

## A Comparative Study on Subcuticular Monocryl Suture Closure Versus Conventional Closure of Surgically Incised Wounds

Jyotsna V<sup>1</sup>, Ashwitha Crasta<sup>2</sup>, Santosh Sairoba Nagekar<sup>3</sup>

<sup>1</sup>Consultant, General Surgeon, Chirag Global Hospital, Bangalore, Karnataka, India

<sup>2</sup>Assistant Professor, Department of General Surgery, Peoples College of Medical Sciences, Bhopal, M.P., India

<sup>3</sup>Assistant Professor, Department of General Surgery, JJMMC, Davangere, Karnataka, India

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Corresponding Author: Dr. Santosh Sairoba Nagekar

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### Abstract

**Background:** Wound closure techniques significantly impact surgical outcomes, wound complications, and cosmetic results. Subcuticular monocryl sutures offer potential advantages over conventional interrupted sutures, but comparative evidence remains limited.

**Objective:** To compare subcuticular monocryl suture closure with conventional closure of surgically incised wounds, evaluating wound complications, cosmetic outcomes, and post-operative pain.

**Methods:** A hospital-based cross-sectional study was conducted at Navodaya Medical College Hospital and Research Centre, Raichur, from January 2021 to June 2022. One hundred patients undergoing clean surgical procedures were randomly allocated to either subcuticular monocryl suture (n=50) or conventional suture (n=50) groups. Primary outcomes included wound complications, duration of hospital stay, antibiotic coverage requirements, wound healing time, post-operative pain, and cosmetic outcomes assessed at follow-up visits up to one month post-operatively.

**Results:** Wound complications occurred in 20% of conventional suture patients versus 6% of monocryl suture patients (p=0.037). Mean hospital stay was significantly shorter in the monocryl group (5.38±1.11 days) compared to conventional group (7.6±1.85 days, p<0.0001). Monocryl sutures required shorter antibiotic coverage (5.16±0.58 vs 7.18±1.47 days, p<0.0001), faster wound healing (5.34±0.97 vs 7.32±1.50 days, p<0.0001), and resulted in less post-operative pain (1.44±0.64 vs 2.24±1.03, p<0.0001). Excellent cosmetic outcomes were achieved in 92% of monocryl cases versus 60% of conventional cases (p=0.0002).

**Conclusion:** Subcuticular monocryl suture closure demonstrated superior outcomes compared to conventional sutures, with significantly reduced wound complications, shorter hospitalization, decreased antibiotic requirements, accelerated wound healing, reduced post-operative pain, and improved cosmetic results.

**Keywords:** Subcuticular suture; Monocryl; Poliglecaprone; Conventional suture; Wound closure; Surgical site infection; Cosmetic outcome; Post-operative pain.

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### Introduction

Wound management represents a fundamental aspect of surgical practice, with closure techniques significantly influencing patient outcomes, recovery time, and cosmetic results. The evolution of wound closure methods has progressed from rudimentary suturing techniques to sophisticated materials and approaches designed to optimize healing while minimizing complications.[1] The primary objectives of wound closure include rapid healing, prevention of infection, restoration of tissue integrity, and achievement of acceptable cosmetic outcomes. As surgical techniques advance, the selection of appropriate wound closure methods has become increasingly important

in determining patient satisfaction and overall surgical success.[2]

The historical development of suture materials reflects continuous innovation in surgical practice. Ancient civilizations utilized natural materials such as animal sinew and plant fibers for wound closure. The modern era of suturing began with the introduction of catgut and silk sutures, which dominated surgical practice until the mid-20th century.[3] The development of synthetic absorbable sutures in the 1960s revolutionized wound closure, offering improved biocompatibility, predictable absorption rates, and reduced tissue reactivity. Among these innovations, poliglecaprone 25 (Monocryl) emerged as a

synthetic absorbable monofilament suture with superior handling characteristics and minimal tissue reaction.[4]

Subcuticular suturing technique, first popularized by Halsted in the early 1900s, involves placing sutures within the dermal layer beneath the skin surface to approximate wound edges without external suture material.[5] This intradermal approach contrasts with conventional transdermal suturing, where sutures pierce the full thickness of the skin with knots visible on the surface. The subcuticular technique gained prominence in plastic surgery due to its ability to produce aesthetically superior results by eliminating visible suture marks and reducing tension on wound edges.[6]

Monocryl (poliglecaprone 25) represents a significant advancement in absorbable suture technology. This synthetic monofilament suture consists of a copolymer of glycolide and epsilon-caprolactone, designed to provide excellent initial tensile strength while undergoing predictable absorption through hydrolysis.[7] The material retains approximately 50-60% of its original tensile strength at seven days post-implantation and 20-30% at fourteen days, with complete absorption occurring within 91-119 days.[8] These characteristics make Monocryl particularly suitable for subcuticular closure, where sustained but temporary wound support is required during the critical healing phase.

The advantages of subcuticular suturing with absorbable materials extend beyond cosmetic considerations. Studies have demonstrated that this technique reduces the risk of wound infection by eliminating transcutaneous suture tracts that may serve as conduits for bacterial contamination.[9] Additionally, the absence of external sutures eliminates the need for suture removal, reducing patient anxiety and healthcare visits while improving overall patient satisfaction.[10] The smooth passage of monofilament sutures through tissue minimizes trauma and inflammatory response, potentially accelerating the healing process.

Conventional interrupted sutures remain widely used in surgical practice due to their technical simplicity, reliability, and surgeon familiarity. This approach involves placing individual sutures through the full thickness of the skin, with each suture tied separately and knots positioned on the wound surface. While effective for achieving wound approximation, conventional suturing presents several limitations. The transcutaneous nature of these sutures creates potential portals for bacterial entry, potentially increasing infection risk.[11] Furthermore, the presence of external suture material and knots can lead to suture marks or "railroad tracking" if sutures remain in place

beyond optimal timing, compromising cosmetic outcomes.

The selection of wound closure technique should consider multiple factors, including wound characteristics, anatomical location, tension on wound edges, patient factors such as age and comorbidities, and desired cosmetic results. Clean surgical wounds in elective procedures represent ideal candidates for subcuticular closure techniques.[12] However, concerns about infection risk in clean-contaminated wounds and the technical expertise required for subcuticular suturing have limited its widespread adoption in all surgical specialties.

Recent literature has explored the comparative effectiveness of various wound closure techniques across multiple surgical disciplines. A randomized controlled trial by Tanaka et al. demonstrated that interrupted subcuticular sutures were non-inferior to interrupted transdermal sutures in terms of wound complications following elective colon cancer surgery, while providing superior cosmetic outcomes.[13] Similarly, Tuuli et al. compared Vicryl and Monocryl for subcuticular closure in cesarean delivery, finding comparable infection rates between the two materials.[14] These studies support the safety and efficacy of subcuticular techniques in diverse surgical contexts.

The economic implications of wound closure technique selection merit consideration. While synthetic absorbable sutures may have higher material costs than traditional non-absorbable sutures, the elimination of suture removal visits and potential reduction in wound complications may offset these expenses.[15] Comprehensive cost-effectiveness analyses considering both direct material costs and indirect costs associated with complications and additional healthcare visits are essential for informed decision-making in resource-limited settings.

Despite growing evidence supporting subcuticular closure techniques, gaps remain in the comparative literature, particularly regarding outcomes in general surgical procedures across diverse anatomical sites. Most existing studies focus on specific surgical specialties, limiting generalizability to broader surgical practice. Furthermore, comprehensive assessments incorporating multiple outcome measures including infection rates, pain scores, healing time, cosmetic results, and healthcare resource utilization are scarce. This study addresses these knowledge gaps by providing a comprehensive comparison of subcuticular monocryl suture closure versus conventional interrupted suture closure in patients undergoing various clean elective surgical procedures. By evaluating multiple clinically relevant outcomes, this research aims to inform

evidence-based surgical practice and contribute to improved patient care in general surgery.

### Aims and Objectives

**Primary Aim:** To compare the efficacy of subcuticular monocryl suture closure versus conventional interrupted suture closure in surgically incised wounds.

### Specific Objectives

1. To compare the incidence of post-operative wound complications between subcuticular skin closure and conventional skin closure techniques.
2. To evaluate and compare the cosmetic outcomes of wounds closed with subcuticular monocryl sutures versus conventional interrupted sutures.
3. To assess and compare post-operative pain levels in patients undergoing subcuticular skin closure versus conventional skin closure.
4. To determine differences in duration of hospital stay between the two closure techniques.
5. To compare the duration of antibiotic coverage required in each group.
6. To evaluate the time taken for complete wound healing in both groups.

### Materials and Methods

**Study Design and Setting:** This hospital-based cross-sectional comparative study was conducted in the Department of General Surgery at Navodaya Medical College Hospital and Research Centre, Raichur, Karnataka, India. The study was carried out over an 18-month period from January 1, 2021, to June 30, 2022.

**Ethical Considerations:** Ethical clearance was obtained from the Institutional Ethics Committee of Navodaya Medical College Hospital and Research Centre on December 22, 2020. Written informed consent was obtained from all participants after explaining the study objectives, procedures, potential risks, and benefits in their native language. Participants were informed of their right to withdraw from the study at any time without affecting their medical care.

**Sample Size Calculation:** Sample size was calculated using the formula for cross-sectional studies with the following parameters: confidence level of 95% ( $z=1.96$ ), expected prevalence based on mean post-operative pain score ( $p=7.88$ ), allowable error of 5.5%, yielding a calculated sample size of 92.

Accounting for potential non-response and dropout rates, the final sample size was rounded to 100 participants (50 in each group).

**Study Population:** The study population comprised patients aged 10 to 65 years presenting to the Surgery Outpatient Department requiring elective surgical procedures with clean wound classification.

### Inclusion Criteria

1. Patients aged between 10 and 65 years
2. Clinically diagnosed cases undergoing clean elective surgical procedures
3. Patients requiring skin closure with either subcuticular monocryl or conventional sutures
4. Patients willing to provide informed consent and participate in follow-up assessments

### Exclusion Criteria

1. Patients refusing to participate in the study
2. Emergency surgical procedures
3. Surgical incisions requiring closure under significant tension
4. Clean-contaminated, contaminated, or dirty wound classifications
5. Traumatic wounds
6. Patients with known allergies to suture materials
7. Immunocompromised patients
8. Patients with bleeding disorders or on anticoagulation therapy

**Sampling Technique:** Simple random sampling was employed for participant selection. Patients fulfilling the inclusion criteria were assigned to either the conventional suture group or the subcuticular monocryl suture group using computer-generated random numbers to ensure unbiased allocation.

**Intervention:** All surgical procedures were performed under appropriate anesthesia (spinal or general) by experienced surgeons following standard surgical protocols. Routine pre-operative preparation included antimicrobial prophylaxis administered one hour before incision and mechanical bowel preparation where indicated.

**Conventional Suture Group:** Wound closure was performed using interrupted non-absorbable sutures (silk or nylon) placed through the full thickness of skin. Sutures were placed approximately 0.5-1 cm apart with adequate tissue bites to ensure proper wound edge approximation. Knots were tied on the wound surface with appropriate tension to prevent ischemia.

**Subcuticular Monocryl Suture Group:** Wound closure was performed using continuous subcuticular technique with 3-0 or 4-0 poliglecaprone 25 (Monocryl) absorbable monofilament suture. The suture was placed in the dermal layer, taking horizontal bites alternating from side to side while maintaining appropriate tension to achieve optimal wound edge

approximation. Both ends of the suture were buried to eliminate external suture material.

### Post-operative Care

Standard post-operative management was provided to all patients, including:

- Regular wound dressing and inspection
- Prophylactic antibiotics as per institutional protocol
- Analgesics for pain management
- Patient education regarding wound care, activity restrictions, and signs of complications
- Dietary advice and laxatives to prevent constipation
- Instructions to avoid heavy lifting and strenuous activities

For the conventional suture group, sutures were removed on post-operative day 7-10 depending on wound location and healing progress.

**Data Collection:** Baseline demographic data (age, gender), clinical diagnosis, type of surgery performed, and presence of comorbidities were recorded at enrollment. Post-operative assessments were conducted at multiple time points to evaluate the following parameters:

### Outcome Measures

#### Primary Outcomes

1. **Wound Complications:** Assessed on days 3, 5, and 7 post-operatively and at one-month follow-up. Complications included surgical site infection, wound dehiscence, hematoma, and seroma. Infection was defined by presence of purulent discharge, erythema, warmth, tenderness, and fever. Wound swabs were collected for culture and sensitivity testing when infection was suspected.
2. **Duration of Hospital Stay:** Calculated from day of surgery to discharge date in days.
3. **Duration of Antibiotic Coverage:** Total number of days antibiotics were administered post-operatively.

4. **Time for Wound Healing:** Number of days from surgery until complete wound healing, defined as complete epithelialization without discharge or signs of inflammation.

#### Secondary Outcomes

1. **Post-operative Pain:** Assessed using Visual Analog Scale (VAS) at 12, 24, 48, and 72 hours post-operatively and on day 7. Patients rated pain intensity on a scale of 0 (no pain) to 10 (worst imaginable pain).
2. **Cosmetic Outcome:** Evaluated at one-month follow-up using a four-point scale: poor, fair, good, or excellent. Assessment considered scar width, color, texture, and overall appearance.

**Statistical Analysis:** Data were coded and entered into Microsoft Excel and analyzed using SPSS software version 20.0 (IBM Corporation, Armonk, NY). Descriptive statistics including means, standard deviations, frequencies, and percentages were calculated.

Categorical variables were compared using chi-square test, while continuous variables were compared using independent t-test. A p-value less than 0.05 was considered statistically significant. Results were presented in tables and graphs for clear visualization.

### Results

A total of 100 patients were enrolled and completed the study, with 50 patients in each group (conventional suture and subcuticular monocryl suture). No patients were lost to follow-up during the one-month study period.

**Demographic Characteristics:** The mean age of all participants was  $34.77 \pm 14.95$  years. The conventional suture group had a mean age of  $34.96 \pm 14.50$  years, while the monocryl suture group had a mean age of  $34.58 \pm 15.38$  years, with no significant difference between groups. Male patients predominated in both groups, comprising 72% of the conventional group and 60% of the monocryl group.

**Table 1: Demographic Characteristics and Clinical Profile**

| Characteristic             | Conventional Suture (n=50) | Monocryl Suture (n=50) | P-value |
|----------------------------|----------------------------|------------------------|---------|
| Age (years), Mean $\pm$ SD | $34.96 \pm 14.50$          | $34.58 \pm 15.38$      | 0.897   |
| Gender, n (%)              |                            |                        |         |
| Male                       | 36 (72%)                   | 30 (60%)               | 0.205   |
| Female                     | 14 (28%)                   | 20 (40%)               |         |
| Comorbidities, n (%)       | 6 (12%)                    | 6 (12%)                | 1.000   |

The distribution of surgical procedures included appendectomy (26% conventional, 28% monocryl), hernioplasty (38% conventional, 22% monocryl), excision of cysts and masses (16% conventional, 22% monocryl), cholecystectomy (6% conventional, 8% monocryl), and various other

procedures. The presence of comorbidities (diabetes mellitus and hypertension) was equal in both groups (12%), showing no baseline difference that could confound results.

**Wound Complications:** Wound complications occurred significantly more frequently in the

conventional suture group compared to the monocryl suture group.

**Table 2: Wound Complications and Microbiological Findings**

| Parameter                         | Conventional Suture (n=50) | Monocryl Suture (n=50) | Chi-square | P-value |
|-----------------------------------|----------------------------|------------------------|------------|---------|
| <b>Wound Complications, n (%)</b> |                            |                        | 4.332      | 0.037*  |
| Yes                               | 10 (20%)                   | 3 (6%)                 |            |         |
| No                                | 40 (80%)                   | 47 (94%)               |            |         |
| <b>Culture Results, n (%)</b>     |                            |                        | 1.042      | 0.307   |
| No growth                         | 47 (94%)                   | 49 (98%)               |            |         |
| Staphylococcus aureus             | 3 (6%)                     | 1 (2%)                 |            |         |

\*Statistically significant ( $p < 0.05$ )

Twenty percent of patients in the conventional suture group developed wound complications, predominantly surgical site infections, compared to only 6% in the monocryl suture group ( $p=0.037$ ). Among patients with wound complications who underwent culture and sensitivity testing,

Staphylococcus aureus was isolated from three patients in the conventional group and one patient in the monocryl group, though this difference was not statistically significant ( $p=0.307$ ).

#### Duration of Hospital Stay

**Table 3: Hospital Stay and Antibiotic Coverage**

| Parameter                                 | Conventional Suture (n=50) | Monocryl Suture (n=50) | T-test | P-value  |
|-------------------------------------------|----------------------------|------------------------|--------|----------|
| Hospital Stay (days), Mean $\pm$ SD       | 7.6 $\pm$ 1.85             | 5.38 $\pm$ 1.11        | -7.276 | <0.0001* |
| <b>Distribution, n (%)</b>                |                            |                        |        |          |
| <5 days                                   | 3 (6%)                     | 43 (86%)               |        |          |
| 6-10 days                                 | 44 (88%)                   | 7 (14%)                |        |          |
| >11 days                                  | 3 (6%)                     | 0 (0%)                 |        |          |
| Antibiotic Duration (days), Mean $\pm$ SD | 7.18 $\pm$ 1.47            | 5.16 $\pm$ 0.58        | -9.039 | <0.0001* |
| <b>Distribution, n (%)</b>                |                            |                        |        |          |
| <5 days                                   | 7 (14%)                    | 46 (92%)               |        |          |
| 6-10 days                                 | 41 (82%)                   | 4 (8%)                 |        |          |
| >11 days                                  | 2 (4%)                     | 0 (0%)                 |        |          |

\*Statistically significant ( $p < 0.05$ )

The mean duration of hospital stay was significantly longer in the conventional suture group (7.6 $\pm$ 1.85 days) compared to the monocryl suture group (5.38 $\pm$ 1.11 days,  $p < 0.0001$ ).

The majority of patients in the monocryl group (86%) were discharged within five days, whereas 88% of conventional suture patients required 6-10 days of hospitalization. Similarly, the duration of

antibiotic coverage was significantly extended in the conventional group (7.18 $\pm$ 1.47 days) compared to the monocryl group (5.16 $\pm$ 0.58 days,  $p < 0.0001$ ). Ninety-two percent of monocryl suture patients required less than five days of antibiotic therapy, while 82% of conventional suture patients needed 6-10 days of antibiotic coverage.

#### Wound Healing Time and Post-operative Pain

**Table 4: Wound Healing and Post-operative Pain Assessment**

| Parameter                                      | Conventional Suture (n=50) | Monocryl Suture (n=50) | T-test | P-value  |
|------------------------------------------------|----------------------------|------------------------|--------|----------|
| Wound Healing Time (days), Mean $\pm$ SD       | 7.32 $\pm$ 1.50            | 5.34 $\pm$ 0.97        | -7.838 | <0.0001* |
| <b>Distribution, n (%)</b>                     |                            |                        |        |          |
| <5 days                                        | 24 (48%)                   | 43 (86%)               |        |          |
| 6-10 days                                      | 24 (48%)                   | 7 (14%)                |        |          |
| >11 days                                       | 2 (4%)                     | 0 (0%)                 |        |          |
| Post-operative Pain Score (VAS), Mean $\pm$ SD | 2.24 $\pm$ 1.03            | 1.44 $\pm$ 0.64        | -4.665 | <0.0001* |
| <b>Distribution, n (%)</b>                     |                            |                        |        |          |
| <3                                             | 43 (86%)                   | 50 (100%)              |        |          |
| $\geq 3$                                       | 7 (14%)                    | 0 (0%)                 |        |          |

\*Statistically significant ( $p < 0.05$ )

VAS: Visual Analog Scale (0-10)

The mean time for complete wound healing was significantly shorter in the monocryl group ( $5.34 \pm 0.97$  days) compared to the conventional group ( $7.32 \pm 1.50$  days,  $p < 0.0001$ ).

Eighty-six percent of monocryl suture wounds healed within five days, whereas only 48% of conventional suture wounds achieved complete healing in this timeframe. Post-operative pain, assessed using the Visual Analog Scale, was

significantly lower in the monocryl suture group (mean score  $1.44 \pm 0.64$ ) compared to the conventional suture group (mean score  $2.24 \pm 1.03$ ,  $p < 0.0001$ ).

All patients in the monocryl group experienced mild pain (VAS  $< 3$ ), while 14% of conventional suture patients reported moderate pain (VAS  $\geq 3$ ).

### Cosmetic Outcome

**Table 5: Cosmetic Outcome Assessment at One Month**

| Cosmetic Outcome | Conventional Suture n (%) | Monocryl Suture n (%) | Chi-square | P-value |
|------------------|---------------------------|-----------------------|------------|---------|
| Poor             | 0 (0%)                    | 0 (0%)                | 16.934     | 0.0002* |
| Fair             | 0 (0%)                    | 1 (2%)                |            |         |
| Good             | 20 (40%)                  | 3 (6%)                |            |         |
| Excellent        | 30 (60%)                  | 46 (92%)              |            |         |
| Total            | 50 (100%)                 | 50 (100%)             |            |         |

\*Statistically significant ( $p < 0.05$ )

Cosmetic outcomes were significantly superior in the monocryl suture group. Ninety-two percent of patients with monocryl closure achieved excellent cosmetic results compared to 60% in the conventional suture group ( $p = 0.0002$ ). None of the patients in either group had poor cosmetic outcomes. The monocryl technique resulted in less visible scarring, better wound edge approximation, and more aesthetically pleasing results as assessed by blinded observers at one-month follow-up.

All statistical comparisons demonstrated consistent advantages for subcuticular monocryl suture closure across all measured outcomes, with highly significant p-values supporting the superiority of this technique over conventional interrupted sutures.

### Discussion

This prospective comparative study demonstrated significant advantages of subcuticular monocryl suture closure over conventional interrupted suture closure across multiple clinically important outcomes. The findings provide robust evidence supporting the adoption of subcuticular monocryl sutures for wound closure in clean elective surgical procedures.

**Wound Complications:** The substantially lower incidence of wound complications in the monocryl group (6%) compared to the conventional group (20%,  $p = 0.037$ ) represents one of the most clinically significant findings of this study. This threefold reduction in complications has important implications for patient safety and healthcare resource utilization. The primary mechanism underlying this difference likely relates to the fundamental distinction between subcuticular and transcutaneous suturing techniques. Conventional interrupted sutures create multiple portals through which bacteria can migrate from the skin surface

into deeper tissues, establishing potential foci for infection. In contrast, subcuticular sutures remain entirely within the dermal layer, eliminating these transcutaneous tracts and thereby reducing bacterial access to the wound.

Our findings align with those of Tanaka et al., who conducted a randomized controlled trial comparing subcuticular and transdermal sutures in 293 patients undergoing elective colon cancer surgery.[13] Their study reported similar infection rates between groups, with the relative risk of subcuticular suture being 1.00, demonstrating non-inferiority. However, our study found superior outcomes with subcuticular sutures, possibly due to differences in patient population (general surgical procedures versus colorectal surgery) and wound classification (clean versus clean-contaminated). A comprehensive Cochrane systematic review by Sajid et al. examining subcuticular sutures in non-obstetric surgery concluded that subcuticular techniques were associated with lower rates of wound complications compared to staples and demonstrated comparable outcomes to tissue adhesives, supporting our findings.[9] The monofilament nature of Monocryl further contributes to reduced infection risk compared to multifilament materials, as braided sutures can harbor bacteria within their interstices.

### Hospital Stay and Healthcare Resource Utilization:

The significantly shorter hospital stay in the monocryl group ( $5.38 \pm 1.11$  days versus  $7.6 \pm 1.85$  days,  $p < 0.0001$ ) represents a substantial reduction in healthcare resource consumption. This two-day difference translates to improved bed utilization, reduced healthcare costs, and enhanced patient satisfaction through earlier return to normal activities. The shorter hospitalization likely results from multiple factors including reduced wound complications, decreased pain requiring less

intensive nursing care, and the absence of suture removal requirements.

The reduced duration of antibiotic coverage in the monocryl group ( $5.16 \pm 0.58$  versus  $7.18 \pm 1.47$  days,  $p < 0.0001$ ) has important implications for antibiotic stewardship. Shorter antibiotic courses reduce the risk of antimicrobial resistance development, decrease adverse effects associated with prolonged antibiotic exposure, and lower pharmaceutical costs. This finding assumes particular importance in the context of growing global concerns about antimicrobial resistance.

**Wound Healing:** The accelerated wound healing observed in the monocryl group ( $5.34 \pm 0.97$  versus  $7.32 \pm 1.50$  days,  $p < 0.0001$ ) reflects the favorable biological properties of subcuticular monocryl sutures. Poliglecaprone 25 elicits minimal tissue reaction, allowing the natural wound healing cascade to proceed with less inflammatory interference. The smooth monofilament structure reduces tissue drag during placement and minimizes mechanical trauma to wound edges. Furthermore, the subcuticular technique provides optimal wound edge eversion, facilitating epidermal cell migration and accelerating re-epithelialization. These findings complement those reported by Gartti-Jardim et al., who compared healing processes using various absorbable sutures in rat dermal tissue.[37] Their histological analysis demonstrated that poliglecaprone 25 (Monocryl) produced less inflammatory infiltrate and more rapid connective tissue organization compared to other synthetic absorbable sutures, providing biological evidence supporting our clinical observations.

**Post-operative Pain:** The significantly lower pain scores in the monocryl group ( $1.44 \pm 0.64$  versus  $2.24 \pm 1.03$ ,  $p < 0.0001$ ) represent an important quality-of-life outcome. Several mechanisms contribute to this difference. First, the absence of transcutaneous suture material eliminates a source of foreign body sensation and mechanical irritation. Second, the buried knot technique prevents palpable knots on the wound surface that can cause discomfort. Third, patients in the monocryl group avoid the additional pain and anxiety associated with suture removal procedures.

Vasudeva et al. reported similar findings in their observational study comparing subcuticular and mattress suturing techniques following obstetric and gynecological laparotomies.[38] Their study demonstrated higher patient satisfaction with subcuticular sutures, attributing this primarily to reduced pain and elimination of suture removal anxiety. These findings emphasize the multifaceted nature of post-operative pain, encompassing both acute procedural pain and anticipatory anxiety.

**Cosmetic Outcomes:** The superior cosmetic outcomes in the monocryl group (92% excellent versus 60% excellent,  $p = 0.0002$ ) represent a critical outcome for patient satisfaction, particularly in younger patients and procedures on visible body areas. The subcuticular technique eliminates suture track marks ("railroad tracking") that commonly occur with transcutaneous sutures, especially when sutures remain in place beyond optimal timing. The continuous running subcuticular technique also provides more uniform wound edge approximation compared to interrupted sutures, resulting in finer, less conspicuous scars.

Lima et al. conducted a randomized clinical trial comparing poliglecaprone 25 and nylon sutures for skin closure in cesarean sections.[41] Their assessment at various post-operative intervals demonstrated that absorbable monofilament sutures (poliglecaprone 25) produced significantly less hypertrophic scarring, thinner scars, and more acceptable scar color compared to non-absorbable nylon sutures, corroborating our cosmetic findings.

Ezzatollah et al. compared Monocryl and Prolene sutures in reduction mammoplasty, finding no significant difference in scar quality between the two materials.[45] However, their study focused on comparing two different suture materials rather than techniques, and both groups utilized similar suturing methods, limiting direct comparison to our study.

**Microbiological Findings:** Although bacterial growth was detected less frequently in the monocryl group (2% versus 6%), this difference did not reach statistical significance ( $p = 0.307$ ), likely due to the small number of infected cases overall. *Staphylococcus aureus*, the most common causative organism in surgical site infections, was the only pathogen isolated in our study. The low overall infection rate reflects adherence to strict aseptic protocols and appropriate antimicrobial prophylaxis. Ming et al. demonstrated in vitro and in vivo antibacterial efficacy of poliglecaprone 25 sutures coated with triclosan against various bacteria including *Staphylococcus aureus*. [11,12] While standard Monocryl sutures were used in our study (without antibacterial coating), the reduced infection rate observed supports the inherent advantages of monofilament absorbable sutures in subcuticular position.

**Study Strengths and Limitations:** The strengths of this study include its prospective design, standardized surgical techniques, comprehensive outcome assessment, and adequate follow-up. The inclusion of diverse surgical procedures enhances generalizability to routine general surgical practice. Multiple clinically relevant outcomes were assessed, providing a holistic evaluation of the two closure techniques.

However, several limitations warrant consideration. The single-center design may limit generalizability to other settings with different patient populations or surgical practices. The relatively short follow-up period (one month) precluded assessment of long-term outcomes such as incisional hernia development or scar maturation, which may take months to years to manifest. Blinding was not feasible due to the obvious visual differences between closure techniques, potentially introducing bias in subjective outcome assessments such as cosmetic evaluation. The exclusion of emergency procedures and contaminated wounds limits applicability to these clinical scenarios. Finally, cost-effectiveness analysis was not performed, although the reduced hospital stay and antibiotic usage suggest potential economic benefits warranting formal evaluation.

**Clinical Implications:** The findings of this study have important implications for surgical practice. Subcuticular monocryl suture closure should be considered the preferred technique for wound closure in clean elective surgical procedures when technically feasible. Surgeons should receive adequate training in subcuticular suturing techniques to facilitate broader adoption. Patient counseling should include information about the benefits of subcuticular closure, particularly regarding cosmetic outcomes and elimination of suture removal procedures. From a healthcare system perspective, the shorter hospital stays and reduced antibiotic requirements associated with subcuticular monocryl closure suggest potential cost savings despite higher suture material costs. Comprehensive cost-effectiveness analyses incorporating all relevant costs and outcomes would provide valuable information for policy decisions.

**Future Research Directions:** Future research should address several unanswered questions. Multicenter randomized controlled trials with larger sample sizes and longer follow-up periods would provide more robust evidence and allow assessment of long-term outcomes. Comparative studies in specific surgical subspecialties (cardiac, orthopedic, gynecological) would inform specialty-specific recommendations. Economic evaluations incorporating quality-adjusted life years would facilitate resource allocation decisions. Investigation of patient-reported outcomes including body image, quality of life, and return to work would provide comprehensive assessment of intervention impact. Finally, studies examining the learning curve for subcuticular suturing and development of educational interventions could facilitate skill acquisition among surgeons.

## Conclusion

This comparative study provides compelling evidence that subcuticular monocryl suture closure offers significant advantages over conventional interrupted suture closure for wound closure in clean elective surgical procedures. Patients who underwent subcuticular monocryl closure experienced substantially fewer wound complications, shorter hospital stays, reduced antibiotic requirements, accelerated wound healing, less post-operative pain, and superior cosmetic outcomes compared to those who received conventional interrupted sutures. All differences achieved statistical significance, supporting the clinical importance of these findings.

The threefold reduction in wound complications (6% versus 20%) represents a clinically meaningful improvement in patient safety. The two-day reduction in hospital stay and two-day reduction in antibiotic coverage have important implications for healthcare resource utilization and antibiotic stewardship. The significantly better cosmetic outcomes address an important aspect of patient satisfaction often overlooked in surgical outcome assessments. Based on these findings, subcuticular monocryl suture closure should be considered the preferred technique for wound closure in clean elective general surgical procedures. The technique is safe, effective, and associated with superior outcomes across multiple clinically relevant domains. Surgeons should be encouraged to adopt this technique when appropriate, and surgical training programs should emphasize teaching proper subcuticular suturing skills.

While these results are encouraging, continued research with longer follow-up periods, larger multicenter populations, and comprehensive cost-effectiveness analyses will further inform evidence-based wound closure practice and ultimately improve surgical outcomes and patient satisfaction.

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