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Incidence of Wound Infection and Gaping Among Patients Receiving Clean Elective Surgical Incisions with 'knot' vs 'no knot' Technique: A Study from Puducherry

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ABSTRACT
The "No Knot" technique, alternatively referred to as the "subcuticular running suture without knots" or "buried continuous suture," has become increasingly popular in recent years due to its alleged benefits compared to conventional closure procedures. To compare the incidence of wound infection and gaping among patients receiving clean elective surgical incisions with 'knot' vs 'no knot' technique. The research investigation was carried out between September 2022 and July 2024 at Department of General Surgery, Aarupadai Veedu Medical College and Hospital, Puducherry. A total of 264 study subjects were chosen based on certain inclusion and exclusion criteria. These subjects were then separated into two groups, with 132 from each group. There are two groups: Group A, which uses the "No Knot" subcuticular technique and Group B, which uses the traditional Knot subcuticular approach. Incidence of wound infection was comparatively less in the No Knot group (8.3%, n = 11 in 'No-Knot Group' Vs 10.6%, n = 14 in 'Knot Group'). Incidence of wound gaping was again comparatively less in the No Knot group (7.6%, n = 10 cases in 'No-Knot Group' Vs 12.1%, n = 16 in 'Knot Group'). "NO KNOT" subcuticular technique is more effective than the standard subcuticular technique in terms of the occurrence of wound gaping, infection and its outcome in patients who undergo clean elective surgeries.

INTRODUCTION

The closure of surgical wounds is a crucial component of surgical interventions, since it has a direct impact on various postoperative outcomes, including wound healing, infection rates cosmetic attributes[1,2]. The conventional approach to wound closure has involved the utilization of many techniques, such as interrupted sutures, continuous sutures subcuticular sutures[3]. Every technique possesses its own set of pros and limitations the selection of a closure method is frequently contingent upon various criteria, including the type of wound, its location the preference of the surgeon[4,5]. The "No Knot" technique, alternatively referred to as the "subcuticular running suture without knots" or "buried continuous suture," has become increasingly popular in recent years due to its alleged benefits compared to conventional closure procedures[6,7]. The present methodology involves the insertion of a continuous suture into the subcutaneous tissue without the use of knots, hence obviating the necessity for suture extraction and perhaps mitigating the likelihood of tissue damage and infection[8,1]. Advocates of the "No Knot" technique contend that it yields enhanced cosmetic outcomes, facilitates expedited wound healing diminishes the occurrence of wound problems in comparison to conventional closure methodologies[9]. Both methodologies possess distinct benefits and constraints, resulting in continuous deliberations among surgeons concerning their relative effectiveness, safety outcomes in terms of patient satisfaction. Therefore this study was conducted to assess and compare the incidence of wound infection and gaping among patients receiving clean elective surgical incisions with 'knot' vs 'no knot' technique.

MATERIALS AND METHODS

This study was hospital based, prospective in design. It was carried out at a tertiary care teaching hospital in Puducherry. Patients presenting to the department of General Surgery of the study site who were posted for clean elective surgeries and fulfilling the inclusion and exclusion criteria, formed the study population. The research was conducted from September 2022-July 2024.

Inclusion Criteria:

- Age group 18-60 years both gender inclusive
- All patients undergoing elective clean surgery with the following Surgical procedures
- Thyroidectomy
- Hernioplasty
- Fibroadenoma

Exclusion Criteria: Patients with

- Immuno-compromised states
- Chronic immunotherapy/steroids
- Contaminated surgeries

Sample size was calculated considering the mean (SD) of Wound Cosmesis scored in a Visual Analogue Scale from 0-100 after intervention using knot subcuticular technique as 72.23 (4.805) and assuming 69.58 (3.355) for 'no knot' subcuticular technique (Haribabu *et al*), with alpha error as 5% and power as 80%, the sample size was calculated using the formula for estimating the difference between means and was found to be minimum 132 per group[10]. Thus, 264 study subjects (132 in each group) were taken up for this study. All patients included in the study were interviewed to ascertain their clinical histories according to Data Collection Proforma. All patients posted for elective surgeries were admitted a day prior to surgery. All necessary fitness examinations were done and anesthetist fitness was obtained. Informed consent was obtained from patients for participation in the study. Ethical clearance was obtained from the institutional ethical board. All clean elective surgeries received standard preoperative care. All clean elective surgeries received preoperative antibiotics. The operative site was cleaned and only clipping of hair was done with aseptic precaution. The mode of Anaesthesia was chosen according to the surgery. Painting was done with 10% povidine iodine solution for all cases. Each patient was followed up at discharge, 1 week and 6weeks. All wound closure were done using same suture material.

Interviews were conducted with patients to evaluate their satisfaction levels with the treatment. The participants were instructed to provide information regarding the impact of the treatment on their lifestyles in the period after the surgical procedure. The data that was gathered was inputted into the Microsoft Excel spreadsheet, suitably coded subsequently reviewed for potential inaccuracies. The analysis was conducted using Statistical Package for Social Sciences (SPSS), version 20 (IBM, Chicago, USA), after compiling the gathered data. The data underwent analysis using suitable statistical tests. The analysis of the gathered data was conducted utilizing suitable statistical techniques. The researchers utilized a Chi-square test to examine the proportions of desired outcome variables between the 'Knot Group and 'No-Knot Group' where appropriate. The mean values between the 'Knot Group' and 'No-Knot Group' were compared using an unpaired t-test. The tests were conducted with a significance level of 5%. Therefore, a relationship was considered significant if the p value is below 0.05.

RESULTS AND DISCUSSION

In the 'Knot Group' the average age of the study subjects was 38.1 years (±12.4), while in the 'No-Knot Group' it was 38.4 years (±12.8). The majority of study

Table 1: Distribution of study subjects according to their age group in 'Knot Group' and 'No-Knot Group'

	Knot Group		No-Knot Group		
Age group	**Frequency**	**Percent**	**Frequency**	**Percent**	**Test of significance**
<20 years	01	0.75	02	01.5	x^2 value =1.49, df=3,
21 to 40 years	84	63.6	75	56.8	p-value = 0.68
41 to 60 years	33	25.0	38	28.8	
>61 years	14	10.7	17	12.9	
Total	132	100.0	132	100.0	

Table 2: Distribution of study subjects according to incidence of wound infection in 'Knot Group' and 'No-Knot Group'

	Knot Group		No-Knot Group		
Wound Infection	**Frequency**	**Percent**	**Frequency**	**Percent**	**Test of significance**
Yes	14	10.6	11	8.3	x^2 value =0.18, df=1,
No	118	89.4	121	91.7	p-value = 0.67
Total	132	100.0	132	100.0	

Table 3: Distribution of study subjects according to wound gaping in 'Knot Group' and 'No-Knot Group'

	Knot Group		No-Knot Group		
Wound Gaping	**Frequency**	**Percent**	**Frequency**	**Percent**	**Test of significance**
Yes	16	12.1	10	7.6	x^2 value = 5.7, df=1 ,
No	116	87.9	122	92.4	p-value = 0.02*
Total	132	100.0	132	100.0	

participants in both the 'Knot Group' and 'No-Knot Group' fell within the age range of 21-40 years. Specifically, n = 84, accounting for 63.6% of the total n = 75, representing 56.8% of the total. The statistical analysis revealed that there was no significant difference in age groups between the study subjects in the 'Knot Group' and the 'No-Knot Group' (p = 0.68). (Table 1) Incidence of wound infection was 10.6%, n = 14 instances within the 'Knot Group' in contrast to 8.3%, n = 11 within the 'No-Knot Group'. The statistical analysis revealed that there was no significant difference in the incidence of wound infection between the study individuals in the 'Knot Group' and the 'No-Knot Group' (p = 0.67). (Table 2) Incidence of wound gaping was 12.1% , n = 16 in 'Knot Group' as compared to 7.6%, n = 10 in 'No-Knot Group'. A statistically significant difference in the presence of wound gaping was seen between the study patients in the 'Knot Group' and the 'No-Knot Group' (p = 0.02). (Table 3) The current study observed that the occurrence of wound infection was 10.6%, with a sample size of[14], in the 'Knot Group', compared to 8.3%, with a sample size of 11 instances, in the 'No-Knot Group'. The statistical analysis revealed that there was no significant difference in the presence of wound infection between the study individuals in the 'Knot Group' and the 'No-Knot Group'.

Another study conducted in Tamilnadu also reported a comparable finding. A total of 130 patients were enrolled in the study, with an equal distribution between two groups (N = 65): knot and no-knot. Out of the 'no-knot' group, only five individuals experienced a wound infection. Furthermore, it is worth noting that the knot group had a higher prevalence of wound infection (5.38%) compared to the other groups, despite the absence of statistically significant differences among them. The incidence of wound infection was reduced in the group that did not have a knot compared to the group that used the usual subcuticular approach[11]. The potential efficacy of subcuticular suture in preventing superficial incisional surgical site infections (si-SSI) in patients having elective clean-contaminated or contaminated surgery has been supported by many observational and randomized studies[12,13]. The randomized clinical trial conducted by Kobayashi *et al*. investigated the effects of subcuticular suture on the incidence of si-SSI in colorectal surgery, along with other outcomes. There were no statistically significant differences observed in the occurrence of si-SSI compared to traditional stapling closure (8.7% vs. 9.8%). Additionally, no significant differences were discovered in relation to other wound issues, such as seroma, or the overall cosmetic outcome[14]. The results presented here are consistent with the findings reported by Tsujinaka *et al*. and Tanaka *et al*., who also examined the potential impact of subcuticular suture on si-SSI following colorectal surgery[4,15].

In a randomized clinical trial conducted by Imamura *et al*[16]. a comparison was made between subcuticular suturing and stapled closure in a diverse group of broad visceral abdominal surgeries. These surgeries encompassed both urgent and elective procedures such as upper gastrointestinal, colorectal, vascular, HBP thoraco-abdominal surgery. The findings of the study indicated that subcuticular suturing did not result in an increased incidence of surgical site infections (si-SSI), as evidenced by a similar si-SSI rate of 12.62% compared to 13.4%. The study found that the occurrence of wound gaping was 12.1% (n = 16) in the 'Knot Group' and 7.6% (n = 10) in the 'No-Knot Group'. The statistical analysis revealed a significant difference in the presence of wound gaping between the study individuals in the 'Knot Group' and the 'No-Knot Group'. The findings of our study are consistent with prior research conducted in Tamilnadu. A total of 130 patients were enrolled in the study, with an equal distribution between two groups (N = 65):

knot and no-knot. Only six individuals in the 'no-knot' group exhibited wound gapping. Furthermore, it is worth noting that the knot group had a higher prevalence of wound gaping (6.92%) compared to the other groups, despite the absence of statistically significant differences among them. The incidence of wound gaping was reduced in the group treated with the no-knot technique compared to the group treated with the usual subcuticular technique[12].

CONCLUSION

Based on the results of this study, it can be inferred that the “no knot” subcuticular technique is more effective than the standard subcuticular technique in terms of the occurrence of wound gaping, infection its outcome in patients who undergo clean elective surgeries. Both patients who undergo skin wound closure with the 'knot' technique and those who undergo the 'no knot' technique are included in the analysis.

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