ORIGINAL RESEARCH

Comparsion between three suture materials in periodontal surgery





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ABSTRACT

Following periodontal surgery, a range of suture materials are available for primary wound closure. The purpose of this study was to re-examine the suture threads characteristics, properties and biological interactions.Silk has been used as biomedical suture material for centuries and it provides important clinical repair options for many applications but the disadvantage is the biocompatibility problems reported for silk obtained from contamination of residual sericin (glue-like proteins). Now-a-days, Vicryl suturing material is the commonly used material in oral surgery, because it does not allow adherence of plaque and is well suited for handling.Nylon is a nonabsorbable, monofilament composed of polyamides, which has long-standing tensile strength and induces minimal cellular reaction, while Vicryl is a synthetic absorbable polyglactin suture (copolymer of glycolide and lactide) but induces more reaction.

INTRODUCTION

Despite the wide variety of suture materials that are available, specialised suture materials are frequently utilised to mend tissue and speed the healing of oral wounds. Due to the significance of certain oral cavity characteristics including the presence of saliva, different biota, high vascularization, mastication, and swallowing, clinicians must be aware of the nature of suture materials. The purpose of wound closure is to promote rapid healing, facilitate functional recovery, and preserve the aesthetics of the surgical site. Because of this, it is crucial to choose the suture material, needle diameter, and procedure very carefully. These factors enable the surgical flaps to be properly stable, which improves patient comfort.High tensile strength, low tissue reactivity, uniform thickness, flexibility for easy handling, the capacity to maintain knot security, minimal inflammatory response to aid in healing, and sterility are all desirable characteristics of a suture material. Suture materials can be roughly divided into two categories: absorbable and nonabsorbable. They can further be categorised into natural or synthetic, coated or uncoated, dyed or undyed, and monofilament or polyfilament depending on their structure.

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CONTENTS

NYLON

Nylon is a nonabsorbable monofilament suture which is most commonly used for skin closure. Nylon sutures are available from U.S.P. size 2 to size 10-0. Suture is available in black colour.Nylon sutures are composed of polymers made from 100% homo polymer of polyamide grade 6.6.

CLINICALAPPLICATION

Nylon sutures are widely used for general closure, skin and plastic surgery

Used in ophthalmic, plastic, neurological surgeries and micro procedures

Monofilament Nylon is a suitable material where considerable resistance for long period of time is required (tendons, ligaments, etc.).

ADVANTAGE

Possess excellent tensile strength

Passthrough tissues easily

Nylon sutures have excellent knot security properties

Can be easily removed with no tissue adherence

It is infection resistant.

sutures do not elongate while knotting.

Extent to which absorbed fluid is transferred along the suture

have good handling

DISADVANTAGE

They are usually not recommended for attachment of artificial prostheses in cardiovascular surgery

They also do not support infection and maintain tensile strength indefinitely in tissues

ETHICON

Ethicon sutures are synthetic sutures which may be absorbable or non-absorbable. Absorbable sutures are vicrylrapide, monocryl, coated vicryl and pdsII. Non absorbable sutures are ethibond ,prolene,stainless steel etc.

CLINICAL APPLICATION

Vicrylrapide suture (coated) – Superficial soft tissue approximation of the skin and mucosa where short term wound support is required, Dental surgeries

Monocryl suture – General soft tissue approximation or ligation

Coated vicryl suture polyglactin- Used in ophthalmology and general soft tissue approximation or ligation

PDS II polydiaxonone– Soft tissue approximation,including use in pediatric cardiovascular tissue where growth is expected to occur. It is also used in ophthalmic surgery and fascia closure

ADVANTAGES

Monocryl sutures: Bactericidal and bacteriostatic effects.

Smooth surface, No capillarity and is more thinner

Vicryl: Minimal tissue reactivity and can be used in infected wounds

Coated with polyglactin 370 and calcium stearate which allows easy passage through tissues as well as easier knot placement

High initial tensile strength, Soft and pliable, Good handling, Good knotting

It gives wound support upto 12 days

Its absorption is associated with minimal tissue reaction facilitating improved cosmetics and reduction of postoperative pain

Polydioxanone : Ease of knot tying and knot security

Minimal tissue reaction and used for wounds under tension or contaminated wounds

DISADVANTAGE

Monocryl : Handling and knotting difficulty

Any knick or crimp in the material leads to breakage

Vicryl: Bacterial harbors- On skin wounds associated with delayed absorption as well as increased inflammation

Capillary action, Tissue trauma, Thicker

SILK

Silk suturing material is natural, multifilament and non absorbable suturing material.it is composed of two materials called fibroin and sericin.fibroin is obtained from the domesticated species Bombyx mori of the family bombicidae.fibroin is covered by the protein called sericin which is a silk material.it has a smooth flow through the tissue while maintaining the knot security. It is coated with a bees wax. Silk material has an excellent strength and handling property and it is flexible, coated with wax for smooth passage and it has no tissue

reactions.At the same time, some biological responses to the protein have raised questions about biocompatibility.

ADVANTAGE

Medical suture requirements:

1. In the wound healing process to maintain sufficient strength, but also should be able to stretch to adapt to wound edema, and with the retraction of the wound and back to its original length.

2. After wound healing it can self-degradation absorption, no longer leave foreign body.

3. Does not produce inflammation.

4. Non-irritating.

5. Easy dyeing, sterilization, disinfection and other treatment.

6. Can form a secure knot.

7. Easy production, low prices, mass production.

DISADVANTAGE

1. Least tensile strength of any Suture Material

2. High tissue reactivity (similar to Catgut Suture)

3. Increases risk of infection due to high capillarity

4. High coefficient of friction

MATERIALS AND METHODS

This study's objective was to assess and compare the mechanical characteristics of three suture materials: Silk, Ethicon, and nylon of size 3-0,4-0,4-0 respectively.The light microscope was magnified 10x to view these 3 suture materials.

DPX mountant was applied to three separate slides, for each suture material, and the mounting medium is holds the cover slip to the slide. Silk and Vicrylethicon appeared to be braided when viewed under a microscope, while nylon appeared to be a monofilament suture material.

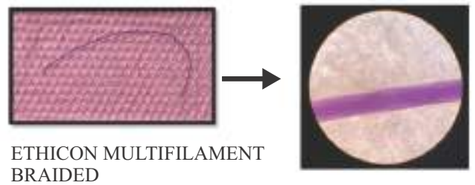
RESULT

From this study we confirmed that vicryl ethicon and silk are multifilament braided type and nylon suture material is monofilament.Since multifilament braided are more stronger and good at handling they are commonly used than monofilaments.

SILK

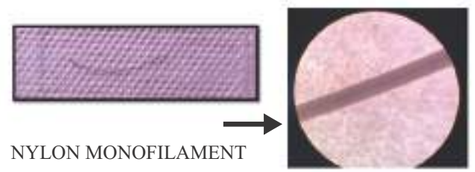
SILK- MULTIFILAMENT BRAIDED TYPE

ETHICON VICRYL



ETHICON MULTIFILAMENT BRAIDED

NYLON



NYLON MONOFILAMENT

DISCUSSION

Suture materials play an important role in wound repair by providing support to healing tissues. Selection of a suture material should be based on an understanding of the physical and biological properties of the material, assessment of the wound, the healing rate of different tissues, and the patient's physical condition. Too often, selection has been governed by the personal preference and training experience of the surgeon and by economic reasons.

Nylon sutures are non-absorbable sutures and possess excellent tensile strength. Nylon sutures are available in black colour. Nylon sutures have excellent knot security properties and can be easily removed with no tissue adherence. These sutures are

infection resistant..

Silk suture is a non-absorbable suture.Braided to improvise the knot security.Coloured black to have a very good visibility during surgical procedures.Coated with bee wax for easy pull out suture.Easy pull out sutures.As it a natural material it is very slowly absorbed in the body over a period of 2 years hence removal is not required from the endodermis.

Vicryl (polyglactin 910) is an absorbable, synthetic, usually braided suture, manufactured by Ethicon Inc., a subsidiary of Johnson and Johnson. A monofilament version is also made for use in ophthalmic practice. It is indicated for soft tissue approximation and ligation.

Monofilament suture – a single stranded filament suture (e.g nylon). They have a lower infection risk but also have a poor knot security and ease of handling.

Multifilament suture – made of several filaments that are twisted together (e.g braided silk or vicryl). They handle easier and hold their shape for good knot security, yet can harbour infections.

The size of a suture represents its diameter and follows a scale similar to negative and positive numbers. In the center of the scale, you'll find zero. To the right of zero, the numbers and sizes progressively get larger. For example, a size-two suture is smaller than a three. A large suture might be used to stitch abdominal tissue

To the left of zero, suture sizes get progressively smaller. Small suture sizes are represented by a number followed by zero. For example, a 3-0 suture is smaller than a 2-0 suture. An extremely small suture, such as one with a 10-0 size, might be used to repair an eye incision.

As sutures get smaller, they lose tensile strength. Physicians typically pick the smallest suture possible that will adequately keep a wound closed to minimize tissue trauma.

In this study we used nylon and ethicon of size 4.0 and silk of size 3.0.

CONCLUSION

Literature review clearly suggests that the use of vicryl sutures will be beneficial than silk suturing material.Vicryl is an absorbable suture material that may be preferred over a non-absorbable suture material like nylon because the latter is more likely to require repeated administration oflocal anaesthetics due to complications and a higher risk of suture removal. Care should be taken to ensure secure knotting of vicryl sutures.

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