Table 1

Author, date, country	Patient group	Study type	Outcomes	Key results	Study weaknesses
Hale PJ, 1988, UK	20 patients admitted to hospital with diabetic ketoacidosis. Simultaneously drawn radial or femoral arterial blood and capillary blood taken from a fingertip. Samples were taken 2 h after the initiation of treatment	Prospective observational	Correlation between arterial and capillary samples (range of values measured: pH 6.77–7.29, P _{CO} ₂ 1.5–5.4 kPa, bicarbonate 2–15 mmol/l) pH P _{CO} ₂ Bicarbonate	 r=0.98 r=0.89 r=0.97	1. Small study 2. Few clinical details, such as severity of illness, duration of acidosis before treatment, and blood pressure

► CLINICAL BOTTOM LINE

There is insufficient evidence to recommend the use of capillary blood in the assessment of acid–base status in patients with diabetic ketoacidosis in the emergency setting; more research is needed to answer this question.

Hale PJ, Nattrass M. A comparison of arterial and non-arterialized capillary blood gases in diabetic ketoacidosis. *Diabet Med* 1988;5:76–8.

Effect of warming local anaesthetics on pain of infiltration

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Abstract

A short cut review was carried out to establish whether warming local anaesthetic solution reduced the pain of infiltration. A total of 720 papers were found using the reported searches, of which 11 presented the best evidence to answer the clinical question. The author, date and country of publication, patient group studied, study type, relevant outcomes, results and study weaknesses of these best papers are presented in table 2. It is concluded that warmed local anaesthetic solution is less painful than that at room temperature.

Three-part question

In [patients requiring local anaesthetic infiltration] is [infiltration of warmed or room temperature solution] [less painful]?

Clinical scenario

A 40-year-old man attends the emergency department, having sustained a 2 cm laceration to his left forearm. There is no tendon/neurovascular damage. He tells you that he has a real phobia of needles and asks if you can make sure it doesn't hurt when you inject the local anaesthetic. You consider saying that that's what the injection is for—but hold yourself back. Afterwards you discuss the matter with a dental colleague who tells you that warming the solution is quite a good way of reducing pain. You outwardly deride his opinion (what do dentists know about pain reduction!) but inwardly wonder whether he might be right.

Search strategy

Medline 1950 to July week 4 2007 using the OVID interface (limited to Humans and English Language): {[lignocaine.mp. or exp Lidocaine or lidocaine.mp. or bupivacaine.mp. or exp

Bupivacaine or prilocaine.mp. or exp Prilocaine or marcaine.mp. or caine.mp. or exp Anesthetics, Local or exp Anesthesia, Local or local.mp.] AND [warm.mp. or exp Heat or heat.mp. or hot\$.mp. or temperature\$.mp. or exp Temperature or exp Body Temperature] AND [pain\$.mp. or exp Pain or exp Pain Measurement]}

The Cochrane Library Issue 3 2007: MeSH descriptor Lidocaine explode all trees AND MeSH descriptor Temperature explode trees 2 and 3–61 none relevant.

Outcome

A total of 720 papers were found, of which only 11 were relevant (table 2).

Comments

Eight papers were double-blinded and three were single-blinded. All were randomised trials. All had small sample sizes ranging from 20–45 patients. Apart from two, all studied healthy volunteers; the two studied infiltration of traumatic wounds, and infiltration of facial lesions before excision. Six studied subcutaneous infiltration, three studied intradermal infiltration, one studied dental procedures, and one studied digital nerve blocks. All studied lignocaine except one studying bupivacaine.

The most relevant paper to wound closure in the emergency department was one that studied pain on infiltrating traumatic wounds. It had the largest sample (45 patients), and concluded that warming reduced pain on infiltration ($p<0.05$). It was, however, single-blinded and did not determine the exact site or size of the wounds. Five more double-blinded studies (on healthy volunteers) supported the result that warming reduces pain.

Two papers showed that warming and buffering have a synergistic effect in reducing infiltration pain. Another paper, however, concluded that only buffering reduces pain, and that warming a buffered solution does not reduce the pain any further.

Only one paper included children; however, it looked at pain of local anaesthetic injections in dental procedures, and a topical local anaesthetic was used before injections. It concluded that warming did not reduce the pain of infiltration.

► CLINICAL BOTTOM LINE

Overall the evidence suggests that warming local anaesthetics, either alone or in combination with buffering, significantly reduces pain of local infiltration.

Bainbridge LC. Comparison of room temperature and body temperature local anaesthetic solutions. *Br J Plastic Surgery* 1991;44:147–8.

Davidson JA, Boom SJ. Warming lignocaine to reduce pain associated with injection. *BMJ* 1992;305:617–8.

Mader TJ, Playe SJ, Garb JL. Reducing the pain of local anesthetic infiltration: warming and buffering have a synergistic effect. *Ann Emerg Med* 1994;23:550–4.

Waldbillig DK, Quinn JV, Stiell IG, et al. Randomized double-blind controlled trial comparing room-temperature and heated lidocaine for digital nerve block. *Ann Emerg Med* 1995;26:677–81.

Table 2

Author, date, country	Patient group	Study type	Outcomes	Key results	Study weaknesses
Bainbridge, 1991, UK	40 adult patients attending for local anaesthetic procedures on the cheeks and chin (4 ml of 1% lignocaine with 1:200 000 epinephrine was used)—subcutaneous injections	Single-blinded RCT	1.5 cm VAS (subjects were instructed to consider pain from needle-stick as the midpoint of the VAS)	Patients perceived significantly less pain ($p<0.005$) when injected with local anaesthetic at body temperature	Single-blinded. Small sample (45 injections). No comment on age/gender. Atraumatic (no wound, used for excision of facial lesion). Paired comparison is not possible because patients received only one of the solutions
Davidson <i>et al</i> , 1992, UK	40 medical and paramedical staff (healthy volunteers)—subcutaneous injections of lignocaine	Double-blinded, randomised, crossover study	100 mm VAS + subject's assessment: which is more painful. Subjects were instructed to exclude pain from needle	25 (89%, 95% CI 72% to 98%) thought that lignocaine at 20°C was more painful	Small sample (40), age 26–59 (no children) + mostly men (33 out of 40). Only 1 ml injected. Atraumatic (no wound). Unclear randomisation method
Mader <i>et al</i> , 1994, USA	32 adult healthy volunteers (age 21–45 years)—subcutaneous injections of lignocaine. Each volunteer had 4 injections with plain, warm, buffered, and warm-buffered	Double-blinded RCT	15 cm VAS	The mean pain score for warm-buffered lignocaine was significantly lower than plain ($p=0.0001$), warm ($p=0.0005$) and buffered ($p=0.0028$) solutions; suggesting a synergistic effect of warming and buffering	Small sample (32), all adults (no children). No comment on gender. No clear randomisation of order of injections. Only 0.5 ml injected. Atraumatic (no wound). No control on time interval between needle-stick and infiltration
Waldhillig <i>et al</i> , 1995, Canada	20 adult healthy volunteers (1st year medical students, 10 males and 10 females, ranging from 21–32 years)—digital nerve block of middle finger with lignocaine	Double-blinded RCT	100 mm VAS	13 felt less pain with warmed, 6 felt less pain with room temp, and 1 perceived no difference	Small sample (20×2), all adults (no children). Atraumatic (no wound)
Barfield <i>et al</i> , 1995, USA	Part 1: 10 healthy adults received intradermal injections of warmed plain and room temperature buffered 1% lignocaine. Part 2: 24 healthy volunteers received intradermal injections of warmed buffered and room temperature buffered 1% lignocaine	Double-blinded RCT	100 mm VAS	Part 1: Pain scores were significantly higher for warmed as compared to room temperature buffered lignocaine (28 ± 22 mm, $p<0.01$)	Small sample (10 and 24), all adults (no children). No comment on gender. Only 0.5 ml injected. Atraumatic (no wound). No comparison between room temperature plain and warmed plain lignocaine. No control on time interval between needle-stick and infiltration
Brogan <i>et al</i> , 1995, USA	45 patients older than 13 years old (mean 30 ± 10), 80% men similar wounds in length, depth, and location. Also looked at effect of buffering pH as well as temp. Each wound had two margins/sides. Each margin was injected with a different solution of lignocaine and patients were divided into 5 groups according to solutions injected and order of injection	Single-blinded, randomised prospective study	VAS	Both warmed and buffered lignocaine had significantly less pain on infiltration. Mean pain scores: 4.9 vs 4.2 vs 8.2 ($p<0.05$)	Single-blinded, small sample (45), mostly men, all adults (no children). Amount of injection not determined (7 variable). Injection performed by two different investigators who were not blinded. No mention of site, size, or depth of wound (despite mentioning that these were similar in all subjects)
Fialkov <i>et al</i> , 1996, Canada	26 adults (16 women, 10 men): 6 patients with two skin lesions for excision, and 20 healthy volunteers injected into both forearms). Subcutaneous injections of equal volumes (ranging from 3–6 ml at a rate of 0.05 ml/s) of 1% lignocaine with 1:100 000 epinephrine	Double-blinded randomised trial	Verbal scoring (0 to 10) to avoid the variable of using the dominant arm immediately after the injection	The mean difference in pain score between the room temperature and warmed solutions was +1.5 ($p<0.0001$)	Small sample (26), all adults (no children). Atraumatic (no wound). Variable volumes of solutions injected (3–6 ml); although volumes were equal in each subject. No control on time interval between needle-stick and infiltration
Martin <i>et al</i> , 1996, USA	40 adult healthy volunteers (18 years and older)—subcutaneous injections of lignocaine	Double-blinded, randomised study	100 mm VAS + subject's assessment: which is more painful (subjects were instructed to consider pain from needle-stick as the midpoint of the VAS)	20 subjects (50%) reported that 20°C buffered lignocaine was more painful and 17 (42.5%) reported that the 37°C solution was more painful ($p=0.74$)	Small sample (40), all adults (no children). No comment on gender. Only 1 ml injected. Atraumatic (no wound). No control on time interval between needle-stick and infiltration
Jones <i>et al</i> , 1998, USA	40 adult healthy volunteers (18 years and older)—intradermal injections of bupivacaine	Double-blinded, randomised study	100 mm VAS (subjects were instructed to consider pain from needle-stick as the midpoint of the VAS)	Pain from warmed buffered bupivacaine was significantly lower than room temp buffered ($p=0.003$; 12.1 mm difference, 95% CI 6.9 to 16.4)	Small sample (40), all adults (no children). No comment on gender. Only 0.5 ml injected. Atraumatic (no wound). Unclear randomisation method. No control on infiltration rate and on time interval between needle-stick and infiltration
Colaric <i>et al</i> , 1998, USA	20 adult healthy volunteers—intradermal injections of lignocaine. Also looked at effect of buffering pH as well as temp. Four solutions were studied: (1) room temp unbuffered 1% lignocaine; (2) warmed 37°C unbuffered; (3) room temp buffered; (4) warmed 37°C buffered	Double-blinded, randomised, prospective trial	200 mm VAS (subjects were instructed to consider pain from needle-stick as the midpoint of the VAS)	Mean pain score for warmed and buffered lignocaine was significantly lower than all the other solutions ($p<0.0005$ for solutions 1 and 2, and $p<0.005$ for solution 3)	Small sample (20 patients receiving 4 injections in each of 4 different occasions). No comment on age/gender. Only 1 ml injected. Atraumatic (no wound)

Table 2 Continued

Author, date, country	Patient group	Study type	Outcomes	Key results	Study weaknesses
Ram <i>et al</i> , 2002, Israel	44 children (age 7.9 ± 2.2 years), 21 girls and 23 boys; were given 1.8 ml of 2% lignocaine with 1:100 000 epinephrine at a rate of 1 ml/min, on two separate occasions. The injections were for dental procedures (palatal or mandibular blocks). Topical anaesthetic gel (5% lignocaine) was applied to the site of injection 1 min before injection	Single-blinded randomised trial	Objective using the modified Behavior Pain Scale (BPS) (Taddio <i>et al</i>), Wong-Baker FACES Pain Rating Scale (FPS), and 100 mm VAS	No statistically significant difference between warmed and room temperature solutions was found using any of the measurement tools	Small sample (44). Single-blinded. The use of topical local anaesthetic may obscure any potential difference (especially that VAS scores were 0 in 29 instances). Atraumatic dental procedure

CI, confidence interval; RCT, randomised controlled trial; VAS, visual analogue scale.

Barfield JM, Crisafulli KM, Raccio-Robak N, *et al*. The effects of warming and buffering on pain of infiltration of lidocaine. *Acad Emerg Med* 1995;**2**:254–8.

Brogan GX Jr, Giarrusso E, Hollander JE, *et al*. Comparison of plain, warmed, and buffered lidocaine for anesthesia of traumatic wounds. *Ann Emerg Med* 1995;**26**:121–5.

Fialkov JA, McDougall EP. Warmed local anesthetic reduces pain of infiltration. *Ann Plast Surg* 1996;**36**:11–3.

Martin S, Jones JS, Wynn BN. Does warming local anesthetic reduce the pain of subcutaneous injection? *Am J Emerg Med* 1996;**14**:10–2.

Jones JS, Plzak C, Wynn BN, *et al*. Effect of temperature and pH adjustment of bupivacaine for intradermal anesthesia. *Am J Emerg Med* 1998;**16**:117–20.

Colacic KB, Overton DT, Moore K. Pain reduction in lidocaine administration through buffering and warming. *Am J Emerg Med* 1998;**16**:353–6.

Ram D, Hermida LB, Peretz B. A comparison of warmed and room-temperature anesthetic for local anesthesia in children. *Pediatr Dent* 2002;**24**:333–6.

Use of tamsulosin in patients with urinary calculi to increase spontaneous stone passage

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Abstract

A short cut review was carried out to establish whether tamsulosin enhances the chances of spontaneous stone expulsion in renal colic. Thirty-five papers were found using the reported searches, of which two (a meta-analysis and one further randomised controlled trial) presented the best evidence to answer the clinical question. The author, date and country of publication, patient group studied, study type, relevant outcomes, results and study weaknesses of these papers are presented in table 3. It is concluded tamsulosin may be useful during periods of watchful waiting to enhance ureteric stone expulsion.

Three-part question

In [patients presenting to the emergency department with urinary calculi] is [tamsulosin better than conservative therapy] at [promoting spontaneous stone passage]?

Clinical scenario

A patient presents to the emergency department with a 6 mm calculi in the left distal ureter. You wonder if the use of tamsulosin would improve the chances of spontaneous stone passage.

Search strategy

Medline 1950–July week 4 2007 using the OVID interface: [(exp ureteral obstruction/or exp ureteral calculi/) AND (exp adrenergic alpha-antagonists/or tamsulosin.mp.)]. LIMIT to human AND English.

The Cochrane Library Issue 3 2007: tamulosin.ti.ab.kw. 135 records, all duplicated in meta-analysis.

Outcome

Thirty-five papers were found, of which 13 papers were relevant to the study question. One paper was a recent meta-analysis (2007) which included all but one of the relevant randomised controlled trials.