

Dielectrical breakdown in sterile surgical gloves during use of electrosurgery

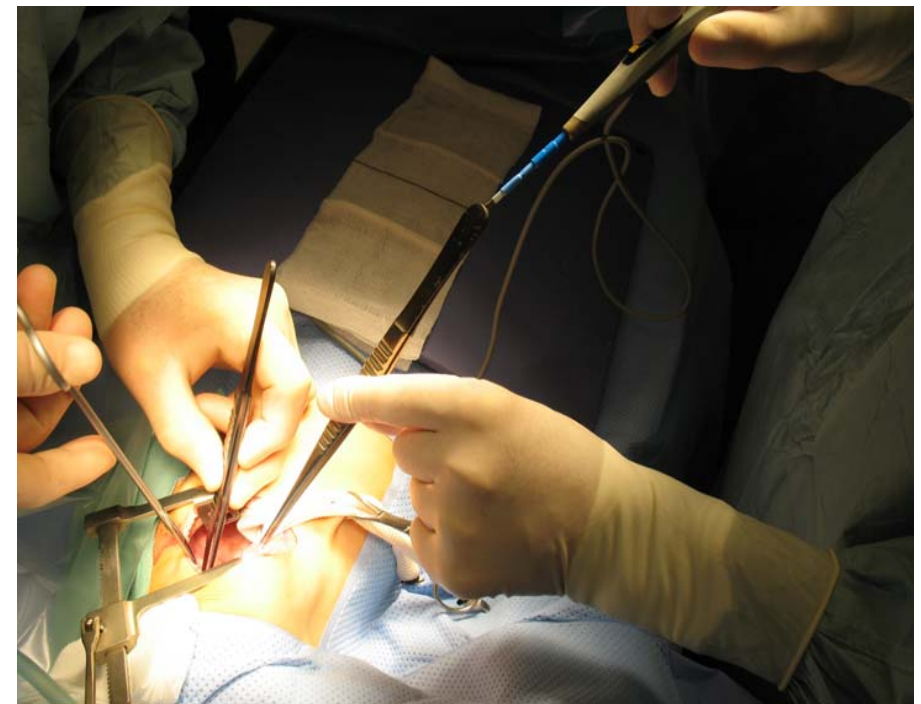
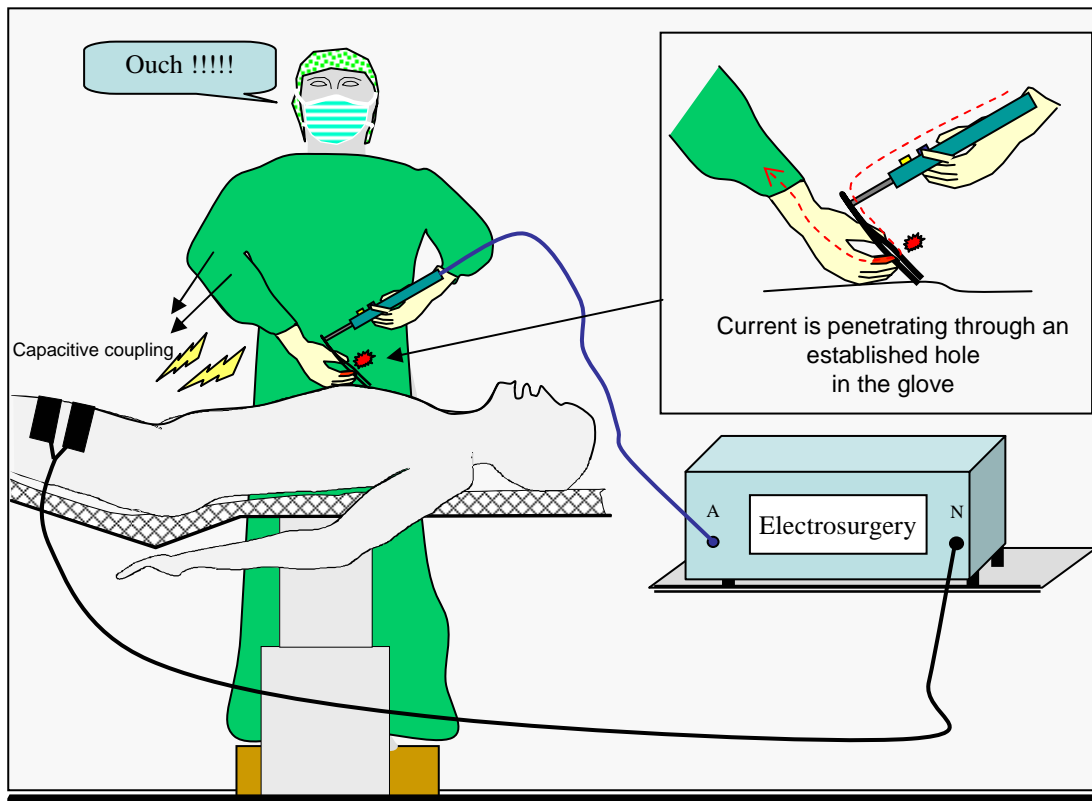
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Introduction

Occasionally surgeons may sense a sudden discharge through their gloves during use of electrosurgery, leading to a current mark on the surgeon's finger and a possible decontamination of the sterile surroundings. This effect is usually experienced when electrosurgery is applied to an uninsulated surgical forceps. We decided to scrutinize current discharge through surgical gloves to find the mechanisms and circumstances behind the phenomenon.



Electrosurgery applied to an uninsulated surgical forceps

Methods

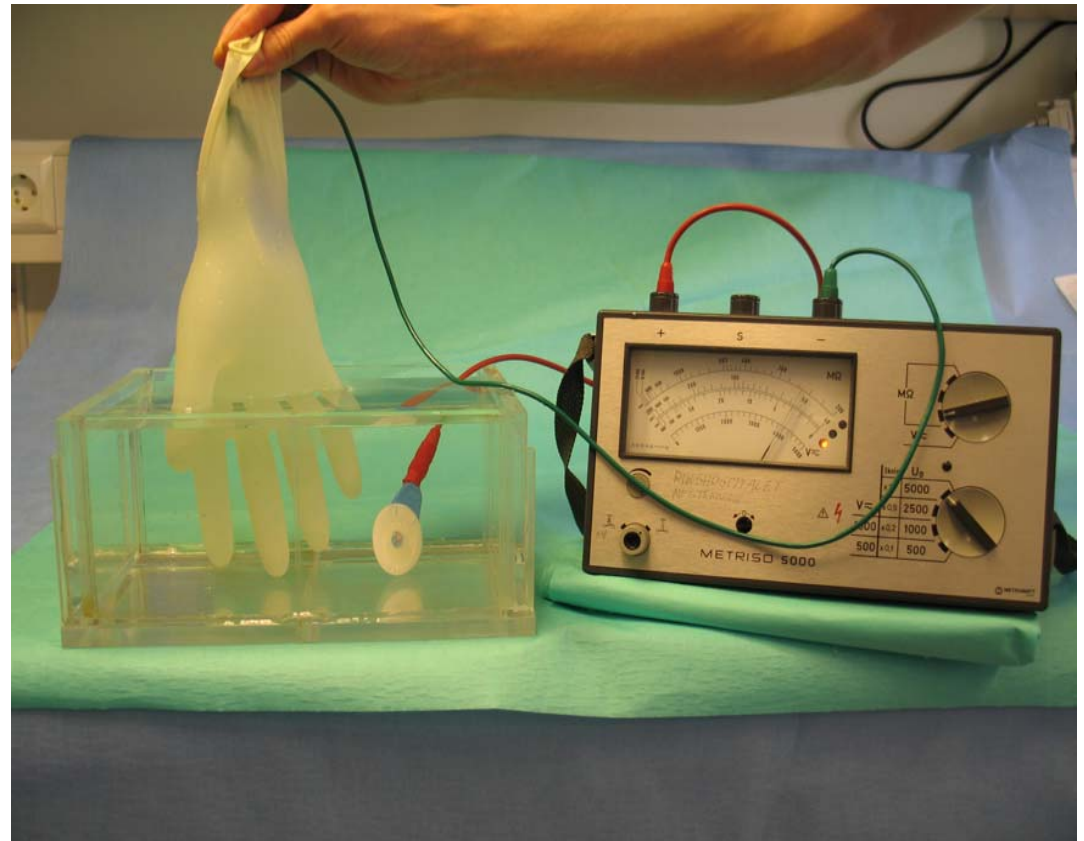
A selection of surgical gloves was filled with freshwater and an electrode inside. The glove was lowered in a tub filled with freshwater and a second electrode. A megger (Metriso 5000) was connected to the two electrodes. A voltage was applied to the electrodes in steps from 500V to 5000V, and back to 500V. After the hole had been established the gloves were also partly lowered in the water tub to see if the current was able to pass through the hole above the surface, comparing possible differences between wet and dry surfaces.

Results

Most gloves were tolerating a voltage of 2500V, but several gloves reacted with an audible click when exposed to 5000V and lost electrical insulation even when the voltage was dropped to 500V. If a glove with an established hole was taken out of the water and dried on the surface and then partly lowered in the water again, none of the gloves had lost their electrical insulation. However, an electrical discharge was observed immediately after the gloves came in contact with the water surface if the gloves were wet.

Discussion

An interesting finding was that when a hole in a glove had been made with high voltage, this would lead to current discharge even if the voltage was lowered to 500V afterwards. It is also important to notice that the risk of current discharge in a glove increases with the time exposed to high voltage.



Conclusion

A dielectrical breakdown is not necessarily in the area of metal contact with the glove as long as the glove surface is wet. Different types of gloves have different dielectric strength.