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Skin Staplers

Rapid and precise wound closure can be achieved through the use of skin staplers. Numerous models are available, but most consist of a disposable hand-held unit that dispenses a single rectangular staple.

Other characteristics of the stapler include an angled head to allow visualization of staple deployment; a rotating head to facilitate precise staple placement; and an ergonomic, lightweight design to minimize hand and arm fatigue (**Figure 1**).

Staples

Although there are slight variations among manufacturers, a standard skin staple is made of 316 L stainless steel and has a diameter of 0.5 mm, a span of 6 to 10 mm, and a leg length of 3.5 mm. Several staplers come with wide staples that span from 7 to 13 mm and have a leg length of 4 mm. Wide staples are thought to be beneficial in wounds with edematous tissue. Most staples penetrate the skin and then are formed to the final box-shaped configuration (**Figure 2**). This allows for good skin closure and a degree of tissue eversion that is favorable to wound healing.

Recently, absorbable skin staples have been developed that provide a rapid and cosmetic skin closure and eliminate the need for staple removal. These staples appose the skin through placement in the subcutaneous tissue, eliminating the need for external sutures or staples. The absorbable subcuticular staples currently available are made of synthetic polymers composed of polyglycolic and polylactic acids.

Indications

The most common indication for staples is routine skin incision closure. Simple laceration repair is also frequently performed with staples. Rapid placement allows the clinician to minimize sedative and local anesthetic medications.[1] Aside from simple wound closure, staples have been described for use in skin graft, skin flap, or wound dressing attachment.[2]

Skin staples have also been evaluated in both small and large animals for use in gastrointestinal surgery. This use was originally described by military surgeons to perform rapid end-to-end intestinal anastomoses in soldiers with intestinal gunshot injuries. Staples have been evaluated for gastrointestinal surgery in small and large animal experimental settings, as well as small animal clinical cases.[3-4] It has been shown that intestinal anastomoses using skin staples are mechanically comparable to hand-sutured anastomoses. Clinically, skin staples have been used for simple gastrotomy and enterotomy closures following focal and linear foreign body removal. Skin staples have also been used to perform belt-loop gastropexy in dogs with gastric dilatation-volvulus syndrome.

Advantages

The use of skin staples for simple surgical wound or laceration closure affords the security of simple interrupted sutures, but with a much more rapid application time. Several experimental studies have evaluated closure times between staple and suture application.[1,5-6] In general, it is felt that wound closure using skin staples decreases closure time by as much as 80%.[1,6]

Standard disposable skin stapler

Configuration of stainless steel staple after firing

In head to head studies, staple closures are thought to be 6 times faster overall and 8 times faster per centimeter than suture closure, decreasing surgical and anesthetic time and costs.[1]

Skin staples are very easy to apply. Individual placement of each staple allows for excellent precision in skin closure. Several types of staplers come with a prepositioning mechanism that holds the staple during formation, such that the surgeon can release pressure on the stapler handle without losing control of the staple itself (eg, Multifire Premium, www.autosuture.com). This feature allows for improved accuracy in staple placement.

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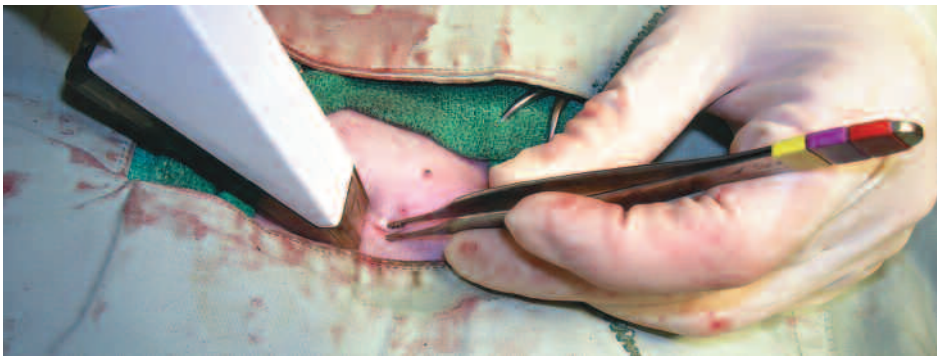
When appropriately placed, skin staples achieve a very secure incisional closure. However, staples are at risk for loosening, rotation, or dislodgement if subjected to trauma resulting in disruption of skin apposition. There is marked variation among staplers as to the degree of security offered, but most provide a high level of security.[7]

Skin staples are thought to be more cosmetic than traditional simple interrupted skin sutures. The staple engages the skin at 2 points and the height of the staple avoids compression of the tissue underneath, minimizing the cross-hatching appearance associated with sutures.[7]

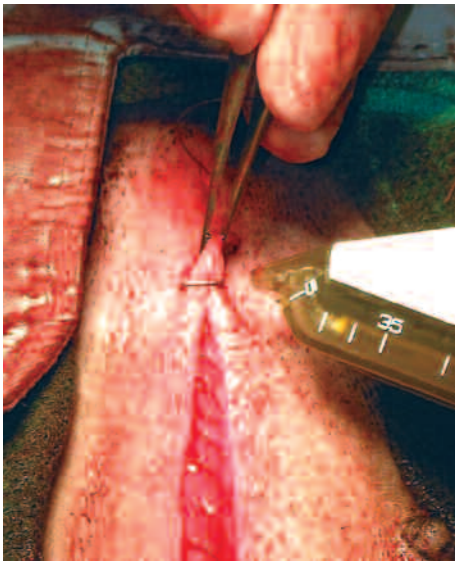
Disadvantages

One main concern associated with skin staples is that there is more discomfort associated with removal when compared to sutures, particularly if the staple has rotated within the tissue.[1] Specific staple removers that straighten the staple before extraction from the tissue facilitate removal and may decrease discomfort.

There is conflicting information in regard to complications associated with skin staple use. While numerous studies have found no increase in morbidity when comparing staple versus suture closure, several recent studies have described an increase in complication rates. A prospective randomized study comparing wound closure methods in patients undergoing surgery for proximal femoral fractures found that superficial complication rates were higher for wounds closed with metallic staples compared to wounds closed with subcuticular sutures.[8]



Positioning of skin stapler over incision. Tissue thumb forceps are utilized to bring the wound edges together prior to stapler firing.



Skin staple implanted in surgical incision

An experimental study assessing the inflammatory response in skin incisions closed by subcuticular staples, subcuticular sutures, and cutaneous metal staples found that metal staples induced more severe inflammatory reactions when compared to the other methods.[5] Not surprisingly, wounds closed with metallic staples are less cosmetic than closure with subcuticular sutures or staples. There is still a high degree of scar visibility with staple closure, although less than what is associated with external sutures.

The use of skin staples for wound closure is contraindicated when there is a moderate amount of tension across the wound. Also, staples should not be used in areas of thin skin, particularly over bone, viscera, or vessels. In general, there should be a distance of at least 4.5 mm (regular-sized staples) to 6.5 mm (wide staples) from underlying structures.

Economic Impact

The financial influence of skin staplers is difficult to assess as there is a large variation in cost between manufacturers. Some studies state that skin staples are 5 to 10 times more expensive than sutures. However, a human study examining the use of staples in closure of simple pediatric head wounds found that using staples allowed for a 30% to 40% decrease in cost of supplies and physician compensation.[9] When considering the use of skin staples, the veterinary practitioner should weigh the cost of the stapler versus the time and cost saved by decreasing procedure time.

Selected Manufacturers & Skin Stapler Devices

Autosuture, www.autosuture.com: Appose UCL, Signet, Multifire Premium

Delasco, www.delasco.com: Reflex

Ethicon Inc, www.ethicon.com: Proximate Plus MD, Proximate RH

Incisive Surgical, www.insorb.com: Insorb Subcuticular Skin Stapler

NewPoint Medical Supply Inc, www.newpointmed.com: NewPoint Disposable Skin Stapler

Texas Medical Device Company, www.surgiclose.com: Surgi-close

3M Worldwide, www.3M.com: Precise Vista

Weck Surgical, www.teleflexmedical.com: Visistat

See Aids & Resources, back page, for references, contacts, and appendices.

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