COMPARATIVE ASSESSMENT OF COSMETIC OUTCOME OF SUTURE MATERIALS IN HEAD AND NECK INCISIONS - A PROSPECTIVE STUDY

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Abstract:

The primary goal of closing surgical skin and soft tissue incisions is to restore the skin's natural appearance as closely as possible. In head and neck surgery, several factors have influence such as the performance of suture materials, including the quality of the tissue, the presence of sweat and the specific microbiota of the area. These factors can significantly impact the healing process and the final cosmetic result. Achieving optimal cosmetic outcomes in this region is crucial, as it can profoundly affect patient satisfaction and overall quality of life. The selection of the right suture material plays a pivotal role in attaining these results. This article will thoroughly examine and compare various types of suture materials used in head and neck surgeries. The focus will be on how different suture materials affect the cosmetic outcomes of surgical closures, considering their advantages and limitations in this sensitive and highly visible area. Comparison of modified Hollander wound cosmesis scales between two groups at each interval was done. Wound index score within each group has shown significant difference from baseline to 4th week in both the groups. The comparison of modified Hollander wound cosmesis scales between two groups at baseline showed non-significant difference; however, there was a significant difference in wound index between two groups after 1 week and after 4 weeks.

Keywords: cosmetic, suture material, wound index, ethilon, prolene

Introduction:

Wound repair is a highly intricate and meticulously coordinated process that encompasses several distinct phases: inflammation, cell proliferation, matrix deposition, and tissue remodeling [1]. The primary objective of suturing the skin is to restore it to as close to its original appearance as possible. In the context of head and neck surgery, the behavior of sutures is affected by various factors including the quality of the surrounding tissues, the presence of saliva, and the specific microbiota in the area. Sutures serve as a vital connection between internal and external tissue layers, significantly influencing the overall quality of the wound healing process [2]. Besides

sutures, other methods for wound approximation include staples, clips, skin closure strips, and topical adhesives, each with its own advantages and limitations.

Nonabsorbable monofilament sutures, such as Ethilon (nylon) and Prolene, are known for causing minimal inflammatory reactions, sliding smoothly through tissues, and being easy to remove [3]. These characteristics make them particularly well-suited for running intradermal stitches. Among nonabsorbable suture materials, monofilament nylon is the most commonly used for superficial skin closure due to its impressive tensile strength, which helps secure the wound effectively. However, a notable disadvantage of nylon is its difficulty in achieving reliable knot security, which can sometimes compromise the stability of the closure [4][14].

Prolene, another type of nonabsorbable monofilament suture, is also highly effective in passing through tissue with minimal reaction [5]. Unlike many other nonabsorbable sutures, Prolene does not lose its tensile strength over time, which makes it an excellent choice for areas requiring prolonged strength and durability. Its smooth surface and high plasticity, however, present a challenge as an additional knot throws are often necessary to ensure that the knots remain secure and maintain their integrity throughout the healing process. This requirement can impact the ease of use and efficiency of suturing, particularly in delicate or challenging surgical environments.

The objective of this study is to compare the cosmetic outcomes of using two different nonabsorbable suture materials, ethilon (nylon) and prolene, in head and neck surgeries. The study aims to assess the effectiveness of these suture materials in achieving optimal cosmetic results, considering factors such as wound healing and scar appearance.

The prespecified hypothesis is that both suture materials will perform similarly in terms of wound healing and cosmetic appearance at different time intervals post-surgery.

Methodology:

This was an in vivo study that was conducted in the Department of Maxillofacial Surgery, Saveetha Dental College and Hospital, Saveetha Institute of Medical Technological Sciences, Chennai. An Ethical clearance was obtained from Saveetha Dental College - Institutional Human Ethical Committee (SDC-IHEC) Registered under Government of India (IHEC/SDC/OMFS-2301/24/105) before we began the study.

Participants' Selection:

The patient age group was selected between 18 and 70 years. Both sexes were included in the study. Only clean wounds were included in the study, while wounds from animal or human bites, decubitus ulcers & crush wounds, patients with uncontrolled diabetes mellitus or known personal or family history of keloid formation or scar hypertrophy were excluded from the study.

Sample size determination:

The sample size was calculated by G Power based on the study conducted by Ganguli et al in 2012 [12] with p value 0.05 and 95 power with effect size 0.636.

Using simple randomization, thirty participants were included in the study with clinical and radiographic diagnosis of facial fractures, bone pathologies, facial lacerations, who require procedures like open reduction and internal fixation, maxillectomy or simple closure of the wound and they were divided into case group (ethilon group) and control group (prolene).

Surgical Procedure:

All procedures were done under general anesthesia, fifteen patients were selected for the case group (ethilon), and fifteen patients were selected for the control group (prolene). Extraoral incisions were made for various surgical procedures. Incision lengths in the range of 8-10cm were closed in both groups using sutures. In both case and control groups, 3.0 vicryl was used to approximate the underlying muscles and tissues. The skin was closed with 4.0 nylon [Figure 1] and 4-0 prolene [Figure 2] sutures with a simple interrupted suture technique. An antiseptic dressing (povidone-iodine) was applied immediately after the closure of the wounds. Patients were recalled on post-operative day 7 [Figure 3,4] and day 28 [Figure 5,6] for follow up.

Fig: 1-6

Follow-up:

The cosmetic outcome was recorded and interpreted on day 7 and day 28, considering the final scores of each parameter evaluated for case and control group. Cosmesis was assessed using Modified Hollander Cosmesis Scale which has 6 clinical variables as step-off borders, edge inversion, contour irregularities, excess inflammation, wound margin separation, and good overall appearance [7].

Statistical analysis:

The sample size was calculated by G Power based on the study conducted by Ganguli et al in 2012 [12], with p value 0.05 and 95 power with effect size 0.636. Our calculated sample size was calculated to be 30.

Data analyzed using SPSS software (version 23.0). Data was analyzed by descriptive statistics which included frequency, percentages, mean and standard deviation with 95% confidence

interval. The Shapiro Wilk test was used for assessing the normality of distribution of all parameters. Analytical statistics included Fisher exact test to assess the association between categorical variables and independent t test was used to assess the difference between means of continuous variable between the groups at $p<0.05$.

Results:

A total cosmetic score was derived by adding the scores of variables. A score of 1 is given to each variable if present in the wound, so a score of 0 was considered optimal while 1 or more was suboptimal. Any complications/infections, if present, are also observed in both groups.

Comparison of modified Hollander wound cosmesis scale within each group

Table 1 shows the Comparison of modified Hollander wound cosmesis scale within each group. Change in wound index score within both the test and control group showed a significant difference from baseline to 4 weeks.

Table 1: Comparison of modified Hollander wound cosmesis scale within each group

Group	Interval	0	1	2	3	4	5	6	p value
Test	Baseline	0	0	0	2 (6.7)	6 (20)	20 (66.7)	2 (6.7)	<0.001*
	1week	0	0	2 (6.7)	6 (20)	16 (53.3)	6 (20)	0	
	4 weeks	0	0	6 (20)	14 (46.7)	10 (33.3)	0	0	
Control	Baseline	0	0	0	6 (20)	14 (46.7)	10 (33.3)	0	<0.001*
	1week	0	0	6 (20)	22 (73.3)	2 (6.7)	0	0	
	4 weeks	8 (26.7)	18 (60)	4 (13.3)	0	0	0	0	

Chi-square test; * indicates significant difference at $p\leq0.05$

Comparison of modified Hollander wound cosmesis scale between two groups at each interval

Table 2 shows the comparison of modified Hollander wound cosmesis scales between two groups at each interval. Wound index score between two groups at baseline showed non-significant difference; however, there was a significant difference in wound index between two groups after 1 week and after 4 weeks.

Table 2: Comparison of modified Hollander wound cosmesis scale between two groups at each interval

	Interval	0	1	2	3	4	5	6	p value
Baseline	**Test**	0	0	0	2 (6.7)	6 (20)	20 (66.7)	2 (6.7)	0.153
	Control	0	0	0	6 (20)	14 (46.7)	10 (33.3)	0	
1 week	**Test**	0	0	2 (6.7)	6 (20)	16 (53.3)	6 (20)	0	0.003 *
	Control	0	0	6 (20)	22 (73.3)	2 (6.7)	0	0	
4 weeks	**Test**	0	0	6 (20)	14 (46.7)	10 (33.3)	0	0	<0.001*
	Control	8 (26.7)	18 (60)	4 (13.3)	0	0	0	0	

Chi-square test; * indicates significant difference at p≤0.05

Discussion:

For the surgeon, a scar may be the only index of the surgical procedure performed. There are many factors that may affect the cosmetic outcome of scars. The faster the healing, the lesser the chances of scarring, hence addressing the healing and esthetic concerns go and in hand for the patient. Many early studies have used adhesives, compared rapid absorbable sutures, anti-fibrinolytic agent or topical agents to improve healing and prevent scaring [15]. The purpose of this study was to ascertain whether the use of different suture materials for the closure of surgical incisions in the maxillofacial region would lead to closure with equal or superior cosmesis and without any

morbidity or not [8][13]. There are various factors important in comparing the different methods available for skin closure, some of them are as follows: -

- Time taken to close the wound.
- Post-operative pain
- Incidence of complications like seroma, erythema, wound dehiscence
- Cosmetic results

Ease of dealing with complications is very important [11][12]. In our study a total of 30 patients were taken and half of them were assigned to the ethilon group and the remaining half to the prolene group. We have performed extraoral incisions for open reduction and internal fixation, neck crease incision, etc. for the present study. The comparison of these two groups was done in relation to Cosmetic outcomes [9].

In our study, the cosmetic outcome was measured using a modified Hollender wound score, revealing that there was no significant difference on day 1 in both the groups. But in the course of time, at the end of one month there is no statistically significant cosmetic outcome between ethilon and prolene group, however, there was a significant difference in wound index between two groups after 1 week and after 4 weeks [10].

Surmounting Challenges:

The limitations of the study were that, it was conducted on a small population with limited parameters and under different conditions. In further studies, the sample size has to be increased and comparative population should of same age group as healing is different in different age groups [16]. The study was also conducted at a single center, further studies must be conducted at multiple centers.

Future Prospects

This study provides valuable insights into the cosmetic outcomes of different suture materials in head and neck surgeries. However, there are several opportunities for further research to enhance the understanding and applicability of these findings.

1. **Larger and More Diverse Sample Size:** Future studies should include a larger and more diverse population to increase the generalizability of the findings. Expanding the sample size would allow for a more comprehensive analysis of the impact of various suture materials across different demographics, including age, skin type, and underlying health conditions.
2. **Long-Term Follow-Up Studies:** While this study assessed cosmetic outcomes over a short-term period, future research should evaluate long-term scar formation, patient satisfaction, and potential complications such as hypertrophic scarring or keloid formation. Longitudinal studies could provide a more complete picture of suture performance over extended periods.
3. **Comparative Studies with Advanced Wound Closure Techniques:** With advancements in wound closure techniques, it would be beneficial to compare traditional suture methods with modern alternatives such as tissue adhesives, absorbable sutures, and minimally invasive wound closure devices. This could help identify more efficient and aesthetically favorable techniques.
4. **Incorporation of Digital Imaging and AI-Based Analysis:** The use of digital imaging and artificial intelligence (AI)-based analysis could provide objective and standardized

assessments of cosmetic outcomes. AI-driven wound healing analysis could enhance accuracy in evaluating scar appearance and tissue integration.

5. **Multicenter Studies:** Conducting studies across multiple medical centers and geographical locations would help validate the findings in diverse clinical settings. This would also allow for an assessment of how environmental and surgical factors influence wound healing and cosmetic results.
6. **Patient-Centered Outcome Measures:** Future research should focus on patient-reported outcome measures (PROMs) to evaluate satisfaction levels with different suture materials. Understanding patient perspectives on cosmetic outcomes, comfort, and post-operative care would contribute to more patient-centered surgical practices.
7. **Exploring the Role of Adjunctive Therapies:** Investigating the effects of adjunctive treatments, such as silicone-based scar management, topical agents, and laser therapy, in combination with different suture materials could lead to optimized healing and superior aesthetic outcomes.

By addressing these areas, future research can further refine surgical wound closure techniques, leading to better cosmetic outcomes and improved patient care.

Conclusions:

Preventing wound infection is critically important because an infection can lead to surgical failure and result in severe complications for patients, including significant morbidity. In our study, we conducted a comparison between two types of suture materials—Ethilon (nylon) and Prolene—used for extraoral skin closure. Our findings indicate that there is no significant difference in the cosmetic outcomes between the two suture materials. Additionally, we observed that the rate of postoperative wound infections was not significantly higher with either Ethilon or Prolene. Based on these results, we conclude that both Ethilon and Prolene are viable options for wound closure. The choice between them can be made based on factors such as availability, cost-effectiveness, and the surgeon's preference. This conclusion supports the flexibility in suture selection for optimal patient care and resource management.

Conflict of interest:

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

Reference

1. *Yilmaz N, Inal S, Muğlali M, Güvenç T, Baş B. Effects of polyglecaprone 25, silk and catgut suture materials on oral mucosa wound healing in diabetic rats: an evaluation of nitric oxide dynamics. Med Oral Patol Oral Cir Bucal. 2010;15:e526–30.*
2. *Soni A, Singhal R, Kumar N, Gupta S, Mahajan M. Comparing cyanoacrylate tissue adhesive and conventional subcuticular skin sutures for maxillofacial incisions—A prospective randomized trial considering closure time, wound morbidity, and cosmetic outcome. J Oral Maxillofac Surg. 2013;71(11):2152.e1–8.*
3. *Robson MC, Steed DL, Franz MG. Wound healing: biologic features and approaches to maximize healing trajectories. Curr Probl Surg. 2001;38:72–140.*

4. *Minozzi F, Bollero P, Unfer V, Dolci A, Galli M. The sutures in dentistry. Eur Rev Med Pharmacol Sci. 2009;13:217–26.*
5. *Ratner BD, Hoffman AS, Schoen FJ, Lemons JE. Biomaterials Science: An Introduction to Materials in Medicine. 3rd ed. Cambridge: Academic Press; 2012.*
6. *Eaton AC. A controlled trial to evaluate and compare a sutureless skin closure technique (Op-Site Skin Closure) with conventional skin suturing and clipping in abdominal surgery. Br J Surg. 2005;67:857–60.*
7. *Banche G, Roana J, Mandras N, Amasio M, Gallesio C, Allizond V, et al. Microbial adherence on various intraoral suture materials in patients undergoing dental surgery. J Oral Maxillofac Surg. 2007;65(8):1503–7.*
8. *Gennari R, Rotmensz N, Ballardini B, Scevola S, Perego E, Zanini V, et al. A prospective, randomized, controlled clinical trial of tissue adhesive (2-octylcyanoacrylate) versus standard wound closure in breast surgery. Surgery. 2004;136:593–9.*
9. *Moy RL, Waldman B, Hein DW. A review of sutures and suturing techniques. J Dermatol Surg Oncol. 1992;18(9):785–95.*
10. *Bush J, Bayat A. Surgical instruments, sutures and suturing techniques. Br J Hosp Med. 2007;68(Suppl 8):M142–M145.*
11. *Chibbaro S, Tacconi L. Use of skin glue versus traditional wound closure methods in brain surgery: A prospective, randomized, controlled study. J Clin Neurosci. 2009;16(4):535–9.*
12. *Kang H. Sample size determination and power analysis using the G*Power software. J Educ Eval Health Prof. 2021;18:17.*
13. *Hollander JE, Singer AJ, Valentine S, Henry MC. Wound registry: Development and validation. Ann Emerg Med. 1995;25(5):675–84.*
14. *FitzGibbon GM. The commandments of Gillies. Br J Plast Surg. 1968;21:226–39.*
15. *To evaluate the efficacy of an Aloe Vera-based gel containing Brahmi and vitamin C in improving wound healing in laceration patients. Afr J Biomed Res. 2024;27(1S):3311–5.*
16. *Arun MD. Effect of age on postoperative complications in geriatric population—a retrospective study. Obstet Gynaecol Forum [Internet]. 2024 Sep 4 [cited 2025 Feb 8];34(3S):2978–80.*