

# CURRENT CONTROVERSIES:

## Controversies on the Use of Silver in Wound Care

D. Heath Stacey, MD



D. Heath Stacey, MD is a plastic surgeon in private practice in Northwest Arkansas. His clinical interests include breast reconstruction, complex abdominal reconstruction, lower extremity reconstruction, breast and body contouring, and facial aesthetic surgery.

**F**OR their antimicrobial properties, silver-containing solutions have been used for decades in the treatment of burns and chronic wounds. The optimal topical antimicrobial would not be toxic to cellular tissue regeneration. Silver solutions are thought to work as a topical treatment by decreasing the risk of infection. The silver is released in the form of silver ions, which destroy bacterial cell walls and bind proteins. Various concentrations are released by different silver-containing products. The presence of a bacterial biofilm on the wound may alter the efficacy of the silver ions.

Areas of confusion in silver use for the clinician include worries of silver resistance, silver toxicity, effectiveness of the antimicrobial properties of silver, and silver cytotoxicity on tissue regeneration.<sup>1</sup>

### SILVER RESISTANCE

It is thought that high-dosage silver concentrations result in rapid kill of bacteria. The newer silver dressings (e.g., hydrofiber dressings, polyurethane foams) have sustained release of silver over a longer period of time. Theoretically, this could result in higher rates of resistance developing.<sup>1</sup> This has been seen clinically in some burn wound patients with silver-resistant *Pseudomonas* species.<sup>2</sup>

Another study looked at the presence of bacteria containing silver resistance genes in diabetic foot wounds being treated with silver compounds.

Percival et al summarized that, although in vitro resistance has been shown, widespread resistance has not been seen to silver clinically.<sup>3</sup> They stress the importance of wound hygiene and judicious use of silver dressings.

### CYTOTOXICITY

Silver-containing dressings have variable concentrations of silver. The level of effect is dependent on the amount of silver that gets released.

A comparative study of several dressings found that all of them delayed cultured epithelial cell proliferation, and they cautioned against use of silver in superficial clean wounds, graft donor sites, or wounds containing cultured epithelial cells.<sup>4</sup>

Silver dressings have been used on donor sites, and several authors stress the importance of moistening the dressing if the wound is dry.

### SILVER TOXICITY

Orally ingested silver has an uptake of up to 15 to 20% and can be toxic. Silver is distributed to all organs including liver, intestine, and stomach. In the skin, a bluish condition, termed argyria, may develop. This effect is mediated by silver ions.

Less toxicity is reported with topical silver dressings, likely due to lower amounts of systemic absorption. One concern is that the wound and surrounding skin may develop a temporary bluish color with a poor cosmetic outcome.

Cochrane et al looked at the effects of various silver-containing dressings on fibroblast proliferation in vitro and found that the type of dressing and silver content can have deleterious effects on fibroblast viability.<sup>5</sup> The optimal silver dressing is unknown.

### EFFECTS OF SILVER ON INFECTED OR CONTAMINATED WOUNDS

A variety of treatments is available for acute or chronic infected wounds. These can include use of antimicrobial dressings, use of systemic antibiotics, sharp debridement, and enzymatic debridement.

Vermeulen et al performed a meta-analysis of the effects of silver-containing dressings on treating contaminated and infected acute or chronic wounds.<sup>6</sup> They found three randomized controlled trials that showed that at 4 weeks, the silver-containing dressings did not significantly increase complete wound healing compared to foam dressings or other best practices (although wound healing may not be the appropriate outcome measure for silver). Some of the studies looked at pain in the wound as an outcome. Others added antibiotics to the silver therapy. They concluded there was not enough evidence to recommend routine use of silver-containing dressings.

Driver et al stress several clinical points<sup>7</sup>:

- If the wound has any exudates, use a silver alginate.
- If the wound has high bacterial toxins, activated charcoal is an option.

- Do not use silver with a saline solution, as this may lead to silver chloride crystals that inhibit efficacy.
- Avoid using papain-urea debriding agents which are inactivated by silver salts.

In summary, silver should be used judiciously in infected or contaminated wounds, in conjunction with debridement and other treatments. Clinical evidence regarding optimal concentrations and length of use are lacking.

#### References:

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