Femoral nerve block in the initial management of femoral shaft fractures

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SUMMARY

The aim of this study was to demonstrate that the under-used technique of femoral nerve block (F.N.B.) (Berry, 1977) has excellent analgesic action for femoral shaft fractures when performed by junior staff. It had no recorded side effects and was used in all age groups for fractures at all levels along the femoral shaft. Twenty-seven consecutive patients were studied as they presented in an accident room, all received a femoral nerve block (10 ml 1% Lignocaine with 1:200 000 adrenaline) from unsupervised junior accident and emergency staff instructed in the technique. Each case was subsequently followed up, and both the delay before the onset of analgesia and total duration of analgesia, together with its efficacy, were assessed. A further F.N.B. using a different agent (10 ml 0.5% bupivacaine) was performed and the same parameters were assessed. Both agents gave effective analgesia of varying duration at all levels of fracture site.

INTRODUCTION

Frequently, a patient with a femoral fracture is withheld opiate analgesia because of a concurrent head or chest injury. An F.N.B. is an effective means of administering a safe and long-lasting analgesic agent (Grossbard & Love, 1979, 1981; Tondare & Kadkarni, 1982). It requires minimal instruction and has few side effects. The only absolute contra-indications are a known hypersensitivity to the local anaesthetic agent, or the presence of a vascular or neurological problem in the affected limb. This effective and cheap procedure is not used to its full potential in accident and emergency (A & E) departments throughout the UK.

PROCEDURE

The following equipment is required: a 10 ml syringe; a 23 G needle; 10 ml of anaesthetic for adults or 5 ml for children; and antiseptic for skin.

Stand on opposite side to fractured limb. Palpate the anterior superior iliac spine and pubic tubercle to visualize the inguinal ligament. Palpate the femoral artery just below the inguinal ligament.

Insert needle at a point 1–2 cm lateral to the arterial pulsation.

Insert needle vertically until either penetration of the fascia over the nerve occurs (often felt) or patient gets sharp pain down leg/thigh indicating that the needle is touching the nerve, in which case withdraw about 1 mm.

Finally, inject the local anaesthetic slowly, and then laterally to the artery in a fan-like distribution.

METHOD

Junior A & E staff were instructed in the method as shown in Figure 1.

Twenty-seven consecutive patients were initially assessed and resuscitated in an accident room. Each received an F.N.B. by an unsupervised SHO after a clinical or radiological diagnosis was made. The agent used was 1% Lignocaine with 1:200 000 adrenaline and was followed, 15 min later, by the application of a Hare splint. Each case was then seen between 4 and 18 h after admission, by which time they had been transferred to modified Hamilton-Russell traction on an orthopaedic ward.

At this point, the delay before onset of analgesia, the total duration of analgesia and an estimate of pain were recorded. Pain was assessed on a visual analogue scale of 0–10 on three occasions: prior to F.N.B., at 15 min post-F.N.B. and, lastly, when Hare's splint was applied.

Each case was then offered a second F.N.B., this time using 10 ml 0.5 bupivacaine. Every patient accepted and, again, the delay before the onset of analgesia and an estimate of pain were recorded.

Fig. 1 Method of femoral nerve block.

Again, pain was recorded prior to F.N.B. and at 15 min post-F.N.B. If the patient allowed, pain was provoked by lifting the knee of the affected limb (free from traction) 15 cm clear of the bed. This was done prior to F.N.B. and at 15 min post-F.N.B. with bupivacaine only.

RESULTS

The results are as shown in the two tables. The approximate level of the fracture is indicated in the first column.

The delay before the onset of analgesia varied: with Lignocaine from 3–15 min (average 8·7 min) and with bupivacaine from 3–21 min (average 9·3 min).

The total duration of analgesia varied: with Lignocaine from 1–8 h (average 3·8 h) and with bupivacaine from 3–24 h (average 11·5 h)

Table 1 shows how initially high visual analogue scores were reduced with the

Table 1 Lignocaine

No.	Site	Onset (min)	Duration (h)	Pre-injection at rest	Post-injection at rest	Post-injection splinting
1	L	15	5·5	8	0	4
2	M	12	*	10	7·5	*
3	L	10	1·5	5·5	2	5·5
4	U	3	6	9	0	0
5	L	15	7	8	0	0
6	U	15	3·5	7·5	0	2
7	L	15	2	8	3	5
8	UML	5	1	10	5	*
9	M	15	1·5	10	5	0
10	M	15	8	8	4	5
11	U	15	5	5	2	*
12	U	10	4	8	6	*
13	M	3	6	10	5	10
14	M	5	1·5	7	4	8
15	L	4	7	8	4	8
16	U	3	2	10	1	*
17	M	5	1·5	8	1	9
18	L	10	2·5	10	6	0
19	M	4	*	6	1	*
20	M	—	—	—	—	—
21	L	—	—	—	—	—
22	M	*	*	10	5	*
23	M	5	—	—	—	—
24	M	10	5·5	Screaming	No pain	c/o Pulling
25	U	15	*	A lot	None	None
26	M	5	>3·5	A lot	No pain	No pain
27	M	5	1	7	0	0

*Not recorded.

Lignocaine and adrenaline F.N.B. Unfortunately, due to concurrent circumstances, for example, head injury, the effects of Lignocaine blocks could not be assessed on subsequent visits in cases 20, 21 and 23. Of the remainder, three required entonox while the Hare's splint was being applied. These included a frightened 5-year-old boy, while the other two cases involved the splint being applied too early (< 15 min).

A further four received opiates. Two patients had 75 mg of pethidine and one 15 mg of cyclomorphine 1M 1 h prior to F.N.B.

The fourth patient had 15 mg cyclomorphine 15 min post-F.N.B. for pain in a fractured forearm. The use of opiates was discouraged in the protocol, these were only to be used if the F.N.B. failed. The patients who received both opiates and F.N.B. gave a preference to block during assessment.

As expected, Table 2 shows initial pain assessment to be low prior to F.N.B. while on skeletal traction. Each case reported a beneficial effect with the bupivacaine block, some with the total abolition of pain. Only one patient declined the provocation test, the remaining 21 reported a good analgesic effect which enabled the affected limb to be moved more comfortably 15 min post-F.N.B.

Table 2 Bupivacaine

No.	Site	Onset	Duration (h)	Pre-injection at rest	Post-injection at rest (15 min)	Pre-injection movement	Post-injection movement (15 min)
1	L	17	24	8	0	10	1
2	M	15	*	10	6	10	6
3	L	20	16	2.5	0	5.5	5
4	U	10	12	9	1	9	2
5	L	12	16	7	0	10	0
6	U	10	>4	7.5	0	9	5.5
7	L	10	12	4	1	10	3.5
8	UML	5	6	3	0	10	5
9	M	5	24	2.5	0	6	1
10	M	8	>3	5	1	10	2.5
11	U	—	—	—	—	—	—
12	U	—	—	—	—	—	—
13	M	10	6	5	3	10	3
14	M	3	*	4	2	8	6
15	L	4	*	7	3	8	3
16	U	10	*	2	0	8	1
17	M	4	>2	4	1	Not allowed	—
18	L	4	3	5	0	7	2
19	M	—	—	—	—	—	—
20	M	12	5	5.5	2	7.5	4
21	L	10	*	8	0	9	4
22	M	5	6	2.5	0	10	2.5
23	M	10	10	1	0	4	1
24	M	10	—	—	—	—	—
25	U	15	>2	Not much	No complaints	A lot	No complaint
26	M	—	—	—	—	—	—
27	M	6	10	1	0	8	0

*Not recorded.

Case nineteen was the only patient to receive an initial F.N.B. with Lignocaine outside of the accident room. Instead, a F.N.B. was performed at the roadside—as per protocol—with the application of the splint 15 min after the F.N.B. at the scene.

Unfortunately, bupivacaine F.N.B.'s could not be offered to all patients as they were either transferred to different hospitals or their fractures were fixed within 4–18 h of admission.

The visual analogue scale could not be used in cases 24, 25 and 26 as these patients were children. Their responses have, therefore, been represented in verbal form.

DISCUSSION

The nerve supply of periosteum is derived from the nerves supplying the overlying muscle. In the case of the femur, this is predominantly the quadriceps femoris group of muscles, innervated by the femoral nerve.

Previous studies have used 1% Lignocaine with adrenaline for F.N.B.'s (Berry, 1977). This is because Lignocaine has a short duration before its onset of action. This paper did not support this as bupivacaine had a comparable duration before its onset of action. Although the bupivacaine F.N.B.'s in this study were used in a totally different setting, i.e. in the ward as compared to the accident room for lignocaine, the authors have subsequently used it in the initial management of femoral fractures with comparable results in both onset of action and total length of analgesia.

A previous study (Tondare & Nadkarni, 1982) suggests that patients with high femoral shaft fractures required supplementary opiate analgesia. This paper did not confirm this as F.N.B. was found equally as effective at all levels. The authors have subsequently used F.N.B.'s for inter-trochanteric fractured neck of femur with good results.

The proximity of the injection to the femoral nerve has not been considered in this study. It is a reasonable assumption to make that, the closer the analgesic agent to the nerve, the shorter the delay before its onset of action. For that reason, the authors refer to a method by Khoo & Brown (1983) who described a technique whereby this agent maybe more precisely located near to the nerve. They advocate the use of a short bevelled needle introduced downwards, perpendicular to the skin, and just lateral to the femoral artery below the inguinal ligament. A characteristic loss of resistance is felt as the needle goes through the fascia lata and fascia iliaca, and then the anaesthetic agent is injected. X-ray studies confirmed that the injected solution spreads upwards in a confined space in which the femoral nerve lies. The authors of this paper found that the sensation of parathesia was a reliable sign of the proximity of the needle to the nerve.

Once an F.N.B. is performed, pathology at other sites of the body may also present. In one case, a patient only started to complain of a fractured forearm once the pain of the fractured femur had abated. Berry (1977) described a similar case of a child complaining of left hypochondrial pain due to a ruptured spleen only after a F.N.B.

Adequate splintage will, of course, also relieve pain, however, this should humanely be done once the F.N.B. has taken effect. Splintage will, in any case, be easier once muscle relaxation has occurred. Two of the authors' patients required entonox during a

splintage because adequate time was not allowed for the block to take effect, despite the guidelines in the protocol. As in any local anaesthetic technique, the usual cause for failure is the doctor's haste.

F.N.B.'s have other applications: they have been used to insert Steinman pins 'with only minimal additional local anaesthetic at the site of entry of the pin on the tibia' (Grossbard & Love, 1981). The authors have used the technique for both fractured and dislocated patellae with good effect. There is also some evidence to suggest that it is useful for intra-articular knee pathology. A study by Ringrose & Cross (1984) described an 80% reduction in opiate administration immediately following anterior cruciate repair when a bupivacaine F.N.B. was given pre-operatively.

The authors recommend the use of F.N.B. using 10 ml of 0.5% bupivacaine in the initial management of femoral shaft fractures. This study confirms that junior medical staff can effectively administer the technique and has the advantage that it may be given at the scene of an accident.

The authors suggest that this simple, effective and cheap method of analgesia be included in future A & E and orthopaedic texts.

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