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Comparative Review of Different Suturing Techniques in Oral Surgery

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ABSTRACT

Suturing is essential in oral surgery for effective wound closure, tissue approximation, and optimal healing. This review examines various suturing techniques used in oral surgery, including interrupted, continuous, and mattress sutures, and highlights their advantages and disadvantages. The interrupted simple suture is valued for its strength and ease of cleaning, making it suitable for various surgical contexts. Continuous sutures allow for rapid closure and even tension distribution but may slacken if cut. The locking or blanket suture offers simplicity and watertight closure but lacks adjustable tension. Vertical and horizontal mattress sutures enhance tissue approximation and healing, especially in deep wounds and bony deficiencies, while the figure-of-eight technique is beneficial for closing edentulous spaces. Additional techniques like sling and periosteal sutures provide specialized support and closure around teeth and underlying bone. This review synthesizes current literature to guide clinicians in selecting appropriate suturing methods, thereby improving surgical outcomes and patient satisfaction. Understanding the principles and applications of these suturing techniques is crucial for enhancing healing, minimizing complications, and achieving optimal aesthetic results in oral surgical procedures.

Keywords: Suturing Techniques, Oral Surgery, Wound Closure, Interrupted Suture, Continuous Suture, Mattress Suture

Introduction

Suturing is a critical component in oral surgery, ensuring proper wound closure, tissue approximation, and facilitating optimal healing. The primary goal of suturing is to stabilize soft tissue, promote rapid healing, minimize scarring, and prevent wound dehiscence or infection.[1] Oral tissues, being highly vascular, demand meticulous suturing techniques to manage soft tissue trauma, control bleeding, and achieve functional as well as aesthetic outcomes. With advancements in materials and techniques, surgeons have various options for suturing, each tailored to specific clinical needs. In oral surgery, the choice of suturing technique and knot is crucial for successful wound closure and healing.[2] Two primary knots are used: the slip knot and the surgeon's knot. The surgeon's knot is ideal for synthetic sutures like polyester, which tend to unravel due to their memory. It involves a double overhand throw followed by a single throw in the opposite direction. The slip knot, commonly used with gut or chromic gut sutures, allows the surgeon to tighten the suture and approximate tissue edges but is not recommended for synthetic sutures.[3] Common suturing techniques include interrupted and continuous methods. The simple interrupted suture is versatile, used for closing small or large wounds with tension-free closure. The crisscross technique is commonly applied for extraction sites, helping maintain blood clots and packed materials. However, neither interrupted nor crisscross sutures are ideal for tensioned wounds or flaps.[4] The horizontal mattress technique is useful for flaps under tension, ensuring stability when the flap is released beyond the mucogingival junction. Continuous sutures are suited for longer wounds, such as those from full-mouth extractions. They can be either locking, providing extra security, or non-locking, which poses a higher risk of wound dehiscence if the knot unravels. In high-tension situations, continuous sutures can be reinforced with horizontal mattress sutures for added support. Choosing the appropriate suturing technique depends on several factors, such as the type of oral surgery, the location and size of the wound, the tension on the tissues, and the desired aesthetic result. Techniques range from simple interrupted sutures to more complex mattress and continuous sutures, each with distinct advantages and limitations.[5] This review compares various suturing methods commonly used in oral surgery, highlighting their applications, benefits, and potential drawbacks to aid in optimal clinical decision-making.

Suture Principles

Key principles include selecting the appropriate needle and suture material based on tissue type and healing time. Absorbable sutures like gut or polyglycolic acid are suitable for internal tissues that heal quickly, while non-absorbable sutures like nylon or polyester provide longer- term support for external closures. Minimizing tissue trauma is crucial, and this can be achieved by careful handling and proper needle insertion. Tissue approximation should be tension-free, with the wound edges aligned and slightly everted to prevent inversion and scarring. Even distribution of tension across the wound

is essential, avoiding excessive force on any single suture to prevent tissue strangulation. Secure knot tying, particularly with the use of surgeon's knots for synthetic sutures, is critical to preventing loosening. Maintaining an aseptic technique is necessary to avoid infection, while sutures should be placed at regular intervals and optimal depths. Timely removal of non-absorbable sutures is important to avoid complications, while understanding tissue healing dynamics ensures the appropriate suturing technique and materials are used. By adhering to these principles, suturing can greatly enhance healing and reduce.[6,7]

Review of literature

A study by Baig, Fawaz Abdul Hamid compared the efficacy of four suturing techniques— simple interrupted, horizontal mattress, vertical mattress, and figure-of-eight—used in deep third molar extraction on 100 patients. The techniques were evaluated based on wound healing, operation time, intraoperative issues, postoperative pain, swelling, and patient satisfaction. Statistical analysis revealed that the figure-of-eight suturing method provided superior outcomes, including lower postoperative pain, reduced swelling, better wound healing, and higher patient satisfaction.[8] Mohammed Enamur Rashid's study found that the continuous suturing technique outperformed other methods in single-tooth extractions, showing the lowest wound dehiscence, better soft tissue healing, and superior bone preservation. Continuous sutures had a 5% dehiscence rate, and 98% bone volume preservation. The study suggests continuous sutures offer significant post-extraction healing benefits.[9] B. Ege conducted a study using a randomized, split-mouth design with 50 patients who had bilateral impacted mandibular third molars. The patients' wounds were sutured using two different techniques: locked knots (Group L) and unlocked knots (Group UL). Postoperative assessments included pain, swelling, trismus, chewing activity, and quality of life. The unlocked knot technique showed significantly better outcomes for all parameters compared to the locked knot technique ($P < 0.05$). The study concludes that the unlocked knot method is preferable for reducing postoperative complications and improving patient quality of life.[10] Éwerton Daniel Rocha Rodrigues' study found that allowing the oblique incision to heal by secondary intention resulted in significantly less postoperative pain, swelling, and trismus compared to primary closure in patients with bilateral impacted third molars. The findings suggest that secondary intention healing is a superior approach for reducing postoperative morbidity.[11]

Interrupted Simple Suture

The interrupted simple suture is one of the most commonly used suturing techniques in surgical procedures. This method involves inserting a single suture through the sides of a wound, typically using a surgeon's knot to secure it. The advantages of this technique are manifold. Firstly, interrupted sutures are strong and can withstand significant stress, making them suitable for high-tension areas. The sutures are usually placed 4-8 mm apart, allowing for the even distribution of tension across larger wounds. Each suture is independent; thus, loosening one suture does not affect the integrity of the others, providing added safety in case of infection or hematoma, as only the affected sutures can be removed. Additionally, interrupted sutures create a degree of eversion, which can promote better healing by ensuring the wound edges are appropriately aligned. Another significant benefit is the ease of cleaning, as the independent nature of each stitch minimizes interference between them, facilitating better postoperative care. Overall, the interrupted simple suture technique remains a reliable choice for wound closure in various surgical contexts.[1,13]

Simple Continuous/Running Suture

The simple continuous or running suture technique involves placing a series of simple interrupted sutures in a continuous manner. The needle is reinserted in a manner that the suture passes perpendicularly below and obliquely above the incision line, culminating in a knot tied over the untightened end of the suture. This technique offers several advantages. It is a rapid method that allows for uniform distribution of tension across the wound, promoting better healing outcomes. Furthermore, it provides a more watertight closure due to the continuous nature of the suture line, which can be particularly beneficial in certain surgical sites where fluid containment is critical. Another advantage is that this technique requires only two knots, minimizing the number of suture tags left behind. However, there are disadvantages; if the suture is cut at any point along its length, the entire suture line may slacken, leading to wound gaping and potential complications. Despite this drawback, the simple continuous suture technique remains popular for its efficiency and effectiveness in various surgical scenarios.[13,14]

Continuous Locking/Blanket Suture

The continuous locking or blanket suture technique is similar to the simple continuous suture but incorporates a locking mechanism. In this method, the suture is withdrawn through its own loop to create a locking effect, which is particularly beneficial for long edentulous areas, such as in the tuberosity or retromolar region. The main advantages of this technique include the avoidance of multiple knots, which simplifies the suturing process and reduces the time required for closure. Additionally, like the simple continuous suture, it distributes tension uniformly across the wound, contributing to a watertight closure. The locking mechanism also prevents excessive tightening of the suture, which can occur in continuous sutures. However, a notable disadvantage is that this technique does not allow for adjustment of tension along the suture line as tissue swelling occurs postoperatively. This limitation can lead to complications if not managed appropriately, making it essential for the clinician to assess the tissue condition carefully during suturing.[15]

Vertical Mattress Suture

The vertical mattress suture technique is employed primarily for closing deep wounds and consists of passing the needle at two levels. One level penetrates deep into the tissue to provide support and adduction of the wound surfaces, while the other level draws the wound edges together and slightly evert them. The needle is passed from one edge of the wound to the other, and then it is brought back through the first flap to tie a knot. The vertical mattress suture technique has several advantages, particularly in enhancing wound adaptation and maximizing tissue approximation. It facilitates slight eversion of the wound margins, which is crucial for optimal healing. This method is especially beneficial in situations where delayed healing is anticipated, as it provides added support to the wound and can help control soft tissue hemorrhage effectively. Furthermore, the technique runs parallel to the blood supply of the flap edges, minimizing interference with healing. Overall, the vertical mattress suture is an invaluable tool in the surgical arsenal, particularly for deep or complex wounds.[16]

Horizontal Mattress Suture

The horizontal mattress suture technique is designed to evert the mucosal margins, thereby maximizing contact between raw tissue surfaces. This technique is particularly useful for closing bony deficiencies, such as oro-antral fistulas or cystic cavities. The suture is placed horizontally across the incision, and the tension it generates can help bring together larger areas of tissue, which is beneficial in certain surgical contexts. The primary advantage of this technique lies in its ability to enhance wound eversion and promote better healing in areas with significant tissue loss. However, a significant drawback is that it can constrict the blood supply to the edges of the incision if not performed correctly. This constriction can lead to complications such as wound necrosis and dehiscence. Therefore, while the horizontal mattress suture can be highly effective in specific scenarios, it requires careful technique and consideration of the surrounding tissues to prevent adverse outcomes.[17]

Figure of 8 or Cross (Crisscross) Suture

The cross (or crisscross) suture technique is particularly beneficial for closing edentulous spaces. This technique involves using a 3/8 circle needle, which penetrates the mucogingival junction at the mesiobuccal line, traveling horizontally under the flap, and emerging at the distobuccal line angle. The suture then crosses over the surgical field, with the knot tied on the buccal aspect, creating a crisscross pattern on the flap. This method provides several advantages, including the everted mucosal margins, which bring greater areas of raw tissue into contact, thereby enhancing the healing process. It is particularly effective for closing bony deficiencies, such as oro-antral fistulas or cystic cavities, and it helps prevent the flap from inverting into the cavity. Additionally, the cross suture can control postoperative hemorrhage by tensing the mucoperiosteum over the underlying bone. However, it does have disadvantages; the technique can be more complex and troublesome to insert, and if improperly executed, it may constrict the blood supply to the incision, leading to potential complications such as necrosis and dehiscence. Careful technique is essential to ensure optimal outcomes with this method.[18]

Sling Suture About a Single Tooth

The sling suture about a single tooth technique is employed to ensure the proper closure of surgical sites around teeth. It involves using a 3/8 circle reverse cutting needle, which is first passed under the distal contact point of the most distal interdental papilla. The needle then pierces through the inner side of the elevated surgical flap, about 3 mm from the tip of the papilla. The suture needle is then passed back under the contact point and under the next contact point in a mesial direction, followed by another penetration through the inner surface of the elevated surgical flap, again about 3 mm from the tip of the interdental papilla. This technique allows for the suturing of the flap back to the surrounding tissues effectively. The primary advantages of this technique include the everted mucosal margins, which improve contact between raw tissues, making it suitable for closing bony deficiencies, extraction socket wounds, and controlling postoperative hemorrhage around the tooth socket. It also prevents the flap from inverting into the cavity, maintaining the integrity of the surgical site. However, this technique can be more challenging to insert compared to simpler suturing methods and requires careful handling to avoid complications. Overall, the sling suture about a single tooth technique is an effective approach for managing surgical closures around teeth, especially in cases of inadequate tissue availability.[19]

Periosteal Suturing Technique

The periosteal suturing technique is a specialized method that involves penetrating the periodontal or peri-implant tissues and the periosteum down to the underlying bone. The needle is rotated back toward its starting point while penetrating through the periosteum again and back through the keratinized tissue. This technique allows for the sutures to grab the periosteum effectively, providing additional stability to the closure. A 180° rotation of the needle facilitates movement along the bone beneath the periosteum, allowing for a secure suture that promotes proper healing. The primary advantage of this technique is that it offers strong support to the wound closure, which is crucial in areas where tissue integrity is vital. Furthermore, by securing the periosteum, this technique helps minimize the risk of wound dehiscence and enhances overall healing outcomes. However, the technique requires a certain level of skill and precision to ensure that the sutures are placed correctly without damaging the surrounding tissues. When executed properly, the periosteal suturing technique can significantly improve the quality of surgical closures, especially in challenging anatomical areas.[20,21]

Parameter	**Interrupted Simple Suture**	**Simple Continuous (Running) Suture**	**Continuous Locking (Blanket) Suture**	**Vertical Mattress Suture**	**Horizontal Mattress Suture**	**Figure-of- 8 Suture**
Ease of Use	Moderate (individual tying required)	Quick (continuous tying)	Moderate (requires careful locking)	Moderate (requires careful placement)	Moderate (requires careful placement)	Moderate (requires careful placement)
Tension Distributio n	Uneven (independen t stitches)	Uniform (across entire length)	Uniform (across entire length)	Variable (depends on technique)	Uneven (may constrict blood supply)	Moderate (distributes tension evenly)
Wound Closure Strength	High (strong independent knots)	Moderate (depends on integrity)	High (strong due to locking mechanism)	High (provides support and approximation)	Moderate (depends on tens ion applied)	High (provides strong closure)
Risk of Gaping	Low (individual loosening)	High (if cut, entire slackens)	Moderate (locked stitches reduce slack)	Low (secure approximation)	Moderate (risk if not properly applied)	Low (secure cross- pattern)
Application Suitability	General use for various wounds	Suitable for longer incisions	Long, straight wounds, or edentulous areas	Deep wounds requiring approximation	Bony deficiencies or oro- antral fistulas	Good for securing loose tissue and tension

Conclusion

Each suturing technique in oral surgery has its unique advantages and limitations, and the choice of technique depends on the clinical scenario. Interrupted sutures are versatile and provide excellent control, while continuous sutures offer efficiency in larger wounds. Mattress sutures are ideal for high-tension areas, while subcuticular sutures provide superior aesthetic outcomes. The selection of the appropriate technique should be based on the surgeon's expertise, the nature of the surgical site, and the desired functional and aesthetic outcomes.

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