

Burns from light source cables during procedures

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Background

A number of circumstances during surgery and procedures can create the risk of a fire or a burn injury.^{1,2} Burns and fires from fiberoptic illumination systems have been reported in the literature for decades.³⁻⁵ In these systems, a powerful light is transmitted from the light projector through a fiberoptic cable to an endoscope. The distal end of the fiberoptic light cable becomes extremely hot, with the potential to cause burns and ignite the drapes covering the patient.⁶⁻⁹ With flexible endoscopes such as colonoscopes, the fiberoptic light cable is often permanently attached,³ but in most cases the light cable is separate and must be attached to the device before the procedure and disconnected afterward. Disconnecting the cable from the endoscope is a potential opportunity for burn injuries if the device is turned on or still hot and comes close to the skin.⁹ The temperature at the tip of the cable can exceed 200°C, which, even if the tip does not come into direct contact with the skin, can cause immediate superficial tissue necrosis that can extend into the subcutaneous fat.^{7,8} If the light cable is set down on the drape too close to the patient's skin, a burn can occur without visible damage to the drape.⁸

Assessment

A Vizient[®] team conducted a retrospective review of event reports submitted to the Vizient Patient Safety Organization (PSO) during the past few years to gain a better understanding of the factors associated with patient burns caused by light source cables during procedures. The data showed 25 cases of burns caused by an illuminated light cable that was placed on or fell onto the surgical drape covering the patient. In most of these cases, the light cable was disconnected and set down on the drape on top of the patient, and the heat from the light cable burned the drape, the patient, or both. In some cases, the light source had been placed in standby mode before being set down; in others the light was reported to have lit up on its own. In other events, the light cable fell off during the procedure — possibly because of a missing or broken adapter — or the light cable became excessively hot and began smoking.

In follow-up to the analysis, the Vizient team conducted a safe table with PSO participants, including perioperative staff. The group reported that in their experience, patient burns from a light cable occurred either prior to the procedure before the light cable was attached to the scope or after the procedure when it was disconnected. Communication failures among the surgical team can result in the light source being turned on, intentionally or accidentally, without the clinician conducting the procedure being aware.

Recommendations

Recommendations generated from the group discussion, the literature or manufacturer's instructions for preventing accidental burns from light cables during the procedure include:

- Conduct maintenance according to manufacturer's recommendations, including careful inspection of fiberoptic light cables and adapters for damage (e.g., cracks, kinks) and loose or missing parts, immediately before and after each use. Do not use any products that are compromised.⁹
- Check that connections are secure, including the locking mechanism of the adapter from the light cable to the endoscope. Replace the adapter if the connection is not secure, is difficult to lock or does not lock.⁹
- Ensure that all light projectors, cables and adapters are compatible and comply with the manufacturer's recommendations for joint application of different products. Ensure that the fiber bundle diameters of the endoscope and fiber light cable match; unsuitable combinations can result in temperature increases at the coupling point or at the light exit point of the endoscope. If the light cable has a larger fiber bundle diameter, the coupling point with the endoscope may overheat and cause burns to the patient or user as well as damage to the endoscope. If the cable's fiber diameter is too small, light output may be reduced.⁹
- Remove any soil or contamination from the light exit area because it can cause burns. Check for and clean any deposits on the glass surface of the light cable. Deposits can cause a spotted or blurred view, impair light transmission, and lead to excessively high temperatures at the connectors that can melt the light cable.
- Ensure that your staff knows not to bend, twist, tightly coil or apply excessive pressure to a cable as it can cause damage.⁹
- Use newer light-emitting diode (LED) projectors or colder light sources that generate less heat and are less likely to cause burns or fires.¹⁰
- Suggest that manufacturers develop products with a forcing function that prevents the light cable from illuminating unless it is connected to the endoscope.
- Label all light sources with warnings that the heat from light sources and cables can ignite flammable materials and can cause burns when set on or near the patient.⁴
- Add light sources to the fire safety checklist.
- Develop a policy and procedure requiring that the surgical team verbally communicate when the light source is turned on and that it has been turned off at the end of the procedure. Develop a process for auditing compliance with this procedure.
- Train your staff to turn on the light source only after the cable is connected to the endoscope because the end of the cable becomes hot and can ignite dry combustibles.²⁻⁴

- When the cable is disconnected from the instrument during surgery, place the cable end on a moist towel on a designated table away from the drapes. Turn the light source off when it is not in use.^{3,4}
- Train your staff to not place light source cables in the vicinity of the operative field and to keep illuminated light cables away from drapes, skin and any flammable material.^{4,9}
- Educate all surgeons, physicians, nurses and other periprocedural staff on the importance of handling the light source cable and equipment properly.³

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References

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