



RESEARCH ARTICLE

STAPLING VS SUTURING IN TRAUMATIC WOUND MANAGEMENT

* Sameeran Sahasrabudhe¹, Vrushali Pandhe², Ananta Kulkarni³ and Sanjana Patil⁴

^{1,2,4}Intern Doctor, Bharat Ratna Atal Bihari Vajpayee Medical College, Pune

³Professor & Head, Department Of Surgery, Bharat Ratna Atal Bihari Vajpayee Medical College, Pune

ARTICLE INFO

Article History:

Received 16th October, 2023

Received in revised form

19th November, 2023

Accepted 26th December, 2023

Published online 18th January, 2024

Key words:

Wound Management, Emergency
Medicine, Cosmetic care, Sutures,
Stapling.

ABSTRACT

Wound closure techniques are vital components of modern medical practice, aimed at promoting healing, minimising infection risks, and achieving optimal cosmetic outcomes. Sutures and stapling are two primary methods utilised for wound closure. This report discusses the importance of sutures and stapling in medical procedures, their advantages and disadvantages, and their respective applications in different clinical scenarios, especially in traumatic situations. Traumatic wounds are injuries resulting from external forces that disrupt the integrity of the skin and underlying tissues. Proper wound closure is essential to minimise infection risk, promote healing, and optimise cosmetic outcomes. The debate between suturing and stapling in traumatic cases has been a topic of discussion among medical professionals for years. Both methods having their own set of advantages and drawbacks, and the choice between them often depends on the specific circumstances of the injury and the patient's condition. We will thoroughly compare both, sutures and staplers when it comes to managing wounds in trauma with respect to the vital components required in traumatic settings.

Copyright © 2024, Sameeran Sahasrabudhe. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Wound closure techniques are vital components of modern medical practice, aimed at promoting healing, minimising infection risks, and achieving optimal cosmetic outcomes. Sutures and stapling are two primary methods utilised for wound closure. This report discusses the importance of sutures and stapling in medical procedures, their advantages and disadvantages, and their respective applications in different clinical scenarios, especially in traumatic situations. Traumatic wounds are injuries resulting from external forces that disrupt the integrity of the skin and underlying tissues. Proper wound closure is essential to minimise infection risk, promote healing, and optimise cosmetic outcomes. The debate between suturing and stapling in traumatic cases has been a topic of discussion among medical professionals for years. Both methods having their own set of advantages and drawbacks, and the choice between them often depends on the specific circumstances of the injury and the patient's condition. We will thoroughly compare both, sutures and staplers when it comes to managing wounds in trauma with respect to the vital components required in traumatic settings.

Sutures: Sutures, also known as stitches, involve using threads made from various materials to manually close wounds. Suturing is a critical technique in the management of traumatic wounds, facilitating wound closure, promoting healing, and reducing infection risk.

*Corresponding author: **Sameeran Sahasrabudhe**,
Intern Doctor, Bharat Ratna Atal Bihari Vajpayee Medical College,
Pune

This report delves into the role of sutures in traumatic wounds, discussing their significance, types, proper techniques, and factors influencing suture selection. Understanding the application of sutures in traumatic wounds is essential for healthcare practitioners to ensure optimal patient outcomes.

Types of Sutures

Several suture materials are available, each with specific properties and applications. Common types include:

- Absorbable sutures: These dissolve over time and are suitable for internal tissues that don't require removal.
- Non-absorbable sutures: These must be manually removed after a specified time period and are often used for external wound closure.
- Monofilament sutures: Single-stranded sutures that cause less tissue trauma due to reduced drag.
- Multifilament sutures: Made of several strands and offer better handling and knot security.

Significance of Suturing in Traumatic wounds:

Sutures are employed to bring together wound edges, providing immediate wound closure. This helps to:

- Prevent contamination and infection by minimising exposure to external pathogens.
- Promote tissue alignment, enhancing the healing process.
- Reduce scarring and improve cosmetic outcomes.

- Facilitate homeostasis by controlling bleeding. .

Factors influencing Suture selection:

The choice of sutures depends on various factors, such as:

- Wound location and depth.
- Tissue type and condition (healthy, infected, inflamed).
- Cosmetic considerations.
- Patient factors, including age and comorbidities.
- Time since injury (primary, delayed primary, or secondary closure).
- Urgency of the need to suture.

Advantages of Suturing in Traumatic wounds:

Precision: Suturing provides the surgeon with greater control over wound edge alignment, making it suitable for irregularly shaped or complex wounds often seen in traumatic cases.

Tension Control: The surgeon can adjust tension while suturing, minimizing the risk of tissue ischemia and ensuring optimal healing.

Cosmetic Outcomes: Suturing enables fine tissue approximation, leading to improved cosmetic results, particularly in highly visible areas like the face.

Drawbacks of Suturing while handling trauma wounds:

Time-Consuming: Suturing can be time-intensive, especially for deep or intricate wounds, potentially prolonging surgical procedures.

Skill Requirement: Achieving consistent and effective suturing outcomes demands a high level of skill and expertise from the surgeon.

Depth and Contamination: For deep or contaminated wounds, suturing might not provide sufficient closure, leading to increased infection risks. The selection of the proper incision, suture material, and closure technique is very important to assist the patient's own repair mechanism and restore normal anatomic relationships after surgery. Attention to these details also prevents such complications as dehiscence and infection, assuring a good cosmetic result.(6,7) As a future perspective, as medical research continues to advance, there may be developments in suture materials and techniques that can further enhance wound closure outcomes. New technologies, such as bioactive sutures and advanced wound closure devices, which aid in cutting extra time required and enhance precision of sutures, may offer improved wound healing and reduced scarring in traumatic wound cases, thus adding a cosmetic edge even in time sensitive situations.

Stapling: Medical stapling is a surgical technique used to close wounds, incisions, or tissue layers by applying metal staples instead of traditional sutures. It is commonly used in various surgical procedures, including those involving traumatic wounds, gastrointestinal surgeries, and even certain types of skin closures. The process involves using a specialised medical stapler, which dispenses surgical staples to hold tissues together securely.

They are frequently used in minimally invasive surgery and are used to close wounds in areas where the skin is tight against bone. There are various types of stapling according to their place of use and convenience. A table published by Sumanta Ghosh, Science Direct (11) explained the clinical accepted designs of staples Each type of medical stapling technique and device is designed to address specific surgical requirements and challenges. The choice of stapling method depends on factors such as the surgical procedure, the anatomical location, and the surgeon's experience and preference.

Advantages of Stapling in Traumatic Wounds:

- **Efficiency:** Stapling is generally quicker than suturing, allowing for efficient wound closure in emergency situations or when dealing with multiple wounds, which can be critical in trauma cases where time is of the essence. Stapling can be very helpful in cases of mass casualty where we do not have sufficient time for individual wound suturing.
- **Uniform closure/Consistency:** Staplers provide uniform pressure along the wound, resulting in consistent closure and reduced tension on wound edges.
- **Less skill-dependent:** Stapling is generally easier to perform and requires less technical skill compared to suturing.
- **Better strength:** Staples offer greater tensile strength compared to sutures, minimising the risk of wound dehiscence.
- **Less Tissue Trauma:** Stapling causes less tissue damage and inflammation, leading to decreased scarring and faster healing.
- **Reduced Infection Risk:** One of the most important factor to consider when handling emergency wound management is to prevent any further complications like infections. The quick closure and minimal manipulation associated with stapling can decrease the risk of contamination and infection.

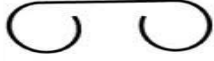

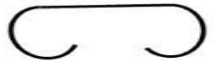

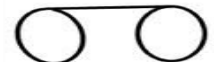


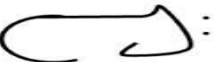
Drawbacks of Stapling while handling trauma wounds

- **Tissue damage:** The mechanical nature of stapling can cause more tissue damage compared to suturing, potentially leading to increased scarring and a higher risk of infection.
- **Tension control limitation:** Staples do not offer the same level of tension control as sutures, which could impact healing outcomes in certain cases.
- **Cosmetic concerns:** While staples can provide quick closure, they might be less desirable for wounds in cosmetically sensitive areas.
- **Tools for removing:** The disadvantages of staples over stitches are that staples need a specialised tool for removal. It usually takes two healthcare professionals to administer them: one who uses forceps to align the tissues, while the other places the staples. It is crucial to have the tissues in the right place to enable optimum healing.

Table 1. Some of the widely used sutures, classified according to their primary intended physical characteristics

	<i>Absorption</i>		<i>Composition</i>		<i>Configuration</i>	
	Absorbable	Non-absorbable	Natural	Synthetic	Multi-filament	Mono-filament
Nylon		X		X	X	X
Prolene		X		X		X
Polyester		X		X		X
Silk		X	X		X	
Surgical gut	X		X		X	
Chromic gut	X		X		X	
Vicryl (Polyglactin 910)	X			X	X	X
Dexon (Polyglycolic)	X			X	X	
Velosorb (Polyester)	X			X	X	
Maxon (Polyglyconate)	X			X		X
Monocryl (Polyglactone25)	X			X		X
Monoderm (Polyglactone75)	X			X		X
Polysorb (Glycolide/lactide)	X			X	X	
Biosyn (Glycomer 631)	X			X		X

Table 2. Above table highlights some of the clinically accepted designs based on their size, shape, uniformity of both legs.

Clinically Accepted Designs	Clinically Un-accepted Designs
 <ul style="list-style-type: none"> Uniform B-shaped Same size leg 	 <ul style="list-style-type: none"> Un-uniform shaped Un-uniform deformed leg
 <ul style="list-style-type: none"> Un-uniform B-shaped Same size leg but incomplete 	 <ul style="list-style-type: none"> Uniform shaped Un-uniform deformed leg, outside head
 <ul style="list-style-type: none"> Uniform B-shaped Same size leg but completely closed 	 <ul style="list-style-type: none"> Uniform shaped Un-uniform deformed leg, Extended side parts
 <ul style="list-style-type: none"> Un-uniform B-shaped Un-uniform deformed leg 	 <ul style="list-style-type: none"> Un-uniform shaped Right leg deformation

Clinical decision-making: The choice between suturing and stapling in traumatic wounds depends on various factors:

Wound characteristics: The location, size, depth, and nature of the wound play a crucial role in determining the appropriate closure method.

Patient factors: Consider the patient's medical history, pain tolerance, and potential allergies to materials used in sutures or staples.

Time sensitivity: Trauma cases often require swift closures; in such instances stapling might be preferred for its efficiency

	Staplers (% of complications)	Sutures (% of complications)
Head and neck	1	6
Chest wall	3	6
Abdomen and groin	6	14
Upper and lower limb	2	4

Cosmetic concerns: Wound in visible areas lean towards the need for careful management in order for it to heal properly,

without any or minimal scars, where suturing proves to be a better option for optimal cosmetic outcome.

DISCUSSION

To discuss and assess the efficiency and effectiveness of both suturing and stapling, it's vital to include the data published in similar articles and meta analysis covering wide spectrum of documented surgical procedures where they evaluated each method, suturing and stapling based on the time required in closing the wound, the results highlighting how well the wound healed, if there were any occurrences of infections at wound site. The most important aim of the article is to see which method of wound closure showed better results when it came to managing traumatic wounds, and if the results differ from management of other surgical settings, like in orthopedic surgery or abdominal surgery. A meta analysis by Cochetti. G(8) found out that risk of overall wound infection in sutures was 49 per 1000 while with staples was 67 per 1000. The risk of severe wound infection for sutures was 13 per 1000 and for staples was 14 per 1000. An original article by Kumar.S, Dr. Shri Krishna Ranjan (2) comparing post surgical outcome of suturing and stapling inclined in favor of stapling over suturing as it took lesser time in closing the wound with staples.

The time taken/wound (in minutes) for closing a wound measuring 7.5 cm was 9.8 mins for sutures and 7.3mins for stapling. The time taken for every suture/staple was 12.54 secs and 8.74 secs respectively. An article by Dr.N Chennaiah (9) comparing percentage of complications which arise in suturing and stapling highlighted the risk of occurrence of complications on wounds at different parts of the body. According to the table below, complications arising with sutures and staplers were 30% and 12% respectively. A study by Orlinsky *et al.* in 1995, USA –studied patients presenting in emergency department with lacerations of scalp, trunk and extremities. The average speed of stapling is 8.3 seconds/cm wound for staplers & 63.2 seconds/cm wound for sutures. The cost of wound repair per wound was significantly higher in skin sutures than staplers.

CONCLUSION

Sutures and stapling are indispensable techniques in wound closure, each with its unique advantages and limitations. Understanding the characteristics of both sutures and stapling is crucial for medical practitioners to make informed decisions that contribute to optimal patient outcomes. Considering our primary aim is to find out better wound closing method in “traumatic wound cases”, we carefully analyzed and compared characteristics through various published articles and available information online.

We checked their individual pros and cons, and therefore concluded that in management of traumatic wound cases, where time is of essence, stapling may prove to be more effective than suturing with significantly less time required and comparatively fewer risk of post operative infections at wound site, among other advantages.

However, both methods have their merits and limitations, making the decision a nuanced one that requires careful consideration of individual patient needs, wound characteristics, and the surgeon's expertise. Collaborative decision-making involving surgeons, wound care specialists, and patients themselves is vital to ensuring the best possible outcomes in traumatic wound management.

REFERENCES

1. Orlinsky M, Goldberg RM, Chan L, Puertos A, Slajer HL. Cost analysis of stapling versus suturing for skin closure. *Am J Emerg Med.* 1995; 13(1):77- 81.
2. Bailey L. Bailey and Love's Short Practice of Surgery. 26th edition. Hodder Arnold, 2013, 34-5.
3. BMJ 2010; 340 doi: <https://doi.org/10.1136/bmj.c1199> (Published 17 March 2010) BMJ 2010;340:c1199
4. Cochetti G, Abraha I, Randolph J, Montedori A, Boni A, Arezzo A, Mazza E, Vermendois JA, Cirocchi R, Mearini E. Surgical wound closure by staples or sutures? Systematic review. *Medicine* 2020;99:25(e20573)
5. Dr. Chennaiah M and Dr. L Sridhar, A study of comparison between skin sutures and skin staplers, *International Journal of Surgery Science* 2019; 3(4): 169-172 <https://www.thomasnet.com/articles/hardware/all-about-medical-staples/>
6. *International Surgery Journal*, Varghese F *et al.* *Int Surg J.* 2017 Sep;4(9):3062-3066
7. Kumar S, Ranjan SK. A Study to Compare the Post Surgical Outcome Using Conventional Suture Material and Stapler for Wound Closure. *Acad. J Surg.* 2019;2(2):34-36.
8. Sanz L, Smith S. *Strategies in gynaecologic surgery.* Springer, 1986, 53-76.
9. Slade Shantz *et al.* *Patient Safety in Surgery* 2013, 7:6
10. Sumanta Ghosh, Namdev More, Govinda Kapusetti, Surgical staples: Current state-of-the-art and future prospective, *Medicine in Novel Technology and Devices*, Volume 16, 2022, 100166, ISSN 2590-0935
