Hellmich, MD*†
Del Szewczuga, RN, EMT-Paramedic‡
Joseph D Losek, MD, FACEP*†
Douglas S Smith, MD*†

Study objective: To evaluate the ability of emergency medical technician-paramedic (EMT-P) units to become and remain proficient in the performance of the intraosseous infusion procedure.

Design and setting: Descriptive nonrandomized trial open to all patients meeting protocol criteria over a five-year period; prehospital urban and suburban area with a population of 951,000.

Participants: One hundred fifty-two consecutive patients (age range, newborn to 102 years) who had intraosseous infusion line placement attempted by EMT-Ps.

Intervention: Jamshidi® sternal intraosseous infusion needle placed in the proximal tibia bone marrow in patients requiring emergency vascular access for fluid and/or medication administration.

Results: EMT-Ps performed 165 attempts on 152 patients with a five-year success rate of 76% per patient and 70% per attempt. Success rates per patient age group were 78%, 0 to 11 months; 85%, 1 to 2 years; 67%, 3 to 9 years; and 50%, 10 years or older.

23 newborns
proximal tibial region via Jamshidi needle
Rate of successful insertion was 78% in children 0–1 years of age
No severe complications mentioned

Arch Dis Child Fetal Neonatal Ed 1999;**80**:F74–F75

Intraosseous lines in preterm and full term neonates

Helmut Ellemunter, Burkhart Simma, Rudolf Trawöger, Heiner Maurer

Abstract
***Aim*—To evaluate the use of intraosseous lines for rapid vascular access in primary resuscitation of preterm and full term neonates.**
***Methods*—Thirty intraosseous lines were placed in 27 newborns, in whom conventional venous access had failed.**
***Results*—All the neonates survived the resuscitation procedure, with no long term side effects.**
***Conclusion*—Intraosseous infusion is quick, safe, and effective in compromised neonates.**

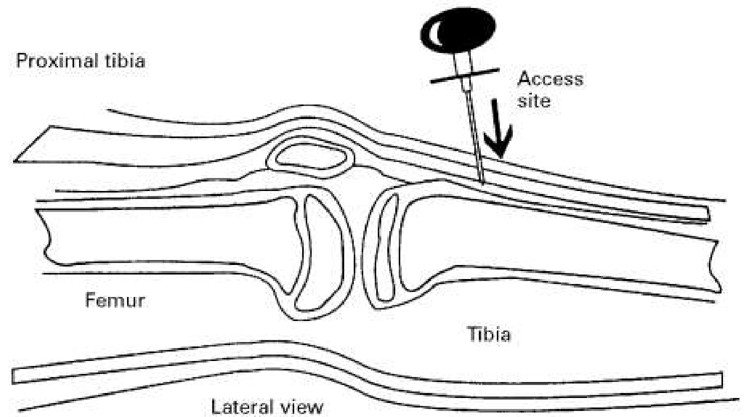


Figure 1 Appropriate placement of the intraosseous infusion needle on the medial surface, distal to tibial tuberosity.

27 newborns with 30 i.o. lines in the proximal tibial region via Cook needle

Mean weight 1,780 g (range 515–4,050 g)

Complication rate 13% (dislocation, subcutaneous necrosis, haematoma)

frontiers in Pediatrics

BRIEF RESEARCH REPORT
published: 18 September 2020
doi: 10.3389/fped.2020.571285

Use of Intraosseous Vascular Access During Neonatal Resuscitation at a Tertiary Center

Lukas P. Mileder, Berndt Urlesberger and Bernhard Schwaberger*

Division of Neonatology, Department of Pediatrics and Adolescent Medicine, Medical University of Graz, Graz, Austria

Mileder LP, Urlesberger B and Schwaberger B (2020) Use of Intraosseous Vascular Access During Neonatal Resuscitation at a Tertiary Center. Front. Pediatr. 8:571285. doi: 10.3389/fped.2020.571285

12 newborns with 15 i.o. lines in the proximal tibial region via EZ-IO

Late preterm and term infants (>2600 g weight)

overall success rate 75%

Minor short-term complications in 3 of 9 successful IO punctures (33%)

EZ-IO®
Intraosseous Infusion System

Supplementary Figure 1. Local skin reaction following successful intraosseous blood administration, without any negative long-term consequences. Note the puncture site at the anterior aspect of the tibia rather than at the antero-medial surface of the tibia.

Mileder LP, Urlesberger B and Schwaberger B (2020) Use of Intraosseous Vascular Access During Neonatal Resuscitation at a Tertiary Center. Front. Pediatr. 8:571285. doi: 10.3389/fped.2020.571285

Systematic Review

Neonatology

Neonatology 2019;116:305–314
DOI: 10.1159/000502212

Received: March 14, 2019
Accepted after revision: July 17, 2019
Published online: October 28, 2019

Use of Intraosseous Needles in Neonates: A Systematic Review

Alexandra Scrivens[a] Peter R. Reynolds[c] Faith E. Emery[d] Calum T. Roberts[e, f]
Graeme R. Polglase[g] Stuart B. Hooper[g] Charles Christoph Roehr[a, b]

14 newborns with 16 i.o. lines

81% proximal tibia, 12% distal tibia, 6% distal femur

Devices included Cook, Jamshidi, Butterfly needle, EZ-IO

Complication rate 31% (including 1 case of tibial fracture, and 2 cases of ischaemic lower limb leading to below-knee amputation)

Human Case Reports: Neonates Only

There are few case reports of IO use on neonatal units (14 cases included in Table 2, 16 insertions). In these cases, IO was used to good effect once other access possibilities had failed. Lake and Emmerson [28] reported that an IO line (butterfly needle in the proximal tibia) was used effectively for 6 days, which is well beyond the recommended length of use by IO manufacturers, Teleflex® (USA). Suominen et al. [23] report a rare but significant side effect of limb ischaemia leading to amputation, and although the infant made a good recovery, significant overlying skin necrosis was noted by Carreras-González et al. [26]. A severe complication rate of 5/16, 31% was observed.

frontiers | Frontiers in Pediatrics

TYPE Original Research
PUBLISHED 26 July 2022
DOI 10.3389/fped.2022.952632

OPEN ACCESS

EDITED BY
Laila Springer,
University Children's Hospital
Tübingen, Germany

REVIEWED BY
Janneke Dekker,
Leiden University, Netherlands
Bernhard Schwaberger,
Medical University of Graz, Austria

Intraosseous access in neonates is feasible and safe – An analysis of a prospective nationwide surveillance study in Germany

Eva Schwindt[1], Daniel Pfeiffer[2], Delphina Gomes[2], Sebastian Brenner[3], Jens-Christian Schwindt[4], Florian Hoffmann[2*†] and Martin Olivieri[2†]

Variable	Count (n)	Proportion (%)
IO accesses (information available for 161 of 161 neonates)		
Successful	146	91
Unsuccessful	15	9

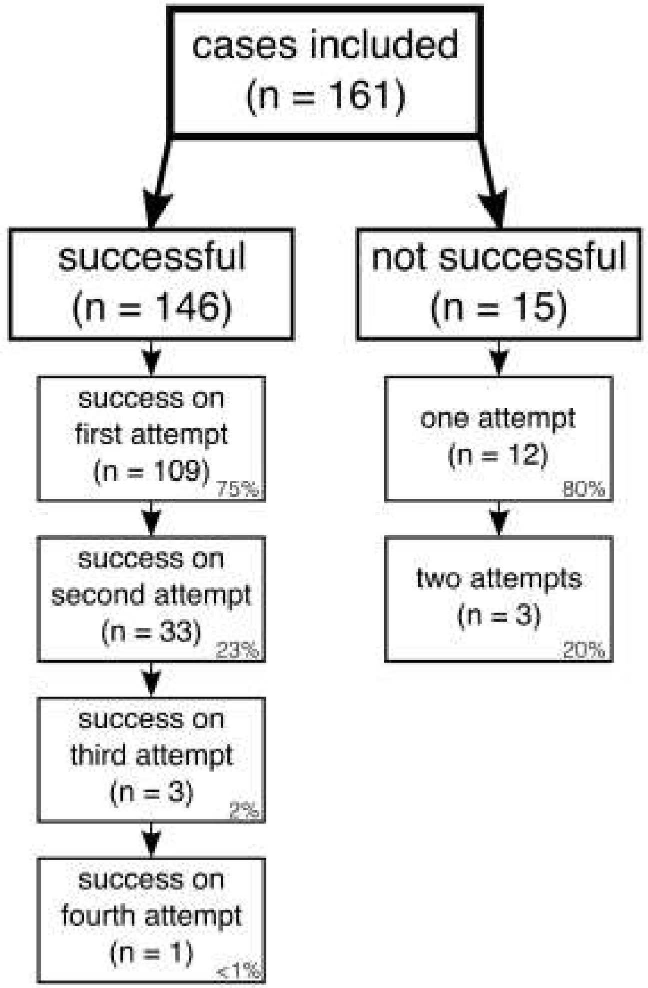


FIGURE 1
IO access attempts and success rates in the total study population (*n* = 161). Relative proportions of successful and unsuccessful attempts are given on the bottom right of each box.

Use of Intraosseous Access in Neonatal and Pediatric Retrieval—Neonatal and Pediatric Emergency Transfer Service, New South Wales

(*Pediatr Emer Care* 2023;39: 853–857)

15-year epoch, neonatal interhospital retrieval service, 102 neonates

Devices changed from a manual to a semiautomatic device

IO injury rate 11% (including 1 case of tibial fracture)

FIGURE 1. Example of injuries from extravasation of tibial IOs in a 29-day-old term neonate with left heart obstruction.

Descriptive	Neonatal (n = 102, 21.8%)
Mean age	PMA 39 + 3 wk (range, 24–44 wk)
Median weight	3.25 kg (IQR, 3.78–2.71 kg)
Sex	
Male	63 (61.8%)
Female	39 (38.2)
Ventilated	70 (68.6%)
IO injury rate	11 (10.8%)
Mortality	19 (18.6%)

Animal studies

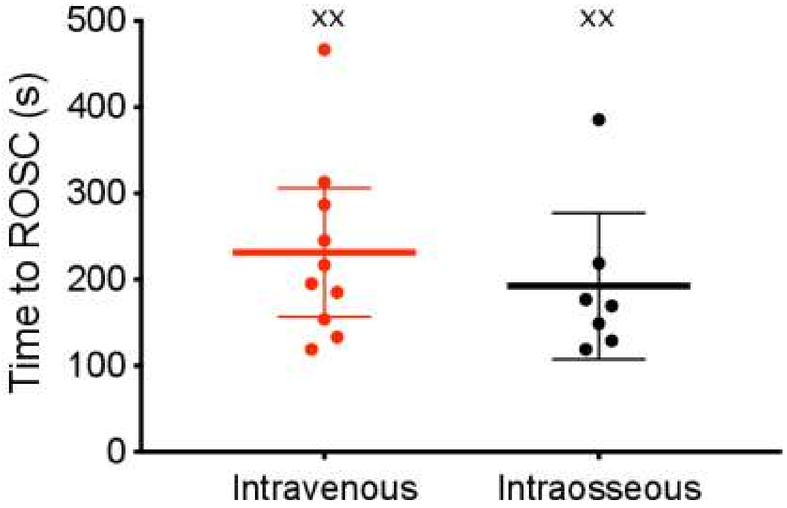


Figure 1 Time to return of spontaneous circulation (ROSC) in intravenous and intraosseous lambs. Individual animals are shown with mean (95% CI) included. This original figure was created by GRP.

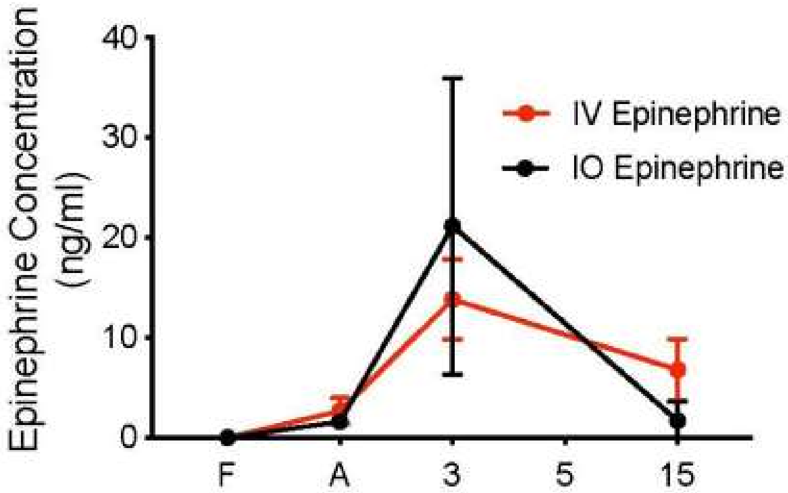


Figure 2 Plasma concentration of epinephrine in intravenous (IV) and intraosseous (IO) lambs measured in the fetal state (F), at end asphyxia (A), and at 3 and 15 min after return of spontaneous circulation. Mean values are shown with error bars representing SD. This original figure was created by GRP.

What this study adds?

- Asphyxiated lambs effectively achieve return of spontaneous circulation with intraosseous epinephrine, at similar rates and administered doses as with intravenous epinephrine.
- Plasma epinephrine levels measured after intraosseous and intravenous epinephrine administration are similar, suggesting effective distribution into the intravascular space.
- Given the similar physiological response, speed of access may be an important determining factor in choosing intraosseous or intravenous epinephrine in the clinical setting.

Which devices are available?

02

Systematic Review

Neonatology

Neonatology 2019;116:305–314
DOI: 10.1159/000502212

Received: March 14, 2019
Accepted after revision: July 17, 2019
Published online: October 28, 2019

Use of Intraosseous Needles in Neonates: A Systematic Review

Alexandra Scrivens[a] Peter R. Reynolds[c] Faith E. Emery[d] Calum T. Roberts[e, f] Graeme R. Polglase[g] Stuart B. Hooper[g] Charles Christoph Roehr[a, b]

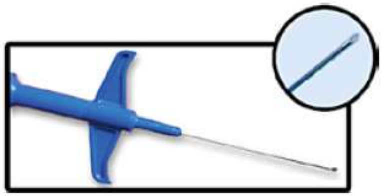
[a]Newborn Services, John Radcliffe Hospital, Oxford University Hospitals, NHS Foundation Trust, Oxford, UK; [b]University Department of Paediatrics, Medical Sciences Division, University of Oxford, Oxford, UK; [c]Neonatal Intensive Care Unit, St. Peter's Hospital, Ashford & St. Peter's Hospitals NHS Foundation Trust, Chertsey, UK; [d]Neonatal Intensive Care Unit, Southmead Hospital, North Bristol NHS Trust, Bristol, UK; [e]Department of Paediatrics, Monash University, Melbourne, VIC, Australia; [f]Monash Newborn, Monash University Hospital, Melbourne, VIC, Australia; [g]Hudson Institute, The Ritchie Centre, Melbourne, VIC, Australia

Table 1. A summary of IO devices described in the literature (images from manufacturers' websites)

Image	Manufacturer	Device type	Purpose-built for IO?	Licenced weight or age use	Needle descriptions
 Arrow®EZ-IO®	Teleflex, USA	Battery-powered driver	Yes	>3 kg	15 G 15, 25, 45 mm needles
 Cook Needle	Cook Medical, USA	Hand driven	Yes	<24 months for smallest needle	14, 16, or 18 G 25, 30, or 40 mm needle
 Bone injection gun (BIG)*	PerSys Medical, USA	Spring loaded	Yes	0–12 years (with adjustable depth)	18 G (paediatric)
 New intraosseous device (NIO) paediatric*	PerSys Medical, USA	Spring loaded	Yes	3–12 years (with adjustable depth)	

FAST1 not included as it is a sternal device. * Not used on neonates.

Table 1 (continued)

Image	Manufacturer	Device type	Purpose-built for IO?	Licenced weight or age use	Needle descriptions
 Jamshidi needle	BD, USA	Hand driven	Bone marrow biopsy needle, "indicated for paediatric IO infusion"	"Paediatric"	15–18 G 48–79 mm (with adjustable depth guard)
 Butterfly needle	Multiple	Hand driven	No	Not licensed for IO	19–25 G 19 mm
 Mallarme needle	Laurane Medical, France	Hand driven	Bone marrow biopsy needle		16 G 20, 30, or 50 mm
 Spinal needle	Multiple	Hand driven	No	Not licenced for IO	Paediatric needles 22–25 G 50 mm (may not connect to standard syringes)

Resuscitation

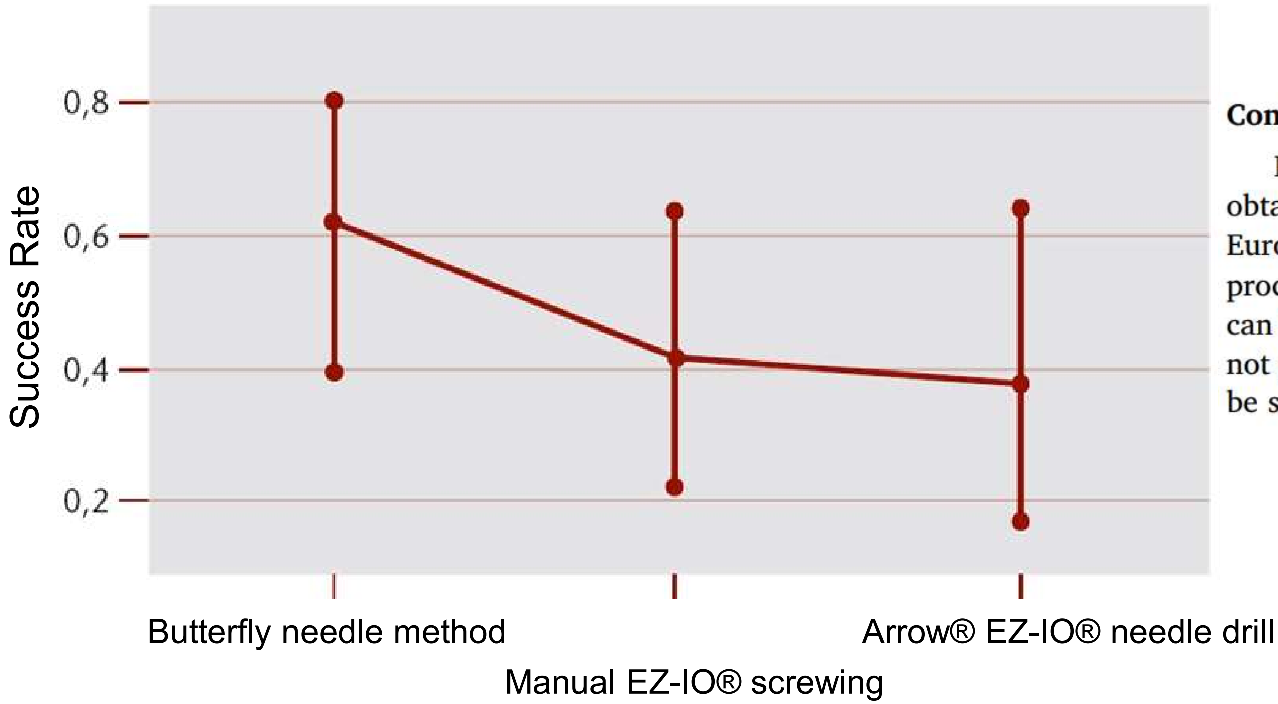
journal homepage: www.elsevier.com/locate/resuscitation

Clinical paper

Anatomical investigations on intraosseous access in stillborns – Comparison of different devices and techniques☆

Zeynep Fuchs[a], Martin Scaal[b], Heinz Haverkamp[c], Friederike Koerber[d], Thorsten Persigehl[d], Frank Eifinger[a,*]

16 stillborns, median: 29.2 weeks (IQR 27.2-38.4)



Conclusions

In the majority of neonatal resuscitation, intravenous access can be obtained via peripheral or umbilical routes as recommended by the European Resuscitation Council (ERC) Guidelines 2015 [2]. If this procedure fails, intraosseous access in premature and neonatal infants can be achieved using a hand-twisted Butterfly needle (21 G). If this is not possible or practicable, an intraosseous needle (e.g. EZ-IO®) should be screwed in manually.

https://doi.org/10.1016/j.resuscitation.2018.04.003
Received 5 January 2018; Received in revised form 24 February 2018; Accepted 3 April 2018
0300-9572/

frontiers | Frontiers in Pediatrics

TYPE Original Research
PUBLISHED 26 July 2022
DOI 10.3389/fped.2022.952632

Check for updates

OPEN ACCESS

EDITED BY
Laila Springer,
University Children's Hospital
Tübingen, Germany

REVIEWED BY
Janneke Dekker,
Leiden University, Netherlands
Bernhard Schwaberger,
Medical University of Graz, Austria

Intraosseous access in neonates is feasible and safe – An analysis of a prospective nationwide surveillance study in Germany

Eva Schwindt[1], Daniel Pfeiffer[2], Delphina Gomes[2], Sebastian Brenner[3], Jens-Christian Schwindt[4], Florian Hoffmann[2*†] and Martin Olivieri[2†]

Variable	Count (n)	Proportion (%)
System used (information available for 185 of 206 attempts)		
EZIO (Teleflex, United States)	162	88
EZIO inserted manually	4	2
COOK (Cook Medical, United States)	17	9
B.I.G (Persys Medical, United States)	2	1

Which location should be used?

03

PEDIATRIC INSERTION SITES

Which location?

frontiers | Frontiers in Pediatrics

TYPE Original Research
PUBLISHED 26 July 2022
DOI 10.3389/fped.2022.952632

Check for updates

OPEN ACCESS

EDITED BY
Laila Springer,
University Children's Hospital
Tübingen, Germany

REVIEWED BY
Janneke Dekker,
Leiden University, Netherlands
Bernhard Schwaberger,
Medical University of Graz, Austria

Intraosseous access in neonates is feasible and safe – An analysis of a prospective nationwide surveillance study in Germany

Eva Schwindt[1], Daniel Pfeiffer[2], Delphina Gomes[2], Sebastian Brenner[3], Jens-Christian Schwindt[4], Florian Hoffmann[2*†] and Martin Olivieri[2†]

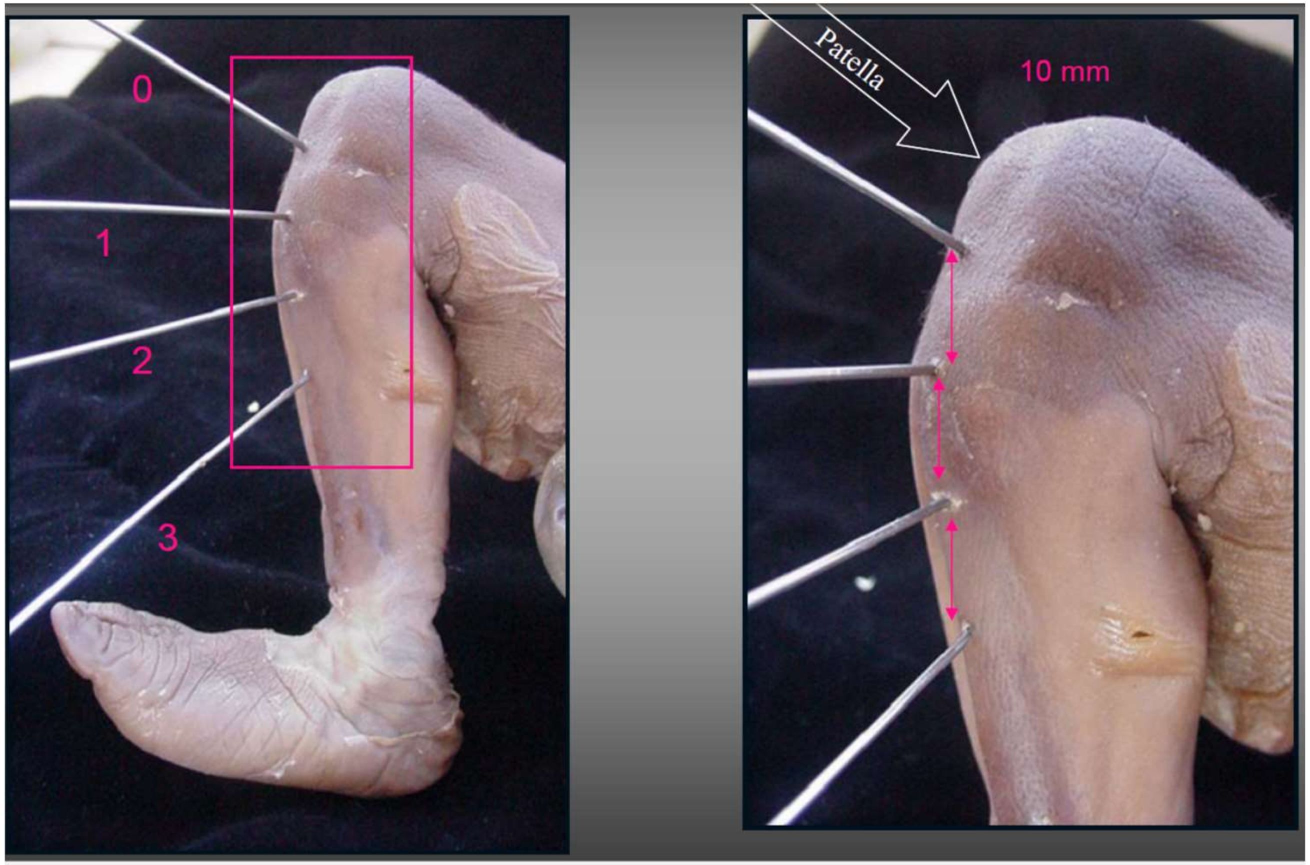
Variable	Count (n)	Proportion (%)
Site of IO access (information available for 202 of 206 attempts)		
Prox. tibia	192	95
Dist. tibia	3	2
Dist. femur	4	2
Prox. humerus	2	1

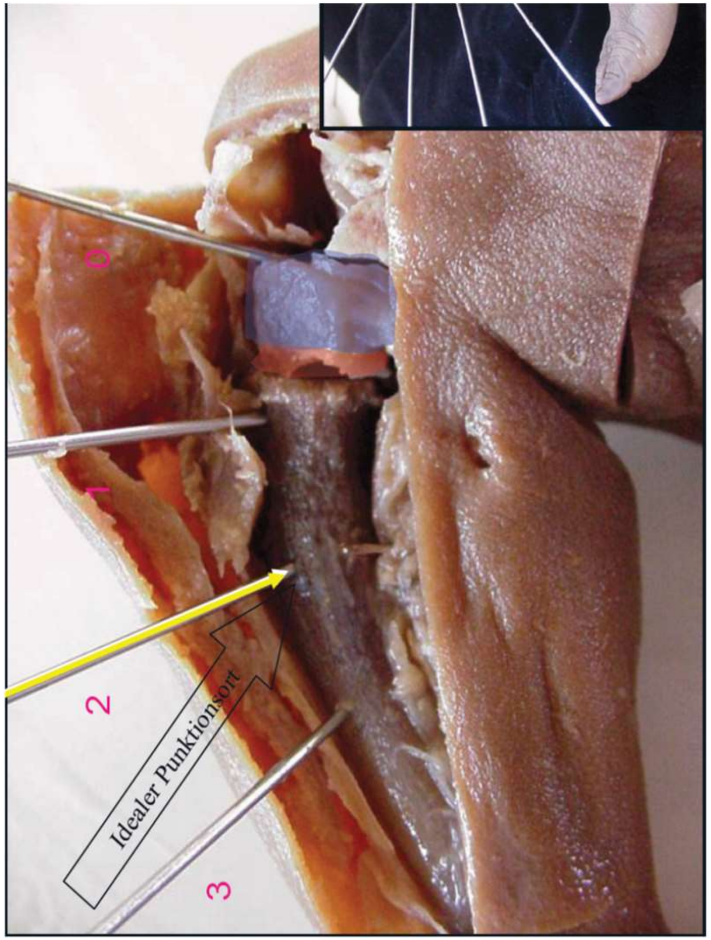
https://www.teleflex.com/

Proximal tibia

The entry point is a few millimeters below the **tibial tuberosity** at the center of the flat antero-medial surface.

Reference unknown





Different insertion pathways were used, wire number 2 represents the ideal puncture site, with adequate distance to the growth plate.

Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation

EUROPEAN RESUSCITATION COUNCIL

Clinical paper

Anatomical investigations on intraosseous access in stillborns – Compariso of different devices and techniques☆

Zeynep Fuchs[a], Martin Scaal[b], Heinz Haverkamp[c], Friederike Koerber[d], Thorsten Persigehl[d], Frank Eifinger[a,*]

Median diameter of the bone marrow cavity:
4.0 mm [IQR 3.3–4.7]

Median cortical thickness:
1.2 mm [IQR 0.8–1.4]

Fig. 1. Postmortem computed tomography (CT) of a preterm stillborn infant, age 29 + 1 gestational weeks showing the correct installation of both intraosseous needles on the tibia on both sides (proximal Butterfly needle and distally located hand-twisted EZ-IO® intraosseous needle).

16 stillborns, median: 29.2 weeks (IQR 27.2-38.4)

https://doi.org/10.1016/j.resuscitation.2018.04.003
Received 5 January 2018; Received in revised form 24 February 2018; Accepted 3 April 2018
0300-9572/

Available online at www.sciencedirect.com

Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation

ELSEVIER

EUROPEAN RESUSCITATION COUNCIL

Letter to the Editor

Intraosseous devices in small children: The need for a clearly defined strategy

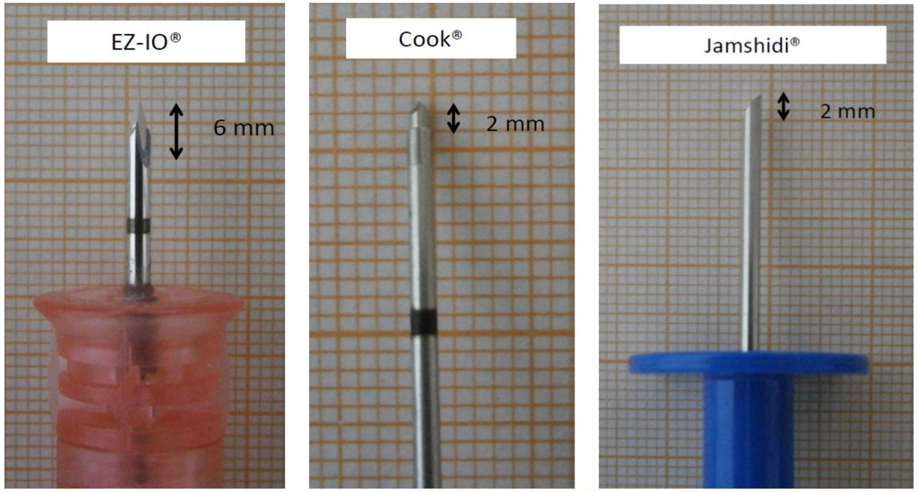
Dear Editor,

We read with great interest the recently published study by Maxien et al. on the rate of malposition of intraosseous (IO) needles in pediatric cadavers.[1] The study showed a high malposition rate, up to 64%, especially in infants of less than one-year-old. These results are well analyzed by the authors. However, we believe that this high malposition rate raises a strategy issue rather than an age, weight or training issue. Perhaps a more suitable question would be: which strategy adopt based on the type of IO device used, the age of the child and the location of the IO site?

Three classical IO devices are utilized in infants: The Cook Intraosseous Infusion Needle (Cook Critical Care, Bloomington, IN), the Jamshidi Intraosseous Needle (Baxter Healthcare, Deerfield, IL) and the EZ-IO device with a motor-driven drilling system (Vidacare, San-antonio, TX, USA). Each needle has specific characteristics. For all three devices, the tip of the needle without the stylet, measures less than 4 mm. However, for the EZ-IO device, the tip of the needle with the stylet grows up to 5–6 mm compared to 2 mm for the other two needles (Fig. 1). The small diameter of the bone marrow space as well as the length difference between the three devices makes it an arduous task to correctly place an IO device in small children. Indeed, the diameter of the medullary cavity of the proximal tibia is estimated to 7 mm ± 3 mm for infants < 1 year, to 4 mm for newborn and only 2 mm in 20–41 weeks of gestation neonate.[1–4] The correct placement of the EZ-IO needle is therefore a challenging task in the proximal tibial site for small children. The risks are mainly that the needle penetrates the opposite cortex or protrudes outside the cortex. Manual IO devices do not encounter this difficulty because of their smaller tip of needle length.

Other IO placement sites have frequently been described such as the distal tibial or distal femur IO site.[5] However, there is a lack of information about the antero-posterior diameter of the femoral medullary space. Also, the medio-lateral diameter of the distal tibial medullary space is not well known. Another issue is the diameter of the corticalis because it conditions the stability of the needle. We need large evaluations of these parameters in order to determine which site has the larger medullary cavity.

Extravasation causing compartment syndrome is a classic complication of the tibial site. Femur site is not concerned by compartment syndrome but extravasation recognition may be retarded due to the enlarged diameter of the thigh. Whatever the site, extravasation is always problematic when inotropic drugs or



Resuscitation DOI: (10.1016/j.resuscitation.2019.11.027)

For all three devices, the tip of the needle without the stylet, measures less than 4 mm. However, for the EZ-IO device, the tip of the needle with the stylet grows up to 56 mm compared to 2 mm for the other two needles (Fig. 1).

Crural Amputation of a Newborn as a Consequence of Intraosseous Needle Insertion and Calcium Infusion

Gorm Erlend Oesterlie, MD, Klaus Kjaer Petersen, MD,* Lars Knudsen, PhD, MD,† and Tine Brink Henriksen, PhD, MD‡*

(*Pediatr Emer Care* 2014;30: 413–414)

FIGURE 3. Perioperative image.

CASE

A newborn girl was admitted with circulatory collapse and respiratory insufficiency due to sepsis. After 3 failed attempts of intravenous access, IO needle insertion was performed anteriorly on the proximal medial right tibia using the 15-mm EZ-IO drill (Vidacare). Correct placement of the needle was confirmed by aspiration before infusion was started. Standard resuscitation protocol for newborn septic shock was followed, including fluid resuscitation and antibiotic treatment. Because ionized calcium level was low (0.6 mM) and compromised ventricular function was verified by immediate echocardiography, calcium was administered through the IO needle. This was followed immediately by a white demarcation of the skin distally from the puncture site.

The child's clinical condition improved as a result of the treatment. An umbilical venous catheter was established, and the IO needle was removed within the first hours of treatment. The newborn survived, but the demarcation progressed to circular necrosis, which later was found to be in full thickness. Transtibial amputation was performed 1½ month later (Figs. 1–3).

FIGURE 1. Shortly after the extravasation.

Intraosseous access in neonates and infants: risk of severe complications – a case report

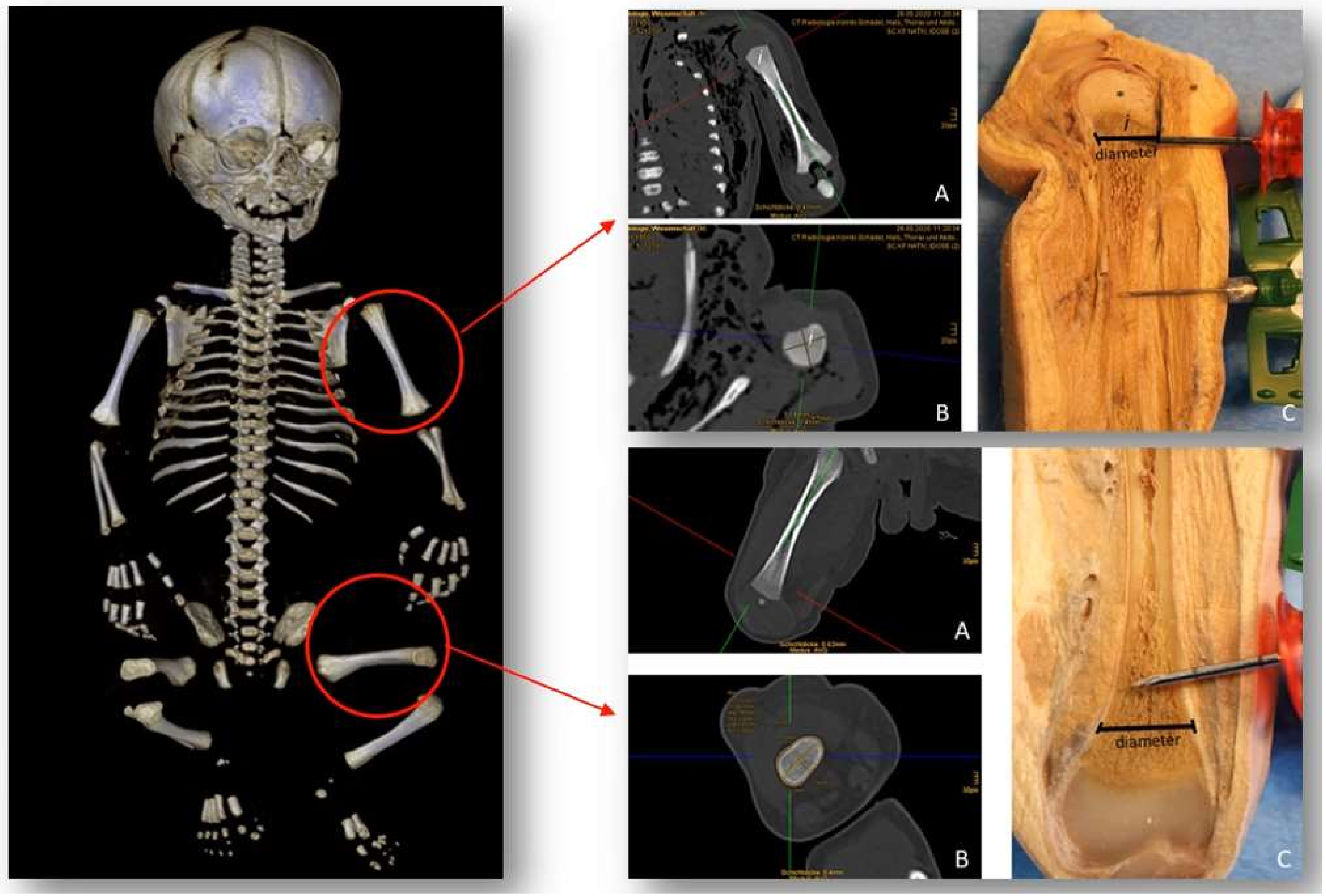
P. K. Suominen[1], E. Nurmi[1] and K. Lauerma[2]

[1]Department of Anaesthesia and Intensive Care, Children's Hospital, University of Helsinki and Helsinki University Hospital, Helsinki, Finland
[2]HUS Medical Imaging Center, Radiology, Children's Hospital, University of Helsinki and Helsinki University Hospital, Helsinki, Finland

IO access at the left proximal tibia was placed by an anesthetist using a power-driven device EZ-IO (Vidacare, San Antonio, TX, USA) and a 15 mm needle. Unfortunately, after a fluid bolus of 5 ml, the calf of the neonate became swollen and the IO needle was removed. Another 15 mm IO needle was placed into the left distal femur. A return to spontaneous circulation was achieved after 18 min of CPR. The femoral IO access was functioning well until the baby started moving his limbs, which caused the dislodgement of the IO needle. Therefore, a third (15 mm needle) IO access was placed into the right tibia. Bone marrow was easily drawn into a syringe and a fluid bolus was easily injected. Furthermore, a good haemodynamic response to adrenaline bolus was achieved. An arterial catheter was subsequently placed into the right femoral artery.

Fig. 1. Ischemia and epidermolysis of the right limb 2 days after the insertion of the IO needle.

Acta Anaesthesiologica Scandinavica 59 (2015) 1389–1393


A
B
i
diameter
C
A
B
diameter
C

ELSEVIER

Available online at www.sciencedirect.com

Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation

EUROPEAN RESUSCITATION COUNCIL

Experimental paper

Finding alternative sites for intraosseous infusions in newborns

Frank Eifinger [a,*], *Martin Scaal* [b], *Lukas Wehrle* [a], *Stien Maushake* [a], *Zeynep Fuchs* [a], *Friederike Koerber* [c]

Table 2 – Diameter [mm] and cross sectional area [mm^2] in pre- and term newborns.

	GA 25–27 BW: 1.2 kg [0.9–1.4]			GA 28–36 BW: 1.5 kg [1.3–2.2]			GA 37–43 BW: 3.5 kg [3.2–3.9]		
	Diameter [mm]	Cross sectional area [mm^2]	n=	Diameter [mm]	Cross sectional area [mm^2]	n=	Diameter [mm]	Cross sectional area [mm^2]	n=
Tibia (prox.) Metaphyseal	9.1 ± 1.6	66.5 ± 11.2	20	10.6 ± 2.2	88.2 ± 23.3	24	12.0 ± 2.4	111.6 ± 29.5	16
Humerus (prox.) metaphyseal	9.4 ± 1.2*	67.7 ± 11.7	28	11.2 ± 0.9	85.5 ± 14.5	24	12.1 ± 1.8	113.5 ± 19.7	28
Femur (distal) metaphyseal	8.4 ± 1.7*	57.7 ± 11.9	20	10.2 ± 2.5	85.6 ± 19.3	24	11.9 ± 3.4	120.6 ± 28.2	24
ANOVA	*$p < 0.05$ n.s.	n.s.		n.s.	n.s.		n.s.	n.s.	

RESUSCITATION 163 (2021) 57 -63

Available online at www.sciencedirect.com

Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation

ELSEVIER

EUROPEAN RESUSCITATION COUNCIL

Experimental paper

Finding alternative sites for intraosseous infusions in newborns

Frank Eifinger[a,*], *Martin Scaal*[b], *Lukas Wehrle*[a], *Stien Maushake*[a], *Zeynep Fuchs*[a], *Friederike Koerber*[c]

A theoretical alternative intraosseous infusion site in severely hypovolemic children

Authors:
Nkhensani Mogale[1,2]
Albert-Neels van Schoor[2]
Marius C. Bosman[2]

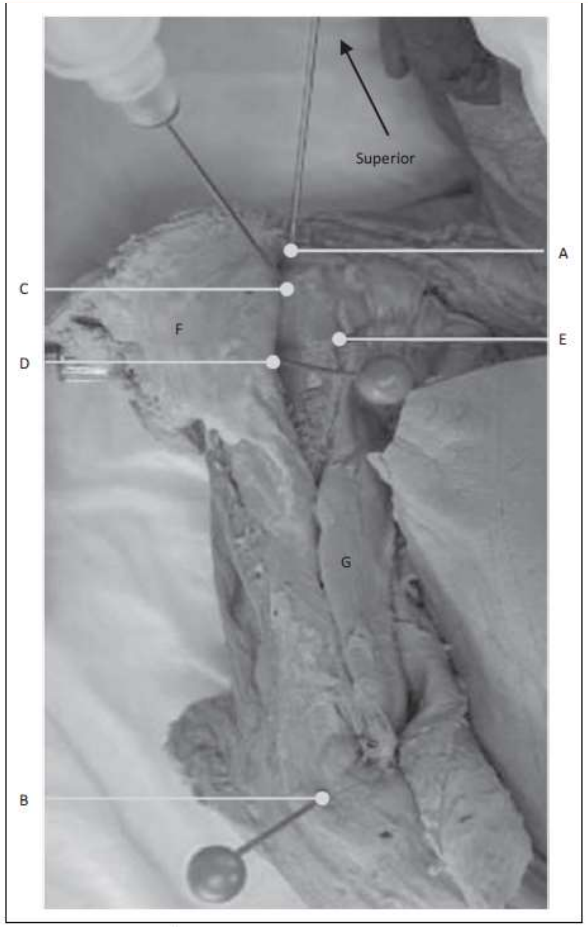
Affiliations:
[1]Department of Anatomy, Sefako Makgatho Health Sciences University, South Africa

[2]Department of Anatomy, University of Pretoria, South Africa

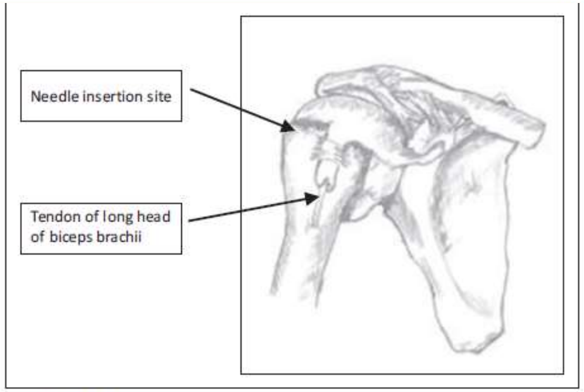
Correspondence to:
Nkhensani Mogale

Email:
nkhensani1909@gmail.com

Postal address:
PO Box 94446, Boordfontein 0201, South Africa

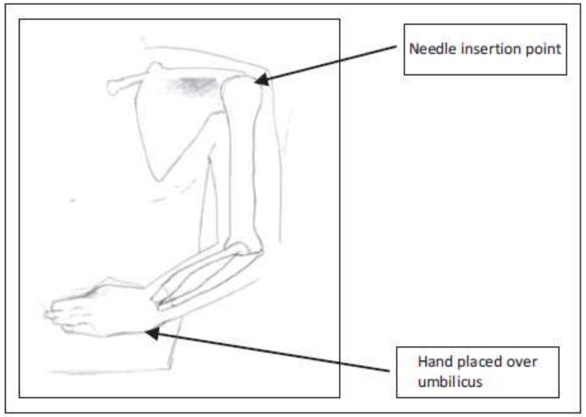


Source: Nkhensani Mogale/University of Pretoria



Source: Mpho Mogale

FIGURE 2: The needle insertion site and the tendon of the long head of biceps brachii muscle shown in the bicipital groove/intertubercular sulcus.



Source: Mpho Mogale

How to cite this article:
Mogale N, Van Schoor A-N, Bosman MC. A theoretical alternative intraosseous infusion site in severely hypovolemic children. Afr J Prm Health Care Fam Med. 2015;7(1), Art. #835, 5 pages. http://dx.doi.org/10.4102/phcfm.v7i1.835

Conclusion

- **Small clinical series and case reports and animal studies** suggest that medications and fluids can be successfully delivered by the IO route during neonatal resuscitation

- **Different devices** for intraosseous access are available without clear evidence which device or method is superior to the others. The EZ IO driver is frequently used but is not licensed for <3 kg bodyweight. Cook or Butterfly needles could be used for preterm infants.

- The proximal tibia is the most frequently used **location,** but safe alternatives might be considered.

Thank you

VjENS
Congress of joint
European Neonatal Societies

NEVAT

https://neonat.org