

## Preventing light source-related burns from laparoscopy, thoracoscopy and arthroscopy

### Issue:

Organizations that conduct laparoscopic, thoracoscopic or arthroscopic procedures should be aware of the potential for patient burns from the light sources associated with these scopes. Burns from these types of light sources can go unnoticed by the surgical team because they typically do not produce smoke or charring, even of surgical drapes.

More than half of the fires/burns sentinel events reported to The Joint Commission since 2019 were associated with surgical or invasive procedures, and nearly 15% of those peri-procedural incidents were related to light sources.

### How the light source can cause a burn

Laparoscopic, thoracoscopic and arthroscopic surgery require a complex illumination system to provide adequate visualization of an enclosed body cavity (e.g., abdomen, thorax) or bone joint. Instrument or component malfunction can lead to excessive heat generation and result in patient burns. There are two major components to the illumination system: the light source and the light cable.<sup>1</sup>

**Light sources:** Depending on the type of system, light sources provide different quality of light and different temperatures. All systems have safety mechanisms to minimize the heat generated by the light source, including a heat filter to help remove the excess heat produced both by the infrared light waves and by the heat buildup resulting from any obstruction within the pathway of the light. Light source fans also are used to dissipate the excess heat energy, and light cable connectors also help disperse the heat.<sup>1</sup>

**Light cables:** Laparoscopic light cables are available as fiberoptic or gel-filled. Gel-filled cables are capable of transmitting 30% more light – ergo more heat – than optic fibers, therefore they can be potentially more hazardous.<sup>1</sup>

High temperatures may be produced if:<sup>1</sup>

- Any of the heat minimizing devices fail within the light source.
- The light source or light cable is defective.
- Different connectors or components are used. For example, if a 10 mm cable is used with a 5 mm scope, or a 5 mm connection is used instead of the required 10 mm one. (The interchangeability of the connections makes this possible.)

Moreover, heat dissipation may not be effective if different brands of connectors are used.<sup>1</sup>

Another cause of burns is detached light cables resting against surgical drapes; the patient may be burnt and permanently scarred without the knowledge of the surgical team. Even momentary proximity between an illuminated laparoscopic, thoracoscopic or arthroscopic light lead and a surgical drape can cause a full-thickness burn to the patient's skin without generating any smoke or fire. The risk of thermal injury rises with the brightness of the lamp used.<sup>2</sup>

One study demonstrated that the heat at the tip of the optical light cord can produce immediate superficial tissue necrosis that can extend into the subcutaneous fat even when the optical tip is not in direct contact with the skin. The maximum temperature at the tip of the optical cable varied between 119.5 degrees Celsius and 268.6 degrees Celsius (i.e., 247.1 to 515.48 degrees Fahrenheit). When surgical drapes were exposed to the tip of the light source, the time to char was 3-6 seconds. The degree and volume of injury increased with longer exposure times, and significant injury was recorded with the optical cable 3 mm from the skin.<sup>3</sup>



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### Safety actions to consider:

Organizations that conduct laparoscopic, thoracoscopic or arthroscopic procedures should take the following actions to help prevent burns related to the use of these scopes in order to protect patients from harm.

- Educate all surgeons, including physicians-in-training, who perform laparoscopic, thoracoscopic or arthroscopic procedures on the importance of handling the scope safely.<sup>1</sup>
- Implement system changes to minimize the risk of patient burns associated with laparoscopy, thoracoscopy and arthroscopy.<sup>1</sup>
- Label light sources with the following: "Warning: High-intensity light sources and cables can ignite drapes and other materials. Complete all cable connections before activating the light source."<sup>1</sup>
- Do not turn on the light source before the cable is connected to the scope; the end of the cable becomes hot and could ignite dry combustibles.<sup>1</sup>
- If the cable is disconnected from the scope during surgery, hold the cable end away from the drapes or place it on a moist towel.<sup>1</sup>
- Keep illuminated light cords away from drapes, patient's skin, personnel's skin, and any flammable material.<sup>1</sup>
- Connect the correct size light source to the correct scope.
- Inspect all instruments and equipment before use to ensure the equipment is in good working order.<sup>1</sup>

### Resources:

1. Ball K. [Lap Burn](#). Agency for Healthcare Research and Quality, PS Net. Oct. 1, 2004.
2. Chitnavis J. Silent burn: The hidden danger and effects of bright light from fibre-optic cables in arthroscopic knee surgery. *Journal of Surgical Case Reports*, 2020 Apr 7;2020(4)
3. Hindle AK, Brody F, Hopkins V, et al. Thermal injury secondary to laparoscopic fiber-optic cables. *Surgical Endoscopy*, 2009 Aug;23(8):1720-3.

*Note: This is not an all-inclusive list.*



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