SHORT REPORT

Emergency department use of a continuous femoral nerve block for pain relief for fractured femur in children

Briar Stewart, Catrin Tudur Smith, Linda Teebay, Mary Cunliffe, Boon Low

This study examined whether an effective continuous femoral nerve block could be inserted by emergency department staff for pain relief in children presenting with a fractured femur.

It is standard practice in fractures of the femoral shaft in children to provide immediate pain relief, followed by more longlasting analgesia using a femoral nerve block.¹ This lasts up to 6 h and covers manipulation of the fracture and transfer. This can be prolonged (up to 48 h) by establishing a continuous nerve block and has been described for use in children with fractures of the femoral shaft in the intensive care setting.^{2,3}

AIM

The primary outcome measure was the need for additional morphine in the first 48 h. Success of placing the catheter and complications at the insertion site were also noted.

METHODS

Forty children (1–16 years) presenting to a large urban paediatric emergency department, with a clinical diagnosis of an isolated femoral fracture over a period of 20 months, were randomised (sealed envelopes) to receive either a standard block or a continuous infusion. Those with multiple injuries, local skin infection in the groin, complete heart block, hypovolaemia or known allergy to local anaesthetic were excluded. Immediate pain relief with intravenous morphine as required was provided.

The nerve blocks were administered by emergency department staff grades or specialist registrars who had received training in the technique. The method used for standard block was that described by the Advanced Paediatric Life Support Group¹ and for the continuous block as described by Johnson.² Fourteen different doctors participated in the study, eight of whom used the infusion technique (range 1–4 times) (supplementary data for details of technique and training are available online at <http://emj.bmjournals.com/supplemental>).

The need for additional analgesia in the first 48 h was determined from the inpatient drug prescription sheets. All children entered in the study were prescribed paracetamol (20 mg/kg), ibuprofen (5 mg/kg), Oramorph Syrup (0.5 mg/kg) to be given according to the routine pain assessment, and diazepam (0.2 mg/kg; for muscle spasm). All infusions were discontinued by 48 h. The primary outcome measure was the number of oral morphine doses required, and secondary outcome the number of doses of codeine, non-steroidal anti-inflammatory drugs and paracetamol required.

The study was reviewed by the trust research committee and approved by the local ethics committee. Blinding was considered impractical and no dummy infusions were used.

Statistical methods

The sample size calculation was based on information gathered from 20 patients who had previously been admitted with a

fractured femur and had been managed with femoral nerve infusion and standard blocks. Calculations showed that to have 80% power to detect a 50% reduction in the mean number of additional oral morphine doses from an estimated mean of 2.72 (standard deviation (SD) 1.446), the study would need to recruit 40 patients.

All analyses were carried out on an intention-to-treat basis. We applied the Mann–Whitney U test to compare the number of additional doses of analgesics (oral morphine, codeine, non-steroidal anti-inflammatory drugs, paracetamol) required in 48 h between groups.

RESULTS

Forty patients were randomised. Fourteen different doctors inserted the blocks on 1–7 occasions each.

Demographics of the two groups were similar (table 1), except that more children in the infusion group subsequently required management in theatre.

Tables 2 and 3 display the analgesic doses required in 48 h.

Complications

In two cases, the infusion catheter was not inserted satisfactorily although the standard block was given. Failures were by different clinicians with different experience. Individual failure numbers were too small to comment on the effect of experience. No other complications were noted.

DISCUSSION

This is the only randomised controlled trial of infusion block for pain relief in children with a fractured femur. The analyses suggest that children given the infusion block tend to require less analgesia than those given the standard block, but the

Table 1 Patients' characteristics at baseline

	Standard block	Infusion	Total
Number randomised	22	18	40
Age (years)			
Median (range)	4 (1–13)	6 (1–15)	5 (1–15)
Sex, n (%)			
Male	15 (68)	14 (78)	29 (72.5)
Female	7 (32)	4 (22)	11 (27.5)
Type of fracture, n (%)			
Traumatic	19 (86)	16 (89)	35 (87.5)
Pathological	2 (9)	1 (5.5)	3 (7.5)
Other	1 (5)	1 (5.5)	2 (5)
Side, n (%)			
Right	11 (50)	10 (55.5)	21 (52.5)
Left	11 (50)	8 (44.5)	19 (47.5)
Managed in theatre	1 (5)	4 (22)	5 (13)

Table 2 Actual number of doses of morphine required

	Morphine doses required			
	0	1	2	5
Infusion (n 18), n (%)	13 (72)	3 (17)	2 (11)	0
Standard block (n 22), n (%)	10 (45)	7 (32)	4 (18)	1 (5)
Total, n (%)	23 (57.5)	10 (25)	6 (15)	1 (2.5)

Table 3 Median (minimum, maximum) number of doses of analgesia required

Analgesia required in 48 h	Standard block (n = 22)	Infusion (n = 18)	Median difference (95.2% CI)	p Value*
Morphine	1 (0, 5)	0 (0, 2)	0 (-1, 0)	0.112
Codeine	0 (0, 5)	0 (0, 1)	0 (0, 0)	0.121
Non-steroidal non-inflammatory drugs †	2 (0, 5)	0.5 (0, 3)	-1 (-2, 0)	0.035
Paracetamol	4 (1, 10)	2.5 (0, 4)	-2 (-3, -1)	<0.001

*Mann-Whitney U test.

†Diclofenac and ibuprofen.

differences between the groups are not statistically significant for the primary outcome.

This technique is known to be effective, but has not been previously assessed in the emergency setting.² This study shows that the continuous block technique can be satisfactorily established by middle-grade emergency department doctors. Ward nursing staff were already competent in dealing with regional anaesthesia and believed that the children who received the infusion were easier to nurse.

Reasons for not finding a difference for primary outcome are as follows:

- More children in the infusion group were managed operatively. Such intervention would require more analgesia.
- Two failures of catheter insertion were analysed in the continuous group, although in effect they received standard blocks.
- The relatively small numbers may have led to a type 2 error.

CONCLUSION

We believe that this technique is a practical and achievable method of pain control for children with a fractured femur, which can be started by emergency department staff. Further

studies, including pain scoring, would be needed to gain conclusive evidence.

Authors' affiliations

Briar Stewart, A&E Department, RLCH NHS Trust Alder Hey, Liverpool, UK
Catrin Tudur Smith, Centre for Medical Statistics and Health Evaluation, University of Liverpool, Liverpool, UK
Linda Teebay, **Mary Cunliffe**, RLCH NHS Trust Alder Hey, Liverpool, UK
Boon Low, Lagan Valley Hospital, Lisburn, UK

Competing interests: None declared.

Correspondence to: Dr B Stewart, A&E Department, RLCH NHS Trust Alder Hey, Eaton Road, Liverpool LA12AP, UK; briar.stewart@rlc.nhs.uk

Accepted 21 November 2006

REFERENCES

- 1 **Advanced Life Support Group**. *Practical procedures—trauma. Advanced paediatric life support: the practical approach*, 4th edn. Blackwell Publishing, 2005:247.
- 2 **Johnson CM**. Continuous femoral nerve blockade for analgesia in children with femoral fractures. *Anaesth Intens Care* 1994;**22**:281–3.
- 3 **Tobias JD**. Continuous femoral nerve block to provide analgesia following femur fracture in a paediatric ICU population. *Anaesth Intens Care* 1994;**22**:616–18.