Is cocaine needed in topical anaesthesia?

S Bush

Are non-cocaine containing topical anaesthetics as effective as cocaine containing topical anaesthetics in the management of lacerations? This review examines the current medical literature for effective agents that do not contain cocaine.

"Pain hurts".

The standard local anaesthesia technique used in UK practice before suturing is infiltration with 1% plain lignocaine (lidocaine). This method is painful but does give good anaesthesia.

Topical anaesthesia (TA) has been used in the United States for two decades. The rationale behind its use was to avoid the needle prick and pain of infiltration while producing effective anaesthesia. There is also no tissue distortion with topical anaesthesia unlike subcutaneous infiltration.

The original mixture used for topical anaesthesia was TAC—0.5% tetracaine, 0.05% adrenaline (epinephrine), and 11.8% cocaine although a number of departments use different concentrations of the three drugs.

Application of TAC is less painful than infiltration of lidocaine in wounds of the face and scalp as the anaesthetic effectiveness of TAC is equivalent to 1% lignocaine. Some studies have demonstrated equivalence with extremity wounds but other publications report that TAC is inferior to 1% lignocaine in this situation. Wound complication rates are similar for both drugs. Most comparisons with lidocaine have been made only in children but some have included adults.

There are a number of drawbacks associated with the use of TAC. TAC is expensive as it is a controlled drug, it is inconvenient to store and some have included adults. There are reports of seizures associated with its use in children. There is also a case report of the death of a child that has been attributed to the rapid absorption of cocaine via mucous membranes. Cocaine has been detected in the plasma of children treated with TAC. The majority of departments that use TAC avoid its use on mucous membranes.

Reducing the concentration of cocaine in TAC has been proposed to improve its safety profile but the safety issues remain, as do the cost and inconvenience factors. It is logical, therefore, to seek an agent that does not contain cocaine but is as effective in topical anaesthesia as TAC. The purpose of this review is to examine the literature for evidence of such an agent.

METHODS

The Medline database (1966–2000) was searched using the Ovid search engine. MeSH headings of “Anesthesia, local”, “Anesthetics, local” and “Administration, topical” were used. Searches were also made using “topical anesthesia” and “topical anaesthesia” as keywords. The results generated were combined with those from the MeSH headings “Wounds, nonpenetrating” and “Wounds, penetrating” and the keywords “laceration” and “incision”. The combined articles were limited to “English language” and “randomised controlled trial”.

Another electronic search was made of Medline using the Internet Grateful Med search engine. The query terms were “topical anaesthesia or topical anaesthesia” with limitation to “Human” and “Randomised Controlled Trial”. The databases EMBASE, COCHRANE LIBRARY and BEST EVIDENCE CD were also searched in a similar manner. The internet was searched for “topical anaesthesia” and “topical anaesthesia” using the Dogpile site.

All of the references of the chosen papers were examined to identify other relevant papers. The journals Annals of Emergency Medicine and Journal of Accident and Emergency Medicine were hand searched from 1994-2000.

RESULTS

Tables 1, 2, 3, and 4 show the results of the literature search.

Sixteen relevant papers have been identified by the search strategy. Five studies compared an agent comprising lignocaine, tetracaine, and vasoconstrictor with either TAC or 1% lidocaine infiltration. In all but one study the agent performed at least as well as the control. Application of the topical agent is less painful than infiltration. TAC is inferior to equivalent to 1% lignocaine. Pain relief with TAC is less painful than infiltration. In all but one study the agent performed at least as well as the control. Application of the topical agent is less painful than infiltration. TAC is inferior to lidocaine infiltration. In all but one study the agent performed at least as well as the control. Application of the topical agent is less painful than infiltration. TAC is inferior to lidocaine infiltration.

Tetracaine alone is a poor topical agent as it is with adrenaline or 2.5% phenylephrine but with 5% phenylephrine it is similar to TAC. Prilophen has been used in three studies by the same investigators. In two studies, it was less effective than lidocaine infiltration and TAC but in one study the results were similar. TAC is superior to prilophen. EMLA cream works better than TAC on extremity wounds in children but is not licensed for use on broken skin in the UK. Mepivacain, etidron, and bupivaphen alleviate less pain than TAC or lidocaine infiltration.

Abbreviations: TA, topical anaesthesia; TAC, tetracaine, adrenaline, cocaine
Bupivacaine is as effective as TAC and lidocaine infiltration. The wound infection rate was low in all studies.

**DISCUSSION**

**Principal results**

Fourteen different non-cocaine containing topical anaesthetics have been studied. Of these, agents with 4% or 5% lidocaine, and tetra
caine show similar effectiveness to TAC or 1% lidocaine infiltration.

There have been no significant complications reported in any study.

**Strengths and weaknesses of the search**

The question chosen was one that was clinically relevant to anesthesiologists in the UK and should allow a number of papers to be identified.

Multiple electronic databases were used using a variety of search engines. Keywords were used in addition to MeSH headings in an attempt to improve sensitivity. Alternative spellings of certain keywords further increase the sensitivity. By using the references of the articles chosen to generate further papers and hand searching the two journals thought most likely to be relevant, more articles were found.

Despite this strategy, it is unlikely that all the relevant papers will have been chosen. There may be other journals that may produce a relevant article but that may be unavailable for hand searching. It is impracticable to attempt to hand search every title that possibly has a useful paper and then search every abstract that possibly has a useful paper. Despite this strategy, it is unlikely that all the relevant papers will have been chosen. There may be other journals that may produce a relevant article but that may be unavailable for hand searching. It is impracticable to attempt to hand search every title that possibly has a useful paper and electronic searches, though extremely useful, do not identify every paper.

**Strengths and weaknesses of the papers**

The studies were all prospective in design and almost all used a “gold standard” control of either VAS or lidocaine infiltration. One paper, however, was a case series, and another used sterile water as the control.
Almost all the trials included here have been performed in the United States and the unfamiliarity with topical anaesthesia in the UK may both contribute to and result from this. The reasons given, together with the case reports of serious harm with the use of TAC and the inconvenience of its use, have resulted in the almost universal use of lidocaine infiltration in the UK. It is unlikely that further USA based trials of topical anaesthesia will affect the management of patients in the UK as 20 years of USA research have had little effect on UK practice.

Topical anaesthesia should be used in the UK for the suturing of lacerations in children. The reluctance to use this technique in the UK may be to some extent reduced by the use of non-cocaine containing agents. The most effective agents available are ones that contain strong lidocaine non-cocaine containing agents. The most effective agents are not commercially available but may be manufactured and used as part of a trial. This trial is needed to identify that a genuine alternative to lidocaine infiltration exists and demonstrate its suitability in UK A&E practice.

**FUTURE RESEARCH**

Two areas have been identified. Firstly, as mentioned above, a UK based trial of a non-cocaine containing agent compared with infiltration. This should be a prospective randomised controlled trial of one of the above mentioned agents compared with 1% lidocaine. The study should have well defined inclusion and exclusion criteria, blinded randomisation, a clear treatment policy, and blinded outcome variables. If the agent is shown to have similar anaesthetic properties to 1% lidocaine infiltration and is less painful on

### Table 3 Other agents

<table>
<thead>
<tr>
<th>Group</th>
<th>Agents</th>
<th>Population</th>
<th>Score</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Smith et al</strong></td>
<td>3 ml tetralidophen (TUP) (1% lidocaine, 2.5% phentolamine, 1% tetracaine)</td>
<td>Children over 1 year Wound &lt;3 cm on or near mucous membrane 45 Lido 45 TUP</td>
<td>VAS of procedure by suturer, observer, video observer, patient and parent Likert scale by all except patient</td>
<td>VAS scores of suturers, observers and video observers higher with TUP than lidoc. Trend favouring lido from scores by patient and parent. Likert scores of suturers, observers, video observers and parents favour lido.</td>
</tr>
<tr>
<td><strong>Wase et al</strong></td>
<td>Up to 5 ml of XAP (1% lidocaine, 1/4000 norepinephrine, 0.5% tetracaine)</td>
<td>‘Minor lacerations’ 192 XAP, No controls</td>
<td>Infiltration rate</td>
<td>16% required infiltration.</td>
</tr>
<tr>
<td><strong>Zempsky et al</strong></td>
<td>3 ml TAC v 5 g EMLA cream (2.5% lidocaine, 2.5% prilocaine)</td>
<td>Children 5–18 years. Extremity lacerations &lt; 5 cm. 16 TAC 16 EMLA</td>
<td>VAS of procedure by suturer, patient, parent.</td>
<td>55% of TAC wounds required infiltration, 15% of EMLA (p=0.03) No significant difference of VAS scores by any group.</td>
</tr>
<tr>
<td><strong>Smith et al</strong></td>
<td>3 ml prilocain (3.56% prilocaine, 1/1000 phenylephrine) v 1% lidocaine infiltration.</td>
<td>Children over 1 year. Wound &lt;3 cm on or near mucous membrane. 20 Lido 20 Prilophen</td>
<td>VAS for suturing by suturer, observer, video observer, parent and patients &gt;5 years.</td>
<td>VAS scores lower with lidocaine than prilocain by suturers (p=0.003) and video observer (p=0.02) No difference with observer, patient or parent. No significant difference in the additional infiltration rate, lidocaine, 3 prilocain (p=0.60)</td>
</tr>
<tr>
<td><strong>Smith et al</strong></td>
<td>3 ml mepivanan (2% mepivacaine, 1/100000 norepinephrine) v 3 ml TAC v 1% lidocaine infiltration.</td>
<td>Children 2 years and older. Wound &lt;3 cm on face or scalp. 23 Lido 24 TAC 24 Mepivanan</td>
<td>VAS for suturing by suturer, observer, video observer, parent and patient Likert score for suturing by parent and suturers.</td>
<td>VAS scores lower with lidocaine or TAC than with mepivanor by suturers and observers No difference with video observer, patient or parent. Likert scores by parents were higher with mepivanor than with lidocaine or TAC (p=0.02)</td>
</tr>
</tbody>
</table>

Likert scale is a 7 point pain scale.
application, there would be a compelling reason for its use in routine UK practice. If this does occur, surveillance of safety is essential as even with TAC use, complications are rare and are routine UK practice. If this does occur, surveillance of safety is essential as even with TAC use, complications are rare and are routine UK practice.

Secondly, wounds near mucous membranes may need suture. The concern with absorption of anaesthetic is attributable to the nature of the tissue, not the wound. Topical anaesthesia is routinely and safely used on intact mucous membranes in ophthalmology, urology, and dentistry. It is logical to suspect that agents that have similar efficacy to TAC and do not contain cocaine would be safe and effective when used on mucous membrane wounds and therefore may be studied in larger trials.

REFERENCES