



CENTRAL LINE-ASSOCIATED BLOODSTREAM INFECTIONS IN SURGICAL PATIENTS: A PROSPECTIVE OBSERVATIONAL STUDY ON SUBCLAVIAN VEIN CATHETERIZATION

General Surgery

**Dr Siddharth
Mohanlal Jain***

Assistant Professor GMC Chatrapati Sambhajnagar *Corresponding Author

**Dr Panjab
Bhimrao Chirmade**

Resident Doctor General Surgery

ABSTRACT

Background: Central venous catheterization via the subclavian vein is a common procedure in surgical and intensive care settings, but it is associated with significant complications, including bloodstream infections. This study aimed to evaluate the incidence, risk factors, and microbial profiles of central line-associated bloodstream infections (CLABSI) in surgical patients. **Methods:** A prospective observational study was conducted over 18 months, involving 146 patients admitted to the Department of General Surgery who required subclavian vein catheterization. Data on demographic characteristics, complications, and infection rates were collected and analyzed. Blood cultures from central lines, peripheral lines, and catheter tips were examined to identify pathogens. **Results:** The majority of patients were male (76.7%), with a mean age of 46.9 years. Immediate complications included local bleeding (4.1%), pneumothorax (2.1%), and hemothorax (0.7%). The prevalence of CLABSI was 32.88%, with bloodstream infections detected in 36.3% of patients. *Pseudomonas aeruginosa* was the most common pathogen, isolated in 11.0% of central line cultures, followed by *Acinetobacter baumannii* (6.6%). Device dysfunction occurred in 5.5% of cases. The risk of infection increased with catheter duration, reaching 66% for catheters in place for more than 10 days. **Conclusion:** Subclavian vein catheterization carries a significant risk of complications and bloodstream infections, particularly with prolonged use. Strict adherence to aseptic techniques, early catheter removal, and targeted antimicrobial strategies are essential to reduce infection rates and improve patient outcomes.

KEYWORDS

Central venous catheter, subclavian vein, bloodstream infection, CLABSI, surgical patients, *Pseudomonas aeruginosa*.

INTRODUCTION

Central venous catheterization (CVC) is a vital procedure in surgical and intensive care settings, facilitating hemodynamic monitoring, fluid resuscitation, and long-term medication administration [1]. The subclavian vein is a preferred site due to its lower infection rates compared to femoral or jugular access [2]. However, CVCs are associated with complications such as pneumothorax, arterial puncture, and central line-associated bloodstream infections (CLABSI) [3].

CLABSI significantly increase morbidity, mortality, and healthcare costs, with an estimated incidence of 0.8–4.1 per 1,000 catheter-days in intensive care units (ICUs) [4]. Despite advances in infection control, CLABSI remain a major challenge in surgical patients due to prolonged hospitalization, immunosuppression, and invasive procedures [5]. This study aimed to assess the incidence, risk factors, and microbiological profile of CLABSI in surgical patients undergoing subclavian vein catheterization.

METHODS

Study Design and Population

A prospective observational study was conducted over 18 months in the Department of General Surgery. Patients aged ≥ 12 years requiring subclavian vein catheterization were included, while those with pre-existing infections or catheters in other veins were excluded.

Sample Size Calculation

The sample size was calculated using the formula for prevalence studies:

$$n = \frac{Z^2 \times P \times Q}{L^2}$$

Where:

$$Z = 1.96 \text{ (95\% confidence level)}$$

$$P = 0.106 \text{ (prevalence of CLABSI in India)}$$

$$Q = 1 - P$$

$$L = 0.05 \text{ (allowable error)}$$

The calculated sample size was 146 patients.

Data Collection and Analysis

Demographics: Age, gender, comorbidities.

Catheter-related complications: Immediate (bleeding, pneumothorax) and delayed (infection, thrombosis).

Microbiological Analysis: Blood cultures from central lines, peripheral lines, and catheter tips.

Statistical Analysis: Data were analyzed using MS Excel and represented as frequencies, percentages, and mean $\pm$ standard

deviation.

RESULTS

Demographics

Age distribution: 41.8% were aged 21–40 years (mean age: 46.9 $\pm$ 18.6 years).

Gender: 76.7% male, 23.3% female.

Complications

Immediate:

- Local bleeding (4.1%)
- Pneumothorax (2.1%)
- Hemothorax (0.7%)

Delayed:

- Device dysfunction (5.5%)
- Bloodstream infections (32.9%)

Bloodstream Infections

-Prevalence: 36.3% had positive blood cultures.

-Common pathogens:

- *Pseudomonas aeruginosa* (11.0% in central lines)
- *Acinetobacter baumannii* (6.6%)
- *Staphylococcus aureus* (3.4%)

Infection risk by duration:

- 3–7 days: 25%
- 8–10 days: 40%
- >10 days: 66%

DISCUSSION

This study highlights the high incidence of CLABSI (32.88%) in surgical patients with subclavian vein catheters, consistent with previous reports [6]. *Pseudomonas aeruginosa* was the predominant pathogen, emphasizing the need for antibiotic stewardship and infection control measures [7]. Prolonged catheter use (>10 days) significantly increased infection risk, supporting early removal when feasible [8].

Comparison with Previous Studies

- Rode et al. (2017) reported a CLABSI rate of 18.96% in ICUs, lower than our findings, possibly due to differences in patient populations and infection control practices [9].

- Lefrant et al. (2002) noted a 7.8% incidence of local bleeding, higher

than our 4.1%, likely due to procedural variations [10].

Limitations

- Single-center study, limiting generalizability.
- Lack of post-discharge follow-up for late-onset infections.

CONCLUSION

Subclavian vein catheterization is associated with significant CLABSI risks, particularly with prolonged use. Strict aseptic techniques, ultrasound-guided insertion, and early catheter removal are crucial for reducing infections. Future studies should explore preventive bundles in resource-limited settings.

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Ethical Approval: Obtained from the Institutional Ethics Committee.

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