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Original Research Article

COMPARISON OF WOUND GAPING AND INFECTION IN "NO KNOT" SUBCUTICULAR TECHNIQUE VERSUS STANDARD SUBCUTICULAR TECHNIQUE IN ELECTIVE SURGERIES

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Abstract

Background: Surgical knots on the suture line serve as an anchoring mechanism; however, they also pose a risk of infection and discomfort. The purpose of knotless barbed sutures is to avoid difficulties caused by knots. Preventing incisional surgical site infections (SSIs) is crucial because they can lengthen hospital stays, increase medical expenses, and have a detrimental aesthetic impact on patients. **Aim:** The current study was carried out to evaluate the incidence of wound Knot-specific "Knot"/"No Knot" subcuticular technique and to compare the incidence of infection in the " Knot or No Knot " subcuticular technique. **Material and Methods:** This analytical cross-sectional study was carried out for 18 months (April 2021 to September 2022) in patients admitted for elective thyroid and lump breast excision surgeries at the Tirunelveli Medical College and Hospital, Tirunelveli. The wound was evaluated for signs of inflammation, such as erythema, induration, infection, and wound gaping on the third postoperative day. **Results:** Our study included 130 patients, divided equally into two groups (N=65): knot and no-knot. Only five patients in the 'no-knot' group had a wound infection. Wound gapping was found in only six patients in the 'no-knot' group. In addition to the lack of statistically significant differences among the groups regarding wound gaping and infection, the knot group had more patients with wound infection (5.38%) and gaping (6.92%). **Conclusion:** The wound gaping and infection incidence was lower in the no-knot group than in the standard subcuticular technique group.

INTRODUCTION

Suturing techniques have dramatically developed from plant-based sutures by Hippocrates, the father of Medicine, to the development of Polymeric materials that are conjugated with bioactive agents to achieve control over release kinetics and improve the targeting efficiency.[1] In addition to skin clips and tissue adhesives, suturing is one of the three primary types of wound closure. Although tissue adhesives are rapid and simple, their cost is higher than other wound-closure techniques. Skin staples are quick and simple to apply, but they cost more than sutures and can hurt during remova.[1,2]

The suturing technique has the benefit of being attractive and may not need to be removed, saving a postoperative visit and any discomfort associated with removing the stitches. Subcuticular suture is the scar's size.[3] A most frequently used method for wound closure. The primary objective of suturing is to position and secure the surgical wounds to promote optimal healing (primary healing). Suturing reduces postoperative pain and increases patient comfort.[4] The major characteristics of modern-day sutures used for wound closure are flexibility, tensile strength, breaking strength, and tissue reactivity. Different types of sutures and techniques exist, depending on the type of tissue being sewn together. A good suturing technique should eliminate dead space in the subcutaneous tissues and minimise the tension that causes wound separation. It involves correct wound placement for relaxed tension lines.[5] Other factors, such as systemic diseases and selection of suture material, also

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influence the outcome. The surgical technique used to close a wound depends on the force and direction of tensions on the wound, the thickness of the tissues to be opposed and anatomic considerations (e.g. eyes, vermilion border of the lips).[6,7]

Continuous subcuticular skin closure is a very helpful and practical technique. Subcuticular stitches are preferred because removing sutures from youngsters may be painful. Subcuticular stitches are appropriate for closing a variety of wounds, including laparoscopic port sites and laparotomy wounds.8 Subcuticular stitching reduces tracking and avoids puncturing the skin. Dissolvable sutures need not be removed to improve patient satisfaction or look good after surgery. They do not lead to inflammation.[9]

There are two further classifications for suture closure: interrupted and intradermal. Suture threads are inserted intradermally into the wound during intradermal wound closure.[10] Intradermal wound closure may be aesthetically pleasing Because of the potential avoidance of the crosshatching linked to the interrupted suture method. Intradermal sutures can be applied with barbed wire, knotted, or knotless sutures. Knots have two possible placements: inside and outside.[11]

When using traditional techniques to place subcuticular stitches, anchoring knots are formed at both ends, which causes a tissue response and hinders the best possible wound healing. Developing sutures with additional properties, such as the release of antibiotics or other therapeutic agents to enhance wound healing, has become an attractive research area for the medical fraternity.[12,13]

Running subcuticular sutures is considered the "holy grail" of suturing techniques. That is, when performed correctly, they provide the best cosmetic outcome. Tying knots securely secure the intradermal suture and reduces the likelihood of wound dehiscence. The drawback is that these knots may serve as potential hubs for bacterial growth, which might raise the wound's susceptibility to infection and stitch abscesses.[13] Additionally, knots may result in localised granulation and irritation, which might hinder the healing of wounds. According to one study, the erosion rate of knots through the skin might reach up to 17% when using Polydioxone Sulfate sutures.[14]

As a solution, newer techniques such as the no-knot subcuticular technique have further decreased tissue reaction along the wound edges with decreased wound gaping and cosmetically better scars.[15] Knotless sutures are generally preferable to knotted ones because of the lower risk of granuloma, infection, discomfort, and stitch abscess. An intradermal suture that is knotless, self-securing, and anchorage-free without the need for additional adhesives. It depends on the number of sutures inserted into the wound to act as anchors.[16]

Preventing incisional surgical site infections (SSIs) is crucial because they can lengthen hospital stays, increase medical expenses, and have a detrimental aesthetic impact on patients.[17]

Aim

The study aimed to evaluate the incidence of wound gaping in the "Knot"/"No Knot" subcuticular technique and to compare the incidence of infection in the "Knot or No Knot " subcuticular technique.

MATERIALS AND METHODS

This analytical cross-sectional study was conducted on 130 patients scheduled for elective thyroid and lump breast excision surgeries in General Surgery at the Tirunelveli Medical College and Hospital, Tirunelveli, for 18 months (April 2021 to September 2022).

A detailed history of each patient was obtained, starting with a history of presenting symptoms, and any co-existing comorbid conditions such as diabetes mellitus, hypertension and Jaundice were ruled out. A thorough physical examination ruled out the presence of pallor, Icterus or Cachexia. Appropriate investigations included CBC, blood sugar, urea, serum creatinine, urine examination, LFT (whenever needed), chest radiography, and ECG (whenever needed) were performed.

Inclusion Criteria

Patients who underwent elective surgeries of the thyroid and breast, including both males and females.

Exclusion Criteria

Patients with anaemia/jaundice/malnutrition, diabetes mellitus/tuberculosis, immunocompromised states, chronic immunotherapy/steroids, emergency/contaminated surgeries, and those developing postoperative cough/ascites/distension were excluded.

Methodology

This study was conducted after obtaining ethical approval from our institution. Patients were included in the study after obtaining their consent. The wound was evaluated for signs of inflammation, such as erythema, induration, infection, and wound gaping on the third postoperative day. Wound infection was defined as any discharge from the wound or the presence of oedema, induration, and erythema along the sutured sites. The wound gaping was considered a factor in epidermal loss or loss of edge opposition and dehiscence (margin separation >2 mm).

RESULTS

Among the 130 patients in this study, 65 were categorised into the knot group and 65 into The No-knot group. Most patients in the < 30 years age group in the knot group had 26 patients, whereas the No Knot group had only 19 patients. The least common age group recorded was > 50 years of age, with the knot group having seven patients and the no knot group having 11 patients. There were more

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female participants in both groups, with 63 and 62 patients in the knot and no-knot groups, respectively. Only two and three patients were in the knot and no-knot groups. The most common diagnosis was multinodular goitre in both groups, with 21 and 18 patients in the knot and no-knot groups, respectively. A solitary nodular goitre is seen in the knot group with ten patients and no knot group with 11 patients. [Table 1]

Thirty-one patients underwent total thyroidectomy using both knot and no-knot techniques. For fibroadenoma breast tissue, 33 patients underwent the knot technique, and 34 had no knot technique. Only one patient with the knot technique underwent a bilateral excision biopsy. [Table 2]

Most patients had no wound infections, with 58 (44.62%) patients in the knot group and 60 (46.15%) in the no-knot group. In comparison, only 7 (5.38%) and 5 (5.38%) patients in the knot and no-knot groups, respectively. There was no significant difference among wound infections using the no-knot subcuticular technique (p = 0.544). However, the incidence of wound infection was lower in the non-knot sub cuticles. [Table 3]

Wound gaping was seen in 9 (6.92%) patients in the knot group and 6 (4.62%) patients in the no-knot group. There were 56 (43.08%) and 59 (45.38%) patients in the knot and no-knot groups, respectively. There was no significant difference in wound gaping in the no-knot subcuticular technique group (p = 0.410). However, the incidence of wound gaping was lower with the no-knot subcuticular technique. [Table 3]

Table 1: Demographic data of the study

		Knot Group	No Knot Group
Age	<30	26	26
	30-39	13	11
	40-50	19	24
	>50	7	11
Mean ± SD		35.1692 ± 14.3315	38.9077 ± 15.3070
Gender	Male	2	3
	Female	63	62
Diagnosis	Bilateral fibroadenoma breast	2	2
	Bilateral lump breast	0	1
	Fibroadenoma left breast	19	11
	Fibroadenoma Right breast	11	11
	Hashimoto thyroiditis	0	1
	Lump left breast	1	2
	Lump right breast	1	7
	Multi Nodular Goiter	20	19
	Solitary nodular goitre	10	11
	Thyroglossal cyst	1	0

Table 2: Procedure done between groups

Procedure done	Knot Group	No Knot Group
Bilateral Excision biopsy	1 (0.77%)	0
Excision biopsy	33 (25.38%)	34 (26.15%)
Total Thyroidectomy	31 (23.85%)	31 (23.85%)

Table 3: Subcuticular Knot and no-knot technique outcome - Wound infection and gaping

		Knot Group	No Knot Group	P value
Wound Infection	Yes	7 (5.38%)	5 (3.85%)	0.544
	No	58 (44.62%)	60 (46.15%)	
Wound gaping	Yes	9 (6.92%)	6 (4.62%)	0.41
	No	56 (43.08%)	59 (45.38%)	

DISCUSSION

Continuous subcuticular sutures are useful in places with the lowest stress, no dead space, and the greatest potential aesthetic outcome. Since the beginning and end of the suture line pierced the epidermis, subcuticular suturing effectively reduced the risk of crosshatching. Although they drew the borders of the wound closer together, the sutures did not significantly strengthen the wound. Therefore, running subcuticular sutures are only used on wounds where deep sutures remove traction, and the wound borders are roughly the same thickness.

As stated earlier, running subcuticular sutures is considered a "holy grail" suturing technique. That is, when performed correctly, they provide the best cosmetic outcome. In our study, 65 patients underwent elective surgery (fibroadenoma excision and total thyroidectomy) with standard subcuticular suturing. In another 65 patients, the skin was closed with the subcuticular 'No knot' technique. Wound complications were compared between the two groups. Wound complications included surgical site wound infections and wound gaping.

In our study, 31 patients underwent total thyroidectomy using both knot and no-knot techniques. For fibroadenoma breast tissue, 33

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patients underwent the knot technique, and 34 had no knot technique. Only one patient who underwent the knot technique underwent a bilateral excision biopsy. The mean age of the patients in the knot group was 35.1692 (±14.3315) years, and that of the no knot group was 38.9077 (±15.3070) years. A similar mean age range of patients was also reported by Krishnamoorthy et al. in their study comparing traditional monofilament knotted sutures with barbed knotless sutures for donor leg wound closure in coronary artery bypass surgery.[18]

Most patients in both groups had no wound infection. Only seven patients in the knot group and 5 in the no-knot group had wound infection. Although there was no statistically significant difference in the incidence of wound infection among the groups, the incidence of wound infection was lower in the group that received no knot subcuticular suturing technique. A recent study showed that suture knots can be a source of infection and leak through the skin after surgery.[19] Another study proposes that adding an extra throw to a knot increased knot body to 1.5-fold and was detrimental to optimal wound healing, further complicating postoperative outcome.[20]

When we analysed the incidence of wound gaping in both groups, it was found that wound gaping in the knot group was seen in nine patients and the no-knot group in six patients. There was no wound gaping in the knot group among the 56 patients and in the no-knot group among 59 patients. Thus, the P value of wound gaping was statistically insignificant, with the incidence of wound gaping in the no-knot technique in six patients compared to less than nine in the knot technique. In a study by Hohenleutner et al., which described the cosmetic status, the Cosmetic results ranged from very good to good at 78.5%, satisfactory at 19.5% and poor at 2% in subcuticular technique with Individual additional superficial sutures to be placed only in 14.7%.[21] Langer also found cosmetically superior scarring with his "NO KNOT" subcuticular technique.[22]

CONCLUSION

Despite advancements in infection control measures and surgical techniques, surgical site infections (SSIs) persist as a significant cause of morbidity and mortality. In elective surgeries like fibroadenoma excision and total thyroidectomy, the retention of subcuticular stitches poses challenges, leading to bulky knots and wound gaping. This study aimed to address these issues by introducing a 'No knot' subcuticular suturing technique. However, statistical analysis revealed no significant reduction in wound gaping and infection with this technique. Nonetheless, the 'no knot' group exhibited lower incidences of wound gaping and infection compared to the standard subcuticular technique group, suggesting potential benefits in improving postoperative outcomes.

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