Non-touch suturing technique fails to reduce glove puncture rates in an accident and emergency department

T K McAdam, R E McLaughlin, B McNicholl

Objective: To assess the impact of introducing a safer non-touch suturing technique into an inner city emergency department.

Methods: The rate of glove perforation, measured by electrical conductance, was used as a marker. Gloves (Bodyguards) used in suturing were collected over a two month period. Two half day suture workshops were then conducted in the emergency department and gloves were collected for a further two months. All doctors (14) were included in the study regardless of grade. Gloves were tested for perforation by electrical conductance.

Results: There were 107 gloves and 19 perforations in the first group, 133 with 28 perforations in the second (p = 0.52), and one perforation in 100 control gloves. Most doctors reported inadvertent needlestick handling.

Conclusion: Two half day suturing workshops are not enough to reduce glove perforations from suturing in the emergency department. Difficulty with compliance suggests that safe suturing practice must be taught before doctors develop bad habits that are difficult to change.

RESULTS

A perforation rate of 17.78% (19 of 107) occurred in the pre-intervention group and a rate of 18.7% (28 of 150) in the post-intervention group (p = 0.52, χ²). A control of 100 unused gloves produced a perforation rate of 1% (1 of 100), below the industry standard of 1.5%. Table 1 shows the rate of perforations in the dominant and non-dominant hands before and after intervention.

Fourteen questionnaires were sent and 12 returned (86%). Nine doctors (75%) made an effort to use NTT; four doctors (33%) expressed difficulty changing to NTT. Eleven (92%) admitted to inadvertently handling the needle during suturing. Most felt that NTT was worthwhile (8, 76%), but nine doctors (75%) said they would like further training. Five doctors (42%) admitted to 12 needlestick injuries during this study.

DISCUSSION

Despite two workshops teaching a recommended NTT the perforation rate in gloves did not change between the groups. The likeliest explanation is difficulty changing to a new technique and inadvertent needle handling (11 of 12, 92%) as indicated by the questionnaire. It is unlikely that any one member of staff with a high puncture rate could have biased the results as most of the staff changed over and the volume of suturing performed by the remaining staff was comparatively small.

There is no research showing that NTT can effectively reduce needlestick injury or glove perforations in emergency departments. A reduction in glove perforation using NTT during abdominal wound closure has been shown in theatre. However, there were no compliance problems reported or breach of protocol in these studies. It may be easier to introduce and enforce a safe suturing technique in a theatre environment where team members are all aware of the research and reinforcing the technique with each other. In contrast, doctors in the emergency department usually suture without supervision by other doctors or a research team and needlestick handling was noted during the study.
We did not use needlestick injury as a measure of effectiveness, as reporting is known to be unreliable.\(^1\) \(^2\)\(^3\)\(^4\)

Glove perforations with significant contamination can remain unnoticed in up to 83% of surgeons.\(^5\) There were no reported needlestick injuries to occupational health during this study despite 42% of our doctors admitting needlestick injuries. Trust policy requires the reporting of all needlestick injuries to the occupational health department.

Suggested measures to aid prevention of glove perforation in suturing include; no touch technique,\(^6\) double gloving,\(^7\) green undergloves,\(^8\) and safe sharps handling.\(^9\)

A comparative study of glove perforation rates after suturing in an emergency department reports a rate of 5.4% per glove.\(^10\) Previous research with hollow needles used for intravenous access in our department\(^11\) shows a perforation rate of 6.9% in the dominant hand suggesting that simple manual tasks with the same gloves in our department does not lead to a high perforation rate.

Our higher rate may be explained in a number of ways. This study used the electrical conductance test for detection of perforations whereas the other studies used the water load test, which is less sensitive.\(^1\) It could also be argued that with the advent of tissue glues, staples, and nurse practitioners, junior doctors are not receiving adequate practice in basic suturing. They are likely to suture more complex wounds, which take longer, are more technically difficult, and may be associated with a higher glove perforation rate.

Some doctors (33%) found it difficult to change their practice to a NTT. This emphasises the need to teach it at undergraduate level. Some specialties such as general surgery have mandatory courses that basic surgical trainees are encouraged to take early in their training.\(^12\) This should be applied to all specialties where suturing is performed. There is evidence that doctors infrequently performing sharps tasks have increased rates of needlestick injury,\(^13\) all the more reason to include this training at undergraduate level.

Training in NTT did not reduce glove perforation rates in our emergency department probably because of poor compliance, although the NTT has not been proved to prevent glove perforations completely. Further research is required to validate the technique and explore the reasons for poor compliance.

Of greater concern is that despite two workshops, glove perforations and needlestick injuries did occur. The annualised rate for these are 11 glove perforations and five detected needlestick injuries per doctor per year from suturing.

Some doctors indicated they would like more training. This needs to be explored. The philosophy of the NTT is simple (do not handle the needle with your fingers) and the technique comparatively easily performed (doctors successfully managed it during workshops). It is not clear what additional training should include. Our doctors received more teaching time on this subject than any other induction topic including cardiopulmonary resuscitation and other critical interventions. If we devote more time to suturing techniques this would be at the expense of other, perhaps more important subjects that our critical incident monitoring highlight. In our current teaching programme suturing usually gets one workshop session. We gave it two this time. We will not justifiably be able to run three workshops to give our doctors more training as they suggested, within our resource framework. It is therefore unlikely that our next team of doctors will fare any better in terms of safety. This emphasises the need to look at medical school training and other techniques to improve safety. Perhaps learning non-touch techniques, which are of confirmed benefit,\(^14\) at the start of medical school suturing would be sustained. Our doctors found it difficult to change unsafe techniques. It would be of great concern if this problem pertains to practising doctors in other emergency departments or surgical disciplines.

### Authors’ affiliations

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### REFERENCES


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**Table 1 Pattern of glove perforations before and after the intervention of a suture workshop**

<table>
<thead>
<tr>
<th></th>
<th>Perforation rate (%) before workshop</th>
<th>Perforation rate (%) after workshop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dominant hand</td>
<td>14.8</td>
<td>21.8</td>
</tr>
<tr>
<td>Non-dominant hand</td>
<td>20.8</td>
<td>14.3</td>
</tr>
<tr>
<td>Overall perforation rate</td>
<td>17.8</td>
<td>18.7</td>
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</tbody>
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