Clinical summary

Influence of double gloving on manual dexterity and tactile sensation of surgeons

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Key points

- This study confirms that manual dexterity and tactile sensation are not compromised when double gloving.
- Breaches in the protective glove barrier in the O.R. expose surgical staff to undue risk. As risk of blood-borne infection has increased considerably since the discovery of HIV the need for better hand protection has become a greater concern. Double gloving practice and indicator double glove systems have been shown to reduce blood contact.
- Despite the considerable extra protection offered by double gloving, surgeons have resisted double gloving due to perceived loss in sensory skills. This study counters these perceptions.

Background

Until the late 1980s and 1990s, when HIV became a threat to the surgical community, surgeons and operating room staff were relatively indifferent to the risk of exposure to patient blood. Once the risk became more immediate, new guidelines were issued for healthcare practitioners, such as mandatory eye protection and recommended double gloving to reduce blood exposure in the O.R.

Numerous studies document the frequency of blood contact with surgical team members' hands as well as the risk-reduction double gloving can provide. Panlilio et al. noted blood contamination in 30 percent of procedures. Quebbeman et al. noted a 50 percent rate of one or more exposures. Popejoy and Fry noted that 90 percent of blood contact events affected the hands and forearms of the surgeon or first assistant. Gerberding et al. noted increased rates of blood exposure in surgeries that lasted longer than three hours. All studies concluded that additional barrier protection in the form of double gloving was advisable, with Quebbeman et al. citing a nearly 90 percent reduction in hand exposure to blood.

Despite the extra protection offered, double gloving has not been uniformly accepted. Surgeons have argued that double gloving may compromise or reduce manual dexterity and tactile sensitivity.

This study, examining the use of no gloves, single gloves and double gloves, aimed to evaluate whether double gloving reduces tactile sensitivity and 2-point discrimination.

Methods

- 53 surgeons and trainee surgeons volunteered at the Clinical Congress of the American College of Surgeons to measure manual dexterity and sensitivity when subjects used single surgical gloves or no gloves at all versus double gloving.
- Sensitivity was defined as 'the ability to discriminate and interpret a stimulus applied to the fingertip'. Manual dexterity was defined as 'the ability to move the fingers skilfully and to manipulate small objects with the fingers rapidly and accurately'.
- The volunteers were studied using the Purdue Pegboard test and a standard 2-point discrimination test to compare manual dexterity and tactile sensitivity with the use of no gloves, a single pair of gloves (Mölnlycke® Biogel® gloves) and double gloving (Mölnlycke® Biogel® Indicator® Underglove and Biogel® Surgeons glove on top).
- Standardised protocol was applied for all subjects. For single gloves, subjects selected the appropriate-sized glove; for double gloving, subjects selected a halfsize larger glove to wear as the underglove and the appropriate-sized glove as the overglove.

- Manual dexterity was tested with the Purdue Pegboard test used three ordered randomised phases, assessing subjects' ability to undertake actions with both the dominant and non-dominant hands as well as bi-manual manipulation. Subjects first placed as many peg assemblies in the pegboard as possible in 30 seconds using the dominant hand; second, this was repeated with the non-dominant hand; this assembly was completed by inserting a pin into a hole with the right hand, a washer with the left, a collar was added to the washer with the right, and a second washer was placed on the collar with the left. Subjects, after five training rounds, were tested on the maximum number of completed assemblies done in 60 seconds.

- Sensitivity data were collected with the Mackinnon-Dellon 2-point discrimination tester and the Weber standard protocol. Subjects' vision was occluded and their tested hand was secured. Testing employed a 5-mm distance between 2 points on both the radial and ulnar side of the index finger, and the subject was asked to state 'one' or 'two' to indicate the number of points perceived.

- Influence of glove status was analysed as an independent variable. Monte Carlo simulation was employed to validate conclusions.

Results

- Manual dexterity: the Purdue Pegboard scores show that no glove treatment effect was detected for dexterity performance ($p = 0.57$). Pair-wise t-tests likewise detected no difference among comparisons of glove treatment means for ungloved and 1 glove ($p = 0.28$), ungloved and double gloved ($p = 0.57$), or 1 glove and double gloved ($p = 1.00$). Monte Carlo simulation results confirm the absence of difference.

- Tactile sensitivity: In the 2-point discrimination testing across glove status, no difference was detected comparing ulnar and radial aspects of the dominant index digit ($p = 0.85$). Pair-wise t-tests also detected no difference among glove comparisons for ungloved and 1 glove ($p = 1.00$), ungloved and double gloved ($p = 0.54$), or 1 glove and double gloved ($p = 0.50$). Monte Carlo simulation results show a high probability that means among glove treatments are not different for ungloved and 1 glove (D53 = 0.99), ungloved and double-gloved (D53 = 0.99) or 1 glove and double gloved (D53 = 0.99).

- Study results show that manual dexterity and tactile sensitivity are preserved while double gloving.

Conclusion

Manual dexterity and tactile sensitivity while double gloving are not substantially impacted as compared to wearing no gloves or wearing a single pair of gloves. The study outcome indicates that 2-point discrimination and tactile sensation are not altered. Double gloving allows for the maintenance of necessary technical precision while offering protection against occupational exposure.

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