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A study comparing the cosmetic outcomes in “no knot” vs standard subcuticular suture technique in clean elective surgical incisions

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ABSTRACT

Introduction: Through a comprehensive analysis of the advantages and disadvantages associated with the "No Knot" technique and the conventional subcuticular suture technique, surgeons will acquire enhanced knowledge to make well-informed choices pertaining to wound closure approaches. Consequently, this knowledge has the potential to enhance patient outcomes and satisfaction. **Aim:** The aim of study was to explore & compare the cosmetic outcomes in “no knot” vs standard subcuticular suture technique in clean elective surgical incisions. **Methods:** This study was carried out between September 2022 and July 2024 at Department of General Surgery, Aarupadai Veedu Medical College & 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. **Results:** Mean Visual Analogue Scale (VAS) score was comparatively more in the No

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Knot group [72.9 (±9.8) in 'No-Knot Group' Vs 66.9 (±11.9) in 'Knot Group']. Mean Hollander Wound Evaluation Score was comparatively more in the No Knot group [4.76 (±0.75) in 'No-Knot Group' Vs 4.15 (±1.24) in 'Knot Group']. **Conclusions**: No Knot group provided a better cosmesis than the other group. Therefore, 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 cosmetic outcome in patients who undergo clean elective surgeries.

Keywords: standard subcuticular suture, cosmetic outcomes, Visual Analogue Scale, Hollander Wound Evaluation Score

Introduction

The field of surgical wound closure techniques has undergone substantial advancements over time, with the primary objective of enhancing outcomes through the reduction of problems and the enhancement of visual appeal.[1] Two often employed ways for closing clean elective surgical incisions include the "No Knot" approach and the standard subcuticular suture technique, among the several possible methods. Both methodologies possess distinct benefits and constraints, resulting in continuous deliberations among surgeons concerning their relative effectiveness, safety, and outcomes in terms of patient satisfaction.[2-4]

The ramifications for clinical practice, surgical training, and patient care are anticipated to be substantial based on the findings of this comparative study.[5,6] Through a comprehensive analysis of the advantages and disadvantages associated with the "No Knot" technique and the conventional subcuticular suture technique, surgeons will acquire enhanced knowledge to make well-informed choices pertaining to wound closure approaches.[7,8] Consequently, this knowledge has the potential to enhance patient outcomes and satisfaction.[9,10]

Our hypothesis is that the "No knot" subcuticular approach may exhibit more efficacy compared to the normal subcuticular technique in the closure of operational skin wounds. This is particularly relevant in terms of overall result in elective surgeries. This study aims to offer evidence-based insights to inform clinical decision-making and enhance surgical practices by a comprehensive

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analysis of cosmetic outcomes in “no knot” vs standard subcuticular suture technique in clean elective surgical incisions.

Materials and methods

The design of this study was prospective and conducted in a hospital setting. The study was conducted at an advanced teaching hospital in Puducherry. The study population consisted of patients who were admitted to the department of General Surgery at the study location for clean elective procedures and met the specified inclusion and exclusion criteria. The study was carried out between September 2022 and July 2024.

Inclusion criteria were; age group 18-60 years both gender inclusive & all patients undergoing elective clean surgery with the following surgical procedures, thyroidectomy, hernioplasty and fibroadenoma. Exclusion criteria were patients with immuno-compromised states, chronic immunotherapy/steroids and contaminated surgeries.

Sample size was calculated considering the mean (SD) of Wound Cosmesis scored in a Visual Analogue Scale from 0 to 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. Thus, 264 study subjects (132 in each group) were taken up for this study.

The clinical histories of all patients included in the study were obtained through interviews, following the guidelines outlined in the Data Collection Proforma. All individuals scheduled for elective surgical procedures were admitted one day prior to the scheduled surgery. All requisite fitness assessments were conducted, and the anesthetist's physical fitness was assessed. Standard preoperative treatment was provided for all clean elective operations. Preoperative antibiotics were administered to all clean elective operations. The surgical site was sterilized and only the hair was clipped using aseptic techniques. The selection of the anesthesia mode was based on the specific surgical procedure. In all instances, the painting process involved the utilization of a 10% povidine iodine solution. Every patient was monitored at the time of release, as well as at 1 week and 6 weeks. The suture material used for all wound closures was same. An independent surgeon, who was unaware of the closure process, assessed the wounds using the Hollander Wound Evaluation Score (HEWS). The wound score encompassed six clinical factors, namely the absence of step-off boundaries, contour defects, wound margin separation greater than

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2mm, excessive distortion, edge inversion, and overall cosmetic look. The measurements were conducted by the lead investigator or a single surgeon in order to achieve appropriate grading. Each of these criteria was assessed using a scale ranging from 0 to 1 for patients. By summing the scores of six variables, a comprehensive cosmetic score was derived. An optimal score was defined as 6, while a score of 5 or lower was considered suboptimal. In addition, the wounds were documented through photography and assessed for cosmesis using the Visual Analogue Score. The cosmetic Visual Analog Scale (VAS) is a 100 mm line that ranges from 0 to 100, with the worst scar rated at 0. The scar was evaluated by a surgeon who was unaware of the wound closure technique. The measurements of the score ranged from 0 to 100 millimeters. The average subjective assessment score (VAS) for each group was determined by comparing it to a photograph.

The researchers conducted interviews with patients in order to assess their levels of satisfaction with the treatment. The participants were given instructions to furnish details pertaining to the influence of the treatment on their lifestyles during the postoperative period. The collected data was entered into the Microsoft Excel spreadsheet, appropriately entered into codes, and then examined for possible mistakes. The data was compiled and analyzed using the Statistical Package for Social Sciences (SPSS), version 20 (IBM, Chicago, USA). The data was subjected to subsequent examination utilizing appropriate statistical techniques. The examination of the collected data was carried out employing appropriate statistical methodologies. A Chi-square test was employed by the researchers to analyze the relative proportions of desired outcome variables between the 'Knot Group' and 'No-Knot Group', as deemed acceptable. An unpaired t-test was employed to compare the mean values of the 'Knot Group' and 'No-Knot Group'. This study employed a significance level of 5% for the conducted tests. Consequently, a link was deemed statistically significant when the p-value was less than 0.05.

Results

Gender wise majority of study subjects both in ‘Knot Group’ & ‘No-Knot Group’ were females; n=75, 56.8% & n=71, 53.8% respectively. The statistical analysis revealed that there was no significant difference in gender between the study subjects in the 'Knot Group' and the 'No-Knot Group' (p=0.71). The gender of study subjects in both groups was comparable. (Table 1)

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Table 1: Distribution of study subjects according to their gender in 'Knot Group' & 'No-Knot Group'

Gender	Knot Group		No-Knot Group		Test of significance
	Frequency	Percent	Frequency	Percent	
Male	57	43.2	61	46.2	$\chi 2$ value =0.14, df=1, p-value = 0.71
Female	75	56.8	71	53.8	
Total	132	100.0	132	100.0	

The average Visual Analogue Scale (VAS) score of 66.9 (±11.9) for study subjects in the 'Knot Group' and 72.9 (±9.8) for subjects in the 'No-Knot Group', in relation to the cosmetic outcome of two types of procedures in the research issue. The statistical analysis revealed a significant difference in the mean Visual Analogue Scale (VAS) score between the study subjects in the 'Knot Group' and 'No-Knot Group'. The independent sample t-test for equality of means yielded a p-value of 0.000, while the Levene's Test for equality of variances yielded a p-value of 0.004. (Table 2)

Table 2: Distribution of study subjects according to cosmesis rating (VAS score) in 'Knot Group' & 'No-Knot Group'

Cosmesis rating (VAS score)	Knot Group	No-Knot Group	Test of significance	
			Independent sample t-test for equality of means	Levene's Test for equality of variances
N	132	132	t=4.444, df=262, Sig. (2-tailed)=0.000	F=8.590, Sig. =0.004
Mean	66.9545	72.9394		
Std. Deviation	11.97317	9.80089		
Std. Error Mean	1.04213	.85306		

Regarding wound evaluation of two types of surgeries in the research question, table 8 depicts that mean Hollander Wound Evaluation Score was 4.15 (±1.24) among study subjects in 'Knot Group' as compared to 4.76 (±0.75) among subjects in 'No-Knot Group'. The distinction in mean Hollander Wound Evaluation Score between study subjects in 'Knot Group' & 'No-Knot Group' was found to be statistically significant with p=0.000 as per both independent sample t-test for equality of means & Levene's Test for equality of variances. (Table 3)

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Table 3: Distribution of study subjects according to Hollander Wound Evaluation Score in 'Knot Group' & 'No-Knot Group'

Hollander Wound Evaluation Score	Knot Group	No-Knot Group	Test of significance	
			Independent sample t-test for equality of means	Levene's Test for equality of variances
N	132	132	t=4.824, df=262, Sig. (2-tailed)=0.000	F=46.567, Sig. =0.000
Mean	4.1591	4.7689		
Std. Deviation	1.24072	.75515		
Std. Error Mean	.10799	.06573		

Discussion

The visual manifestation of a surgical scar is either a main consideration in the context of a cosmetic procedure or an unavoidable consequence of surgery in other cases. For patients, scarring is often the sole visible evidence of a significant life event, which can potentially deter them from undergoing elective procedures. However, practitioners tend to underestimate the impact of scarring, as evidenced by the limited correlation between objective and subjective scar satisfaction scales. Additionally, patients tend to express higher levels of concern about postsurgical scarring compared to their surgeons. Consequently, surgeons' focus on functional outcomes may conflict with the unintended physical and psychological consequences experienced by patients.[11]

Although it is possible that these potential inconsistencies indicate a focus on technical and operational aspects in order to ensure safety and effectiveness, adopting a heuristic approach to scar cosmesis may inadvertently influence patient factors, leading to biases based on their demographic characteristics. For example, although there have been reports indicating higher rates of scarring and larger perceptions of unsatisfactory cosmetic outcomes among men, scars in men are generally considered to be nearly twice as acceptable as those in women. Furthermore, scholarly literature has documented unexpressed biases towards or against specific patient characteristics among healthcare professionals, which can be seen as a reflection of the broader

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population. These biases have been found to be associated with a decline in the quality of healthcare provided.[12]

Furthermore, an inquiry arises regarding whether the perceived significance of scar cosmesis is inherent to individual practitioners or stems from the influence of conditioning and experience within the specific field. Therefore, it is of importance to examine the variances in attitudes among surgeons from different specialties. Previous research has demonstrated variations in patient-centeredness, indicating that surgeons exhibit the lowest level of patient-centeredness compared to the other disciplines included in the sample.[13,14]

The cosmetic outcomes of surgical wound closure are influenced by several factors.[15-17] Firstly, the characteristics of the surgeon, such as their specialty, years of practice, and work sector, play a significant role. Secondly, patient factors, including factors such as age, gender, cosmetic requests, and visibility of body parts, can also influence the perceived importance of scar cosmesis. Lastly, technical factors, such as the rating of surgical factors that may diminish the significance of scar cosmesis, such as emergency and trauma surgery, also contribute to the overall outcome.

Average Visual Analogue Scale (VAS) score of 66.9 (±11.9) for study subjects in the 'Knot Group' and 72.9 (±9.8) for subjects in the 'No-Knot Group', in relation to the cosmetic outcome of two types of procedures in the research issue.

The statistical analysis revealed a significant difference in the mean Visual Analogue Scale (VAS) score between the study subjects in the 'Knot Group' and 'No-Knot Group'. The independent sample t-test for equality of means yielded a p-value of 0.000, while the Levene's Test for equality of variances yielded a p-value of 0.004.

The results of our investigation were corroborated by a separate study conducted in Rawalpindi, Pakistan by Islam A et al.[18] This study examined the impact of several methods for closing subcutaneous fat and skin on the health of mothers. Within group I, the rectus sheath was stitched using vicryl No.1 thread. The thread was then inserted into the skin using subcuticular stitches, and the edges were secured with a knot. Within group II, the rectus sheath was stitched using vicryl

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No. 1. Subsequently, the thread was severed and interrupted sutures were inserted into the subcutaneous fat using vicryl No. 2. The skin was sutured utilizing subcuticular sutures employing proline 2, a propylene suture that is non-absorbable. In order to facilitate a consistent evaluation of pain, the researchers employed the Visual Analogue Scale (VAS) with a 10 cm continuum denoted as '0' representing the absence of pain and '10' representing the most severe pain. Group I experienced a notable reduction in pain.

In relation to the assessment of wounds in two distinct surgical procedures, the average Hollander Wound Evaluation Score was 4.15 (±1.24) for participants in the 'Knot Group', whereas it was 4.76 (±0.75) for participants in the 'No-Knot Group'.

The study individuals in the 'Knot Group' and 'No-Knot Group' exhibited a statistically significant difference in mean Hollander Wound Evaluation Score, as determined by both the independent sample t-test for equality of means and Levene's Test for equality of variances, with a p-value of 0.000.

The findings of our study are consistent with prior research conducted in Bangkok. In their study, Nepal S et al.[19] assessed the cosmetic results of using staples vs the subcuticular suture technique for closing wounds. The participants were assigned randomly to either the staples or subcuticular suture groups. At the 6-week and 3-month follow-ups, the Hollander Wound Evaluation Scale (HWES) was assessed. No notable disparities were observed in the HWES and cosmetic-VAS scores between the groups throughout the 6-week or 3-month follow-up assessments.

Conclusion

No Knot group provided a better cosmesis than the other group. Therefore, 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 cosmetic outcome in patients who undergo clean elective surgeries.

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