Comparison of local anaesthetic techniques in the reduction of Colles' fracture

J. WARDROPE, M. FLOWERS AND D. H. WILSON

Department of Accident and Emergency, General Infirmary, Leeds, England

SUMMARY

A trial comparing the use of Bier's block and the direct infiltration of the fracture site with local anaesthetic was carried out to assess their effectiveness in the reduction of Colles' fracture. This showed Bier's block to be superior in terms of patient acceptability and in ease of reduction. The results of the reduction were also significantly better using the Bier's block, as judged by the measurement of the residual displacement on the X-ray.

INTRODUCTION

Bier's block is increasingly used in the reduction of wrist fractures. However, there have been reports of side-effects following the use of this procedure and a few deaths have occurred. Thus it has been recommended that two doctors should be present during a Bier's block (Casualty Surgeons Association, 1983).

The injection of local anaesthetic into the site of the fracture has been suggested to be an acceptable alternative for the manipulation of wrist fractures (Dinley & Michelinakis, 1973). This technique has also been used in our department. Since direct infiltration is not likely to cause systemic side-effects it might be preferable to use this technique if it could be shown to be as effective as Bier's block.

The trial was undertaken to compare these two methods and to assess whether there was any difference in the results of the routine management of Colles' fracture.

METHODS

Patients with Colles' fractures requiring manipulation were asked to take part in the trial. The patients were over 45 years of age, had had no previous wrist fracture on the injured side and had none of the contra-indications to Bier's block or to local anaesthesia.

The patients were examined, weighed and their blood pressure measured and true lateral and antero-posterior X-rays taken.

The following techniques of local anaesthesia were used on alternate days:

Bier's block. 0.5% plain prilocaine (Citanest) was used in a dose of 0.6 ml/kg. A 'butterfly' was inserted into a vein on the dorsum of the injured hand. Another 'butterfly' was placed in a vein of the normal hand to give quick access to the circulation should any systemic reactions occur. The injured limb was then elevated for a few minutes and a well-padded single cuff was placed around the arm. The cuff was then inflated to 100 mm Hg above the systolic pressure and the injection of 0.5% plain prilocaine given slowly over about one minute. After 5 minutes the manipulation was carried out.

Direct infiltration. 1% plain lignocaine was used in a dose of 0.2 ml/kg. The area was palpated to establish the level of the fracture.

The skin over the dorsum of the fracture site and the ulnar side of the wrist was thoroughly cleaned with an iodine solution. Observing aseptic precautions a 23-gauge needle was inserted into the fracture site through the dorsum of the wrist (Fig. 1). Entry

Fig. 1 A lateral view of Colles' fracture illustrating the site of injection for the local anaesthetic agent.

into the fracture haematoma was indicated by the reflux of blood in the syringe barrel. About four-fifths of the total dose was given in this site; the rest was injected into the area of the ulnar styloid. After a period of 5 minutes the manipulation was performed.

Following the manipulation a padded plaster of Paris backslab was applied and check X-rays taken. If the reduction was thought to be inadequate then a further attempt was made during the same anaesthetic.

The doctor performing the manipulation completed a questionnaire recording the patient's details, the interval between injury and reduction, the presence of any pre-

manipulation complications, the number of attempts needed to achieve satisfactory reduction and the occurrence of any complications.

The nurse attending then helped the patient to complete a questionnaire about the anaesthetic (Fig. 2). As well as the direct question about the severity of the pain, a Visual Analogue Scale was included since this is thought to be a more reliable indicator of pain (Revill *et al.*, 1976).

Name of patient

A/E No.

The following questions are to be asked by the nurse attending.

(1) How painful was the procedure? (Ring appropriate word)

Unbearable/very painful/painful/uncomfortable/just noticeable/painless

(2) What was the worst part of the procedure? (Ring appropriate word)

The needles/the injection/the pulling/the cuff/other

(3) Would you rather have been given a general anaesthetic (put to sleep)?

Yes/no

(4) Look at the line below. One end represents no pain and the other represents the worst pain that you can imagine. Where would you gauge the pain of the procedure? For example, if you thought the procedure was very painful but not the worst pain you have had then the line would be marked thus:

Example No pain I-----I-----I Worst

Mark your pain No pain I-----I Worst

Fig. 2 Patient questionnaire.

Fig. 3 (a) Volar angulation, lateral X-ray; (b) distance from radial styloid to plain of ulnar articular surface, antero-posterior X-ray; (c) ulnar angulation of articular surface of radius.

The patients were followed up in the fracture clinic.

The X-rays were analysed by measuring the volar angulation on the lateral film, the ulnar inclination of the articular surface of the radius on the antero-posterior view and the distance between the articular surface of the ulna and the tip of the radial styloid (Fig. 3) (Friberg & Lundstrom, 1976).

The notes of the patients were reviewed following discharge from the fracture clinic to record complications or if re-reduction had been necessary.

The data were analysed using Student's *t* test and the *chi*-squared test.

RESULTS

The two groups were comparable in age and initial degree of displacement of the fracture (Table 1).

Table 1 Mean values for the patients at presentation (standard deviation)

	Local	Bier's	Stat.	Signif.
Age (years)	65.0 (9.2)	64.5 (10.0)	$t = 0.18$	$p > 0.5$
Initial volar angulation (degrees)	-25.4 (11.0)	-23.6 (9.5)	$t = 0.70$	$p > 0.1$
Initial ulnar angulation (degrees)	3.4 (6.9)	6.1 (8.0)	$t = 1.53$	$0.5 > p > 0.1$
Initial distance (mm)	5.6 (3.2)	6.1 (3.8)	$t = 0.58$	$p > 0.5$

The first attempt at reduction was not satisfactory in more cases in the local infiltration group than in the Bier's block group (Table 2). Analysis of the final check X-rays showed that in the Bier's block group a better reduction had been achieved. There were significant differences in the ulnar angulation and the distance between the articular surface of the ulna and the radial styloid (Table 3).

The patients appeared to experience less pain with the Bier's block as shown by the responses to both pain questions in the questionnaire (Tables 4 and 5). Five patients in the local infiltration group and four in the Bier's block group said that they would have preferred a general anaesthetic.

Table 2 Numbers of patients requiring more than one manipulation at first anaesthetic

	Local	Bier's	
> 1 manipulation	12	6	$\chi^2 = 4.32$ $p < 0.05$
1 manipulation	24	39	

Table 3 Post reduction radiographic measurements. Mean values (standard deviation)

	Local	Bier's	
Volar angulation (degrees)	2.6 (8.6)	4.5 (8.1)	$t = 0.98$ $0.5 > p > 0.1$
Ulnar angulation (degrees)	9.6 (5.2)	13.6 (6.6)	$t = 2.8$ $p > 0.01$
Distance (mm)	9.1 (3.2)	10.9 (2.3)	$t = 2.74$ $p > 0.01$

Table 4 Numbers of patients responding

	Local (n = 37)	Bier's (n = 42)	
Painless	1	11	
Just noticed	8	7	$\chi^2 = 9.82$
Uncomfortable	12	13	$0.05 > p > 0.02$
Painful	9	8	
Very painful	7	3	

Table 5 Pain scale, numbers of patients marking the scale at less than and more than 2 cm from the 'no pain' end

	Local	Bier's	
< 2 cm	8	21	$\chi^2 = 6.8$
> 2 cm	29	21	$p < 0.05$

Three patients in the direct infiltration group required to have an early re-reduction of the fracture. None in the Bier's group required early re-reduction. There were no problems due to infection in either group. There were equal numbers of problems with swelling and neurological symptoms in the two groups and there was no significant difference in the time to discharge from the fracture clinic.

DISCUSSION

We have found Bier's block to be a safe and effective method of anaesthesia for the reduction of Colles' fracture. Our junior staff are given training in the technique early in their stay in the department and are aware of the possible complications of the technique and the measures to take should these occur. We have tried to keep the procedure as simple as possible by using a single cuff and a bicycle pump to inflate the cuff. We have always used prilocaine in the past and there have been no major complications due to Bier's block.

The direct infiltration technique is quicker to perform and there is less chance of an intravenous bolus of local anaesthetic agent being given by mistake. However, direct infiltration would appear to give less satisfactory results than Bier's block in the hands of our junior staff.

We conclude that Bier's block is a better method of local anaesthesia in this situation.

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