Clinical scenario

A 65-year-old woman presents to the emergency department with signs and symptoms of SBO. She had previously had an abdominal hysterectomy. Plain abdominal radiograph (AXR) is non-specific. You wonder whether abdominal CT would be useful in the management of a patient with presumptive SBO.

Search strategy

Medline 1950 to March 2006 using the OVID interface, combined with manual cross-referencing (exp Intestinal obstruction/AND exp Intestine, Small/AND exp Tomography, X-Ray Computed/) AND ((intestinal adj obstruction) AND CT).mp. limit to (humans and English language).

Search outcome

A total of 491 papers were found of which 16 were relevant to the topic and one systematic review incorporating 11 of these papers (table 3).

Comments

Published literature supports the use of CT as a sensitive and specific test for small bowel obstruction. The evidence supports the proposal that CT provides reliable information regarding cause of the obstruction and presence of bowel strangulation.

► CLINICAL BOTTOM LINE

CT is a useful investigation in patients presenting with suspected SBO.

Beall DP, Fortman BJ, Lawler BC, *et al.* Imaging bowel obstruction: a comparison between fast magnetic resonance imaging and helical computed tomography. *Clin Radiol* 2002;**57**:719–24.

Ha HK, Kim JS, Lee MS, *et al.* Differentiation of simple and strangulated small-bowel obstructions: usefulness of known CT criteria. *Radiology* 1997;**204**:507–12.

Lazarus DE, Slywotsky C, Bennett GL, *et al.* Frequency and relevance of the "small-bowel feces" sign on CT in patients with small-bowel obstruction. *AJR Am J Roentgenol* 2004;**183**:1361–6.

Scaglione M, Grassi R, Pinto A, *et al.* [Positive predictive value and negative predictive value of spiral CT in the diagnosis of closed loop obstruction complicated by intestinal ischemia]. *Radiol Med (Torino)* 2004;**107**:69–77.

Suri S, Gupta S, Sudhakar PJ, *et al.* Comparative evaluation of plain films, ultrasound and CT in the diagnosis of intestinal obstruction. *Acta Radiol* 1999;**40**:422–8.

Mallo RD, Salem L, Lalani T, *et al.* Computed tomography diagnosis of ischemia and complete obstruction in small bowel obstruction: a systematic review. *J Gastrointest Surg* 2005;**9**:690–4.

The effect of warming local anaesthetics on pain of infiltration

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doi: 10.1136/emj.2007.053819

Abstract

A short cut review was carried out to establish whether warming local anaesthetic solutions reduced the pain on injection. A total of 758 papers were found using the reported search, of which 11 represented 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 4. The clinical bottom line is that warming local anaesthetics, either alone or in combination with buffering, significantly reduces pain of local infiltration.

Three part question

In [patients requiring local anaesthetic infiltration] is [warmed local anaesthetic rather than room temperature local anaesthetic] on infiltration [less painful]?

Clinical scenario

A 40-year-old man sustains a 2 cm laceration to his left forearm. There is no tendon/neurovascular damage. Would warmed local anaesthetic or room temperature local anaesthetic be less painful on infiltrating the wound before suturing?

Search strategy

Medline 1966-12/06 using the OVID interface (limited to Humans and English Language) {[lignocaine.mp. or exp Lidocaine or lidocaine.mp. or exp Lidocaine 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]}.

Search outcome

A total of 758 papers were found, of which only 11 were relevant (table 4).

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. All studied healthy volunteers, apart from two which 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 which studied 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. It, however, 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.

Warming the local anaesthetic using commercially available warmers is a simple, inexpensive, and practical way of reducing the pain of local anaesthetic infiltration in the accident and emergency environment.

► CLINICAL BOTTOM LINE

The overall 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 Plast Surg* 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.

Bartfield 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.

Table 4

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, randomised, controlled study	15 cm visual analogue scale (VAS) (subjects were instructed to consider pain from needle stick as the mid point 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 and Boom, 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% confidence interval (CI) 72% to 98%) thought that lignocaine at 20°C was more painful	Small sample (40). Age 26–59 years (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 to 45 years)—subcutaneous injections of lignocaine. Each volunteer had 4 injections with plain, warm, buffered, and warm-buffered	Double blinded, randomised, controlled study	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
Waldbillig <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 blind, randomised, controlled, crossover trial	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)
Bartfield <i>et al</i> , 1995, USA	Part I: 10 healthy adults received intradermal injections of warmed plain and room temperature buffered 1% lignocaine. Part II: 24 healthy volunteers received intradermal injections of warmed buffered and room temperature buffered 1% lignocaine	Two part randomised, double blinded clinical trial	100 mm VAS	Part I: 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 (SD) 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 five 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.	Single blinded. Small sample (45). Mostly men. All adults (no children). Amount of injection not determined (?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 and McDougall, 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 (0–10) 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 mid point 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). No comment on gender. All adults (no children). Only 1 ml injected. Atraumatic (no wound). No control on time interval between needle stick and infiltration

Table 4 Continued

Author, date, country	Patient group	Study type	Outcomes	Key results	Study weaknesses
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 mid point 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). No comment on gender. All adults (no children). 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 mid point 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)
Ram <i>et al</i> , 2002, Israel	44 children (mean (SD) 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

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.

Colaric 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.