ORIGINAL ARTICLE

Percutaneous regional compared with local anaesthesia for facial lacerations: a randomised controlled trial

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Objective: Facial lacerations are usually repaired after local infiltration of an anaesthetic agent. Regional nerve blocks of the face offer several theoretical advantages over local infiltration. This study compared the pain of injection and anaesthetic efficacy of percutaneous regional and local anaesthesia for facial lacerations.

Study design: Randomised clinical trial.

Participants: Convenience sample of emergency department patients with facial lacerations requiring suturing in anatomical areas innervated by a regional nerve (supraorbital, infraorbital, or mental).

Interventions: Facial lacerations treated using standard wound care. Lacerations were randomised to local or regional infiltration of lidocaine (lignocaine) 1% with adrenaline (epinephrine) 1:100 000 using a number 27 needle.

Outcomes: Pain of injection on 100 mm visual analogue scale (VAS) and need for rescue anaesthetic infiltration before suturing.

Data analysis: Group comparisons were with Student's *t* test and χ^2 test. This study had 80% power to detect a 20 mm difference in pain of injection (two tailed, $\alpha = 0.05$).

Results: 36 patients were randomised to local (18) and regional (18) anaesthesia. Mean (SD) age was 20 (14); 19% were female. Groups were similar in baseline characteristics. Patients in the regional anaesthesia group experienced more pain during infiltration than patients in the local anaesthesia group (42.4 mm v 24.8 mm, mean difference 17.6 mm (95% CI 0.3 to 35.6 mm) and were more likely to require additional infiltration of a local anaesthetic (28% v 0%, (95% CI 6% to 50%)) than patients in the local anaesthetic group.

Conclusions: Local infiltration of anaesthetics for facial lacerations is less painful and results in more effective anaesthesia than percutaneous regional infiltration.

An estimated 1.4 million facial lacerations are treated yearly in US emergency departments.¹ Examination, preparation, and suturing of these lacerations can be painful and should be preceded by some form of anaesthesia.² Direct infiltration of local anaesthetics into or around a wound is a simple, efficient method and is used to anaesthetise most lacerations treated in the emergency department (ED).^{2–3} Its advantages include familiarity, speed of onset, reliability of anaesthesia, and ease of training. Despite its efficacy and simplicity, local infiltration has several potential disadvantages. It may require multiple painful needle sticks, has the potential to disseminate wound contaminants, may cause local tissue distortion making accurate approximation of wound edges more difficult, may require use of large and potentially toxic amounts of anaesthetic agent, and may decrease local tissue perfusion.³ As a result, many advocate use of regional nerve blocks, especially for digital and facial wounds. While the superiority of regional nerve blocks in the distal extremities is well established,⁴ we are unaware of studies comparing local and regional anaesthesia for facial lacerations. The objective of this study was to compare the pain of injection and success of anaesthesia in facial lacerations anaesthetised by regional or local infiltration of anaesthetics. Our null hypothesis was that there would be no differences between the groups.

METHODS

Study design

A randomised controlled clinical trial design was used to compare the pain of anaesthetic administration, the need for rescue anaesthesia, and the pain of suturing after local or

regional infiltration of local anaesthetic agents for the repair of simple facial lacerations. This project was approved by the institutional review board.

Study setting and population

The trial was conducted in the Emergency Department of University Hospital at the State University of New York at Stony Brook, a tertiary care centre with an annual census of 75 000. A convenience sample of patients with isolated facial lacerations was considered for entry into the study. Table 1 summarises inclusion and exclusion criteria. Eligible patients were enrolled when one of the investigators was present in the ED.

Study protocol

Before the start of patient enrolment, all study investigators participated in a standardised training consisting of a two hour didactic session and hands on cadaver model. All emergency physicians were trained in the anatomy of facial regional sensory innervation and the methods of percutaneous facial regional nerve blocks. A total of 13 physicians participated in the study. Landmarks for supraorbital (SO), infraorbital (IO), and mental nerve (MN) blocks were shown and practised on a cadaver. The nerves were dissected out so practitioners could have instant feedback on the accuracy of needle placement. All practitioners were observed and certified by one of the authors before the study began.

Abbreviations: ED, emergency department; IO, infraorbital; MN, mental nerve; SO, supraorbital; VAS, visual analogue scale

Table 1 Inclusion and exclusion criteria

Inclusion	Exclusion
Patients >1 year old	Changed mental status
Repair by experienced ED physician or physician assistant	Allergy to anaesthetic
Isolated facial laceration requiring suturing	Absolute indication for regional or general anaesthesia
Laceration amenable to either local anaesthesia or supraorbital, infraorbital, or mental nerve block	Major trauma
	Isolated ear lacerations
	Contraindication to adrenaline (epinephrine)
	Lacerations crossing the vermilion

After identification of eligible patients, we obtained written informed consent from the patients or their legal guardians. The patients were then randomised to percutaneous regional nerve block or local infiltrative anaesthesia using a solution of 1% lidocaine (lignocaine) with 1:100 000 adrenaline (epinephrine) administered through a 27 gauge needle. The anaesthetic was injected slowly over a period of several seconds. No topical anaesthetic agents were used in this study. Assignment to regional or local anaesthesia was determined by opening the next of consecutively numbered opaque envelopes. The envelopes were prepared by pharmacy personnel uninvolved in the study using a random numbers table. Envelopes contained even proportions of assignments to regional or local anaesthesia. Because of the nature of the intervention it was not possible to mask patients or practitioners.

Patient and wound characteristics were recorded prospectively using a closed question data collection instrument.⁵ We recorded demographic information (age, sex) and wound characteristics (blunt compared with sharp mechanism, wound length, width, shape, location, and alignment with lines of tension). None of the wounds received topical anaesthetics before study enrolment.

Local infiltration of the anaesthetic agent was performed slowly through the wound edges using a fine needle. The SO nerve was blocked by injecting the anaesthetic percutaneously in the area of the SO nerve above the eyebrow. The supratrochlear branches were blocked by raising a subcutaneous wheal of anaesthetic parallel to the eyebrow. The IO nerve was blocked by injecting the anaesthetic percutaneously in the area of the IO foramen below the eye. The MN was blocked by injecting the anaesthetic agent in the area of the mental foramen via the muco-buccal fold.

Wounds were then anaesthetised using the assigned method. Immediately after injection of anaesthetic, patients and practitioners rated the pain of injection on a previously validated 100 mm visual analogue scale (VAS) marked "worst imaginable pain" at the high end.⁶ Adequacy of anaesthesia was determined by an independent practitioner by pinprick with a 30 gauge needle either immediately (in the local group) or after 20 minutes (in the regional group). If the wound was not completely anaesthetic to pin prick by that time, rescue anaesthesia was given by local anaesthetic infiltration. Inspection, irrigation, exploration, and suturing were performed following standard principles of care.² After wound closure, patients and practitioners rated pain of suturing using the same VAS. For children under 8 years old guardians completed the VAS.

Patients were assessed at 5 to 10 days for the presence of infection. Wounds were considered infected if the patient was specifically prescribed a systemic antibiotic to treat a presumed wound infection.⁵ Patients were also evaluated for the presence of persistent anaesthesia or numbness in the wound area or an allergic reaction.

Figure 1 Patient flow.**Table 2** Baseline characteristics

	Local anaesthesia	Regional anaesthesia	p Value
Mean age (SD), years	20.3 (14.1)	19.9 (15.2)	0.90
Male, number (%)	13 (72)	16 (89)	0.41
Location			
Number SO (%)	7 (44)	11 (69)	0.25
Number IO (%)	7 (44)	5 (31)	
Number MN (%)	2 (12)	0	
Wound length (SD), mm	24.3 (13)	23.1 (9)	0.77
Wound width (SD), mm	2.7 (1.4)	3.3 (1.4)	0.28

Outcomes

The primary outcome was the pain of anaesthetic injection. Secondary outcomes were the need for rescue local anaesthetic, and presence of adverse events (infection, persistent numbness, allergic reaction).

Data analysis

Data were entered into Access 2000 (Microsoft, Redmond, WA) and imported into SPSS 11.0 for Windows (SPSS, Chicago, IL) for statistical analysis. Patients were grouped based on intention to treat. Continuous variables are presented as means and standard deviations. Categorical data are presented as percentage frequency of occurrence.

For both pretreatment characteristics and outcomes, continuous variables were compared with *t* test or Mann-Whitney U test as appropriate. The use of parametric statistics specifically for VAS analysis has been previously validated.⁷ The χ^2 test and Fisher's exact test were used to compare categorical variables. Significance was set at a level of 0.05.

The sample size necessary to detect a 20 mm difference in pain between the groups with a power of 0.80 and an α of 0.05 was 18 in each group. A difference of 13 to 20 mm was considered to be clinically significant.^{8,9}

RESULTS

Thirty six patients were enrolled in the study. Eighteen were randomised to local and 18 to percutaneous regional anaesthesia. All patients completed their assigned treatment.

Table 3 Outcomes

	Regional anaesthesia (n = 18)	Local anaesthesia (n = 18)	Mean difference (95% CI)
Pain of injection, mean (SD), mm	42.4 (29.2)	24.8 (23.4)	17.6 (0.3 to 35.6)
Pain of suturing, mean (SD), mm	23.2 (25.7)	10.1 (18.4)	13.1 (−2.3 to 28.5)
Use of rescue anaesthetic, number (%)	5 (28)	0 (0)	6% to 50%

Figure 1 summarises participant flow. Mean (SD) age was 20 (14) years. Seven patients (19%) were female. Twenty two (61%) wounds were located in the SO distribution (forehead), 12 (33%) in the IO region (cheek and upper lip), and two (6%) in the MN distribution (lower lip). The mean (SD) length of the lacerations was 2.4 (11.1) cm, and their mean (SD) width was 3 (1.4) mm. Baseline patient and wound characteristics were similar between the two groups (table 2). Patients in the regional anaesthetic group experienced more pain during infiltration of anaesthetic (42.4 mm compared with 24.8 mm, mean difference 17.6 mm (95% CI 0.3 to 35.6, $p = 0.05$)). Those receiving regional anaesthesia were also more likely to require additional “rescue” local anaesthetic (28% compared with 0%, Fisher’s exact test, 95% CI 6% to 50%, $p = 0.04$). We found no significant difference in the pain of suturing when only those patients that did not require rescue medications were included (local injection: 10.1 mm compared with regional injection: 17.1 mm, mean difference 7.0 mm (95% CI −8.0 to 22.0, $p = 0.35$)) (see table 3). All patients were available for 5–10 day follow up. There were no wound infections in either group. No complication such as paraesthesias, anaesthesia, or persistent pain was reported. The distributions of method of infiltration and injection pain scores were similar for all 13 physicians who participated in the study.

DISCUSSION

The results of this study show that performance of percutaneous regional anaesthesia of the face in this group of patients before laceration repair was more painful than local infiltration of the anaesthetic agent. We also found that use of percutaneous regional anaesthesia was more likely to be unsuccessful and require adjunctive rescue local anaesthesia than local infiltration. Finally, even when regional anaesthesia resulted in anaesthesia of the wound edges there was a trend towards more pain during suturing in patients receiving nerve blocks.

Several authoritative texts in emergency medicine, surgery, and anaesthesia cite numerous advantages of regional nerve blocks over local anaesthesia.^{3 10 11} Theoretical advantages of regional facial blocks include reduced pain of administration, lower risk of spreading contaminants secondary to infiltration through a contaminated wound edge, and reduction of the anatomical distortion that accompanies direct infiltration anaesthesia. Disadvantages may include delayed and less reliable onset of anaesthesia, requisite skill and knowledge of the local anatomy, and potential for neurovascular injury.^{3 10 11} These potential disadvantages of regional blocks probably contribute to their unpopularity among emergency physicians, especially as speed and efficiency of care become increasingly important. A recent survey of emergency practitioners showed that 85% preferred local wound infiltration to regional blocks for facial lacerations. Of those

surveyed, 95% cited ease of procedure as a reason and 41% preferred local infiltration for its rapid onset (unpublished data). Even those who preferred regional nerve blocks used local infiltration more frequently.

The superiority of regional blocks is logical and has been shown in other body locations such as the digits, where local anaesthetic volume cannot easily be accommodated. For example, Robson *et al* found digital blocks to be superior to local infiltration for the repair of finger lacerations.⁴ They studied both pain of anaesthetic application and pain of suturing from the perspective of patients as well as practitioners. They did note, however, that digital blocks were particularly effective in larger lacerations and those of the distal pulp, stating that in the context of a busy ED smaller, proximal lacerations might be better anaesthetised by local infiltration.

We chose to compare local infiltration with percutaneous regional blocks of the face. However, some have suggested that the intraoral method of injection may be less painful and more effective. Syverud *et al* and Lynch *et al* found that the intraoral approach to IO and mental nerve blocks after pre-treating with a topical anaesthetic was less painful than the percutaneous approaches.^{12 13} We chose, however, to study only the percutaneous method in accordance with ACEPs recommendation to avoid procedures that meet the CDCs definition of exposure prone due to increased risk of inadvertent needlestick injury.^{14 15} It is possible that the oral approach may have resulted in less pain and been more effective for those lacerations in the distribution of the MN or IO nerves. Regardless, most patients in our study had lacerations in the distribution of the SO nerve, where the percutaneous approach is the only one available.

Limitations

Our study has several limitations that merit further discussion. We attempted to minimise practitioner variability by standardising wound care. However, there is still a possibility of practitioner variability and bias. Also, our study population was a convenience sample, introducing the possibility of selection bias. Obviously we could not blind patients or practitioners to method of infiltration. Some patients might have been apprehensive about nerve blocks and that may have influenced their evaluation of pain or effectiveness. Despite didactic and cadaver model sessions taught by practitioners with extensive experience in performing these procedures, the percentage of patients requiring rescue anaesthesia was comparatively high in the regional block group, suggesting the possibility of inadequate technique, making regional anaesthesia seem less effective than it actually is. It is possible that the differences between groups may have been less with practitioners who had greater experience administering regional blocks of the face. Most patients in the study group sustained forehead lacerations, requiring block of the SO nerve. Thus subgroup analysis based on type of nerve block was not possible. It is possible that the difference noted may not have been present in all types of regional block. We did not perform long term follow up. It is still possible that there might be differences in cosmetic outcome based on method of anaesthesia. Finally, our sample size was comparatively small, limiting the power to detect small differences in adverse outcomes.

Summary

We found percutaneous regional facial nerve blocks to be more painful and less effective than local infiltration of anaesthetics before repair of facial lacerations. Future studies should be conducted to determine the effects of type of anaesthesia on ultimate cosmetic outcomes.

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