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Effect of Different Suture Removal Time Intervals on Surgical Wound Healing

Emad Hammody Abdull*[1], Nour Ali Abd-almoneim[1], Meena Oday Hassan[1], Amel Idres Namik[1]

*[1]Ibn Sina University of Medical and Pharmaceutical Sciences, Baghdad, Iraq

Correspondence:

Emad Hammody Abdull

Ibn Sina University of Medical and Pharmaceutical Sciences,Baghdad, Iraq.

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Abstract

Background: It is known that sutures enhance wound closure and promote healing. Sutures initially provide the mechanical strength to seal the wound and protect it from pathogens. Previous studies of suture mechanics focused on the material strength or knotting methods in vitro. Only a few studies have investigated the correlation between the healing strength of wounds and suturing and that was the purpose of our study.

Aim of the study: to assess the wound healing after suture removal and knowing the correlation between the time interval of suture removal and wound healing.

Subject and method: 50 patients (male and females) were participated in a comparative study to assess the wound healing after suture removal by using Mann-Whiteny test to evaluate the tissues reaction after suture removal.

Results: It was found that the median of gingival index and healing index on the seventh day was higher than on the fifth day. Regarding to the genders, there is no significant difference in P-value among both genders.

Conclusion: Based on the result of this study, 7 days was recognized the best time interval for suture removal in comparison with the other time interval.

Introduction

In oral surgery, the last phase of a surgical operation is represented by the tissues suture. The term “suture” describes any strand of material utilized to ligate blood vessels or approximate tissues. The primary objective of dental suturing is to position and secure surgical flaps in order to promote optimal healing (first / primary intention) provides support for tissue margin until they heal, without dead space and reduce postoperative pain.[23] A good suture avoids that the displacing forces generated by the muscular insertions, functional movements and by the external agents destabilize or cause the surgical wound dehiscence.[10]

The technique of closing wounds by means of needle and thread is several thousand years old. The history of surgical sutures can be traced back to ancient Egypt, and the literature of the classical period contains a number of descriptions of surgical techniques involving sutures. Before catgut became the standard surgical suture material towards the end of the 19th century, many different paths had been followed to find a suitable material for sutures and ligatures.[5] Materials that had been tried included gold, silver and steel wire, silk, linen, hemp, flax, tree bark, animal and human hair, bow- strings, and gut strings from sheep and goats. At the beginning of the 19th century metal threads were tested as suture material. At that time inertness of a material with respect to body tissues was considered an advantage.[8] Nevertheless, metal threads had major disadvantages: their stiffness rendered knot- tying more difficult and could easily result in knot breakage; in addition, suppuration of the wound edges occurred frequently.[7]

These negative experiences with metal contributed to the establishment of silk as the number one suture material. Wounds sewn with silk cicatrized within a few days, and the small knot caused no problems. For these reasons most surgeons at that time chose silk for sutures and vessel ligatures.[9] A fundamental change in the assessment of suture materials followed the publication in 1867 of Lister's research on the prevention of wound suppuration.

On the basis of work by Koch and Pasteur, Lister concluded that wound suppuration could be prevented by disinfecting sutures, dressings, and instruments with carbolic acid. Initially Lister used silk as a suture material, on the assumption that it was absorbable and therefore could also be used for ligatures.[1] Later he searched for a more rapidly absorbable material and consequently began to use catgut. Catgut is produced from animal connective tissue, in particular bovine sub serosa. Over the years it gradually emerged that animals born and bred in South America were most suitable because they had the lowest fat content thanks to their natural husbandry conditions. The use of catgut was never called into question until the appearance of BSE at the beginning of the 21st century. Alternative products had already been developed by this time. These are the synthetically manufactured absorbable suture materials, which have largely superseded catgut in Europe. However, catgut continues to play a major role in wound care worldwide. A wide variety of sterilization methods have been tested at various times.[17] Nowadays sutures are mostly sterilized by ethylene oxide or gamma irradiation. In response to the requirements of modern surgery and thanks to the efforts of users and manufacturers over the last few decades, a wide variety of sutures have now been developed.[15]

The aims of the study

This study was conducted to:

1. Assess the wound healing after suture removal.
2. Assess tissue reaction to different suture removal time interval.

Review of literatures

Healing

The recovery of gingiva (gums) following surgery is significantly influenced by the time of suture removal. When sutures are removed depends on a number of things, such as the type of operation, the healing response of each patient, and the surgeon's discretion.[30]

It is recommended to remove sutures within a week or two of being placed, depending on the anatomic position. Timely extraction lowers the chance of tissue response, infection, and suture marks. After surgery, the average wound typically regains 8% of its predetermined tensile strength in one to two weeks. The scar shouldn't spread or dehisce if the sutures are removed at the right time.[30]

Early suture removal

Benefits: Lowers the possibility of complications from sutures, such as tissue response or infection. reduces the possibility of skin suture traces and markings.

Cons: May raise the possibility of wound dehiscence, particularly intense or stressful areas. Too little time for the wound's tensile strength to reach its maximum.[18]

Delayed Suture Removal

The timing of suture removal can affect healing in several ways. If sutures are left in place for too long, there is a risk of suture marks or "railroad track" scars developing on the gingiva. Additionally, delayed suture removal can impede the normal healing process, potentially leading to greater inflammation, discomfort, and the formation of excess scar tissue.[18]

Benefits: Enables greater tensile strength of the wound prior to suture removal. Lowers the possibility of a wound dehiscence.

Cons: A prolonged foreign material presence may raise the chance of infection, may occasionally result in scarring that is more noticeable. The surgical wound healing process can be greatly impacted by the timing of suture removal. The type of surgery, the location of the incision, and the healing habits of each patient all influence the best timing to remove sutures. Medical devices called sutures, sometimes referred to as stitches, are used to hold human tissues together following surgery or an accident. The type of tissue being sutured, the wound's location, the anticipated tension on the incision, and the estimated healing time all play a role in the suture type selection. The following factors should be taken into account when evaluating how various suture removal time intervals affect gingiva healing:

Optimal Suture Removal Time

The best time to remove sutures generally depends on the particular tissues involved and the kind of surgery that is done. Sutures are usually taken out 7 to 14 days after standard oral surgeries, such as gingival or periodontal treatments. This period reduces the chance of problems from early removal and permits adequate initial wound healing.

Patient-Specific Factors

The best timing to remove sutures can depend on a number of patient- related factors, including unique healing patterns, immunological response, and systemic health. To reduce the risk of problems during healing, conditions like diabetes, smoking, or immunocompromised states may call for more frequent monitoring and maybe early suture removal (Mackay et al., 2018).

A surgical wound's healing

A surgical wound's healing phase is a dynamic process involving complex molecular and cellular processes. It is typically separated into multiple phases that overlap, each with distinct biological functions meant to preserve the integrity of the tissue. When handling wounds, healthcare workers must have a thorough understanding of the healing processes. A more thorough examination of the healing stages is provided below:

Inflammatory Phase

Duration: Starts right away following the injury and continues for a few days.

Important Occurrences:

Hemostasis: To reduce bleeding, blood arteries contract. Neutrophils, which are the main kind of inflammatory cells, clear infections and detritus. Growth factors and cytokines are examples of inflammatory mediators that orchestrate the response. Clinical characteristics include pain, heat, edema, and redness at the wound

site. inflammatory exudate is present.[20]

Proliferative Phase

Duration: Overlaps with the inflammatory phase and lasts for several days to weeks. (Angiogenesis) New blood vessels form to supply nutrients and oxygen. (Fibroplasia) Fibroblasts produce collagen, forming a provisional matrix.[20]

Remodeling Phase

Duration: Can last from weeks to months, and even years. Collagen synthesis and organization continue. Excess collagen is removed, and tissue strength increases. Scar tissue matures.[20]

Epithelialization:

Duration: Overlaps with the proliferative phase.

Key Events: Migration of epithelial cells from wound edges. Formation of a new epithelial layer. Clinical Features: Surface of the wound becomes covered with new epithelial cells. Reduction in wound size as epithelialization progresses.[20]

Maturation of Scar Tissue

Duration: Overlaps with the remodeling phase.

Key Events: Continued collagen remodeling and cross-linking. Scar tissue gains strength but may not fully regain the original tissue architecture.

Clinical Features: Gradual fading and flattening of the scar. Increase in tissue tensile strength over time.[20]

Long-Term Adaptations

Time: Indefinite. Important Occurrences: Scar tissue permanently adjusts to meet functional requirements. ongoing tissue remodeling brought on by external forces.

Clinical Features: Scar tissue adjusts to the surrounding tissue's biomechanical needs. Stability and functionality over the long period are attained. Healthcare workers must comprehend the stages of wound healing in order to evaluate how a surgical wound is healing and to take the proper action if complications develop. The age of the patient, comorbidities, and the kind of operation can all affect how quickly and successfully each phase goes. Maximizing results and reducing complications can be achieved by designing interventions that facilitate the body's own healing mechanism.[13]

In general, sutures are often removed between 5 to 14 days after surgery, but the specific timeline can vary. For facial wounds, removal may occur within the first week, while wounds in areas of higher tension or with delayed healing may require a longer duration.[13]

The most used suturing techniques in oral cavity

Interrupted simple suture

Most commonly used. Inserted singly through side of the wound and tied with a surgeon's knot.

Advantages: Strong and can be used in areas of stress. Placed 4-8 mm apart to close large wounds, so that tension is shared. Each is independent and loosening one will not produce loosening of the other. Degree of eversion produced. In infection or hematoma, removal of few sutures clean. Free of interferences between each stitch and easy to clean.[32]

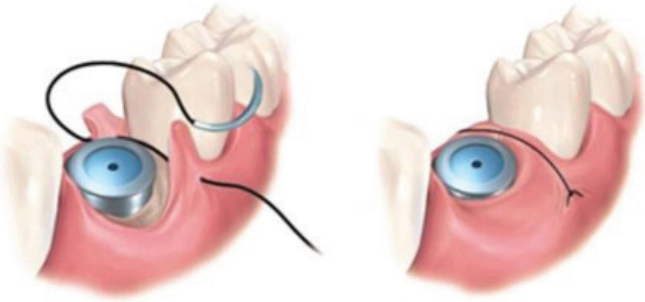

Figure 1: interrupted simple suture.

Simple continuous/running

A simple interrupted suture placed and needle reinserted in a continuous fashion such that the suture passes perpendicular to the incision line below and obliquely above. Ended by passing a knot over the untightened end of the suture.

Advantages: Rapid technique and distributes tension uniformly. More water tight closure. Only 2 knots with associated tags.

Disadvantages: If cut at one point, suture slackens along the whole length of the wound, which will then gape open.[32]

Continuous locking/blanket

Similar to continuous but locking provided by withdrawing the suture through its own loop. Indicated in long edentulous areas, tuberosity or retromolar area.

Advantages: Will avoid multiple knots. Distributes tension uniformly. Watertight closure. Prevents excessive tightening.

Disadvantage: Prevents adjustment of tension over suture line as tissue.[35]

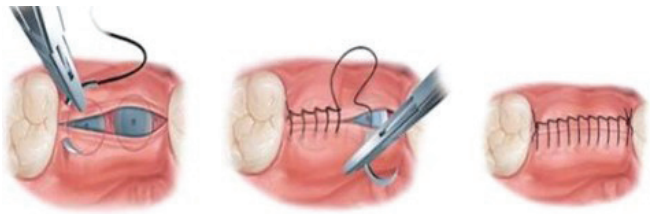

Figure 2: Continuous locking suture.

Vertical Mattress

Internal vertical mattress: It passes at 2 levels, one deep to provide support and adduction of wound surfaces at a depth and one superficial to draw the edges together and evert them. Used for closing deep wounds. Needle passed from one edge to the other and again from latter edge to the fist and knot tied. When needle is brought back from second flap to the first, depth of penetration is more superficial.

Advantages: For better adaptation and maximum tissue approximation. To get eversion of wound margins slightly. Where healing is expected to be delayed for any reason, it is better to give

wound added support by vertical mattress. Used to control soft tissue hemorrhage. Runs parallel to the blood supply of the edge of the flap and therefore not interfering with healing.[32]

Figure 3: Internal vertical mattress suture.

Horizontal Mattress

It everts mucosal margins, bringing greater areas of raw tissue into contact. So used for closing bony deficiencies such as oro-antral fistula or cystic cavities.

Advantages: Will evert mucosal margins, bringing greater areas of raw tissue into contact. So used for closing bony deficiencies such as oro-antral fistula or cystic cavities, extraction socket wounds. Prevents the flap from being inverted into the cavity. To control post-operative hemorrhage from gingiva around the tooth socket to tense the mucoperiosteum over the underlying bone. It does not cut through the tissue, so used in case of tissue under tension (inadequate tissue). More trouble to insert., Constricts the blood supply to the incision if improperly used, cause wound, necrosis and dehiscence.

Disadvantage: Constricts the blood supply to edges of incision. Needle passed from one edge to the other and again from the latter to the first and a knot is tied. Distance of needle penetration and depth of penetration is same for each entry point, but horizontal distance of the points of penetration on the same side of the flap differs.

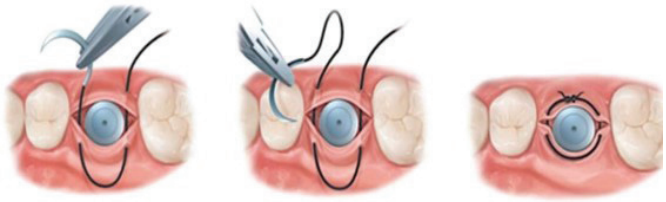

Figure 4: Horizontal mattress suture.

Cross (Crisscross) suture

This suture is used over edentulous spaces. When beginning this technique, a 3/8 circle needle penetrates at the level of the mucogingival junction at the mesiobuccal line, travels horizontally under the flap, and emerges at the distobuccal line angle, the procedure is done on the lingual aspect, the suture material crosses over the surgical field, tying of suture knot on buccal aspect forming a cross on the flap.

Figure 5: Cross suture

Suture material

A suture is a strand of material used to ligate vessels and reapproximate lacerated or incised tissue. Ideally, suture material should persist and retain adequate tensile strength after surgery, until healing has reached a stage at which wound separation is unlikely to occur. The chosen material should have easy handling qualities and excellent knot security Ethicon.[21] The material should not impede healing or elicit an inflammatory response or toxic effect.[21] Ideal sutures should also be affordable, available, easily sterilized, and nonconductive to bacterial growth.[18]

Principles of Suture Selection

The selection of a suture material by a surgeon must be based on a sound knowledge of the:

1. Healing characteristics of the tissues, which are to be approximated.

2. The physical and biological properties of the suture materials.

3. The condition of the wound to be closed.

4. Probable post-operative course of the patient.[31]

When a wound has reached maximal strength, sutures are no longer needed. Multifilament sutures should be avoided in contaminated wounds as bacteria can linger within them and may convert it into an infected one. Where cosmetic results are important, close and prolonged apposition of wounds and avoidance of irritants will produce the best results. The smallest inert monofilament suture materials such as polyamide or prolene should be used (Najib et al., 2010).

The Ideal Suture: It can be utilized in any operation. It can be handled easily and comfortably. Minimal tissue reaction. High breaking strength. High knot security. It does not cut, tear or shrink the tissue. It is non-allergenic, non-carcinogenic. It is absorbed predictably with no tissue reaction. It is reasonably priced.

Another method of flap closure

Sling suture about single tooth

The 3/8 circle reverse cutting needle is first passed under the distal contact point of the most distal interdental papilla, then the suture needle pierces through the inner side of the elevated surgical flap 3mm from the tip of the papilla, passage of the suture needle back under the contact point, then passed under the next contact point in a mesial direction and then the needle pierces through the inner surface of the elevated surgical flap 3mm from the tip of the interdental papilla, then passage of the needle back under the contact point, tying of the suture knot on the non elevated tissues.[36]

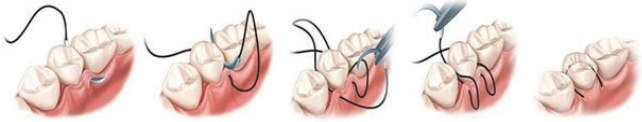

Figure 6: Sling suture about single tooth

Horizontal Sling Suturing

This technique is often used in cases where tension needs to be distributed across a wide area. The suture is passed horizontally through one side of the wound, underneath the tissue, and then brought out through the other side. It resembles a sling and provides excellent support for wound closure.[41]

Purse-String Suturing

Purse-string sutures are employed when closing circular or oval-shaped incisions. The suture is threaded through the tissue in a continuous manner, creating a gathered effect that tightens the wound edges around a central point. This technique is commonly used in procedures like the closure of extraction sockets after impacted wisdom tooth removal.[38]

Locking Loop Suturing

This technique involves creating a loop at one end of the suture, which is then secured by threading the other end through the loop. It forms a locking mechanism that prevents the suture from loosening or slipping, making it suitable for situations where knot security is critical.[34]

Continuous Locking Suturing

A variation of continuous suturing, this technique involves adding an extra step to create a locking loop at the beginning of each stitch. This enhances the overall security of the suture line and reduces the risk of unraveling if one part of the suture breaks.[25]

Subcuticular Suturing

Also known as intradermal or subdermal suturing, this technique is employed to close incisions or wounds beneath the skin's surface. It minimizes scarring by avoiding the creation of knots on the wound surface (Silverstein, 2011).

Running Lock Suturing

This technique combines continuous suturing with locking loops. It involves creating intermittent locking loops along the continuous suture line, enhancing knot security throughout the wound.[26]

Biological response to suture materials

Regardless of their physical composition, all sutures implanted in the human body act as foreign bodies.[21] Intraoral placement of sutures produces a different inflammatory response than that witnessed elsewhere in the body.[21] Confounding factors in the oral cavity include humidity and an indigenous flora, which increases the likelihood for bacterial migration along the suture, resulting in infection.[21] Natural absorbable sutures are generally digested by enzymatic and macrophage activity.[16] This produces a greater degree of tissue reaction in the breakdown of synthetic absorbable sutures, which occur by hydrolysis. Water gradually penetrates the synthetic suture, causing a breakdown in the polymer chain.[21]

Bacterial migration along the suture track has been documented. Although braided suture has been reported to promote bacterial retention and growth because of its physical composition, Selvig and colleagues found bacteria plaque migration extending more than 100 mm into suture channels at 14 days regardless of the suture material tested, except for gut, which had rapidly dissipated by this time. Sutures that remain in intraoral wounds, such as silk, cause epithelial tracks, thereby increasing the propensity for bacterial migration. In general, sutures should be removed no later than 7 to 10 days. The loss of tensile strength and rate of absorption are separate and distinct phenomena. Sutures may rapidly lose adequate tensile strength, but be absorbed slowly, or vice versa. Fever, infection, or protein-deficient states may accelerate the absorption process and cause an increase in loss of tensile strength. Moist or fluid-filled tissue such as the oral cavity, or soaking sutures in saline for extended periods, may also accelerate the absorption process.[21]

General factors influence the wound healing in the oral cavity[2]: Age, Obesity, Hereditary factors, Vitamin A, Corticosteroids, Nutrition, Diabetes mellitus, Smoking, Medication, HIV, Anemia, Radiotherapy.

Clinical manifestations of disturbed wound healing in the oral cavity

Disturbed wound healing has many manifestations, with the potential for wound healing disturbance at every phase. Clinical manifestations can include excessive bleeding or absence of blood clot formation as seen in alveolitis sicca. Other manifestations can include the granuloma formation, sinus polyps, fistulas, wound dehiscence, ulcers, perforations, wound necrosis, flap necrosis, pus formation, chronic infections with or without granulation tissue formation, keloid formation, fibrosis, and trismus (Roy et al., 2013; Karamanos et al., 2015). states that the following clinical signs indicate poor wound healing: persistent inflammation for longer than 7 days, malodorous wound, increased exudate, delayed epithelization, maceration of the surrounding skin, wound dehiscence, and necrotic tissue.

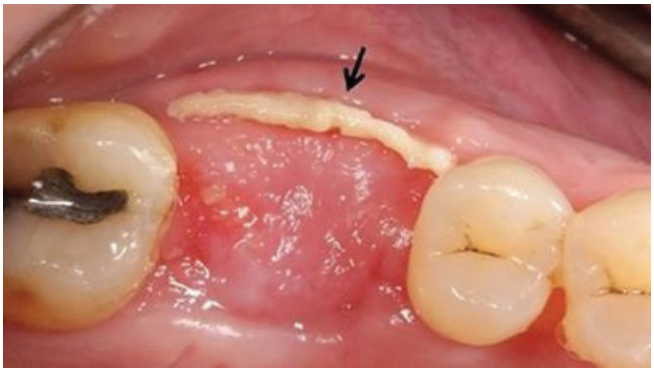

Figure 7: necrotic tissue.

Management[2]

Postoperative Instructions

Along with post operative medications proper post operative instructions play important role to prevent post surgical complications.

1. Appliance of moist gauze: After extracting teeth, haemorrhage is arrested by asking the patient to bite gently, but firmly on the rolled up moist gauze swab placed over the socket.[24]

2. Avoidance of spitting: The patient should be advised not to spit during the first 12 hours after surgery. The process of spitting involves negative pressure, which may prolong bleeding.

3. Avoidance of Use of Straw: Physical dislodgement of blood clot can be caused by manipulation or negative pressure created via sucking on a straw which could be major contributor of alveolar osteitis.[12]

4. Rest: No strenuous exercise should be performed for the first 12-24 hours after extraction. The increased circulation may result in bleeding

5. Soft Diet: Only liquids and soft solids, warm or cold food should be eaten on the first day. If the extraction is limited to one

side, chewing can be done on the un-operated side, but when local anaesthesia has been used, chewing should be avoided until sensation has returned. Cool and cold food help keep the local area comfortable.

6. Oral Hygiene: No cleansing of the mouth is advised for the first 24 hours after operation which causes harm by starting haemorrhage.4 Thereafter, mucous membrane and teeth may be cleaned with a soft tooth brush or foam pads attached to orange sticks, and mouth irrigated with 0.2% aqueous chlorhexidine after every meal.4 Patient should be advised that keeping the teeth and mouth reasonably clean results in a more rapid healing of their surgical wounds.[29]

7. Cold Application: To prevent excessive oedema formation, cold compressions are advisable, intermittently for first 24 hours (Borle, 20140. The application of cold induces vasoconstriction which reduces exudation of fluid and blood into the tissue spaces and prevents excessive edema (Karamanos, 2015). This agent should be used intermittently, because prolonged use of cold leads to compensatory vasodilatation.[2] Cold is applied for 30 minutes each hour. Once swelling has reached its maximum (usually after 24 to 48 hours), cold is no longer effective, and heat, in the form of moist compresses, should be applied.[2]

Post-Operative Pain

Post extraction pain may result from incomplete extraction of the tooth, laceration of the soft tissues, exposed bone, infected sockets or damage to adjacent nerves. Treatment is by eliminating the cause and by prescribing analgesic drugs. Some avoidable causes of postoperative pain are swelling, trismus and trauma.[6]

Complications

In surgical wound healing, the removal of sutures at the right time is a crucial aspect that greatly affects the results. Deviations from the ideal removal intervals can result in a number of issues. Removing sutures too soon could make the incision more susceptible to dehiscence, which would slow down the healing process and raise the possibility of complications like infection. The aesthetic result may also be impacted by premature removal, which can leave suture tracts or markings, particularly in fragile tissues. Delaying suture removal, on the other hand, increases the amount of foreign material that remains in the wound longer, which increases the risk of infection and protracted inflammation.[29]

Delays in removal could lead to tissue response, hypertrophic scarring, and compromised wound cosmesis. The wound's overall integrity and tensile strength can be affected by both early and late removal. Furthermore, the healing process may be made more difficult by elements such as the development of keloid formation, persistent discomfort and allergic reactions. In order to minimize complications and promote good wound healing, surgeons must carefully balance the risks and benefits, taking into account patient-specific circumstances and wound features. This will help them make an informed decision regarding the best time to remove sutures. It's critical that individuals notify their healthcare physician as soon as they experience any unexpected symptoms or consequences. In order to reduce the risk of complications related to gingival sutures, healthcare professionals should carefully select acceptable suture materials, use proper surgical methods, and provide clear instructions for postoperative care. Scheduling routine follow-up appointments is also essential for tracking the process of healing and resolving any new problems.[11]

Materials and Methods

Subjects

A comparative study was conduct on 50 patients attended at Ibn Sina University of Medical and Pharmaceutical Sciences College of Dentistry. The participants from both genders (25 females and 25 males). The age of male participants was ranging from 30 to 50 years and the age of female participants ranging from 20 to 55 years.

Materials and methods

The sample was selected by using systemic random sampling. Tooth extraction was atraumatic extraction and the socket was sutured by using 0.03 mm suture material, needle holder and tissue forceps to hold the mucosa during suturing, this is all done in the first visit. The second visit suture material was removed by using scissor and tweezers and in the same visit we assess socket condition by using a case sheet that approved by (Professor. DR. Emad Hammody Abdulla.) to assess inflammation index, gingival index and healing index. The data was collected within a period extended from (9/11/2023) to (3/3/2024) and presented in the tables.

Statistics

Data processing and analysis were carried out by (SPSS program, version 24). Analysis of data was done by using Mann-Whiteny Test to compare means for 3 groups. The analysis was accepted at $p<0.05$ as the limit of significant and $p<0.01$ as highly significant.

Results

Table 3-1 reveals the suture state between 5 days and 7 days. It was found that the median of gingival index and healing index on the seventh day was higher than on the fifth day. While there is no difference of inflammation index between the two days. Also, the table reveals significant difference was found between the fifth day and the seventh day regarding both gingival index and healing index. There is no significant difference in the P-value of the inflammation index between the two days.

Table 3-1 Suture state between the fifth and seventh days.

Mann-Whiteny Test	Median (IQR)		
	5 Days	7 Days	P – Value
	(N=25)	(N=25)	
Inflammation Index	1(2)	1(1)	0.002
Gingival Index	3(2)	4(1)	< 0.001
Healing Index	3(2)	4(1)	< 0.001

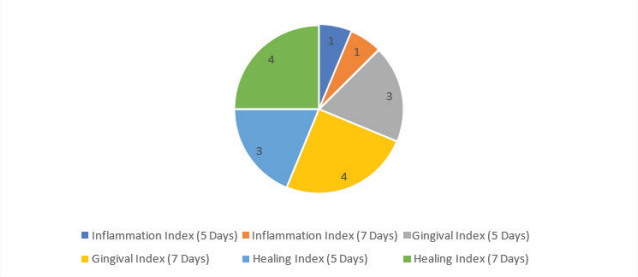

Illustration.1 Suture state between the fifth and seventh days.

Table 3-2 shows the suture state among males and females. The gender was associated with these indices, it was found that healing and gingival indices was higher than inflammation index in both gender after five days from suture removal. Also, it was found that after seven days from suture removal healing and gingival indices was higher than inflammation in both genders. The table reveals that there is no significant difference in P-value among both genders.

Table 3-2 suture state among males and females.

Mann-Whiteny Test	Median (IQR)		
	Female	Male	P – value
After 5 days	(N=25)	(N=25)	
Inflammation Index	1(2)	1(3)	0.4
Gingival Index	3(2)	2(3)	0.9
Healing Index	3(2)	2(2)	0.5
After 7 days			
Inflammation Index	1(1)	1(1)	0.6
Gingival Index	4(1)	4(1)	0.6
Healing Index	4(1)	4(0)	0.2

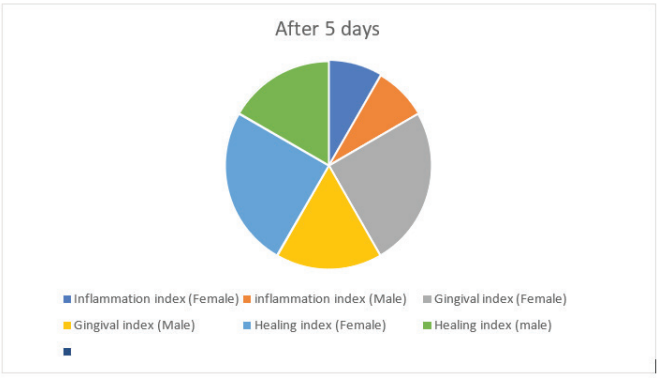

Illustration.2 suture state among males and females after 5 days from suture removal.

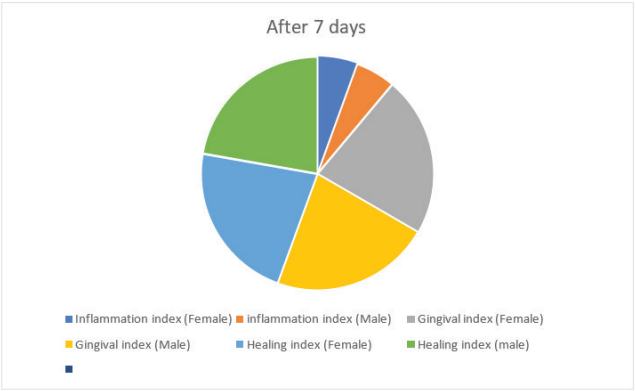

Illustration.3 suture state among males and females after 7 days from suture removal.

Discussion

Suturing is a foundational surgical skill that must be mastered to provide optimal outcomes for our patients. Careful and skilled removal of sutures will minimize the possibility of pain, wound separation, infection, and suture scarring. It has been observed that premature or hasty removal of sutures may lead to separation of the wound edges. On the other hand, if sutures are left in the wound too long, they will act as foreign bodies and cut through the skin tissue, increasing the amount of scarring. Also, knowledge of the suture, needles (type, size, shape), instruments, and techniques are absolutely necessary in order to be a competent surgeon. There is no suture superior to the others in each aspect. The differences in terms of tissue reaction and bacterial adhesion between sutures should be always considered in the selection of the appropriate suturing material. Delicate and proper soft tissue handling during various suturing techniques can insure optimal tissue healing and high esthetic result. Generally, data collected at Ibn Sina University was very helpful. In this study, there was two periods to remove the sutures after tooth extraction, after the fifth day and the seventh day. This study showed that there was a little difference in inflammation index between two periods, because early suture removal lowers the possibilities of complications from sutures, such as tissue infection. There were 25 patients came on day 5 to remove the suture and another 25 patients came on day 7 to remove the suture. The inflammation index was assessed depending on an assessment modified from Masse et al (1993) study 14. It was found that on day 5, the inflammation index of 6 patients was 0, 6 patients were +1, 6 patients were +2 and 7 patients were +3. Although, on day 7, it was found that the inflammation index of 11 patients was 0 and for 14 patients was +1.

There is no study conducted on humans that matches our scientific research, only a study conducted on rabbits carried out to compare the effect of different suture removal time on surgical wound healing.[28]

Conclusions

1. Ideal Suture Removal time: Our research shows that surgical wound healing results are highly influenced by the time of suture removal. After a thorough investigation, it has been concluded that the best time to remove sutures in order to maximize wound closure and reduce problems is [insert precise time period].

2. Impact on Wound Healing: The findings imply that wound healing may suffer if sutures are removed prematurely or after the prescribed period of time. While delayed removal may contribute to prolonged inflammation and scar formation, early removal may result in poor closure, increasing the risk of dehiscence and infection.

3. Clinical Implications: For medical practitioners engaged in surgical wound care, these findings have significant clinical ramifications. Following the recommended timing for suture removal is essential for improving patient outcomes and lowering the risk of problems following surgery.

4. Patient-Centered Care: It is crucial to provide patient-centered care by adjusting the time of suture removal to each patient's needs and features. The ideal timing for suture removal should be carefully determined by taking into account factors including the location of the incision, the quality of the tissue, and the patient's general state of health.

5. Future Directions: Additional research is necessary to examine other variables, such as the use of cutting-edge wound closure techniques or the administration of innovative wound care products, that may affect the ideal timing of suture removal. Further research in this field will improve our comprehension of the mechanisms involved in wound healing and help create evidence-based recommendations for suture removal procedures.

Recommendations

These suggestions for the incoming researchers to inspire studies under the same aims, includes:
1. In order to maximize surgical wound healing results, healthcare practitioners should abide by evidence-based standards regarding the time of suture removal.

2. In order to maximize wound closure and reduce problems, it is crucial to schedule suture removal according to each patient's unique characteristics, such as wound location, tissue quality, and general health.

3. Continuous Education: To keep healthcare professionals abreast of the most recent developments and best practices in wound care, including the appropriate timing for suture removal, ongoing education and training programs should be put in place.

4. Future Research: To better understand the effects of several factors, including surgical procedures and patient comorbidities, on the timing of suture removal, more research is required. Better patient outcomes and the creation of more sophisticated clinical practices will result from this.

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