

## Tips & Techniques:

### A Holistic Approach to Managing an Incision

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During general surgery training he was chosen to be an administrative chief and was inaugurated into the prestigious Alpha Omega Alpha Medical Honor Society. He has been published in the Journal of Vascular Surgery, as well as the American Journal of Surgery, and was invited to be a guest editor for the International Wound Journal.

As a surgeon, it has been my experience that much focus goes into the big details of an operation. The pre-operative workup and intraoperative plan are thought out meticulously; however, little thought is given to the very action that sets all these wheels in motion – the incision. This field revolves around incisions, yet these incisions are often made with the swift intention of beginning the operation and are closed with the accomplished sense of finishing the operation. Although this is true, I feel incision management in every phase of surgery (pre-operative, intraoperative, and post-operative) requires deliberation and adherence to a few basic principles. The following tenets can optimize the outcomes of all incisions. My intention with this article is to bring mindfulness to the surgical incision.

#### Pre-operative

Pre-operative incision management should focus on minimizing patient factors that may contribute to surgical site complications.

One of the most challenging things for patients to do is stop smoking in the pre-operative period. Cigarette smoke contains nicotine, carbon monoxide, hydrogen cyanide and thousands of other noxious constituents that have been linked to surgical site complications.<sup>1</sup> Nicotine causes tissue ischemia via vasoconstriction and thrombus formation by increasing platelets adherence.

Although no evidence-based studies have determined the ideal timing of smoking cessation in the perioperative period, most agree that cessation should start 4 weeks pre-operatively and continue for 4 weeks post-operatively. Also, there is no data linking transdermal nicotine patches to these deleterious outcomes, contrary to popular belief, and they may be a useful adjunct in getting patients to stop smoking.<sup>1</sup>

Target glucose control in the perioperative period should be between 180–200mg/dL. Hyperglycemia results in dysfunction of the basement membrane, resulting in decreased delivery of nutrients to the wound bed.<sup>2</sup>

Adequate nutritional parameters should be met in the perioperative period since the demand for nutritional supply will increase in the acute phase of wound healing. Vitamin intake prophylaxis is being recommended anecdotally, but only supplementation with Vitamin A in patients on steroids has evidence based benefit.<sup>3</sup> Recommended dose is 15,000 to 25,000 IU 5–7 days postoperatively.

High dose steroids (15–40mg/kg/day) have a negative effect on wound healing secondary to decreased collagen production, which inhibits epithelialization, increases wound dehiscence and infection and can lead to delayed healing. Although steroid administration for less than 10 days has no clinically important effect on wound healing, patients taking steroids for 30

days or more have wound complication rates 2–5 times higher than those not on steroids.<sup>4</sup>

Certain chemotherapeutic agents, biologic drugs, radiation and obesity can also contribute to surgical site complications. These patients should not have surgery in the elective setting if at all possible.

#### Intraoperative

Intraoperative incision management should focus on surgical technique and on creating a host environment that is not formidable to bacteria.

Antibiotics should be chosen based on wound classification and surgical quality improvement project guidelines (SQIP). When given, antibiotics should ideally be administered 30 minutes prior to incision in order to achieve therapeutic tissue concentrations. In most operating rooms, my observation is that these antibiotics are being infused as the incision is being made or just prior to incision.<sup>5</sup>

There are no evidence-based data supporting decreased bacterial loads in patients that receive pre-operative chlorhexidine showers, so patients may be spared this extra step. However, when comparing skin preparations, chlorhexidine is more effective than povidone-iodine at reducing the incidence of surgical site infections. It should be kept in mind that it does not, however, provide anti-fungal coverage.

For open wounds, patients should receive either a dichloride and phenylethanol solution versus povidone-iodine. Clipping, not shaving, of the surgical site and maintenance of a core body temperature greater than 96.8F should be followed per the SQIP guidelines.<sup>6</sup>

Gentle tissue handling and hemostasis are crucial in decreasing surgical site complications. Crushing tissue can lead to vasoconstriction, which promotes ischemia and necrosis, which is often followed by infection. Also, hematoma can provide an excellent medium for bacteria. Progressive tension sutures should be used when possible to approximate the dead space, decreasing tension on the skin and eliminating the need for drain placement which decreases hematoma and seroma formation. This should include the approximation of the superficial fascia (i.e. Scarpa's Fascia).<sup>7,8</sup>

There is currently no evidence that shows that irrigation with either bulb syringe or with pressurized delivery decreases incidence of surgical site complications. Although wound classification dictates incidence of wound infection, irrigating wounds may help you fall on the favorable side of the spectrum.<sup>6</sup>

Closure technique should be based on the wound and patient characteristics. Suture should be chosen based on wound tension requirements, and last, at least 2 to 6 months to enable the wound to achieve peak maximal strength. High tension wounds and wounds that necessitate skin eversion require mattress sutures. Most wounds can be closed using a running stitch, which provides hemostasis as well as perfect skin opposition. Buried dermal sutures provide the strength component to skin closure, and closure choice for the epidermis with monofilament suture, braided suture, skin staples, skin adhesive, and skin tape

are all equivocal in wounds that are not under high tension.

Absorbent dressings are usually needed if compression or padding will be applied to the surgical site or if the nature of the procedure predisposes the site to higher wound drainage. A relatively new dressing that has shown promise in this setting is negative pressure incision management which has been shown in a chart review of 90 patients to decrease wound dehiscence and incidence of infection in the high risk areas of the intertriginous space of the groin compared to skin adhesives or absorbent dressings. This system offers the advantage of increased fluid removal, prevention of lateral spread of the wound, and provides a barrier to external contamination, promoting a sterile environment for wound healing.<sup>9</sup>

### Post-operative

Similar to pre-operative care, post-operative incision management should focus on minimizing patient factors that may contribute to surgical site complications.

Antibiotics should be continued based on wound classification and SQIP guidelines. Glucose should be maintained at 180-200mg/dL, and patients should refrain from smoking for 4 weeks post-operatively.

Adequate pain control is not only psychologically beneficial to the patient, but decreases surgical site complications by preventing vasoconstriction. Supplemental post-operative oxygen used to prevent wound infection is controversial, and no definitive data have proven or disproven its utility.

In conclusion, appropriate patient selection and precise intra-operative techniques with clear post-operative instructions for the patient are essential for successful reduction of surgical site complications.

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