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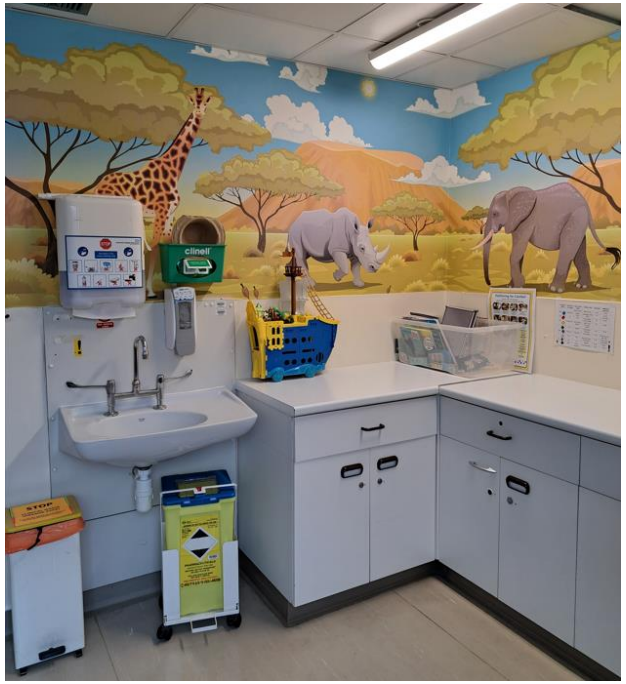
Administration of intravenous ceftriaxone in children



Helen Green

(Paediatric ID and OPAT CNS)

Background

- Ceftriaxone is one of the most administered parenteral antibiotics in children in the UK.
- Adverse effects with ceftriaxone are rare and severe adverse effects even rarer
- Lack of clarity from the manufacturers regarding speed of administration of doses ≥50mg/kg.

> *doses ≥50mg/kg in infants and children up to 12 years of age should be administered as a 30-minute infusion (60-minute infusion in neonates).* [1]

- Common practice in other countries to give doses of ≥50mg/kg more quickly.[2]
- Doses of 100mg/kg have been given over 10–15 minutes in clinical trials involving children with no evidence on the risk of increased side effects.

1. Ceftriaxone 1g Powder for Solution for Injection or Infusion. https://www.medicines.org.uk/emc/product/1361/smpc.
2. UMass Memorial Medical Center. Pediatric Guidelines for IV Medication Administration. https://www.umassmed.edu/globalassets/anesthesiology/files/resources/2016-resources/pediatric-guidelines-for-medications.pdf.

Randomized Controlled Trial > Int J Antimicrob Agents. 2005 Nov;26(5):408-11.

doi: 10.1016/j.ijantimicag.2005.08.005. Epub 2005 Oct 7.

Cefotaxime and ceftriaxone cerebrospinal fluid levels during treatment of bacterial meningitis in children

Paul N Goldwater [1]

Affiliations + expand

PMID: 16216469 DOI: 10.1016/j.ijantimicag.2005.08.005

Aims and methods

Aims: to demonstrate the clinical feasibility, safety, and patient/carer satisfaction of 10-minute ceftriaxone infusions for doses 80mg/kg.

Inclusion criteria:

- >4 weeks of age - <18 years of age
- Prescribed 80mg/kg ceftriaxone
- Between 1st March 2018 and 28th February 2019.

Exclusion criteria:

- Hartmann's, PN, or any calcium-containing solution in the preceding 24 hours
- Severe/life-threatening allergy to ceftriaxone or non severe penicillin allergy receiving 1st dose of ceftriaxone.

Methods:

- Written/verbal information & verbal consent
- Ceftriaxone 80mg/kg dose (max 4g) diluted to 50mg/mL in 0.9% saline
- Syringe driver for 10-minute infusion
- Observations (temperature, HR, BP and RR) pre/post
- Systemic symptoms or side effects recorded
- Patient/carer feedback collected

Results S1

- 213 doses started with 193 doses (90.6%) successful

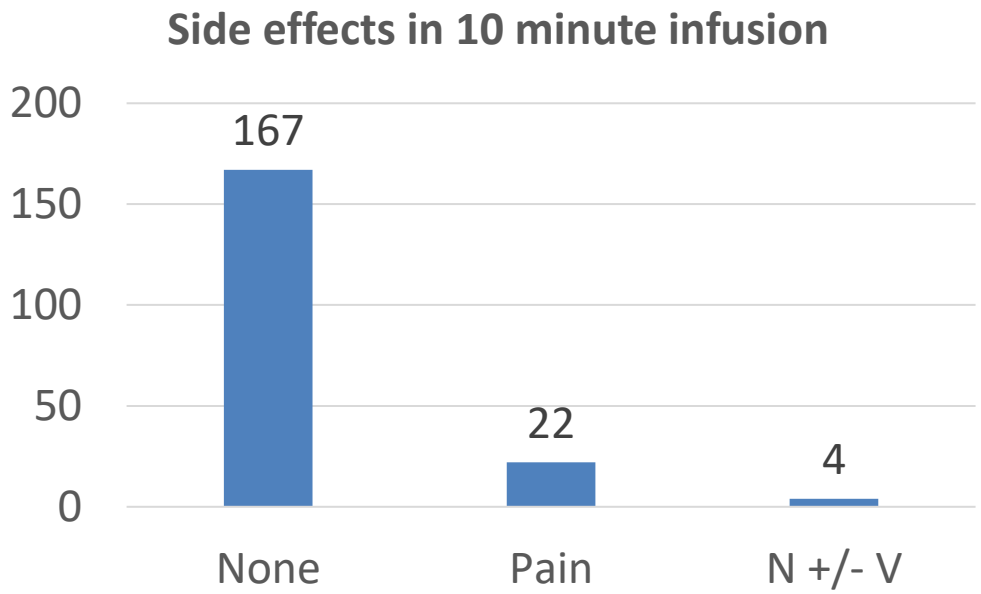
- 78.4% (n=167) had no side effects

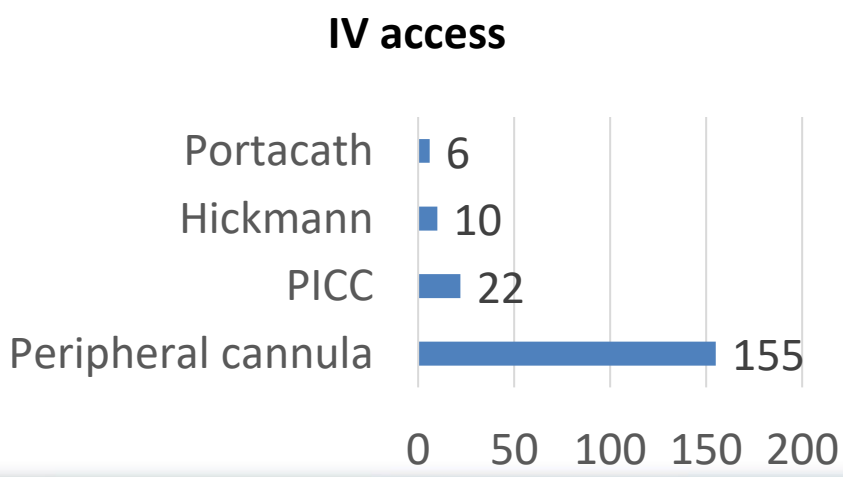
- 12.2% (n= 26) had manageable side effects:
  - **mild pain at infusion site** in 22 (10.3%)
  - **nausea** in 4 (1.9%)

- 9.4% (n=20) unsuccessful due to unmanageable side effects:
  - **moderate pain at infusion site** in 19 (8.9%)
    (median, 5 years; IQR, 2.5–6 years)
  - **nausea +/- vomiting** in 1 (0.5%)

- No abnormal observations & no phlebitis/extravasation

- 88% (n=73) reported 10-min infusion was better





Discussion

- Administration over 10 minutes was well tolerated in most children
- Associated with high rates of patient/carer satisfaction
- No safety concerns in any recipients of the 10-minute infusion

Pediatr Infect Dis J. 2021 Feb 1;40(2):128-129. doi: 10.1097/INF.0000000000002923.

Evaluating Ceftriaxone 80 mg/kg Administration by Rapid Intravenous Infusion–A Clinical Service Evaluation

Sanjay Patel [1 2], Helen Green [1], Jacqueline Gray [1], Michelle Rutter [1], Amanda Bevan [1 3], Kieran Hand [4], Christine E Jones [2 5], Saul N Faust [2 5]

Affiliations + expand

PMID: 33165272 DOI: 10.1097/INF.0000000000002923

Next steps….

Inclusion criteria:

- >4 weeks of age - <18 years of age
- Prescribed **>50 mg/kg** ceftriaxone
- Between **1st October 2018 and 24th April 2024**.

Exclusion criteria:

- Hartmann's, PN, or any calcium-containing solution in the preceding 24 hours
- Severe/life-threatening allergy to ceftriaxone or non severe penicillin allergy receiving 1st dose of ceftriaxone.

Methods:

- **Verbal consent not obtained**
- Ceftriaxone **>50 mg/kg** dose (max 4g) diluted to 50mg/mL in 0.9% saline
- Syringe driver for 10-minute infusion
- Observations (temperature, HR, BP and RR) pre/post
- Systemic symptoms or side effects recorded
- **Patient/carer feedback collected but not collated**

Results S2

- 1056 doses started as a 10-minute infusion with 1002 doses (94.9%) successful

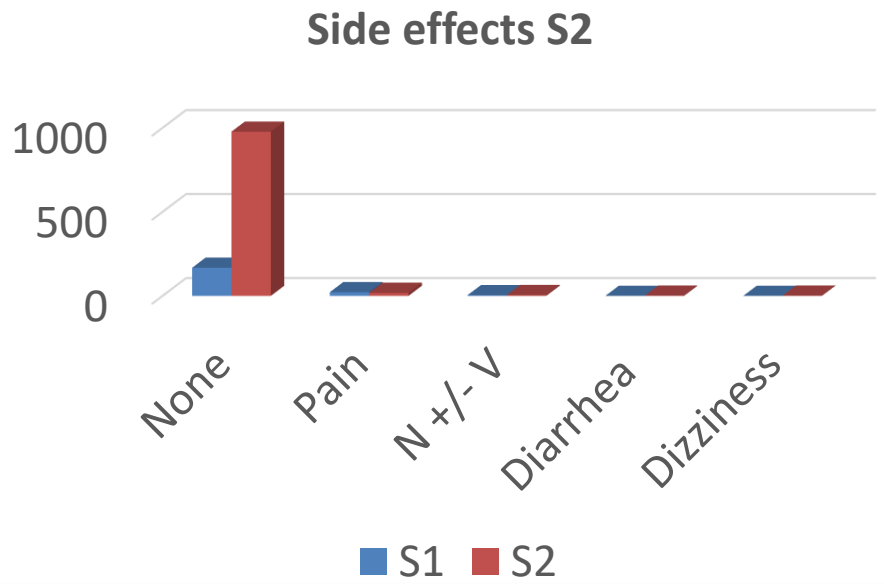
- 92.5% (n=977) had no side effects

- 2.4% (n= 25) had manageable side effects:
    - **mild pain at infusion site** in 18 (1.8%)
    - **nausea +/- vomiting** in 5 (0.5%)
    - **diarrhoea** in 1 (0.1%)
    - **dizziness** in 1 (0.1%)

- 5.1% (n=54) unsuccessful due to unmanageable side effects:
    - **moderate pain at infusion site** in 50 (4.7%)
    - **mild pain at infusion site + nausea** in 2 (0.2%)
    - **mild pain at infusion site + abdo pain** in 1 (0.1%)
    - **headache + vomiting** in 1 (0.1%)

- No abnormal observations & no phlebitis/extravasation.

- Most common SE comparable between S1 and S2.



Take home messages

- Administration of ceftriaxone >50mg/kg over 10 minutes is well tolerated in most children
- Associated with high rates of patient/carer satisfaction
- No safety concerns in any recipients of the 10-minute infusion
- Benefits of 10 min infusion include:
    - early sepsis management
    - healthcare staff workload & time management
    - patient flow
- Updated data can be found on the PIER website (https://www.piernetwork.org/ceftriaxone.html)

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Statement Regarding Ceftriaxone Prescribing

Administration of Ceftriaxone 80mk/kg over 10 minutes

In order to facilitate ambulating children on IV ceftriaxone, 80mg/kg ceftriaxone (generic) is safe to give over 10 minutes by slow intravenous injection.

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https://www.piernetwork.org/ceftriaxone.html

Timing of Second Dose of Ceftriaxone

The EU FP7 funded GriP Neonatal and Paediatric Prescribing Book was published in 2019. It is a handbook on Neonatal and Paediatric Prescribing that complements the BNFc, which facilitates translation of essential pharmacological principles into good prescribing practice. Chapters were peer reviewed, and the book has been endorsed by GriP, RCPCH, NPPH and BNFc.

The Prescribing in infection (i) antibacterials chapter states:

- If a first dose of ceftriaxone has been given overnight it can be moved to day time by giving the second dose early, any time from 12 hours following the initial dose
- A regimen of 80mg/kg with the first two doses being given at a 12 hourly interval was previously widely and effectively used for paediatric meningococcal sepsis without adverse effects

In addition:

- In patients of any age ceftriaxone must not be mixed or administered *simultaneously* with any calcium-containing IV solutions (such as TPN or Hartmann's), even via different infusion lines or at different infusion sites
- In patients older than 28 days of age ceftriaxone and calcium-containing solutions may be administered *sequentially* one after another through a different IV site or through the same IV site if thoroughly flushed with normal saline.

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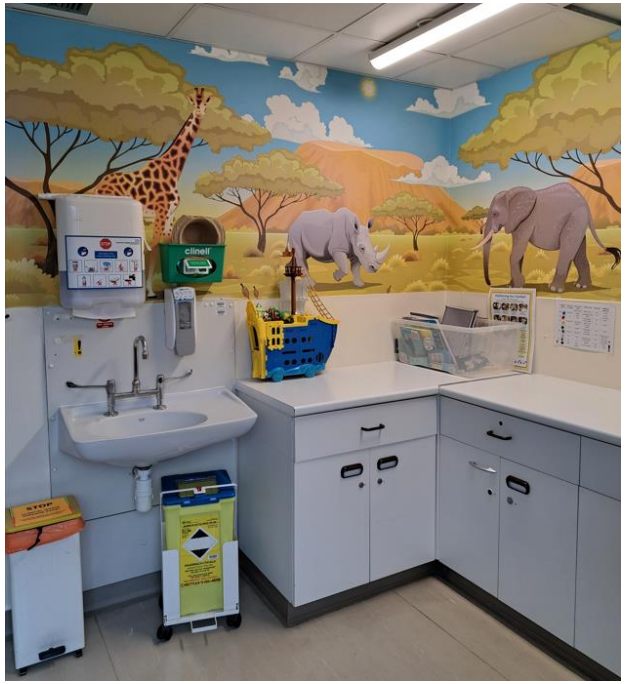
Many thanks for listening.



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Any questions?