The Influence of Skin Closure Modalities on Infection: A Comparison of Absorbable Subcuticular Staples, Continuous Subcuticular Absorbable Suture, and Percutaneous Metal Skin Staples in the Closure of Contaminated Wounds

Angela Piñeros-Fernandez, M.D., Lisa S. Salopek, LVT, RLAT, Pamela F. Rodeheaver, BA, George T. Rodeheaver, Ph.D.

Plastic Surgery Research, University of Virginia Health System, Charlottesville, Virginia

Abstract

Background: Wound infection is a threatening, troublesome and costly complication contributing to increased mortality and morbidity. The methods and materials used to close a wound significantly influence the quality of the repair process and the risk of surgical site infection.

Materials and Methods: Six pigs were used to evaluate the influence of four separate skin-closure modalities on the potentiation of infection in contaminated wounds. Full-thickness skin wounds on the abdomen were contaminated with $10^4$ Staphylococcus aureus and then closed with one of four devices. The four devices included (1) a novel absorbable staple (Insorb™) placed in the subcuticular tissue, (2) a braided absorbable suture (Vicryl™), (3) a monofilament absorbable suture, (Monocryl™), and (4) percutaneous metal staples.

Results: Wound infection was assessed 7 days after closure by clinical signs and quantitative bacterial swabs. Insorb™ staples had significantly lower infection rates than Vicryl™ continuous suture (39% vs 100%, p=0.002) and Monocryl™ continuous suture (39% vs 89%, p=0.014). The Insorb™ subcuticular staple and the metal percutaneous skin staple were statistically equivalent in wound infection rate and parameters of inflammation. The combined data for both interrupted staple modalities documented less inflammation compared to the combined data for continuous sutures. These lower levels of inflammatory metrics were statistically significant for edema (p=0.018), gauze exudate observed (p=0.007) and purulent exudate in wound (p<0.0001).

Conclusions: Insorb™ staples were shown to be an acceptable choice for the closure of contaminated wounds because they had a significantly lower incidence of wound infection and inflammation when compared to continuous intradermal suture closure with Monocryl™ monofilament suture or Vicryl™ braided suture.